WORLD MARITIME UNIVERSITY
Malmö, Sweden

A PROPOSAL FOR THE TRAINING AND CERTIFICATION OF GMDSS IN THE PEOPLE'S REPUBLIC OF CHINA

by

YE Yue Qian

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I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has been previously conferred upon me.

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

(Signature) 叶跃前
(Date) NOV. 5, 1992

Supervised by:

Professor Zade
Vice Rector and Academic Dean
World Maritime University

Assessed by:

J.H. Mulders
Visiting Professor
World Maritime University

Co-assessed by:

Captain L. Brödje
Maritime Advisor
INMARSAT
London
Visiting Professor
World Maritime University

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ABSTRACT

It is well known that GMDSS has been implemented since 1992.

In planning for a smooth introduction of GMDSS, China, which operates more than 1500 ocean-going vessels, is facing with two major tasks, namely:

1) to conduct GMDSS training of communications personnel;

2) to establish a GMDSS course for the students who will obtain a General Operator's Certificate.

To fulfill these two tasks, the author introduces the current implementation of GMDSS and training of communications personnel in China, according to the 1988 amendment of SOLAS Convention, 1974 and the 1991 amendment of STCW Convention, 1978. Taking the situation of China into consideration, the author makes some proposals for GMDSS training and certification in China.

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Chapter ONE: Introduction

1.1 The need of a new system for maritime distress and safety communications

Every year, several ships vanish without trace, either because they can not get a distress message out in time, or because the distress message they do get out is not received. At the heart of the problem lies a distress communications system based on radio technology that, in essence, is almost a hundred years old-although, of course, there certainly have been improvements over the years. GMDSS is being introduced to counter its shortcomings and to enhance maritime safety by providing the most up-to-date radiocommunications technology.

The current system is centred on relatively short range communications. As such, it relies on other ships being in range of the ship in distress and being fitted with equipment that operates on the same frequencies. In the less populated sea lanes, this can never be guaranteed, particularly as the combination of radio equipment that a ship must carry is minimal and is determined solely by her size and not by the area she operates in.

Under the existing system, a qualified radio officer is required to operate shipboard radio-telegraph equipment above 1600 GRT. This is not just a regulatory quirk but a reflection of the specialist skills that are needed to send out a distress message that otherwise might not be sent.

The GMDSS will change the emphasis in distress

communications from ship-to-ship alerts to ship-to-shore alerts. Using the latest, automated technology in both satellite and terrestrial communications it will give all ship, wherever they are sailing, the ability to transmit a distress alert both to ships in the vicinity and to search and rescue authorities ashore. It will also promote easy-to-use equipment that will allow non-specialists to send distress communications also provide means for distress relays from RCCs.

1.2 Basic Concept of the GMDSS

The basic concept of the system is that search and rescue authorities ashore, as well as shipping in the immediate vicinity of the ship in distress, will be rapidly alerted to a distress incident so they can assist in a co-ordinated search and rescue operation with the minimum of delay. (Please refer to page 3 "Figure 1")

1.2.1 The Old System

The distress and safety system formerly used by world shipping was regulated by the International Convention for the Safety of Life at Sea, 1974 (SOLAS)- Chapter IV and the Radio Regulations of the International Telecommunication Union (ITU). It required Morse telegraphy on 500 KHz and on telephony 156.8 MHz(Channel 16) for all ships 1600 GRT and above.

The traditional system was thus primarily a ship-to-ship service whose effectiveness depended on other ships being within range, since the maximum required range of radiotelegraphy and radiotelephone equipment was only 135 nautical miles. The system also had other disadvantages,

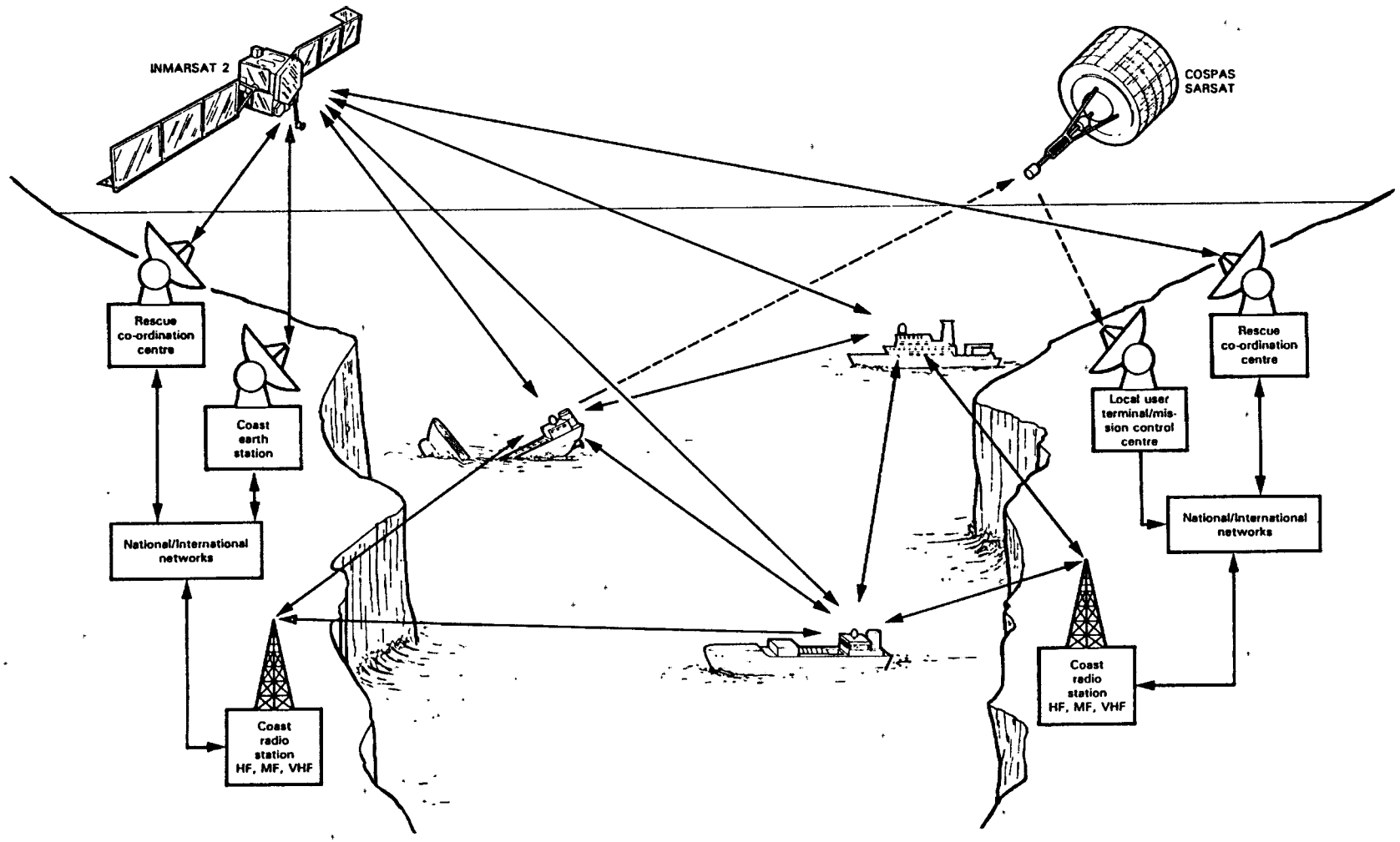


Figure 1 – General concept of the global system

such as reception difficulties, manual distress altering and the need for ships to maintain a continuous radio listening watch.

1.2.2 The New System

The **GMDSS** is a new maritime radiocommunications system for distress and safety purposes that has been designed to ensure a combination of safety and efficiency; consequently, it is a largely automated system. The system applies to all **SOLAS** Convention cargo vessels of 300 gross tonnage and upward, and to all passenger ships on international voyages.

IMO Member Governments decided to take advantage of the major technological advances in modern radio communications, including satellite capabilities, in developing the new maritime distress and safety system. The **GMDSS** also provides for urgency and safety communications and the dissemination of maritime safety information, including navigational and meteorological warnings. Every ship is able, irrespective of the area in which it operates, to perform those communications functions considered essential for the safety of the ship itself and of other ships operating in the same area.

1.3 Introduction to the Amendments to the STCW Convention, 1978

The 1988 **GMDSS** Conference having adopted the maintenance requirements to (Regulation **IV/15**) and the requirements for radio personnel it was then possible for the Sub-Committee on Standards of Training and Watchkeeping(**STW**) to finalize its revision of chapter IV of the 1978 **STCW**

Convention at its twenty first session in 1989.

The amendments to the 1978 STCW Convention attached hereto, were adopted by the expanded Maritime Safety Committee by resolution MSC.21(59) on 22 May 1991 and will enter force on 1 December 1992.

The amendments are complimented by the draft Assembly resolution on training of radio personnel (GMDSS) (MSC 59/33, annex 23), attached hereto, which was adopted by the 17th Assembly in November 1991. The resolution contains at:

Annex1- Recommendation on training of radio operators related to the first-class radioelectronic certificate;

Annex2- Recommendation on the training of radio operators related to the second-class radio electronic certificate;

Annex3- Recommendation on the training of radio operators related to the general operator's certificate;

Annex4- Recommendation on the training of radio operators related to the restricted operator's certificate; and

Annex5- Recommendation on training of personnel performing maintenance of the GMDSS installations aboard ships

1.4 Introduction to the Amendments to the SOLAS Convention, 1974

On 9 November 1988, IMO, on the Conference of Contracting Governments to the International Convention of the Safety of Life at Sea, 1974 on the Global Maritime Distress and Safety System adopted, in accordance with article VIII(c)(ii) of the Convention, amendments to chapter I, II-1 III, IV, V of, and the appendix to the Convention.

Chapter I deals with General Provisions

Chapter II-1 deals with Construction-Subdivision and Stability, Machinery and Electrical Installations.

Chapter III deals with Life-Saving Appliances and Arrangements.

Chapter IV deals with Radiocommunications, the existing text of chapter IV is completely replaced by a new chapter IV.

Chapter V deals with Safety of Navigation.

The existing **APPENDIX** deals with the ship's certificates is completely replaced by a new **APPENDIX**.

Chapter TWO: Introduction to the GMDSS

2.1 Introduction

The biggest change to distress communications at sea since the introduction of radio at the beginning of the century began on 1 February, 1992 when the Global Distress and Safety System (GMDSS) entered into force.

The GMDSS was adopted in 1988 by the Conference of Contracting Governments to the international Convention for the Safety of Life at sea (SOLAS), 1974, on the GMDSS. The conference was convened by IMO and the GMDSS was adopted in the form of amendments to SOLAS which entered into force on 1 February, 1992. The Convention has been ratified by 114 countries and applies to 97% of the world's fleet of merchant ships.

The new system will be phased in between 1992 and 1999. The GMDSS will be a ship-to-shore, shore-to-ship and ship-to-ship system. The equipment required on board ships will depend not on their tonnage, as in the existing system, but on the sea areas in which they operate.

2.2 Communications Functions

IMO has defined nine principal communications functions which need to be performed by all ships and then specified the equipment that would meet these functional requirements in the specific sea areas in which they trade. In other words, every ship will be provided, irrespective of the area in which it operates, with radio

installation capable of participating in these nine communications functions throughout its intended voyage:

1. Distress alerting--ship-to-shore
2. Distress alerting--shore-to-ship
3. Distress alerting--ship-to-ship
4. Search and rescue co-ordination communications
5. On-scene communications
6. Locating signals
7. Transmitting and receiving maritime safety information
8. General radiocommunications
9. Bridge-to-bridge communications

2.3 Operational Areas

The oceans of the world have been divided into operational sea areas, which recognize the capabilities and limitations of various communications techniques. The Maritime Administration of each Contracting Government to the SOLAS 1974 Convention will define the sea(s) for its country, pursuant to the following IMO criteria:

Sea Area A1- a coastal area within radio-telephone coverage of at least one VHF coast radio station (range of 20-30 nautical miles) providing continuous digital selective calling (DSC) alerting;

Sea Area A2- an area, excluding Sea Area A1, within the radio-telephone coverage of at least one MF coast stations providing continuous availability of DSC alerting;

Sea Area A3- an area, excluding Sea Areas A1 and A2, within the coverage of INMARSAT

geostationary satellites providing for continuous availability of alerting;

Sea Area A4- an area outside Sea Area A1, A2 and A3. Basically, Sea Area A4 will be found only in high latitudes, e.g., the extreme polar areas.

2.4 Communications Systems that Support the GMDSS

2.4.1 Satellite Communications Systems

There are two satellite systems now open to use by ships for distress and safety purposes. One is the INMARSAT system, The other is the COSPAS-SARSAT system.

2.4.1.1 The INMARSAT System

As early as February 1966, IMO's Maritime Safety Committee (MSC) decided to study the operational requirements for a satellite communications system devoted to maritime purposes.

The main reasons for establishing such a system were:

* to improve distress, urgency and safety communications;
* to relieve existing congestion in the medium-frequency (MF) and high-frequency (HF) bands;
* to improve reliability, quality and speed of communications;
* to improve geographical coverage and ensure continuous availability of services;
* to provide more reliable circuits and permit automation of radiotelephony and teleprinters;

* to cater for services not possible at present in the MF and HF bands, such as high-speed data transmission;
* to provide for radiodetermination.

After much preparatory work and many conferences, in 1976 the convention on the International Maritime Satellite Organization (**INMARSAT**) was adopted.

The convention entered into force in 1979 and **INMARSAT** became operational in February, 1982 when it took over the system operated by **MARISAT**, an American system which had pioneered the use of satellites for merchant shipping.

The maritime satellite system has three major components: the satellite capacity provided by **INMARSAT**, the coast earth stations provided by **INMARSAT** Signatories and the ship earth stations.

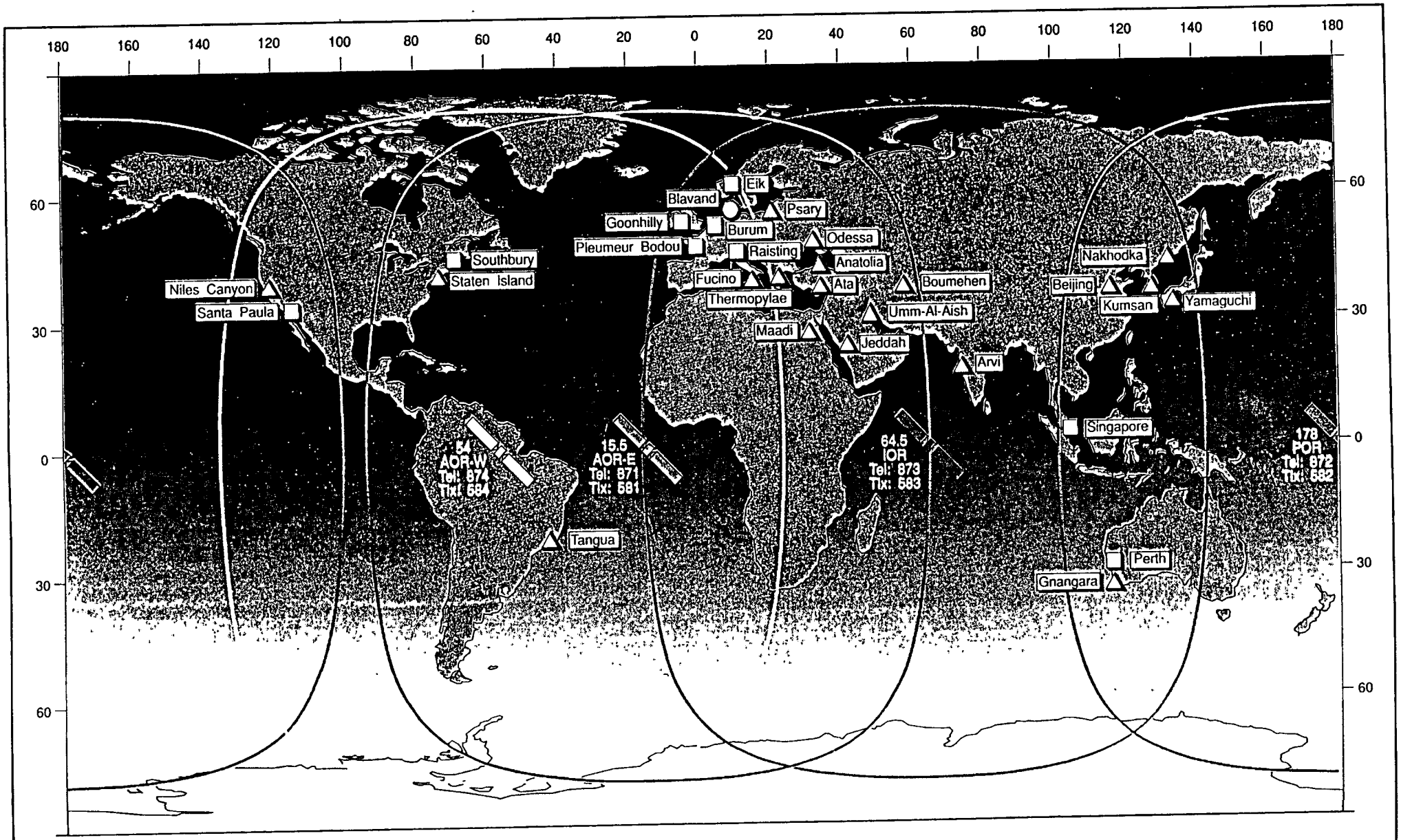
INMARSAT satellite system is based on four ocean regions. (Please refer to page 11 "Figure 2 " These are at:

* Atlantic Ocean Region East (**AORE**)
* Pacific Ocean Region (**POR**)
* Indian Ocean Region (**IOR**)
* Atlantic Ocean Region West (**AORW**)

The nerve centre of the system is the operations control center) located at **INMARSAT's** London headquarters. The **NCC** is also connected directly by leased lines to the satellite control centres of the organizations from which additional satellite capacity is currently leased and by its own ship earth stations to the Atlantic and Indian Ocean satellites, and to all coast earth stations around

WORLD OF MARITIME SATELLITE COMMUNICATIONS

Inmarsat



△ Inmarsat-A ○ Inmarsat-C ❑ Inmarsat-A + C

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the world. Operating 24 hours a day, it co-ordinates a wide range of activities. The **INMARSAT** headquarters in London also arrange the commissioning of ship earth stations upon application by the shipowner.

2.4.1.1.1 L-band EPIRBs

The **L-band EPIRBs** can be used in sea area **A1, A2** and **A3**. They operate on 1.6 GHz through the **INMARSAT** geostationary satellites, and are so designed that they may be automatically activated or manually activated. the vessels last position could be entered manually or connected to a position determining device. Some models will have an inbuilt GPS receiver. It has a output of about 1 watt and is effective in its coverage area of up to 70 degrees latitude North or South. It will give a quick alerting (about 2 minutes) and will give 20 alerts within a 10 minute interval, and will transmit a distress message containing the ship station identity, the last position and any other information which may help the rescue. It may also carry a 9 GHz radar transponder.

2.4.1.2 The COSPAS-SARSAT System

The **COSPAS-SARSAT** system is a satellite-aided search and rescue system designed to locate distress beacons transmitting on the frequencies 121.5 MHz or 406 MHz. It is intended to serve all organizations in the world with responsibility for search and rescue operations whether a distress occurs at sea, in the air or on land.

COSPAS-SARSAT is a joint international satellite-aided search and rescue system, established and currently operated by organizations in Canada, France, the United

States and the former USSR.

The COSPAS-SARSAT EPIRB operates on 121.5 MHz frequency and 406 MHz. It uses low altitude polar orbit satellites and complete global coverage is obtained. The position of the EPIRB is calculated by observed Doppler shifts and relayed to the closest Rescue Co-ordination Centre. As this system provides global coverage, IMO has decided that carriage is to be mandatory in the GMDSS system. Vessels trading in the areas A1, A2, and A3 may replace the 406 MHz EPIRB with an L-band EPIRB.

2.4.2 Terrestrial Communications System

2.4.2.1 Long-range Service

2.6.2.1.1 HF will provide long-range service for use in the ship-to-shore and shore-to-ship directions. In areas covered by INMARSAT it can be used as an alternative to satellite communications and outside these areas it will provide the only long-range communications capability. Frequencies have been designated in the 4, 6, 8, 12 and 16 MHz bands to provide means for transmitting and receiving distress alerts and safety calls and for passing distress and safety traffic.

2.4.2.1.2 Digital selective calling (DSC) will form the basis for distress alerting and safety calling. Coast stations participating in the HF distress and safety watchkeeping network will need to choose from the five available frequency bands relaying an alert. The choice will depend on the position of the ship in distress, the geographical area to be alerted and the current propagation characteristics. It is envisaged that ships

equipped with the HF option will maintain a watch on the 8 MHz alerting frequency and one of the other dedicated HF frequencies. The latter will be the frequency most appropriate to the area in which the ship is sailing.

2.4.2.1.3 Distress and safety communications following DSC calling will be performed by radiotelephony or narrow-band direct printing (NBDP) or both.

2.4.2.2 Medium-range Service

2.4.2.2.1 A medium-range service will be provided on frequencies in the 2 MHz band. In the ship-to-shore, ship-to-ship and shore-to-ship directions 2187.5 KHz will be used for distress alerts and safety calls by DSC, and 2182 KHz will be used for distress and safety traffic by radiotelephony, including SAR co-ordinating functions and on-scene communications. 2174.5 KHz will be used for distress and safety traffic by radiotelex (NBDP).

2.4.2.2.2 Frequencies near 500 KHz will be used in the shore-to-ship direction. The frequency 518 KHz is used to transmit navigational and meteorological warnings in the NAVTEX system.

2.4.2.3 Short-range Service

VHF will provide a short-range service on the following frequencies:

-- 156.525 MHz (channel 70) for distress alerts and safety calls by DSC, and

-- 156.8 MHz (channel 16) for distress and safety traffic

by radiotelephony, including SAR co-ordinating functions and on-scene communications.

2.5 Worldwide Navigational Warning Service (including NAVAREA Warnings Service and the International NAVTEX Service)

2.5.1 Introduction

The world-wide navigational warning service (WWNWS) has been established by IMO and IHO for the purpose of co-ordinating the transmission of radionavigational warnings in geographical areas. The delimitation of such areas is not related to and shall not prejudice the delimitation of any boundaries between States. Where appropriate, the term NAVAREA, followed by an identifying roman numeral, may be used as a short title for the areas.

2.5.2 Components of the WWNWS

2.5.2.1 NAVAREA Warnings Service

The NAVAREA warning service is directed towards the timely promulgation by satellite communication or terrestrial radio of information on hazards to navigation MSI and meteorological warnings in or near main shipping lanes and ocean areas, of concern to the international mariner. In each NAVAREA effective and adequate facilities for scheduled broadcast to the entire area are or will be established, taking into account the appropriate geographical location for propagation purposes with regards to terrestrial communication. Transmission coverage is of both the NAVAREA and as such of the adjacent areas as can be covered in 24 hours'

sailing by a fast ship (about 700 miles).

2.5.2.2 NAVTEX Service

This is a means of sending important maritime safety information (MSI) such as navigational and meteorological warnings and urgent messages, which is automatically received by the ship in printed form. The fact that this information is in printed form means that misunderstanding are less likely.

2.6 INMARSAT's Enhanced Group Call (EGC) System

The Enhanced Group Call (EGC) system enables INMARSAT to provide a global service capable of addressing messages to predetermined groups of ships or all vessels in both fixed and variable geographical areas.

The system supports INMARSAT's SafetyNET service, which is able to meet the requirements of authorities and administrations for the broadcasting anywhere in the world of global, regional or local maritime safety information (navigation warnings, meteorological warnings and forecasts, shore-to-ship distress alerts and other urgent information). In addition to covering the mid-ocean areas, the EGC system can also provide an automated service in coastal areas where countries may not find it economical to install 518 KHz NAVTEX transmitters for low density shipping.

Through the INMARSAT FleetNET service, commercial users can address any national or commercial fleets of ships in a single group call. It is possible also to offer subscription type services (eg. news) to any mixed group

of vessels.

A particularly useful feature is the ability to direct a call to a given geographical area. The area may be fixed, as in the case of a **NAVAREA** or weather forecast area, or it may be unique defined. This will be useful for messages, such as a local storm warning or a shore-to-ship distress alert, for which it is inappropriate to alert all ships in an ocean.

The format of SafetyNET messages is functionally compatible with **NAVTEX**- a major advantage to safety authorities in the preparation and despatch of messages.

EGC messages can be transmitted in any international alphabet or language.

2.7 Ship Equipment Carriage Requirements Under GMDSS

2.7.1 Minimum Equipment Requirements

With communications functions and operational areas defined, IMO specified the communications equipment to be each of the areas of operation. All **SOLAS** Convention ships of 300 gross tonnage and above are required to carry a minimum set of communications equipment:

1. **VHF** installation capable of transmitting and receiving DSC on channel 70 and radiotelephony on channel 6, 13 and 16;

2. Equipment able to maintain continuous DSC watch on **VHF** channel 70;

3. Radar transponder operating in 9 GHz band;

4. Receiver, capable of receiving International **NAVTEX** service broadcasts, if the ship operates in any area where **NAVTEX** is provided;

5. Facility for reception of maritime safety information by the **INMARSAT** Enhanced Group Call system (SafetyNET service), if on voyage in areas of **INMARSAT** coverage where **NAVTEX** is not provide;

6. Satellite emergency position-indicating radio beacon (**EPIRB**) capable of being manually activated and floating-free and activating automatically.

2.7.2 Additional Requirements for Ship Operating Exclusively in Sea Area A1:

1. The **VHF** installation shall be capable of general radiocommunications using telephony;

2. (Optionally), a float-free **EPIRB** capable of transmitting of a distress alert using DSC on **VHF** channel 70, in lieu of a satellite **EPIRB**;

3. Another installation capable of initiating the transmission of a distress alert from the navigating position, either by (1) **VHF** using DSC, (2) Manual activation of an **EPIRB**; (3) **MF** using DSC; (4) **HF** using DSC, or (5) an **INMARSAT** ship earth station.

2.7.3 Additional Requirements for Ship Operating in Sea Area A1 and A2:

1. An MF installation capable of telephony on 2182 KHz and DSC on 2187.5 KHz;

2. Equipment capable of maintaining continuous DSC watch on 2187.5 KHz;

3. Equipment capable of general radio communications on working frequencies in the MF band 1605-4000 KHz, OR an INMARSAT ship earth station;

4. Another means of initiating the transmission of distress alerts from the navigating position by a radio service other than MF, either by: (1) Manual activation of a satellite EPIRB; (2) HF using DSC, or (3) an INMARSAT ship earth station.

2.7.4 Additional Requirements for Ship Operating in Sea Areas A1, A2 and A3(i.e. Within Coverage of INMARSAT Satellites):

1. MF installation capable of telephony on 2182 KHz and DSC on 2187.5 KHz;

2. Equipment capable of maintaining continuous DSC watch on 2187.5 KHz;

3. INMARSAT-A or INMARSAT ship earth station OR an HF radio installation as required for Sea Area A4;

4. Facilities must include at least two of the following radio systems for transmitting the

distress alert from the navigating position: (1) INMARSAT ship earth station (INMARSAT-A or INMARSAT-C); (2) Manual activation of a satellite EPIRB; (3) HF radio installation.

2.7.5 Additional Requirements for Ships Operating in Sea A4 (Outside the INMARSAT Coverage):

1. MF/HF radio installation capable of transmitting and receiving on all distress and safety frequencies in the band 1605-27500 KHz using DSC telephony and direct-printing. It shall also be capable of general communications using telephony of direct-printing in band 1605-27500 KHz;

2. Equipment capable of selecting any of the distress and safety DSC frequencies in the band 4000-27500 KHz, and maintaining DSC watch on 2187.5, 8414.5 KHz and at least one additional distress and safety DSC frequency in the band.

3. Capability to initiate a distress alert from the navigating position through the polar orbiting satellite system on 406 MHz(manual activation of a 406 MHz satellite EPIRB).

2.8 Equipment Availability Requirements

1. In sea areas A1 and A2 availability shall be ensured by duplication of equipment, shore-based maintenance or at-sea maintenance, or a combination of these as approved by the Administration.

2. In sea areas A3 and A4 availability shall be

ensured by a combination of at least two methods such as duplication of equipment, shore-based maintenance or at-sea maintenance as approved by the Administration.

2.9 The Role of the Radio Officer/Radio Operator

One important issue before IMO and ITU while developing the new system concerned the role of the radio officer under the GMDSS. Under former regulations, ships that were required to be fitted with radiotelegraphy equipment must carry a radio officer trained in the use of Morse code. The introduction of the GMDSS, however, will result in the gradual phasing out of Morse radiotelegraphy in favour of direct-printing telegraphy ("telex" by radio) or through maritime satellite communications.

As a result, many governments maintained that there will be no need to have a radio officer on board, since it requires no special skills to use a radiotelephone or operate the other emergency equipment that will be required by the system.

Other governments insisted that, although a radio officer may not be required, a radio specialist will still be needed to carry out on-board maintenance and emergency repairs.

A compromise between these two positions was successfully achieved during the GMDSS Conference and, under regulation 15 of the amended chapter IV, ships operating in areas A1 and A2 must ensure the availability of equipment, "by using such methods as duplication of equipment, shore-based maintenance or at sea electronic

maintenance capability, or a combination of these, as may be approved by the Administration of at least two of these methods must be used.

On ships engaged in sea area **A3** and **A4**, the availability shall be ensure by using a combination of at least two methods such as duplication of equipment, shore-based maintenance or at-sea electronic maintenance capability, or a combination of these as may be aproved by the Administration, taking into account the recommendations of the Organisation.

Regulation 16 deals with radio personnel. This states that "every ship shall carry personnel qualified for distress and safety radiocommunication purposes to the satisfaction of the Administration. The personnel shall be holders of certificates specified in the Radio Regulations as appropriate, any one of whom shall be designated to have primary responsibility for radio communications during distress incidents."

Chapter THREE: The Implementation of the GMDSS in the P.R. of China

3.1 China's Main Features

A brief introduction about China's main features will facilitate the proper understanding this chapter.

3.1.1 Population

China has a population of over 1.1 billion, about one fifth of the whole population of the world.

3.1.2 Geography

China covers a land area of 9.6 million square kilometers, the second largest in the world, after Canada. Its mainland coastline spreads from North-east down to the South aggregating some 18,000 kilometers. The whole country is divided into 31 administrative districts (28 provinces and autonomous regions including Taiwan, and 3 municipalities, namely Beijing, Shanghai and Tianjin).

3.1.3 The Government

The People's Republic of China (referred as the P.R. of China or China in this paper) was founded by the Chinese Communist Party on the first of October 1949. According to the current Constitution of the People's Republic of China, the People's Congress is the paramount powerful and legislative organization of the country. The state Council is the central administrative body of the state.

The Supreme Court has the responsibility of implementation of the country's legislation.

3.1.4 China Is a Socialist Country

After the founding of new China the government carries out a policy of centralize plan. Since 1979 a new general policy has been adopted, that is the policy of reforms, open-door and invigorating the economy. The structure of government in China was reformed in order to be in line with the general policy.

3.1.5 China Is a Developing Country

Since 1949 rapid progress is being made in the development of national economy. Although Chinese government paid and pays much attention to the transport and communications sector, but they are not yet ready to meet all the demands.

Due to the well known reasons new China had to carry on the construction of country in a closed situation. In a broad sense, for long time railways were almost the sole means of transportation. Ocean shipping, civil aviation and pipelines in China started to develop in late fifties and the beginning of sixties. Owning to the historical factor China's five principal modes of transportation--rail, road, water, air and pipeline are controlled by separate organizations at national level. Only road and waterborne transportations are within the competence of the Ministry of Communications.

3.2 Relevant Authorities Responsible for the Implementation of GMDSS

The Ministry of Communications is the body which is responsible for the introduction of GMDSS. The Ministry has thirteen offices, departments, Bureaus and administrations which are advised to carry out the introduction of GMDSS. Among other things, they are the Register of Shipping of the People's Republic of China (the P.R. of China), the Harbour Superintendency Administration, the China Transport and Telecommunication Centre and the Maritime Rescue and Salvage Bureau which are mainly involved in the field of introduction of GMDSS.

3.2.1 The Register of Shipping of the P.R. of China

The Register of Shipping of the P.R. of China is a state bureau which conducts statutory surveys of ships, offshore installations, containers, ship machinery, major equipment, parts and materials. The main function of the Register is, through these statutory surveys, to ensure ships, offshore installations and containers to be equipped with proper technical conditions so as to ensure the safety of life and property at sea and the safe shipping and operation as well as the prevention of marine pollution from ships and offshore installations. In the field of introduction of GMDSS, the Register of shipping of the P.R. of China is mainly responsible for the introduction, installations and survey of GMDSS equipment on the shore as well as on the board ship.

3.2.2 The Harbour Superintendency Administration

The Harbour Superintendency Administration plays an active part in maintaining national sovereignty, ensuring water-borne traffic safety, promoting sea transport. Under the authority of the Ministry of Communications the Harbour Superintendency Administration is the competent authority responsible for the supervision of the water-borne traffic safety.

The main functions of the Harbour Superintendency Administration are:

1. Ship registration
2. Port state control of sea-going ships
3. Prevention of marine pollution
4. Examination and certification of seafarers
5. Safety of navigation
6. Supervision of transport of dangerous goods
7. Search and rescue

In the field of introduction of GMDSS, the Harbour Superintendency Administration is mainly responsible for the GMDSS examination and certification of seafarers.

3.2.3 The China Transport and Telecommunication Centre

The China Transport and Telecommunication Centre is a governmental organ led by but outside the Ministry of Communications.

In the maritime field, the China Transport and Telecommunication Centre is mainly responsible for:

1. Administering activities of transport telecommunication;
2. Planning and implementing a transport telecommunication network;
3. Providing day and night listening watch on international distress frequencies;
4. Transferring the information on distress at sea to the Harbour Superintendency Administration;
5. Providing the communication links between the relevant SAR units, including vessels engaged in search and rescue activities.

In the field of introduction of GMDSS, the China Transport and Telecommunication Center is mainly responsible for the construction of GMDSS facilities on shore and the installation of GMDSS equipment on board ship.

3.2.4 The Maritime Rescue and Salvage Bureau

The Maritime Rescue and Salvage Bureau takes the tasks of:

1. Search and rescue operation.
2. Searching and salvaging the ships in distress.
3. Salvaging ships.
4. Fire-fighting at sea.
5. Prevention of marine pollution.
6. Providing underwater operation with divers.

The Bureau has three branches at Yantai, Shanghai and Guangzhou and 16 coastal rescue stations located along the coastline. Each station is provided with a stand-by rescue boat on duty round the clock. Currently the Bureau

has about 9,000 employees, including 600 divers and 5,000 seafarers. The technical personnel accounts for 30% of the total.

The branches, especially the stations, play important roles in the operation of rescue and salvage. Usually the head of the branches or rescue stations acts as the commander on scene during these operations.

In the field of introduction of GMDSS, the Maritime Rescue and Salvage Bureau takes the tasks of the construction of Search and Rescue facilities and any activities relating to Maritime Search and Rescue.

3.3 The Introduction of GMDSS in China

3.3.1 The establishment of GMDSS is an internationally compulsory requirement. The "SAR Convention 1979 " came into force on the 22nd of June, 1985. The Chinese government ratified this convention on the 24th of July , 1985. Therefore, China must comply with this international convention.

3.3.2 As soon as GMDSS becomes operational, vessels will use the advanced facilities which meet the requirements of GMDSS. The Coast Radio Stations and the Coast Earth Stations (CESs) are the unique facilities which can be used to communicate with domestic and ocean-going vessels. Therefore, it is logical to use these facilities which meet the requirement of GMDSS.

3.3.3 The present facilities of Coast Radio Stations in China are, however, obsolete as they have a high failure rate and incur great maintenance expenses. Most

facilities were set up during the 1950s or the 1960s and some were even installed during the 1940s. Taking Shanghai Coast Radio Station, which is the largest coast radio station in China, as an example: six percent of its facilities was established during the 1940s or 1950s, eighty-eight percent during the 1960s and six percent during the 1970s. As these facilities do not meet the operational requirements under GMDSS, they need to be renewed as soon as possible.

3.3.4 According to statistics, there are some three thousand marine accidents and casualties occurring per year in China, the direct economic loss reaches six million U.S. dollars. Nevertheless, the present ship-shore distress safety communication system in China is fully manually operated, has a low reliability which means a low rate of successful communication when a vessel is in distress. It has been shown in several incidents that this will cause great losses of economy and lives, damage Chinese reputation if a vessel is not able to send a distress message or shore stations are not able to receive the distress message. So, there is a need for the national shipping community to establish a modern Maritime Safety System.

3.4 The Introduction Scheme

3.4.1 The Sub-system of SATCOM

The SATCOM subsystem is the main technical fundament of the Maritime Safety System. The sub-system of SATCOM is the main means of global, all-time and all-weather communication. An INMARSAT A/C standard CES has been built in Beijing. In addition, an INMARSAT B/M standard

CES is being built in Beijing as well in order to fit in with the development of the international maritime SATCOMs.

3.4.2 The Sub-system of COSPAS-SARSAT

According to the requirement of GMDSS, all ships of 300 gross tons and above on international voyages must carry a satellite EPIRBs either COSPAS-SARSAT or L-band EPIRB requirements by August 1, 1993. Therefore, the Local User Terminal (LUT) of COSPAS-SARSAT, which will be set up at Shahe, near Beijing in 1993, will provide information for the search and rescue authorities, reduce the searching time at sea by means of receiving the distress signals of 406 MHz EPIRBs, automatically finding the distress location.

3.4.3 The Sub-systems of MF , HF and VHF

The sub-system of the terrestrial radio communication is the main way of short distance alerting communication within the Maritime Safety Communication. It is the essential means of a vessel which sails in the sea areas which can not be seen by INMARSAT's geostationary satellites and a vessel on international voyage which has not been outfitted with satellite' Ship Earth Station (SES) using Digital Selective Calling (DSC), Narrow Band Direct Printing (NBDP), Single Side Band (SSB) telephony and VHF transceiver. Therefore, China will reconstruct and extend the twenty three coast radio stations which are currently open to foreign vessels and get additional equipment.

3.4.3.1 Extending the Shanghai Coast Radio Station

which, participates in the international DSC watchkeeping. Implementing DSC watchkeeping circuit of channel 4, 6, 8, and 16. At the same time, this Coast Radio Station can be served for distress and safety communications by the means of NBDP and SSB in corresponding international frequencies.

3.4.3.2 Expanding the Coast Radio Stations which take over the DSC watchkeeping along the national coast and of the open sea beyond the littoral zone. Establishing specific watchkeeping circuit of channel 4, 6, 12, 16, 18 and 22 MHz DSC. At the same time, these Coast Radio Stations can be used for distress and general communications through NBDP and SSB in corresponding frequencies.

3.4.3.3 Extending the Coast Radio Stations which participate the DSC watchkeeping in the sea area along national coast and nearby waters. Setting up DSC specific watchkeeping circuit of channel 4, 6, 8 MHz. At the same time, these Coast Radio Stations can be used for distress and general communications through NBDP and SSB in corresponding national frequencies.

3.4.3.4 Apart from expanding the Coast Radio Stations above, constructing MF DSC watch keeping circuits in the other harbors, which are open to foreign vessels. Also, distress and general communications are available by NBDP and SSB in corresponding frequencies. Getting additional circuits of international VHF DSC watchkeeping. Also, distress and general communications are available in corresponding frequencies.

3.4.4 Setting up the NAVTEX System

The NAVTEX circuit on frequency 518 KHz is an important sub-system of precaution and of ensuring the safety of navigation. The sub-system of NAVTEX covering the Chinese coastal sea waters will be implemented so as to enhance the safety of navigation at sea.

3.4.5 The Ship Position Reporting Sub-system

This is a sub-system of collecting the ship navigation information and being controlled by computer to detect the ship position automatically. The stored messages can be used not only for the Search and Rescue (SAR) Bureau to find out the ship position and to organize search and rescue on the scene rapidly but also for the ship dispatch division to enhance the ship operating benefits. Ship reporting centre and sub-centre are being set up to provide the operating conditions by means of computer networks for any administration Bureaus concerned.

3.4.6 The RCC Network Ashore

Radiocommunications between ship and shore need to be transferred via communication networks ashore to Salvage Bureaus, Administration Bureaus and Shipping Companies, so a perfect communicating network is the major component part of the Maritime Safety System.

The National Marine Salvage Co-ordination Centre, all Salvage Co-ordination Sub-centres, Salvage Bureaus and Ship Competent Authorities should be connected with the Coast Radio Station or INMARSAT CES by specific links.

3.5 The Implementation Plan of GMDSS

IMO adopted the amendments of the International Convention for the Safety of Life at Sea Chapter IV submitted by the Maritime Safety Committee at the Diplomatic Conference held in October, 1988 and also stipulated that the timetable for introducing the GMDSS is as follows:

1. Between 1 February 1992 and 1 February 1999, existing ship can comply either with the GMDSS or with the requirement of the existing Chapter IV of SOLAS, 1974.

2. All ships when in NAVTEX covered waters must carry NAVTEX receivers and satellite EPIRBs by 1 August 1993.

3. All new vessels must comply with GMDSS provisions beginning 1 February 1995.

4. After 1 February 1999, all vessels must comply with the GMDSS.

So, China needs to fulfill the tasks as below according to the time schedule mentioned above:

1. From now on, before August 1, 1993, each shipping company should install NAVTEX or EGC and 406 MHz EPIRBs or L-band EPIRB's for all vessels on international voyages. New vessels constructed after 1995 should be equipped for GMDSS.

2. From now until the end of 1995 constructions, reconstructions of Coast Radio Stations and other

facilities ashore in relation to GMDSS should be completed.

3. From now on all radio personnel on board ship or ashore and all personnel performing the maintenance of the GMDSS facilities ashore should be trained according to the training plan set up by the Transport and Telecommunication Centre.

3.6 China Ocean Shipping Company (COSCO) Applies GMDSS

3.6.1 The Composition of It's Fleet

China Ocean Shipping Company is the largest national shipping enterprise in China. Up to now, COSCO operates about 650 ships, including 78 container ships, with a combined tonnage over 14 MM dwt.

3.6.2 Organization Structure

COSCO with its head office in Beijing, employs over 50,000 employees including crew members. It controls seven main fleets:

-COSCO Guangzhou, operates various types and sizes of ships, the largest in number of ships and the second in ships tonnage among COSCO fleets. In 1988 it operated around 150 ships.

-COSCO Shanghai, operates various types and sizes of ships, the largest in ships tonnage. It controls most of COSCO container tonnage. It operated 146 ships in 1988.

-COSCO Tianjin operated 113 ships of various types and

sizes in 1988.

-COSCO Qingdao is COSCO'S dry bulk fleet. It operates around 50 bulk carriers of handy size and Panamax.

-COSCO Dalian. It controls COSCO tanker fleet, of around 15 tankers in 1988. It also operates several timber carriers and a small number of general cargo ships, around 35 ships in 1988.

-COSCO controls two fleets in Hong Kong as well.

Apart from the main fleets COSCO also operates several fleets jointly with 6 provinces. These COSCO's associated fleets are:

-COSCO Jangsu branch

-COSCO Zhejing branch

-COSCO Jangxi branch

-COSCO Anhui branch

-COSCO Hebei branch

-COSCO Hubei branch.

COSCO had established 45 oversea companies, joint ventures, and representatives offices all over the world up to 1988. It also runs five maritime colleges and schools.

3.6.3 The Current State of the GMDSS in COSCO

The Global Maritime Distress and Safety System (GMDSS) has become operational on 1 February 1992. This marine communication system involves the most advanced communication techniques such as INMARSAT Ship Earth Station (SES), NBDP, DSC, Enhanced Group Call (EGC) receiver, EPIRBs, Search and Rescue Radar Transponder (SART), etc. The adoption of GMDSS improves the safety of ships and mariners and, at the same time, provides shore organizations with a tool for modern management through prompt, reliable and multi-functional communications.

In planning for a smooth introduction of GMDSS, China Ocean Shipping Company (COSCO), which operates more than 600 ocean-going ships, is faced with two major problems : how to conduct training of radio officers, deck officers and communications management personnel, and how to realize the installation of the necessary GMDSS communication equipment. Since 1986 the relevant departments of COSCO responsible for the work have been making a careful study of these problems and have now drawn up a long-term plan for the step-by-step application of GMDSS.

The installation of GMDSS is planned in stages and in batches according to different ship types, fitment time, areas of navigation and the effective dates of the various international laws and interim regulations. (For details, please see page 37 "Figure 3" and page 38 "Figure 4")

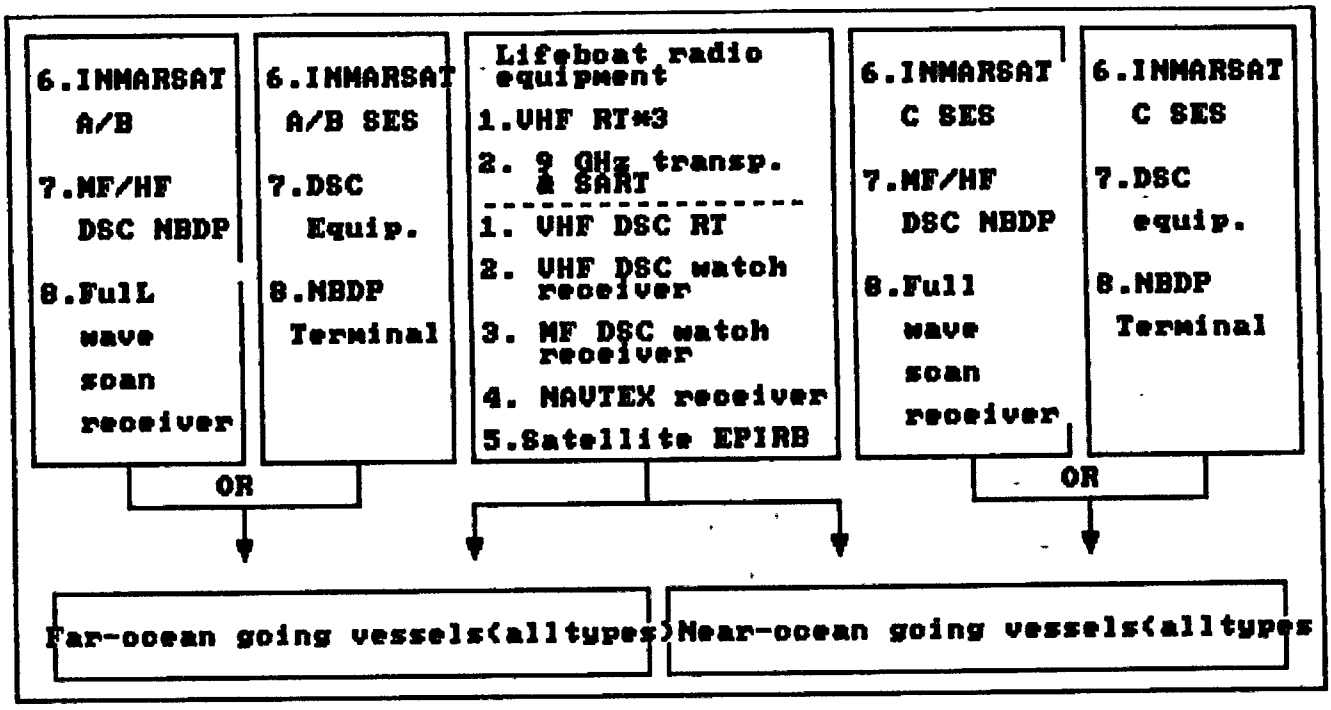

Fig 3 :The scheme of complete set outfitting of GMDSS equipment for present COSCO vessels

SHIP TYPE: General Cargo Ship		SERVICE LIFE : 25 years
BUILT YEAR	OUTFITTING DATE	OUTFITTING RANGE
Before 1968		Not to be equipped
After 1969		Partial set
After 1974	Before 1 Feb. 1999	Complete set
After 1982	1995	Complete set

SHIP TYPE: Bulk carrier		SERVICE LIFE : 20 years
BUILT YEAR	OUTFITTING DATE	OUTFITTING RANGE
Before 1973		Not to be equipped
After 1974		Partial set
After 1979	Before 1 Feb. 1999	Complete set
After 1982	1995	Complete set

SHIP TYPE: Oil Tank		SERVICE LIFE: 15 years
BUILT YEAR	OUTFITTING DATE	OUTFITTING RANGE
Before 1978		Not to be equipped
After 1979		Partial set
1 Feb.31 Dec.1984		Partial set
After 1985	1995	Complete set

Fig. 4: The schedule of GMDSS equipment outfitting for present COSCO vessels

In these, priority has been given to passenger ships, large vessels, container ships and ro-ros. To date COSCO has five ships and completely fitted out with sets of GMDSS equipment, 83 vessels with INMARSAT SES, 105 ships with NBDP and auxiliary transmitters and receivers, and 205 ships equipped with NAVTEX receivers. It is known that all the company's ships have been fitted out with EPIRBs before 1 July 1991.

To take advantage of satellite communications, COSCO installed a L-CES, with the approval of INMARSAT, in 1987 and extended it to its direct subsidiaries, so providing a satellite communications exchange network between ship and shore. Not only has L-CES effectively solved the problem of global, all-time and all-weather telex, telephone and fax communications by satellite between offices on land and ships at sea, but it has allowed the preferential conditions of paying half the fee for satellite telex communications and reducing the fee for satellite telephone an fax messages by utilizing non-peak hours. This has laid a good foundation for COSCO's further development of the different functions of an automatic data exchange system.

The training of personnel is of course vital for the effective use of GMDSS. On the basis of the differences in educational level, professional competency and age of radio officers on board, COSCO has formulated plans for training radio communication personnel of various grades. It has decided to build a training base in Qingdao Ocean Shipping Mariner College to introduce them to the workings of GMDSS. In order to turn out practical talent of the highest level, COSCO has assigned more than US$ 70,000 for the base, and a further US$ 320,000 has been

spent on a laboratory for the first rate teaching in GMDSS. The base began recruiting students in 1990. COSCO will send selected radio officers, office communications management personnel and maintenance workers to the base at different times for short-time training. It is expected that by 1997, all COSCO's communications personnel will have undergone the training. It can be seen that COSCO is making a determined effort to bring its personnel up to date with modern satellite communications. With the gradual adoption of GMDSS the company will be at the forefront of ship/shore communications.

3.7 GMDSS Equipment Maintenance in the P.R. of China

Under the 1988 amendments of SOLAS Convention, 1974, there are three options of maintenance.

1. On-board maintenance
2. Shore-based maintenance
3. Duplication of equipment

Ships sailing in GMDSS Sea Area A1 and A2 will be required to apply one of the above options or a combination of them.

Two of three options will have to be used in case of ships operating in Sea Area A3 and A4.

Irrespective of the options selected, a ship should not depart from any port "unless and until the ship is capable of performing all distress and safety functions for all sea areas in which the ship will sail to its next port of call".

To solve the GMDSS equipment maintenance problem, different country takes different option. For ships sailing in GMDSS Sea Area A3 and A4, most developed countries take the options of shore-based maintenance and duplication of equipment since they do not intend to send radio electronic officers on board ship.

It is well known that China is in rich of labour so China, taking its own conditions into account, will take the options of on board maintenance and shore-based maintenance and will still send radio electronic officers working on board ship. To do the shore-based maintenance of GMDSS equipment, due to the lack of maintenance facilities, COSCO has signed an agreement with a commercial firm-Radio Holland, which, as a third party, is involved in the GMDSS equipment maintenance.

Chapter FOUR: The Training and Certification of GMDSS Radio Personnel in the P.R. of China

4.1 The Maritime Institutions

Up to now there are more than ten institutions at the different levels in the P.R. of China. They are the main force for educating and training the necessary GMDSS courses. According to the individual backgrounds of the students and the functions in the field of maritime education and training, including the GMDSS course, these maritime institutions can be divided into the four categories:

4.1.1 Maritime Institutions of Higher Education (University and College level, four-year duration)

There are three maritime institutions of higher education (University and College level) in China. They are Dalian Maritime University, Shanghai Maritime University and Jimei Navigation Institute which are respectively located in the northern, middle-east and southern part of China.

Senior middle school graduates (after 12 years education) after passing the Annual State University Entrance Examination can enter these maritime universities and college. The duration of study for this kind of maritime institutions is 4 years. After 6 months' practice at sea within the period of four years of study and successful completion of their practice report, the graduates are awarded a Second Officer or Third Engineer or Second Class Radio Officer certificate on board ship according

to their individual learning specialties.

Amongst these maritime institutions, up to now there is only Dalian Maritime University which has offered GMDSS course. Jimei Navigation Institute has being been ready to offer the GMDSS course: First, two complete sets of JRC GMDSS equipment have been introduced into and installed in this Institute. Second, there is of qualified teaching staff. It seems to be a little late that until now Shanghai Maritime University has not yet been ready to offer the GMDSS course although a new specialty of Marine Radio Communication and Radio Navigation is being set up in the Navigation Department.

4.1.2 Specialized Maritime Institutions of Higher Education (Technical College Level, Three-year Duration)

There are two specialized maritime institutions of higher education, Qingdao Ocean Shipping Mariners' College and Shanghai Vocational Maritime College, which are operated by the China Ocean Shipping Company (COSCO) and the Shanghai Bureau of Maritime Transportation Administration.

Apart from high school graduates, these maritime technical colleges offer enrollment to seafarers with a high school or equivalent educational background and 2 years' sea experience as a seaman. The duration of study in these colleges is 3 years. The graduates will get a Third Officer or Fourth Engineer Certificate after finishing their study and after 12 months of sea practice on board ship.

4.1.3 Maritime School of Medium Level of Technology (Two-year Duration)

This category of the maritime institutions includes 8 institutions, they are Shanghai Marine School, Nanjing Marine School, Guangzhou Marine School, Dalian Marine School, Nantong water transport School, Guangdong Marine School, Mawei Merchant School and Zhejiang Traffic School. These maritime schools also enroll high school graduates, but the duration of study is only 2 years. They have a close relationship with the shipping companies. Some of them belong to certain shipping companies.

In addition to the general courses for a deck or engine room rating, these marine school also provide the basic theoretical maritime study courses in all aspects of navigation, seamanship, carriage of cargo and other relevant subjects on shipping business. The students will be working firstly on board ship as a deck or engine room rating after their graduation, but after having two years' sea experience, they can get a Third Officer or a Fourth Engineer Certificate if they successfully pass the certification examination.

4.1.4 Maritime Technical School (Three-year Duration)

Under this category, there are 3 maritime technical schools named Shanghai Mariner Schools, Guanzhou Mariner School and Tienjing Mariner School in the different parts along the Chinese coast.

These mariner schools enroll junior middle school graduates. After three years of study, the students are

qualified to work on board ship as a deck or engine rating.

Due to the entrance background and the learning subjects at the school, the graduates of these Maritime Technical Schools can only serve as a deck or engine room rating on board ship after their graduation. If they want to become a marine officer or engineer, they have to continue and finish their further study in the maritime university or college.

4.2 Training Radio Personnel in the P.R. of China

4.2.1 Introduction

As the traditional distress and safety system used by world shipping could not meet the requirement for long distance radio altering and distress communications, IMO, after having done many things, decided to develop the GMDSS in 1979. Since the first of February, 1992, this new system has come into the transition period of fully operation.

The establishment of GMDSS will improve the safety of mariners and also change the way of communications between ship and shore. Therefore, the RR 1979 was amended by the ITU World Administrative Radio Conference for Mobile (WARC MOB) services 1987. The final decisions made by the WARC MOB-87 can be summarized as follows:

1. The regulations regarding radio officers and manning of ships are reserved.

2. The regulations regarding the minimum knowledge and

skills of operating GMDSS which radio personnel should master and radio certificates under GMDSS were added.

It is extremely important to carry out the training of radio personnel and on-the-job training under the requirements of GMDSS for ensuring the rapid communications of distress safety and enhancing the general communications to a new level.

4.2.2 The Present State of Radio Personnel

According to statistics, the number of radio personnel who are concerned with maritime safety communication in the Chinese transport field is currently amount to 7,300. Amongst them, there are 4,300 persons who work on board ship or on shore and the rest are persons doing communications management, scientific research, maintenance and repairing jobs.

At present, amongst the 7,300 radio personnel, most of them lack of high level educational background and their technical skills are not high enough. For instance, there are 1,250 persons who have high level educational background; 3,550 persons do not have qualified educational background. 2,770 persons have professional posts as engineers or higher; However, there are still 3,200 persons whose professional posts are lower than assistant engineer.

Under GMDSS, radio personnel should be of enough theoretical knowledge or skill and also of the abilities to safely, effectively maintain all GMDSS radio communications, radio navigation and other equipment required by the SOLAS convention, 1974. Currently, as

radio communication personnel's educational background and technical skill are rather low, most of them need to restudy the new technology and to refresh their knowledge so as to meet the technical and operational requirements of the new system.

4.2.3 Estimating the Future Requirement of Radio Personnel

In order to meet the requirement of the introduction of GMDSS gradually, radio personnel training can be done by two approaches:

1. To improve teaching conditions in maritime universities or polytechnics, so that radio personnel graduating from universities or polytechnics can meet the requirement of GMDSS;

2. To try to do the on-the-job training as well as possible, so that the on-the-job personnel can be trained to meet the requirement of the new system gradually and at the same time they can do their jobs as well.

According to the development of the transport field and taking into account of international regulations or conventions, it is estimated that, by the time of 2000, China will need to have 5,000 radio personnel working on board ship or ashore and 3,500 persons for doing the jobs of the communications management or maintenance and repairing.

Amongst the 7,300 persons, by the time that GMDSS becomes fully operational, there will be some 4,000 persons who can engage in doing their communications jobs. From the

analysis above, consequently, there are still 4,500 persons who should be provided by universities or polytechnics

4.2.4 The Training Capacity of Maritime Colleges

According to the investigation, 1989, on universities or polytechnics under the Ministry of Communications, it is known that the capacities of providing radio officers annually in maritime universities or polytechnics are as follows:

	(persons)
1. Dalian Maritime University :	60
2. Jimei Navigation Institute :	30
3. Wuhan Inland Waterway Transportation College :	100
4. Dalian Marine School :	40
5. Guangzhou Mariner School :	39
6. Shanghai Mariner School :	41
7. Nanjing Marine School :	45

Annually, there are 190 graduates coming from marine schools or specialized marine institutions and there are 165 graduates coming from mariner technical schools. In addition, both Radio communications engineering and Electronic engineering courses are established at the Electronic engineering department in Dalian Maritime University. Therefore, this department can provide 100 graduates doing communications management, research, maintenance and repairing jobs.

4.2.5 The Plan for Radio Personnel Training

According to the number of annual enrolling new students, at the time of 2,000 year that GMDSS is fully

operational, there are some 3,500 graduates coming from maritime universities or polytechnics. In addition, taking into consideration that there are some 2,000 on-the-job radio personnel who are still able to undertake the on board ship or ashore communications jobs of GMDSS. So, the number of radio personnel may meet the requirement of GMDSS.

At present, it is the unique university that Dalian Maritime University establishes the courses of Radio communications engineering and Electronic engineering. According to the number of annual enrolling new students, 100 persons, it can not meet the predetermined requirement of communications management, research and maintenance of GMDSS. Therefore, the enrollment quantity of the two courses should be increased reasonably. By doing so, at the time of 2,000 year that GMDSS is fully operational, if Dalian Maritime University can provide 1,500 persons of doing communications management, scientific research, maintenance and repairing jobs of GMDSS, plus the 2,000 persons who are still able to undertake the communications management, research, maintenance and repairing jobs of GMDSS, it will meet the requirement of GMDSS.

At the time that GMDSS began to become operational, amongst 4,000 persons who are able to undertake the radio communications jobs on board ship or ashore and the jobs of communications management, scientific research, maintenance and repairing, there were still about 2,500 persons who needed to be trained and the training should be emphasized on the improvement of technical skills.

The GMDSS training classes have been opened in Qingdao

Ocean Shipping Mariner College which is owned by COSCO. Annually, 60 on-the-job radio-electronic engineers can be trained by this college. It is estimated, by the time of 2,000 year, that the 600 person training task will be fulfilled. The 2,000 person on-the-job training task beyond COSCO will be undertaken by Dalian Maritime University and Wuhan Inland Waterway Transportation College.

Two six-month classes for the update training of radio officers can be opened in both Dalian Maritime University and Wuhan River Transportation Institute annually. There is a 60 person training class in Dalian Maritime University and there is a 50 person training class in Wuhan Inland Waterway Transportation College. So, 220 on-the-job radio-electronic engineers can be trained annually in these two training centres. By calculating so, in the 8 years from 1992 to 1999, the on-the-job training task can be almost fulfilled.

4.3. Training Radio Personnel in Dalian Maritime University

4.3.1 Introduction to Dalian Maritime University

Dalian Maritime University, situated in Dalian, Liaoning Province and founded on the basis of the mergence of Shanghai Nautical College, Northeast Navigation College and Fujian Navigation School in 1953, a comprehensive maritime university under the Ministry of Communications embracing three categories of specialties: marine transport, engineering and shipping management, with emphasis on marine transport, and one of the national key college and university.

The university has 9 departments including marine navigation, marine engineering, marine electrical engineering, marine shipping management, electronics, computer and automatic control, and social sciences, offering specialties of marine navigation, marine engine control, marine electrical control, marine communication and radio navigation, electronic engineering, communication engineering, management engineering of communications and transports, international affairs, shipping administration, computer and application, automatic control, control informational system, scientific education management, electronic technology, ideological & political education, etc..

Now it has an enrollment of 3,634 students, including 178 postgraduates, 3,370 undergraduates of four-year duration, 62 undergraduates of three-year duration and 24 foreign students. Of the 714 full-time teachers, 229 are professors and associate professors, and 339 lecturers.

4.3.2 Training of Maritime Communication Personnel at the Department of Electronic Engineering, Dalian Maritime University

The Department of Electronic Engineering, a department mainly teaching ship-to-shore communications and navigation electronic engineering, was set up in 1962. The Department of Electronic Engineering offers two specialties: electronic engineering and communication engineering (both with a schooling period of four years) and a two-year electronic technique course.

Since IMO officially proposed in 1980 the FGMDSS(the Future Global Maritime Distress and Safety System) and

the GMDSS was adopted in 1988, a new comprehensive system and its operating procedures, for the purpose of improving the traditional maritime distress and safety communication system, the Department has already taken into account all the requirements involved in the use of this system and tried to realized them in its curriculums of Radio Communication Specialty.

First, the Department has offered a course of Maritime Distress Communication, which familiarizes the students with the traditional maritime distress communication system. In this course it is also point out that the propagation properties of the traditional system are affected by various of factors because of the application of medium and short waves in the system. Thus, when a vessel is sailing in the area of low density and far off a coast radio station, there is little possibility for the warning messages to be received; and very often a delay of several hours is inevitable even if the messages can ever be received. Besides, the out-of-date equipment in the traditional system and the inherent defects in the operation procedures and in the organization work make it hard to perform successful salvage and rescue. Moreover, the traditional system is important to cope with emergencies and is absolutely disabled to give an alarm of an abrupt overturn of a vessel. Since more and more high-speed and large-size vessels are being used in modern maritime transportation, the safety of navigation, that is the safety of lives and property, has become one of the main concerns of all departments concerned. It is on the basis of the serious consideration of how to ensure maximum navigation safety that the GMDSS is proposed. The recent developments in communication and navigation aids have provided solid ground for improving

the traditional mode of maritime distress and safety communication.

And so, the students are not only briefed on the background of the development of GMDSS, but also stressed on the different kinds of new technology which are currently employed in GMDSS. The new technology includes: maritime satellite communication with geostationary satellite relay; position fixing with the low altitude polar orbit satellite; Narrow Band Direct Printing (NBDP), Digital Selective Calling (DSC) and the Single Side Band telephony (SSB), EPIRB, SART and VHF telephony. Moreover, with the introduction of micro-computers into this field, the distress communication equipment is made simpler in design, more reliable in operation and more complete in function. Consequently, the maritime distress and safety communication are pushed to a new stage.

Second, in the course of Maritime Distress Communication the students are supplied with the knowledge of the various functions of GMDSS, such as alarming, identifying, position indicating, searching and rescuing, communication coordinating, on-spot communicating, position locating as well suggestion making. Obviously, these functions are complete and organically related to each other and they are not available at the traditional system. Elaboration is on the working principles and the constituents of the equipment employed in GMDSS for fulfilling these functions. It should be noted that the working principles and the composition of much of the equipment in GMDSS are very complicated, and that the theory it is based on is rather profound, involving digital circuitry, micro-computer hardware and software, cybernetics, modern communication theory and radio

navigation knowledge. This is a great challenge to the courses of basic technology, because, on the one hand, the subject on the traditional distress communication can not be weakened or omitted, and, on the other hand, the basic theory involved in GMDSS must strengthened. What is important here is that the requirements of GMDSS must be realized.

In order to solve this problem, the Department has distributed the contents concerning the basic technology over the courses already offered by making proper addition of what is new and by deleting what is comparatively obsolete and less important. Endeavor has been done to make sufficient facilities available to the students for them to be trained to learn the operating skills in the courses of basic technology and equipment operation, for instance, in the courses of hardware and software of micro-computer.

The facilities which are introduced to the students and which are employed in GMDSS include: INMARSAT Ship Earth Station, Satellite Emergency Position Indicating Radio Beacon(EPIRB), Satellite Coast Earth Station, MF-, HF-, and VHF Transmitter-Receivers and their terminals (via SSB Radio Telephones, Digital Selective Calling (DSC) Terminals, Narrow Band Direct Printing(NBDP) Terminals, and VHF EPIRB as well. Among them, the INMARSAT satellite ship station and the NBDP are in the highlight, whereas the MF-, HF-, and VHF Transmitter-Receivers are dealt with in the relevant courses.

The exposition of the working principles of facilities employed in GMDSS is aimed at ensuring the students a better understanding of the facilities involved, the

necessary knowledge of their maintenance and the manipulating skills. The proper maintenance and manipulation depend upon a perfect understanding of the working principles. But can we achieve this purpose only by giving explanations in class? Of course not. Therefore, a considerable amount of practice is set for the students, enabling them to work on every kind of equipment available in the college, so that they can better understand the working principles in reference to the actual equipment, and by taking part in locating the simulated troubles they can require the ability to make scientific judgments on mechanical breakdowns and obtain some practical servicing skills.

Since the students following the present syllabus are to be working in the transition period from the traditional distress communication system to GMDSS, the latter can not yet at present substitute completely for the traditional distress communication system, and so the Narrow Band Direct Printing can not yet replace Morse Telegraphy. That is to say, Morse Telephony is still one of the means of maritime communication during the transition period from 1992 to 1999 in the P.R. of China. Therefore, students have to spend a fairly long time on the Morse keying training. This puts the teaching to tremendous inconvenience because students have to spend their times for studying both Morse telephony and GMDSS. Recently the problem of how to achieve the reduction and how to adjust the syllabus after cutting down the training has become one of the Department's major concerns.

It should be noticed GMDSS is a comprehensive system of distress and safety communication. It involves not only

all the particular facilities used in distress communication. but also all the organization work for fulfilling it, such as division of the search and rescue coordination areas and their operation, the identification coding of the mobile and coast radio stations, the on-scene communication between the distress ship and the rescuing plane, and the basic requirements to the ship equipment, all of which must be arranged in the curriculums so that the students will be able to take GMDSS as a comprehensive system.

To sum up, the substitution of GMDSS for the traditional maritime distress communication system has set still higher requirements for training communication experts, radio officers and maintenance workers. It should be noted that many facilities in GMDSS are the common communication aids used aboard a ship today. Therefore, the introduction of GMDSS will surely bring about renewal of the contents and inclusion of the latest developments of radio technology in the training courses; reforms in the teaching methods; great weighing on the courses of basic technology and workshop practice; appropriate reduction of training on Morse Keying; and closer connection with the society and the marine transportation. In a word, the introduction of GMDSS will produce profound influence on the training of maritime communication experts. Therefore, special attention should be paid to the achievements in the new technology which reflects the orientation in the development of maritime radio communication, and to the application of these achievements in communication and navigation.

4.3.3 The GMDSS Training Plan for on-the-job Radio Personnel in Dalian Maritime University

4.3.3.1 Objective

Having completed the course, trainees should have knowledge of:

- the composition of GMDSS
- the general principles and equipment required in the GMDSS
- correct and efficient operation of all GMDSS subsystem and equipment
- modern communication theory and technology
- electronic communication circuit and the application of computer in the field of communication

4.3.3.2 The Training Scope and Conditions

According to statistics, there are some 3,000 on-the-job radio personnel who need to be trained in the maritime transportation society. It has been decided that training should be fulfilled in four years. Therefore, there are at least 800 trainees need to be trained annually.

The electronic engineering department at Dalian Maritime University has more than 30 year teaching experience in the field of maritime communication. The department has a strong teaching staff and a stringent teaching managerial system. The electronic circuit laboratory, pulse & digital circuit laboratory, microcomputer laboratory and microwave laboratory provide perfect conditions for the practical teaching. Fully GMDSS equipment and other communications equipment are installed in the

communications laboratory. Therefore, high level operation, maintenance and repairing training are available in this department.

4.3.3.3 Training Methods

According to the working nature and characteristics of the on-the-job radio technician, two model and three level training methods can be taken. The so-called "two models" means that the training emphases and content should be different between the radio technician at sea and those ashore.

4.3.3.4 The Curricula

1. The training curriculum for the radio technician at sea

Subjects	Training hour	
	Theory (hours)	Practice (hours)
(1) General introduction of GMDSS	20	30
(2) NBDP receiving and transmitting equipment	40	30
(3) EPIRB & SART	20	10
(4) DSC technology	20	10
(5) NAVTEX	40	20

(6) SSB new technology	50	20
(7) INMARSAT COMMs (A,B,C,M)	60	30
(8) Digital communications	50	30
Total	300	150

2. The training curriculum for the radio technician ashore (Whose professional posts are higher than engineer)

* One year duration, training by correspondence.

Subjects	Training hours
(1) Microcomputer & Interface technology	80
(2) Computer system & Programming Language	80
(3) Digital communications	60
(4) General introduction of GMDSS	20
(5) INMARSAT COMMs (A,B,C,M)	60
(6) NBDP & NAVTEX equipment	60
(7) SSB new technology	40

(8) EPIRB & SART	20
(9) DSC technology	20
Total	440

3. The training curriculum for the radio technician ashore (Those whose professional posts are lower than engineers)

* Two year duration, training by correspondence.

Subjects	Training hours
(1) Electronic Circuits	120
(2) Pulse & Digital Circuits	80
(3) Microcomputer principles & Interface technology	80
(4) Computer system & Programming Language	80
(5) Digital communications	80
(6) Introduction to GMDSS	20
(7) INMARSAT COMMs.. (A,B,C,M)	60
(8) NBDP & NAVTEX equipment	80
(9) SSB new technology	60

(10) EPIRB & SART	20
(11) DSC technology	20
(12) Microwave communications	60
(13) Fundamentals of Optical Fiber Communication System	40
Total	440

4.3.4 The GMDSS Training Plan for the Ship Surveyors

1. Objective

Having completed the course, trainees should have the knowledge of:

- fundamental principles and factors of equipment in the GMDSS

and be able to operate the GMDSS equipment

2. The Entry Requirement of the Trainees

The educational background of trainees should be longer than three years.

3. The Training Duration

Ten weeks

4. The Training Curriculum

Subjects	Training hours	
	Theory	Practice
(1) Introduction to GMDSS	20	
(2) INMARSAT COMMs. equipment	60	15
(3) NBDP equipment	40	10
(4) SSB technology	40	15
(5) DSC equipment	20	5
(6) NAVTEX equipment	20	5
(7) EPIRB & SART	20	5
(8) Radar Transponder	10	5
Total	230	60

4.4 Training Radio Personnel in Qingdao Ocean Shipping Mariner College

4.4.1 Introduction to Qingdao Ocean Shipping Mariner College

Qiandao Ocean Shipping Mariners College, Situated in Qingdao, Shandong Province, was founded under the name of Qingdao Marine Transportation School in 1976. In order to strengthen the training of seamen, it was transformed

into the present college for adults in 1980, and is now under both the Ministry of Communications and China Ocean Shipping Company (COSCO). Of the 490 teaching and administrative staffs, including 44 higher professional title holders and 179 medium-level professional title holders, 200 are full-time teachers with an enrollment of 1,000 students.

To meet the needs of China's Ocean Shipping development, the college now offers seven specialties marine navigation, marine engine control, marine electrical control, marine radio communications, marine shipping management, finance and accounting, and political work, and also runs dozens of classes of professional certificates, classes of short-terms and the training classes of seamen's professional skills required by the International Maritime Organization (IMO), thus having formed a training system of multiple levels, types and scales, and trained 17,821 students ever since it was set up.

The college has laid great stress on improving the students's English and their ability for practical work and paid full attention to enabling the students to master the latest marine technologies in the world. In the past 15 years, the college has set up more than 40 laboratories and installed a number of advanced teaching aids and equipment worth more than 6 million U.S. dollars, such as a navigational manoeuvring simulator, an anti-collision radar simulator, an engine-room simulator, an automated engine-room, a planetarium and a Global Maritime Distress and Safety System (GMDSS), therefore providing the most advanced aids for training officers, engineers and managerial cadres.

4.4.2 The GMDSS Training Plan for the On-the-job Deck Officers in Qingdao Ocean Shipping Mariner College

4.4.2.1 The Trainees

On-the-job deck officers, in the COSCO

4.4.2.2 Training Objective

By training, deck officers have a general knowledge of the GMDSS and also are able to operate the GMDSS equipment on board ship. In particular, trainees will know the operational procedures relating to the distress alerting.

4.4.2.3 Training Subjects and Contents

1. Introduction to GMDSS

2. INMARSAT geostationary maritime satellite communication system

2.1 Introduction to INMARSAT

2.2 The fundamental principles of satellite communications

2.3 INMARSAT-A ship earth station (SES)

a. The preparation of the text of a telex
b. Antenna turning
c. The procedures of telex communications
d. The procedures of telephony communications
e. The procedures of the communications in distress

2.4 INMARSAT-C ship earth station (SES)

a. Text Editing
b. Transmitting the text
c. Transmitting Distress text
d. Ship position reporting

3. NBDP terminal

3.1 Introduction to the working principles
3.2 Text Editing
3.3 ARQ (Automatic Repeat Request) communication principles and the operation of ARQ communications
3.4 The communications procedures and operation of FEC(Forward Error Correcting)
3.5 Group exercises

4. DSC

4.1 Introduction to the working principles
4.2 The operational procedures of transmitting distress messages
4.3 The operational procedures of general communications
4.4 DSC operation

5. The CONSOLE

5.1 Introduction to the working principles
5.2 Selection, save, edition and modulation of frequencies
5.3 The transmitting and receiving of distress telegraphy (500 KHZ)
5.4 The production and watchkeeping of dual signals of distress telephony

6. Weather Fax

6.1 Introduction to the working principles
6.2 Edition
6.3 The operational procedures of receiving the meteorological information
6.4 The operational procedures of receiving maritime safety information(518 KHZ)

4.5 Certification of Radio Officers in the P.R. of China

As I have mentioned in Chapter III, China will take the options of on board maintenance and shore-based maintenance and will still send radio electronic officer working on board ship. Consequently, China is intending to train personnel for service onboard as radio electronic officers. The on-the-job radio electronic officers need to be trained according to the new training requirements of the 1991 amendments of STCW Convention, 1978.

To implement the GMDSS as smoothly as possible, the Bureau of Harbor Superintendency Administration has being considered to issue the regulation concerning the GMDSS certification, examination syllabi and the training syllabi. Due to the hard work put in by those involved in drawing up the regulation, this regulation currently is still in the drafting stage. However, it is obvious that the certificates will be in accordance with the 1991 amendments of STCW Convention, 1978. One thing should be noticed is that, in China, the deck officer will not hold the General Operator's Certificate during the 1992-1999 transition period.

Chapter FIVE: Proposals for the GMDSS Training and Certification in the P.R. of China

5.1 The Existing Training Requirements for Radio Personnel

The existing requirements for training radio personnel are contained in:

Articles 55 and 56 of the Radio Regulations (RR); and Chapter IV of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978.

The requirements for ships to carry a radio officer or radiotelephone operator are contained in regulations 6 and 7 of the old Chapter IV of 1974 SOLAS Convention as follow:

Regulations 6(a) requires each ship fitted with a radiotelegraph station to carry at least one radio officer and, if the ship is not the radiotelephone frequency by means auto-alarm, to listen continuously on the radiotelephone frequency by means of a radio officer using headphones or a loud speaker; implying at least three radio officers on ships on long voyages. Passenger ships fitted with an auto alarm carrying more than 250 passengers on voyages exceeding 16 hours are required to carry at least two radio officers;

Regulation 7 requires ships to carry one radiotelephone operator if vessels between 300 and 500 tons gross tonnage;

The Radio Regulations specify four categories of radiotelegraph operator's certificates:

1. The radiocommunication operator's general certificate;
2. The first-class radiotelegraph operator certificate;
3. The second-class radiotelegraph operator's certificate;
4. The radiotelegraph operator's special certificate

Two types of Radiotelephone operator's certificate are:

1. The radiotelephone operator's general certificate; and

2. The restricted radiotelephone operator's certificate.

There is a considerable difference in the training requirements for radiotelegraph operators and radiotelephone operator, particularly in the time taken to train.

Basic training of radiotelegraph operators takes between twelve months and two years depending on the level of electronics and maintenance ability to be achieved and the types and number of equipment for which maintenance skills are needed. About a total of six months of the basic training is generally needed to obtain the essential minimum standard of ability in Morse radiotelegraphy.

The training for the radiotelephone operator's general certificate takes between one and two weeks and that for restricted radiotelephone operator's certificate about five days and the latter is frequently not formal training.

5.2 Future Training for GMDSS Radio Operators

The future training for GMDSS radio operators should be under the 1991 amendments to the 1978 Convention, which were adopted by the expanded Maritime Safety Committee by resolution MSC.21(59) on 22 May 1991 and will enter into force on 1 December 1992. The resolution contains at :

a. Recommendation on training of radio operators related to the first-class radio electronic certificate; (Annex 1)

b. Recommendation on the training of radio operators related to the second-class radio electronic certificate; (Annex 2)

c. Recommendation on the training of radio operators related to the general operator's certificate; (Annex 3)

d. Recommendation on the training of radio operators related to the restricted operator's certificate; (Annex 4)

and

e. Recommendation on training of personnel performing maintenance of the GMDSS installations aboard ships (Annex 5)

The five recommendations are syllabuses which go into far greater detail than Article 55 of the RRs on which all except annex 5 are based. On the basis of these recommendations it should be possible for the necessary

education arrangements for issue of the different certificates to be developed nationally. This has already taken in some countries for the General Operators Certificates and many others should have their training courses in place shortly.

A summary of the requirements of the four radio operators certificates is as follows:

1. First-Class Radio Electronic Certificate

- Knowledge of the principles of electricity and theory of radio and electronics;

- Theoretical knowledge of all GMDSS radio equipment, and general knowledge of the principles of equipment for radio navigation

- Practical knowledge of operation and preventive maintenance of the equipment mentioned in (b);

- Practical knowledge for the location and repair of faults in the equipment mentioned in (b);

- Knowledge and abilities as requires for the General Operator's Certificate in para a(d)

2. Second class Radio Electronic certificate

- Knowledge of the principles of electricity and theory of radio and electronics;

- Theoretical knowledge of all GMDSS radio equipment, and general knowledge of the principles of equipment for

radio navigation;

- Practical knowledge of operation and preventive maintenance of the equipment mentioned in (b);

- Practical knowledge for effecting repair of faults in the equipment mentioned in (b), using the means available on board and, if necessary, replacing modular units; and

- Knowledge and abilities as required for the General Operator's Certificate in para. a(d).

3. General Operators Certificate

- Detailed practical knowledge of the operation in all GMDSS sub-system and equipment;

- Ability to send and receive correctly by radiotelephone and direct printing;

- Detailed knowledge of the regulations applying to radiocommunications and knowledge of those SOLAS regulations relating to radio;

- Sufficient knowledge of English language ; both speech and writing.

4. Restricted Operator's Certificate

- Practical knowledge of the operation of those GMDSS sub-systems which are required for A1 ships;

- Ability to send and receive correctly by

radiotelephone;

- Knowledge of the regulations applying to radiotelephony communications, specifically those relating to safety;

- Elementary knowledge of one of the working languages of the union, both speech and writing. However, Administrations may waive this requirement in defined areas.

5.3 Introduction to the GMDSS Certificating in the Netherlands

In the Netherlands, there will be two different Maritime Communication operator's Certificates. The General Maritime Communication (or Marcom A) Certificate and the Restricted Maritime Communication (or Marcom B) Certificate.

Marcom A- the general certificate- applies to all vessels operating in sea areas **A2**, **A3** and **A4**. **All** officers in charge on the bridge are required to possess this certificate.

Marcom B- the restricted certificate- applies to vessels operating in and equipped for **A1** areas. At least one officer in charge on the bridge must hold a **Marcom B** certificate.

5.4 Introduction to the GMDSS Certificating in Sweden

Sweden does not intend to educate personnel for service on board as radio electronic officers. The only certificates that will be issued for GMDSS are thus,

General Operator's certificate (GOC) for sea area A2, A3, A4 and Restricted Operator's Certificate (ROC) for sea area A1. The Administration has not yet issued any of these certificates, pending the implementation of GMDSS. However, ship's officers serving on board ships exempted from the obligation of carrying a radio telegraph station, have since the year 1988 being educated and issued with certificates to the same competency level as for General Operator's Certificate. The requirements for obtaining this certificate, which are based on the amendments to the Radio Regulations (ITU) and the SOLAS-convention (IMO), and the amendments to the STCW-convention (IMO), are regulated in the Administrations regulation TVTFS 1989:102. In the future, courses for obtaining GOC and ROC will be a mandatory subject in the syllabus for ship's officers.

5.5 Proposed GMDSS General Operator Certificate Syllabus in the P.R. of China

According to the amendments of RRs, SOLAS Convention and STCW Convention, any one if he/she holds the GMDSS General Operator's Certificate (GOC) may serve at GMDSS sea area A1, A2, A3, and A4 as well. The minimum requirements for GOC are set up in the 1991 amendments to STCW Convention, 1978. The duration for GOC training is very much depended on the background of trainees. Normally, it takes between two and three weeks.

A Proposed GMDSS GOC Syllabus may be as follows:

Learning Objectives

(Lecture Contents)

I. GMDSS: Procedures, equipment, Distress and Safety Communication

1. Knowledge about the requirements/regulations for Radio Equipment in GMDSS

(A1- A4 areas; DSC and Satcom-equipment; INMARSAT A, B, C and M; EPIRB for L-band or COSPASAT; SART; EGC; NAVTEX)

2. Links for Distress and Safety Communications

(Frequency allocations in GMDSS; Protection of Distress frequencies; Transmission methods; Transmission priorities; Priority 3)

3. Procedures in Maritime Distress and Safety Communications

(Distress alarm; Transmissions; Procedures for relay and confirmation of distress calls; Reception and confirmation by LUT,CRS, CES or RCC; Preparation for the handling, further transport, coordination and finalization of distress traffic;)

4. Urgency and Safety message, including Maritime Safety Information

(Navtex receiver, Worldwide Maritime Safety transmissions, Navareas, Priorities 2 and 1, Limitation of Information quantity.)

II. Exercises with Equipment for Data Input

1. The operational aspects of Telex- and Satcom

terminals and the DSC-receiver

(Special codes, Message identification, English keyboard, Flawless operation, changing and mixing of texts, buffering of message, DSC message.)

III. Operational Procedures of SATCOM, DSC and Telex

1. Sufficient skill in procedures with SATCOM installations

(Transmitter engagement, Choice of CES and signalling methods (Telex, Telephone, Fax), Priority Zero, Country identificating, Abbreviations used in Telex traffic)

2. DSC-transmission, reception and confirmation

(Choice of appropriate frequencies, Procedures for making a connection, Repeating messages)

3. Providing for a Telex-communication link

(Telecommunication regulations, Ship safety regulations, INMARSAT regulations)

IV. Law and Regulations

Knowledge of relevant national and international regulations as far as concerned with GMDSS

(Telecommunication regulations, Ship safety regulations, INMARSAT regulations)

V. Technical Aspects of Telecommunication

As far as concerns GMDSS, the ability of the operator, related to:

1. The assessment of the technical principles of equipment

(Technical Manual of the installation, Block diagrams, Control of indicators, Antenna, Gyroscopes, Earth connection, status alarms, Status reports, Printer tests, Paper transport)

2. The performance of test-sequences, Fault identification, Correction for simple faults as far as is possible on board.

(Fuses, Measurements at test-points, Power failures, communication with service/maintenance companies, Replacing PCB's.)

5.6 Proposed Maritime Search and Rescue Courses in P.R. of China

Search and Rescue systems are informed about required actions by the GMDSS. At present, none of the three main maritime universities offers the SAR course to the nautical students and whenever a marine accident occurs, the officers obviously lack of the knowledges to do search and rescue jobs. So offering the SAR course to the nautical students in the maritime universities has become immediately necessary. According to the IMO model course, the detailed course framework and course outline are as followed:

Part A: Course Framework

1. Scope

This course covers the organization of an SAR service, co-ordination of SAR operations, emergency communications, recording and reporting, resources used in SAR operations and the responsibilities of the co-ordinator surface search. It also covers the establishment of search areas and search patterns, SAR operating procedures and communication between surface search units and air search units.

2. Objective

Upon completion of the course, trainees should be able to perform the duties of a coordinator surface search efficiently and effectively.

3. Entry Standards

Those candidates whishing to enter the course should hold a Masters Certificate F.G., be able to interpret and use weather maps and forecasts, and be familiar with emergency communications procedures.

Part B: Course Outline

Subject Area	Training Hours
1. Administration	

1.1 Responsibilities of an SAR organization and co-ordinator of an SAR	1
1.2 Co-ordination of RCC/CSS and role of CSS in an SAR operation	1
	2

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2. International Provisions	
2.1 IMO SAR Convention, 1979	0.5
2.2 MERSAR manual	1.5
	2

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3. Emergency Communications	
3.1 Visual Signals Electronic Signals Emergency Frequencies IFF Equipment EPIRB and ELT Sound Communications GMDSS	2
3.2 Communications facilities	1
	3

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4. Operating Procedures	

4.1 Recording, reporting, Abbreviations and definitions	1.5
4.2 Lookout procedures	1.5
4.3 Surface rescue equipment and methods	1
4.4 Assisting an aircraft to ditch	1
4.5 Reception and interrogation of survivors	1
	6

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5. SAR Resources

5.1 Types of resources	1
5.2 Air-droppable equipment	1
	2

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6. Navigation

6.1 Estimating set and drift	1
6.2 Use of navigational aids in SAR operations	1
6.3 Plotting	1
	3

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7. Search Areas

7.1 Establishing search areas	1.5
7.2 Search area when position or route is known	1
7.3 search strategy	2.5
7.4 Exercises in search planning	3
	8
8. Search Patterns	
8.1 Surface search patterns	2
8.2 Air search patterns	1
	3
9. SAR case exercise	4
10. SAR case study	2
11. Review and Final Assessment	3
TOTAL	38

5.7 The need for Satellite Communication Simulator Training

It is well known that satcoms has played a major part in the reduction of manning levels and in increasing operating efficiency for most types of shipping. Much of

this is due to the quality, efficiency and privacy of the satellite link which has multiplied the possibilities available via conventional radio. But part of it is due to the ease of operation of the system, which has enabled anyone to make use of it, not just skilled personnel. Nevertheless, it is one thing to make a telephone or telex call on the equipment and another to know how to make full use of its capabilities. This means being able to use it in the most cost-effective way, to understand and accommodate its particular characteristics and to handle any problems that might arise.

5.8 Maritime Communication Simulators

It is a complete training system which is totally integrated and operating within its own environment. All the current **INMARSAT** features, **INMARSAT A** and **C** are included as well as additional enhancements that are expected to become operational within the next few years. Any Coast Earth Stations (**CES**) or Network Co-ordinating Stations (**NCS**) that are currently in use or planned by **INMARSAT** may be incorporated within the simulator. It can be used for both telex and speech communications.

5.8.1 Types of Satellite Communication Simulators

There are three main different versions of satellite communication simulators in the market today. The United Kingdom firm, Inpro, devised the Worlds' first satellite communications simulator. It was installed at the nautical college Leith, near Edinburgh, Scotland. It was fairly basic when compared with to todays standards and since then Inpro has gone on to develop the technology and the latest model is now operating in two Finnish

nautical colleges, and at a college in Varna, Bulgaria. It is being marketed world-wide by Radio Holland.
The other two are from Marac Electronics, which is Piraeus-based firm, in Greece and Jeppesen which was developed in Norway.

The three products are distinctly different while they are all trying to do very similar jobs. All are based on IBM compatible machines but Inpro's device is available only with dedicated hardware. The Marac offers the option of software either alone or with hardware and Jeppesen is offering just software alone. The Inpro and Marac systems use an instructor's station and Jeppesen is a self-teaching aid. They all have in common the essential features required by INMARSAT A system definition manual, from which the Ship Earth Station manufacturers develop their own products, and the ability to vary many of the parameters that affect usage.

5.8.2 Maritime Communication Simulator Description

The Marac SCS-1000XF and the Inpro system are described below separately:

5.8.2.1 General Description of Standard-A satellite Communications Simulator Type SCS-1000XF

The SCS-1000XF satellite communication simulator is based on a PC Ethernet LAN and includes real speech communication facilities, using a special purpose PBX system. The simulator is designed according to INMARSAT's standard-a System definition Manual.

1. Training Facilities

The training facilities of the **SCS-1000XF** simulator includes the following:

a) Exercises in aerial dish positioning.
b) Ship originated telex call set-up.
c) Shore originated telex call set-up.
d) Ship originated telephony call set-up.
e) Shore originated telephony call set-up.
f) Distress, safety and urgent message priority procedures.
g) Familiarization with all **INMARSAT** service requests.
h) Queueing procedures.
i) Billing routines.
j) Self teaching.

2. System Description

The **SCS-1000XF** simulator consists of the teacher position (console) and a minimum of three student positions (terminal).

2.1 Teaching Position (Console)

The teachers position consists of a computer (**PC-AT**), with 2.5 M byte **RAM**, 40 Mbyte hard disk, 1.2M Byte floppy disk driver, a 10 **MB**/sec Ethernet controller and a printer. Facilities offered include:

a) Broadcasting short messages
b) Control **CES** status (active/down).
c) Control satellites status (main/standby).
d) Repositioning of any **SES** to specific latitude and

longitude.

e) Control the educational level for each student (low/mid/high).

f) Dynamic representation of the overall network activities.

2.2 Student Positions (Terminal)

Each terminal consists of a computer (PC), with 640K Byte RAM, 360K byte floppy disk drive, 10MB/sec Ethernet controller, a printer (optional) and a telephone equipment.

Terminals can be used depending on the teaching schedule, as SES or as CES operator, and/or as a Terrestrial Subscribers.

Facilities offered by all terminals include:

a) Electronic telex simulator.
b) Network status indicator.
c) On-line help.
d) Self teaching ability.
e) Off-line telex message preparation.
f) Pre-loaded standard text.

Terminals used as SES are comprising the following additional facilities.

a) Personal access code (SES-IS/Password) for each student.
b) Access to the network can only be achieved using correct INMARSAT operational routines.
c) Tx and Rx signal level indicators.

3. Technical Specifications

Number of terminals	3-50
Maximum distance between console & terminals	1000 meters
Simulated message speed	50 Bauds
Actual network speed	10M Bit/sec
Network type	Ethernet
Network Operating System	Novell network
Operating System	MS-DOS
Number of Satellites	6-20
Number of CES	30-40
Number of NCS	3-10
Number of CES Operators	0-10
Number of Terrestrial Subscribers	0-5
Number of simultaneous messages over network	limited by Queue parameters
Number of simultaneous speech conversations	up to 10
Visible character set	ITA number 2
Octal numbering system	YES
ITU Numbering system	YES

5.8.2.2 General description of INPRO SATCOM SIMULATOR

A complete training system for the INMARSAT global communication system.

The system comprises a master (instructors) position and up to thirty student positions located along on a common network cable up to 1 k.m. in length.

The simulator system operates within its own environment and can be used for both telex and speech communication. Each student position can operate either as a class 1,

Inmarsat-A terminal (telex and telephony) or as a Inmarsat-C INMARSAT terminal (telex message switching only).
Full simulation of the INMARSAT system can be achieved including enhanced group calls, SOS call diversions, short code selection, etc. Antenna control routines are available to nominated student terminals for positioning exercises.

The instructor can control how the complete system functions by changing operational characteristics of the network, e.g. satellite position, queueing limits, coast station facilities, etc.

The complete system is run from the instructors position. A colored graphics display screen is used to show how the system is operating at any time through the use of maps with symbolic overlays. "Pull down" windows are used by the instructor to change any system operations. A second (monochrome) display screen allows the instructors to communicate in telex mode and to show systems messages.

Each student position comprises a self contain "intelligent" terminal to allow for message preparation as well as for normal telex communications.

The complete system allows all INMARSAT facilities requested by any terminal to operate simultaneously.

Student Positions
Each student position simulates either:

Inmarsat-A class 1 SES equipment (telex and telephony) or Inmarsat-C message terminal (telex only). (The mode of

operation is selected by the student.)

Facilities offered by the terminals are as follows:

1. Off-line message preparation.
   Up to ten separate message texts can be prepared. Additionally, provision is made for a distress message texts to be prepared.

2. Distress message generate (DMG)
   Distress message can be automatically transmitted at intervals after an "SOS" request by the student.

3. Antenna positioning exercises.
   Two modes are available (controlled by the instructor). Model "manual" requires the student to calculate the azimuth and elevation of the antenna before the satellite TDM signal is detected.

   Model "auto" will position the antenna automatically for the student.

4. Conversation mode.
   Once student connection has been established with a selected CES then telex and/or telephony conversation mode is possible (full duplex simulation).

5. Message switching.
   Previously prepared messages can be recalled for transmission either as part of a Inmarsat-A connection or in Inmarsat-C mode.

6. Enhanced group call EGC.
   A "listening channel" is maintained for EGC calls which are valid for the SES terminal (fleet and

national numbers for each SES terminal are controlled by the instructor position).

7. Options: Fax/data transmission.
   If required the simulator can be modified for use with fax/data transmissions.

Instructor Position

The instructors position automatically simulates the following functions simultaneously;

1. All coast earth stations (CES).
   The instructor can configure up to 30 CES stations each with different operational facilities.

2. All satellite positions.
   In addition to the main satellite associated with each ocean area there also two standby satellites for each ocean area which can be configured by the instructors.

3. Any terrestrial telex/telephone number or SES number.
   Country code routines are incorporated for automatic simulated connections. A current list of approximation 8,000 valid SES numbers is also maintained by the system for immediate call-up/verification.

4. Short code selection.
   The current range of short code selections are automatically incorporated for selection if required.

5. Diversion procedures.
   Nominated CES stations can offer diversion routines under "distress" priority.

6. Inmarsat-C

   Message switching facilities are incorporated consistent with Inmarsat-C operation.

7. Enhanced Group Calls (EGC).

   Ocean area calls, national calls and fleet calls can be automatically transmitted under the timing control of the instructor. The message texts can also be varied.

8. System Management.

   Connection limits and queueing limits on the network can be imposed with automatic "de-queueing".

9. System Log.

   A log file is maintained showing all network activity in real-time. This facility is useful for "billing" simulation.

In addition to the automatic operation, the instructor can annually select the following facilities:

10. Relocation of SES terminals.

    Student terminal can be placed at specific latitude and longitude positions

11. Conversation Mode.

    The instructor can respond to, or initiate, both telex and telephony calls with specific SES terminals.

The instructors position offers all facilities simultaneously and all times. Where a facility is requested by a student that need a response then "recorded responses" are generated if required.

Brief Technical Information:

The telex communications operate on a simulated 50 bauds around the network and uses ITA NO. 2 character set. The actual (hidden) transmission speed is 4,800 bauds using ASCII character set.

The communications protocol is master/slave (with the instructors position as "master"). A reply-after-receipt mechanism is incorporated to ensure that only an addressed SES terminal will respond to a specific message. Buffering facilities at all terminals coupled with the increased transmission speed ensure that the effect is to show real-time communications at the simulated 50 bauds.

Printing facilities are available at all terminals. At the instructors position this can be dedicated either to the real-time system log or to provided a copy of the instructors status/messaging screen; at the student positions the printer can be redirected to display the incoming EGC messages whiles the terminal is in Off-line mode, or for printing out any other recorded or stored texts.

Telephony mode uses simulated tone dialling with the standard INMARSAT response tones for "busy" "unavailable" etc. A slave "SOS" button is incorporated into each SES telephone keyboard.

5.9 Recommendation on the Certification of GMDSS in the P.R. of China

Under the 1991 amendments to the STCW Convention, 1978,

four radio operator's certificates are recommended. There are First-class radio electronic certificate, Second-class radio electronic certificate, General operator's certificate and restricted operator's certificate.

Under the Regulation 16, Chapter IV, the 1988 amendments to SOLAS Convention, 1974, " Every ship shall carry personnel qualified for distress and safety radiocommunication purposes to the satisfaction of the Administration. the personnel shall be holders of certificate specified in the Radio Regulations (RRs) as appropriate, any one of whom shall be designated to have primary responsibility for radio communications during distress incidents."

According to the adoptions of the 1991 amendments to the STCW Convention, 1978 and the 1988 amendments to the SOLAS Convention, 1974, as above, the kinds of radio operator's certificates are different from those before. This means whether a vessel should carry a radio officer on board ship or not depended on the decision of the Administration and what kind of radio operator's certificate that a radio personnel should hold depended on which sea area that a vessel is sailing. On this field of matter, different countries take different measures. Most developed countries prefer to training deck officers to do radio communications jobs, this is the case in Sweden and the Netherlands, Developing countries, as China, will still keep radio officers working on board ship. The main reason may be that they are rich in labors.

In my personal view, during the transition period from 1992 to 1999, China may take combination measures. That

is, on-the-job radio officers serving at sea area **A2**, **A3** or **A4** should be retrained so as to hold the first-class radio electronic certificate or the second-class radio electronic certificate; and on-the-job deck officers or Cadets studying at maritime institutes who will serve for vessels which are sailing at sea area **A1**, **A2**, **A3** or **A4** should be trained to hold the General Operator's Certificate. The main reasons are: First, each year, China sends a lot of crew including senior deck officers to serve for foreign vessels which belong to developed countries. Second, the equipment of **GMDSS** is installed on the bridge and deck officers will directly use some Parts of the equipment, as **EPIRBs**, **SART**, **VHF**, etc., certainly, they should know how to operate them. Finally, looking for the future of shipping, with the introductions of advanced communications technology and the duplication of communications equipment, the reliability of the communications equipment will be very high and the Mean Time Between Failures (**MTBF**) will be very long. Consequently, operating the communications equipment becomes quite simple, as using computer keyboard or just pressing a button. Also, repairing the communications equipment at sea will be almost impossible, unless in the case that changing a assembled electronic board is available. So if deck officers know how to operate and maintain the communications equipment, there is no need for having radio officers on board ship.

Chapter SIX: Conclusion

In conclusion, to introduce the GMDSS, China has already done many things. Amongst other things, an INMARSAT A/C standard CES has been built in Beijing, an INMARSAT B/M standard CES and a LUT of COSPAS-SARSAT are being built in Beijing, new CRSs are being set up and the present facilities of CRSs have being expanded step by step.

Finally, in my personal view, some points that I put out as follows may be helpful for the Authorities concerned to introduce the GMDSS in the P.R. of China.

1. The GMDSS sea areas in China should be defined as soon as possible.

2. National regulations in accordance with the 1988 amendments to the SOLAS Convention, 1974 and the 1991 amendments to the STCW Convention, 1978 should be implemented.

3. Recommendation on the Certification of GMDSS

During the GMDSS implementation transition period from 1992 to 1999, in the matter of the certification of GMDSS, China shall take its own situation into account and, may refer to what the Netherlands or Sweden has done to do as follows:

For the sea area A2, A3 and A4, China shall issue the first or the second class radio electronic certificates for the radio officers and issue the General Operator's Certificates for the deck officers as well.

For the sea area A1, China shall issue the Restricted Operator's Certificates for the deck officers.

4. With the disappearance of Morse telegraphy, the use of modern equipment and the introduction of GMDSS sea areas, new forms of operator training will have to be devised. These new requirements are based on the system.

5. Recommendation on the GMDSS Course

In order to introduce the GMDSS from the transition period to the fully implementation period, from now on, the maritime institutions in China shall offer the GMDSS course to the nautical students and the deck officers mainly those have held the Masters Certificates F.G.. The training duration of the GMDSS course can be from two to three weeks depending on the backgrounds of the trainees. The course syllabus can be based on that described in Chapter 5.

6. Search and Rescue (SAR) course shall be offered to the nautical cadets and the Radio Officers. The course syllabus is described in Chapter 5.

7. In order to train the radio operator's personnel to meet the requirements of GMDSS and the demand of radio operator's personnel, China, taking its own situation into consideration, should pay more attention to training the nautical cadets in maritime institutes to hold the General Operator's Certificates rather than electronic personnel.

8. With the introduction of GMDSS, there is a crying need

for qualified GMDSS instructors in China. In order to meet this requirement, we can select certain lecturers to be trained as GMDSS instructors.

9. With the introduction of GMDSS, when a vessel is sailing in international waters, the working language involved in this system is obviously only English. So, how to improve the maritime English levels of cadets has become more and more important.

In order to improve the English level of a cadet, some measures mentioned follows may be taken.

First, a lecturer should try to use English as teaching language other than Chinese.

Second, more practical teaching hours should be offered to cadets than those before.

10. Running the equipment of GMDSS, a cadet should have a fundamental computer knowledge and the skill of using a computer keyboard as well.

11. Recommendation on the Purchase of Simulator

Nowadays, the application of simulator for training in the maritime field has become more and more popular. It is of economical and effective; Its advantages and the main products so far in the market are described in Chapter 5. The maritime institutions in China shall purchase the maritime communications simulators for the training of maritime communications personnel as soon as possible.

ABBREVIATIONS

COSCO	-China Ocean Shipping Company
COSPAS	-Space System for the Search of Vessels in distress
CES	-Coast Earth Station
CRS	-Coast Radio Station
DSC	-Digital Selective Calling
ELT	-Emergency Locator Transmitter
EGC	-Enhanced Group Calling
EPIRB	-Emergency Position Indicating Radio Beacon
F.G.	-Foreign Going
GMDSS	-Global Maritime Distress and Safety System
GOC	-General Operator's Certificate
IFF	-Identification Friend or Foe
HF	-High Frequency
IHO	-International Hydrographic Organization
IMO	-International Maritime Organization

INMARSAT	-International Maritime Satellite Organization
ITU	-International Telecommunication Union
LUT	-Local User Terminal in the COSPAS-SARSAT system
MCC	-Mission Control Centre in the COSPAS-SARSAT system
MF	-Medium Frequency
MRCC	-Maritime Rescue Co-ordination Centre
MSC	-Maritime Safety Committee
MSI	-Maritime Safety Information
MTBF	-Mean Time Between Failures
NBDP	-Narrow Band Direct Printing (Radio Telex)
NCC	-Network Control Centre
RRs	-Radio Regulations
RT	-Radio Telecommunication
ROC	-Restricted Operator's Certificate
SARSAT	-Search and Rescue Satellite Aided Tracking
SAR	-Search and Rescue

SES	-Ship Earth Station
SSB	-Single Side Band
SOLAS	-Safety Of Life At Sea
STCW	-Standards of Training, Certification and Watchkeeping
VHF	-Very High Frequency
WWNWS	-Word-Wide Navigational Warning Service

BIBLIOGRAPHIES

1 . A QUESTION OF SAFETY. OCEAN VOICE, January 92

2. COSCO Applies GMDSS by Wang Yong. MARITIME CHINA, Spring 1991.

3. COLLEGES AND UNIVERSITIES OF CHINA'S COMMUNICATIONS. September, 1989.

4. Documents of the Conference on the National Transportation communications, 1991, Shenyiang, the P.R. of China

5. DALIAN MARINE COLLEGE, GENERAL SURVEY OF TEACHING. 1986.

6. FGMDSS and Training of Maritime Communication Officers by Professor Yang Guangzhi, Electronic Engineering Department, Dalian Maritime University.

7. GMDSS (Global Maritime Distress and Safety System.) LLOYD'S LIST, International, August, 1991.

8. GMDSS TRAINING SYLLABUS FOR DECK OFFICERS from Qingdao Ocean Shipping Mariners College.

9. GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM. IMO, LONDON, 1987.

10. GMDSS Training Syllabus for the on-the-job Personnel from the Electronic Engineering department, Dalian Maritime University. 1990.

11. INTRODUCING THE GMDSS IN THE NETHERLANDS. Professor W. Tieman, Traffic Safety Division, Directorate-General for shipping and Maritime Affairs (DGSM)

12. Letter from Mr. Lars Bergqvist, INMARSAT HEADQUATERS, LONDON.

13. LETTER from MARAC, ELECTRONICS S.A. 16th May, 1989.

14. Maritime Search and Rescue Co-ordinator Surface Search. IMO Model Course 2.02.

15. MARITIME COMMUNICATIONS SEMINAR by Lars Brodje, Frank Guinard and Ivette Jaen, INMARSAT. The World Maritime University, Malmö, 16-20 September 1991.

16. PROPOSED SYLLABUS FOR EDUCATION AND TRAINING OF GENERAL RADIO (OFFICERS) CERTIFICATE IN GERMANY. 30TH NOV., 89.

17. Qindao Ocean Shipping Mariners College. 1990.

18. Revolution in radio at sea gets under way. OCEAN VOICE, FEBRUARY 1992

19. School for satcoms, OCEAN VOICE. Maritime Information Technology & Electronics, October. 1989.

20. SAFETY AT SEA. Periodical Magazine.

21. SATCOM SIMULATOR. Materials from RADIO HOLLAND GROUP. 20th NOV., 1991.

22. THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM, Inmarsat Facts,JUNE 1991. Handout from Ms. IVETTE JAEN.

23. The Shipboard Technical Management Information System in COSCO by Dong Jiufeng, Xu Deyi and Huang Dalei (COSCO). MARITIME COMMUNICATIONS AND CONTROL, 21-23 November 1990.

24. THE MARITIME ADMINISTRATION IN CHINA by SHEN ZHAOQI (from the P.R. of China), visiting professor of WMU.

25. TRAINING OF RADIO PERSONNEL IN THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS). IMO RESOLUTION A.703(17), adopted on 6 November 1991.

26. TRAINING IN THE GMDSS by Captain J.L. Thompson, head, Navigation section, IMO.

'ERNATIONAL MARITIME
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ASSEMBLY - 17th session
Agenda item 10

RESOLUTION A.703(17)
adopted on 6 November 1991

TRAINING OF RADIO PERSONNEL IN THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS)

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

CONSIDERING the 1987 amendments to the Radio Regulations, the 1988 amendments to the International Convention for the Safety of Life at Sea, 1974 (SOLAS), and the 1991 amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW), for introduction of the global maritime distress and safety system (GMDSS),

NOTING that the 1991 amendments to regulation IV/2 of the STCW Convention require that, in determining the appropriate level of knowledge and training for certification of GMDSS radio personnel, the Administration shall also take into account the relevant recommendations of the Organization,

NOTING ALSO that resolutions 14 and 15 of the International Conference on Training and Certification of Seafarers, 1978, concerning the training and certification of radio officers and radiotelephone operators do not apply to radio personnel on ships operating in the GMDSS,

NOTING FURTHER that resolution A.702(17) on radio maintenance guidelines for the GMDSS related to sea areas A3 and A4 includes provisions permitting Administrations to approve at-sea electronic maintenance qualifications which are equivalent to those recommended for holders of certificates specified by the Radio Regulations,

RECOGNIZING the need for developing recommendations on training for radio personnel in ships operating in the GMDSS,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its fifty-ninth session,

1. ADOPTS:

(a) the Recommendation on Training of Radio Operators related to the First-Class Radioelectronic Certificate, set out in annex 1;

(b) the Recommendation on Training of Radio Operators related to the Second-Class Radioelectronic Certificate, set out in annex 2;

(c) the Recommendation on Training of Radio Operators related to the General Operator's Certificate, set out in annex 3;

(d) the Recommendation on Training of Radio Operators related to the Restricted Operator's Certificate, set out in annex 4; and

(e) the Recommendation on Training of Personnel Performing Maintenance of the GMDSS Installations Aboard Ships, set out in annex 5;

2. RECOMMENDS Governments to take account of the appropriate recommendation set out in the annexes to the present resolution on the training of radio personnel for ships operating in the GMDSS;

3. INVITES the Maritime Safety Committee to keep the present resolution under review in consultation or association with other international organizations, as appropriate, particularly with the International Labour Organisation and the International Telecommunication Union, and to bring any future amendments to the attention of all Governments concerned;

4. AUTHORIZES the Maritime Safety Committee to keep the annexed recommendations under review and to adopt, when appropriate, amendments thereto.

ANNEX 1

RECOMMENDATION ON TRAINING OF RADIO OPERATORS RELATED TO THE FIRST-CLASS RADIOELECTRONIC CERTIFICATE

1 General

1.1 Before training is commenced, the requirements of medical fitness, especially as to hearing, eyesight and speech, should be met by the candidate.

1.2 The training should be relevant to the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), the provisions of the Radio Regulations annexed to the International Telecommunication Convention (Radio Regulations) and the provisions of the International Convention for the Safety of Life at Sea (SOLAS) then in force, with particular attention to provisions for the global maritime distress and safety system (GMDSS). In developing training requirements, account should be taken of knowledge of the following items, which is not an exhaustive list.

2 Theory

2.1 Knowledge of the general principles and basic factors necessary for safe and efficient use of all the subsystems and equipment required in the GMDSS sufficient to support the training requirements listed in the practical section of this annex.

2.2 Knowledge of the use, operation and service areas of the GMDSS subsystems, including satellite system characteristics, navigational and meteorological warning systems and selection of appropriate communication circuits.

2.3 Knowledge of the principles of electricity and the theory of radio and electronics sufficient to meet the requirements specified in 2.4, 2.5, 2.6, 2.7 and 2.8 below.

2.4 Theoretical knowledge of GMDSS radiocommunication equipment, including narrow-band direct-printing telegraphy and radiotelephone transmitters and receivers, digital selective calling equipment, ship earth stations, emergency position-indicating radiobeacons, marine antenna systems, radio equipment for survival craft together with all auxiliary items, including power supplies, as well as general knowledge of the principles of other equipment generally used for radionavigation, with particular reference to maintaining the equipment in service.

2.5 Knowledge of factors that affect system reliability, availability, maintenance procedures and proper use of test equipment.

2.6 Knowledge of microprocessors and fault diagnosis in systems using microprocessors.

2.7 Knowledge of control systems in the GMDSS radio equipment including testing and analysis.

2.8 Knowledge of the use of computer software for the GMDSS radio equipment and methods for correcting faults caused by loss of software control of the equipment.

3 Regulations and documentation

The operator should have knowledge of:

.1 the SOLAS Convention and the Radio Regulations with particular emphasis on:

.1.1 distress, urgency and safety radiocommunications;

.1.2 avoiding harmful interference, particularly with distress and safety traffic;

.1.3 prevention of unauthorized transmissions;

.2 other documents relating to operational and communication procedures for distress, safety and public correspondence services, including charges, navigational warnings, and weather broadcasts in the Maritime Mobile Service and the Maritime Mobile Satellite Service;

.3 use of the International Code of Signals and the IMO Standard Marine Navigational Vocabulary.

4 Watchkeeping and procedures

Training should be given in:

.1 communication procedures and discipline to prevent harmful interference in the GMDSS subsystems;

.2 procedures for using propagation prediction information to establish optimum frequencies for communications;

.3 radiocommunications watchkeeping relevant to all GMDSS subsystems, exchange of radiocommunications traffic, particularly concerning distress, urgency and safety procedures and radio records;

.4 use of the international phonetic alphabet;

.5 monitoring a distress frequency while simultaneously monitoring or working on at least one other frequency;

.6 ship position-reporting systems and procedures;

.7 communication procedures of the IMO Merchant Ship Search and Rescue Manual (MERSAR), using radiocommunications;

.8 radio medical systems and procedures.

5 Practical

Practical training, supported by appropriate laboratory work, should be given in:

.1 correct and efficient operation of all GMDSS subsystems and equipment under normal propagation conditions and under typical interference conditions;

.2 safe operation of all the GMDSS communication equipment and ancillary devices, including safety precautions;

.3 adequate and accurate keyboard skill for the satisfactory exchange of communications;

.4 operational techniques for:

.4.1 receiver and transmitter adjustment for the appropriate mode of operation, including digital selective calling and direct-printing telegraphy;

.4.2 antenna adjustment and re-alignment, as appropriate;

.4.3 use of radio life-saving appliances;

.4.4 use of emergency position-indicating radio beacons (EPIRBs);

.5 antenna rigging, repair and maintenance, as appropriate;

.6 reading and understanding of pictorial, logic and circuit diagrams;

.7 use and care of those tools and test instruments necessary to carry out at-sea electronic maintenance;

.8 manual soldering and desoldering techniques, including those involving semiconductor devices and modern circuits and the ability to distinguish whether the circuit is suitable to be manually soldered or desoldered;

.9 tracing and repair of faults to component level where practicable, and to board/module level in other cases;

.10 recognition and correction of conditions contributing to the fault occurring;

.11 maintenance procedures, both preventive and corrective for all the GMDSS communication equipment and radionavigation equipment;

.12 methods of alleviating electrical and electromagnetic interference such as bonding, shielding and bypassing.

6 Miscellaneous

The operator should have knowledge of, and/or receive training in:

.1 the English language, both written and spoken, for the satisfactory exchange of communications relevant to the safety of life at sea;

.2 world geography, especially the principal shipping routes, services of rescue co-ordination centres (RCCs) and related communication routes;

.3 survival at sea, the operation of lifeboats, rescue boats, liferafts, buoyant apparatus and their equipment, with special reference to radio life-saving appliances;

.4 fire prevention and fire fighting with particular reference to the radio installation;

.5 preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical, radiation, chemical and mechanical hazards;

.6 first aid, including heart-respiration revival technique;

.7 co-ordinated universal time (UTC), global time zones and international date line.

ANNEX 2

RECOMMENDATION ON TRAINING OF RADIO OPERATORS RELATED TO THE SECOND-CLASS RADIOELECTRONIC CERTIFICATE

1 General

1.1 Before training is commenced, the requirements of medical fitness, especially as to hearing, eyesight and speech, should be met by the candidate.

1.2 The training should be relevant to the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), the provisions of the Radio Regulations annexed to the International Telecommunication Convention (Radio Regulations) and the provisions of the International Convention for the Safety of Life at Sea (SOLAS) then in force, with particular attention to provisions for the global maritime distress and safety system (GMDSS). In developing training requirements, account should be taken of knowledge of the following items, which is not an exhaustive list.

2 Theory

2.1 Knowledge of the general principles and basic factors necessary for safe and efficient use of all the subsystems and equipment required in the GMDSS sufficient to support the training requirements listed in the practical section of this annex.

2.2 Knowledge of the use, operation and service areas of the GMDSS subsystems, including satellite system characteristics, navigational and meteorological warning systems and selection of appropriate communication circuits.

2.3 Knowledge of the principles of electricity and the theory of radio and electronics sufficient to meet the requirements specified in 2.4, 2.5, 2.6, 2.7 and 2.8 below.

2.4 General theoretical knowledge of GMDSS radiocommunication equipment, including narrow-band direct-printing telegraph and radiotelephone transmitters and receivers, digital selective calling equipment, ship earth stations, emergency position-indicating radiobeacons, marine antenna systems, radio equipment for survival craft together with all auxiliary items, including power supplies, as well as general knowledge of other equipment generally used for radionavigation, with particular reference to maintaining the equipment in service.

2.5 General knowledge of factors that affect system reliability, availability, maintenance procedures and proper use of test equipment.

2.6 General knowledge of microprocessors and fault diagnosis in systems using microprocessors.

2.7 General knowledge of control systems in the GMDSS radio equipment including testing and analysis.

2.8 Knowledge of the use of computer software for the GMDSS radio equipment and methods for correcting faults caused by loss of software control of the equipment.

3 Regulations and documentation

The operator should have knowledge of:

.1 the SOLAS Convention and the Radio Regulations with particular emphasis on:

.1.1 distress, urgency and safety radiocommunications;

.1.2 avoiding harmful interference, particularly with distress and safety traffic;

.1.3 prevention of unauthorized transmissions;

.2 other documents relating to operational and communication procedures for distress, safety and public correspondence services, including charges, navigational warnings, and weather broadcasts in the Maritime Mobile Service and the Maritime Mobile Satellite Service;

.3 use of the International Code of Signals and the IMO Standard Marine Navigational Vocabulary.

4 Watchkeeping and procedures

Training should be given in:

.1 communication procedures and discipline to prevent harmful interference in the GMDSS subsystems;

.2 procedures for using propagation prediction information to establish optimum frequencies for communications;

.3 radiocommunications watchkeeping relevant to all GMDSS subsystems, exchange of radiocommunications traffic, particularly concerning distress, urgency and safety procedures and radio records;

.4 use of the international phonetic alphabet;

.5 monitoring a distress frequency while simultaneously monitoring or working on at least one other frequency;

.6 ship position-reporting systems and procedures;

.7 communication procedures of the IMO Merchant Ship Search and Rescue Manual (MERSAR), using radiocommunications;

.8 radio medical systems and procedures.

5 Practical

Practical training, supported by appropriate laboratory work, should be given in:

.1 correct and efficient operation of all GMDSS subsystems and equipment under normal propagation conditions and under typical interference conditions;

.2 safe operation of all the GMDSS communication equipment and ancillary devices, including safety precautions;

.3 adequate and accurate keyboard skill for the satisfactory exchange of communications;

.4 operational techniques for:

.4.1 receiver and transmitter adjustment for the appropriate mode of operation, including digital selective calling and direct-printing telegraphy;

.4.2 antenna adjustment and re-alignment, as appropriate;

.4.3 use of radio life-saving appliances;

.4.4 use of emergency position-indicating radio beacons (EPIRBs);

.5 antenna rigging, repair and maintenance, as appropriate;

.6 reading and understanding of pictorial, logic and module interconnection diagrams;

.7 use and care of those tools and test instruments necessary to carry out at-sea electronic maintenance at the level of unit or module replacement;

.8 basic manual soldering and desoldering techniques and their limitations;

.9 tracing and repair of faults to board/module level;

.10 recognition and correction of conditions contributing to the fault occurring;

.11 basic maintenance procedures, both preventive and corrective, for all the GMDSS communication equipment and radionavigation equipment;

.12 methods of alleviating electrical and electromagnetic interference such as bonding, shielding and bypassing.

6 Miscellaneous

The operator should have knowledge of, and/or receive training in:

.1 the English language, both written and spoken, for the satisfactory exchange of communications relevant to the safety of life at sea;

.2 world geography, especially the principal shipping routes, services of rescue co-ordination centres (RCCs) and related communication routes;

.3 survival at sea, the operation of lifeboats, rescue boats, liferafts, buoyant apparatus and their equipment, with special reference to radio life-saving appliances;

.4 fire prevention and fire fighting with particular reference to the radio installation;

.5 preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical, radiation, chemical and mechanical hazards;

.6 first aid, including heart-respiration revival technique;

.7 co-ordinated universal time (UTC), global time zones and international date line.

ANNEX 3

RECOMMENDATION ON TRAINING OF RADIO OPERATORS RELATED TO THE GENERAL OPERATOR'S CERTIFICATE

1 General

1.1 Before training is commenced, the requirements of medical fitness, especially as to hearing, eyesight and speech, should be met by the candidate.

1.2 The training should be relevant to the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), the provisions of the Radio Regulations annexed to the International Telecommunication Convention (Radio Regulations) and the provisions of the International Convention for the Safety of Life at Sea (SOLAS) then in force, with particular attention to provisions for the global maritime distress and safety system (GMDSS). In developing training requirements, account should be taken of knowledge of the following items, which is not an exhaustive list.

2 Theory

2.1 Knowledge of the general principles and basic factors necessary for safe and efficient use of all the subsystems and equipment required in the GMDSS sufficient to support the training requirements listed in the practical section of this annex.

2.2 Knowledge of the use, operation and service areas of the GMDSS subsystems, including satellite system characteristics, navigational and meteorological warning systems and selection of appropriate communication circuits.

3 Regulations and documentation

The operator should have knowledge of:

.1 the SOLAS Convention and the Radio Regulations with particular emphasis on:

.1.1 distress, urgency and safety radiocommunications;

.1.2 avoiding harmful interference, particularly with distress and safety traffic;

.1.3 prevention of unauthorized transmissions;

.2 other documents relating to operational and communication procedures for distress, safety and public correspondence services, including charges, navigational warnings, and weather broadcasts in the Maritime Mobile Service and the Maritime Mobile Satellite Service;

.3 use of the International Code of Signals and the IMO Standard Marine Navigational Vocabulary.

4 Watchkeeping and procedures

Training should be given in:

.1 communication procedures and discipline to prevent harmful interference in the GMDSS subsystems;

.2 procedures for using propagation prediction information to establish optimum frequencies for communications;

.3 radiocommunications watchkeeping relevant to all GMDSS subsystems, exchange of radiocommunications traffic, particularly concerning distress, urgency and safety procedures and radio records;

.4 use of the international phonetic alphabet;

.5 monitoring a distress frequency while simultaneously monitoring or working on at least one other frequency;

.6 ship position-reporting systems and procedures;

.7 communication procedures of the IMO Merchant Ship Search and Rescue Manual (MERSAR), using radiocommunications;

.8 radio medical systems and procedures.

5 Practical

Practical training should be given in:

.1 correct and efficient operation of all GMDSS subsystems and equipment under normal propagation conditions and under typical interference conditions;

.2 safe operation of all the GMDSS communications equipment and ancillary devices, including safety precautions;

.3 accurate and adequate keyboard skills for the satisfactory exchange of communications;

.4 operational techniques for:

.4.1 receiver and transmitter adjustment for the appropriate mode of operation, including digital selective calling and direct-printing telegraphy;

.4.2 antenna adjustment and re-alignment as appropriate;

.4.3 use of radio life-saving appliances;

.4.4 use of emergency position-indicating radio beacons (EPIRBs).

6 Miscellaneous

The operator should have knowledge of, and/or receive training in:

.1 the English language, both written and spoken, for the satisfactory exchange of communications relevant to the safety of life at sea;

.2 world geography, especially the principal shipping routes, services of rescue co-ordination centres (RCCs) and related communication routes;

.3 survival at sea, the operation of lifeboats, rescue boats, liferafts, buoyant apparatus and their equipment, with special reference to radio life-saving appliances;

.4 fire prevention and fire fighting with particular reference to the radio installation;

.5 preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical, radiation, chemical and mechanical hazards;

.6 first aid, including heart-respiration revival technique;

.7 co-ordinated universal time (UTC), global time zones and international date line.

ANNEX 4

RECOMMENDATION ON TRAINING OF RADIO OPERATORS RELATED TO THE RESTRICTED OPERATOR'S CERTIFICATE

1 General

1.1 Before training is commenced, the requirements of medical fitness, especially as to hearing, eyesight and speech, should be met by the candidate.

1.2 The training should be relevant to the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), the provisions of the Radio Regulations annexed to the International Telecommunication Convention (Radio Regulations) and the provisions of the International Convention for the Safety of Life at Sea (SOLAS) then in force, with particular attention to provisions for the global maritime distress and safety system (GMDSS). In developing training requirements, account should be taken of knowledge of the following items, which is not an exhaustive list.

2 Theory

2.1 Knowledge of the general principles and basic factors, including VHF range limitation and antenna height effect necessary for safe and efficient use of all the subsystems and equipment required in the GMDSS in sea area A1, sufficient to support the training requirements listed in the practical section of this annex.

2.2 Knowledge of the use, operation and service areas of the GMDSS sea area A1 subsystems, e.g. navigational and meteorological warning systems and the appropriate communication circuits.

3 Regulations and documentation

The operator should have knowledge of:

.1 those parts of the SOLAS Convention and the Radio Regulations relevant to sea area A1, with particular emphasis on:

.1.1 distress, urgency and safety radiocommunications;

.1.2 avoiding harmful interference, particularly with distress and safety traffic;

.1.3 prevention of unauthorized transmissions;

.2 other documents relating to operational and communication procedures for distress, safety and public correspondence services, including charges, navigational warnings and weather broadcasts in the Maritime Mobile Service in sea area A1;

.3 use of the International Code of Signals and the IMO Standard Marine Navigational Vocabulary.

4 Watchkeeping and procedures

Training should be given in:

.1 communication procedures and discipline to prevent harmful interference in the GMDSS subsystems used in sea area A1;

.2 VHF communication procedures for:

.2.1 radiocommunications watchkeeping, exchange of radiocommunications traffic, particularly concerning distress, urgency and safety procedures and radio records;

.2.2 monitoring a distress frequency while simultaneously monitoring or working on at least one other frequency;

.2.3 digital selective calling system;

.3 use of the international phonetic alphabet;

.4 ship position-reporting systems and procedures;

.5 communication procedures of the IMO Merchant Ship Search and Rescue Manual (MERSAR) using VHF radiocommunications;

.6 radio medical systems and procedures.

5 Practical

Practical training should be given in:

.1 correct and efficient operation of the GMDSS subsystems and equipment prescribed for ships operating in sea area A1 under normal propagation conditions and under typical interference conditions;

.2 safe operation of the relevant GMDSS communication equipment and ancillary devices, including safety precautions;

.3 operational techniques for:

.3.1 use of VHF, including channel, squelch, and mode adjustment, as appropriate;

.3.2 use of radio life-saving appliances;

.3.3 use of emergency position-indicating radio beacons (EPIRBs);

.3.4 use of NAVTEX receiver.

6 Miscellaneous

The operator should have knowledge of, and/or receive training in:

.1 the English language, both written and spoken, for the satisfactory exchange of communications relevant to the safety of life at sea;

.2 services of rescue co-ordination centres (RCCs) and related communication routes;

.3 survival at sea, the operation of life boats, rescue boats, liferafts, buoyant apparatus and their equipment, with special reference to radio lifesaving appliances;

.4 fire prevention and fire fighting with particular reference to the radio installation;

.5 preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical, radiation, chemical and mechanical hazards;

.6 first aid including heart-respiration revival technique.

ANNEX 5

RECOMMENDATION ON TRAINING OF PERSONNEL PERFORMING MAINTENANCE OF THE GMDSS INSTALLATIONS ABOARD SHIPS

1 General

1.1 Reference is made to regulation IV/15, Maintenance requirements, as contained in the 1988 amendments to the 1974 SOLAS Convention concerning radiocommunications for the GMDSS and to resolution A.702(17) on radio maintenance guidelines for the GMDSS related to sea areas A3 and A4 which includes in its annex the following provision:

> "4.2 The person designated to perform functions for at-sea electronic maintenance should either hold an appropriate certificate as specified by the Radio Regulations, as required, or have equivalent at-sea electronic maintenance qualifications, as may be approved by the Administration, taking into account the recommendations of the Organization on the training of such personnel."

1.2 The following guidance on equivalent electronic maintenance qualifications is provided for use by Administrations as appropriate.

1.3 Training as recommended below, does not qualify the person to be an operator of GMDSS radio equipment, unless he holds an appropriate radio operator's certificate.

2 Maintenance training equivalent to the first-class radioelectronic certificate

2.1 In determining training equivalent to the maintenance elements of the first-class radioelectronic certificate, knowledge of the items referred to in the following paragraphs contained in annex 1 to the present resolution should be taken into account, but the list should not be considered exhaustive.

2.2 Theory

2.1, 2.3, 2.4, 2.5, 2.6, 2.7 and 2.8.

2.3 Practical

5.2, 5.4.1, 5.4.2, 5.4.3, 5.4.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11 and 5.12.

2.4 Miscellaneous

6.4, 6.5 and 6.6.

3 Maintenance training equivalent to the second-class radioelectronic certificate

3.1 In determining training equivalent to the maintenance elements of the second-class radioelectronic certificate, knowledge of the items referred to in the following paragraphs contained in annex 2 to the present resolution, should be taken into account, but the list should not be considered exhaustive.

3.2 Theory

2.1, 2.3, 2.4, 2.5, 2.6, 2.7 and 2.8.

3.3 Practical

5.2, 5.4.1, 5.4.2, 5.4.3, 5.4.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11 and 5.12.

3.4 Miscellaneous

6.4, 6.5 and 6.6.