航 海 类 系 列 教 材

GMDSS 通信英语

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内容简介

主要内容:本书根据《全球海上遇险和安全系统(GMDSS)操作员考试大纲和评估规范》最新要求编写,主要介绍了 GMDSS 通信系统设备组成、业务范围和相关法规等。

本书特色:本书全面体现了 STCW 公约马尼拉修正案和"11 规则"精神;始终围绕航海教育的特点,内容紧扣最新考试大纲,深广度适中;始终贯穿职业综合素养培养目标,打破原有的学科体系,按功能模块的要求对编写内容进行了全面调整;理论学习和实际训练紧密结合,强化理论教育和技能训练。

读者对象:本书可作为航海类院校"GMDSS 通信英语"课程教材,也可供海船船员参加适任考试选作复习用书或作为广大海员的自学读本和考试发证机关试题命题参考材料。

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前　言

“全球海上遇险与安全系统（GMDSS）”是目前海上遇险、紧急、安全常规通信的唯一通信系统，在保障航行安全方面起到非常重要的作用。多年来，我国的航海院校和船员培训机构培训了大批适任 GMDSS 普通操作员，有力地保障了该系统在我国的顺利实施，对海上交通安全做出了积极的贡献。

近几年，随着航海技术的快速发展，新技术、新设备不断应用到 GMDSS 系统中。为确保 GMDSS 普通操作员能够胜任该系统的新要求，《中华人民共和国海船船员适任考试和发证规则》（交通运输部 2011 年第 12 号令，简称“11 规则”）对现有的 GMDSS 考试大纲进行了相应的调整。为此，中华人民共和国海事局组织相关专家对《全球海上遇险和安全系统（GMDSS）操作员考试大纲和评估规范》（以下简称《GMDSS 考试大纲和评估规范》）进行了修订。

为全面履行经 2010 年修正的《1978 年海员培训、发证和值班标准国际公约》（简称“STCW 公约马尼拉修正案”），实施“11 规则”和《GMDSS 操作员考试大纲和评估规范》，进一步提高船员素质，使 GMDSS 通信英语教学改革与创新能跟上新形势的发展，符合现代航海技术发展的需求，我们根据最新考试大纲，编写了《GMDSS 通信英语》这本教材。浙江省级课堂教学改革项目“多维互动式教学法在《GMDSS 通信设备与业务》课程教学中的探索与应用(kg2015201)”及“基于航海模拟器的船舶 VHF 通信课程沉浸式实验教学研究(kg2015198)”的部分研究成果也完全融入到本教材之中。

本书共分为 7 章，其编写特色如下。

1. 全面体现了 STCW 公约马尼拉修正案和“11 规则”中强调的：教育必须遵守知识更新的原则，强调技能，培养能适应现代化船舶管理复合型人才要求的精神。

2. 始终贯穿“职业素养能力作为培养目标的主线”，打破原有的学科体系，按功能模块的要求对课程内容进行了全面的调整、删减，抓住基本要素重新组合。各部分衔接紧凑，避免重复教学，并紧跟现代科学技术，有较强的科学性和先进性。

3. 编写始终围绕航海教育的特点，内容紧扣考试大纲，深广度适中，不但体现了理论和实践的结合，也体现了加强能力教育和强化技能训练的力度。

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4. 编写过程中还把品德素养、知识素养、能力素养和身心素养等素质教育的内容交融并贯彻其中，体现了对海员综合素质及能力培养的力度。

全书由艾万政主编统稿。第 1 章由艾万政编写，第 2 章由刘虎编写，第 3 章由池弘福编写，第 4 章由吴建平和王家宏编写，第 5 章由淦学甄和王伟军编写，第 6 章由山东理工职业学院王庆占编写，第 7 章由陈筱姁编写。山东省船员培训中心的王敬涛主任和孙一华也参与了本书部分内容的编写。本书题库由池弘福和丁天明提供，他们两位也参加了本书的审核工作。

本书通俗易通，内容主要介绍 GMDSS 重要设备、重要业务和相关法规。学生前期已学过《GMDSS 通信设备与业务》，可中英文对照开展自学。

本书可作为航海类院校“GMDSS 通信英语”课程教材，也可供海船船员参加适任考试选作复习用书，或作为广大海员自学读本和考试发证机关试题命题参考材料。

本书由浙江海洋大学教材出版基金资助出版，在编写和出版过程中，得到了浙江海事局、山东海事局和海洋出版社的大力支持，在此表示衷心的感谢。

由于作者水平有限，书中难免存在错误和不足，恳请读者批评指正。

编者

2016 年 1 月

目　录

Chapter 1 Introductions to the GMDSS

1.1 Basic Knowledge of GMDSS

1.1.1 History of GMDSS

Since its establishment in 1959, the International Maritime Organization (IMO), in its efforts to enhance safety at sea by the adoption of the highest practicable standards, has sought to improve the radiocommunication provisions of the International Convention for the Safety of Life at Sea (SOLAS) and to exploit the advances made in radiocommunication technology.

The shipborne radiocommunication equipment prescribed by the 1960 and 1974 SOLAS Conventions consisted of radiotelegraph equipment for passenger ships of all sizes and cargo ships of 1,600 tons gross tonnage and upwards, as well as radiotelephone equipment for cargo ships of 300 to 1,600 tons gross tonnage. The ships so fitted, although they could receive the distress alert, could not communicate with each other, and it was not until 1984 that all ships were required to be able to communicate by means of VHF and MF radiotelephone. The range of transmission on MF was only 150 miles, so for ships beyond this distance from the nearest Coast Station, the old system is essentially a ship-to-ship distress system.

In 1972, with the assistance of the International Radio Consultative Committee (CCIR), IMO commenced a study of maritime satellite communications which resulted in the establishment, in 1979, of the INMARSAT organization, thus making available to shipping an international satellite communications system.

In 1973, through Assembly resolution A. 283 (VIII), IMO reviewed its policy on the development of the maritime distress system so as to incorporate satellite communications and foresaw the possibility of automatic alerting and transmission of maritime distress and safety information.

In 1979, the International Conference on Maritime Search and Rescue adopted the International Convention on Maritime Search and Rescue, 1979 (1979 SAR Convention), the ultimate objective of which is to establish a global plan for maritime search and rescue (SAR) on a framework of multilateral or bilateral agreements between neighboring states on the provision of SAR services in coastal and adjacent ocean waters to achieve co-operation and mutual support in responding to distress incidents. The conference also invited IMO to develop a global maritime distress and safety system, including telecommunication provisions, for the effective operation of the

search and rescue plan prescribed in the 1979 SAR Convention.

The IMO Assembly, at its eleventh session in 1979, considered the existing arrangements for maritime distress and safety communications and decided that a new global maritime distress and safety system should be established to improve distress and safety radiocommunications and procedures. In conjunction with a coordinated search and rescue infrastructure, it would incorporate recent technical developments and significantly improve the safety of life at sea.

With the assistance of the International Telecommunication Union(ITU), CCIR, other international organizations, notably the World Meteorological Organization(WMO), the International Hydrographic Organization(IHO), INMARSAT, and the COSPAS-SARSAT partners, IMO developed and proved various equipments and techniques used in the global maritime distress and safety system(GMDSS). The ITU also established the appropriate regulatory framework for the implementation of the GMDSS.

The 1983 and 1987 World Administrative Radio Conferences for the Mobile Services (WARC Mob-83 and-87) and WARC-92 adopted amendments to the ITU Radio Regulations which prescribe the frequencies, operational procedures and radio personnel for the GMDSS.

In 1988, the Conference of Contracting Governments to the 1974 SOLAS Convention on the Global Maritime Distress and Safety System(GMDSS Conference) adopted amendments to the 1974 SOLAS Convention concerning radiocommunications for the GMDSS, together with several relevant resolutions. These amendments entered into force on 1 February 1992, and the GMDSS was fully implemented on 1 February 1999.

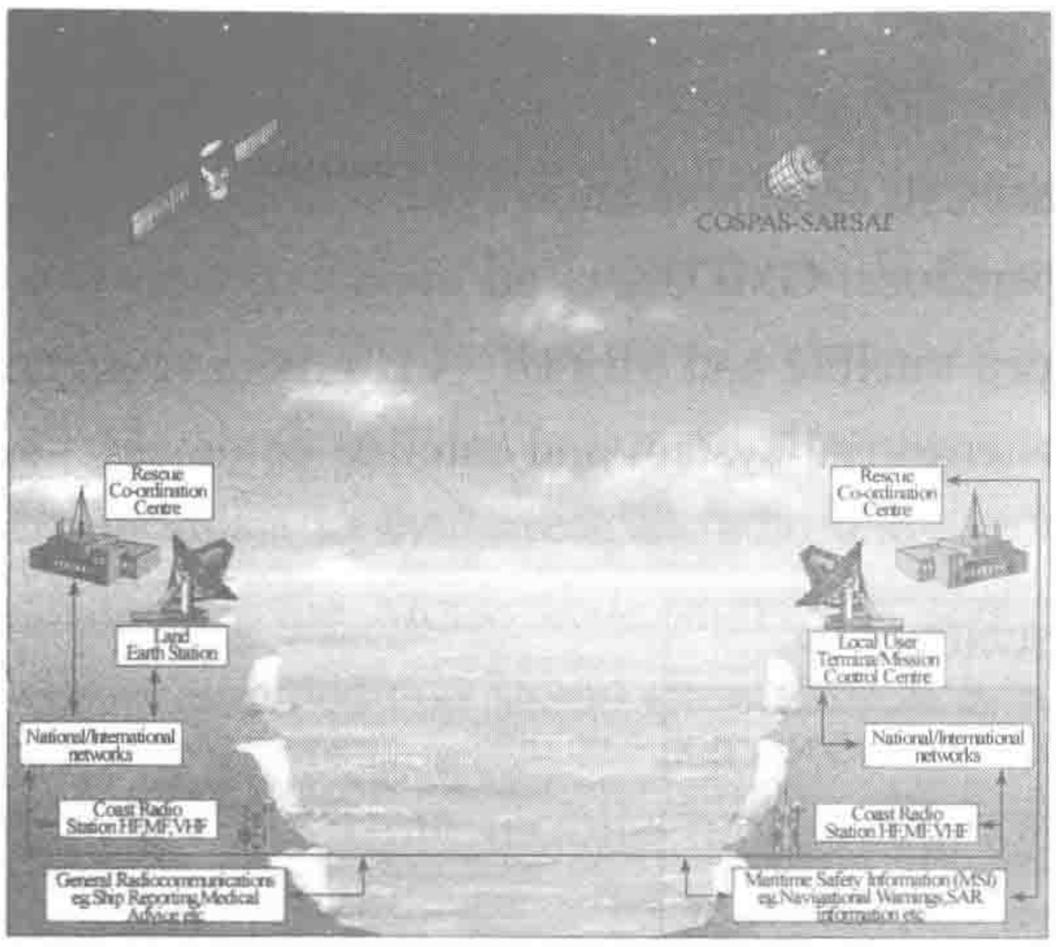
1.1.2 Basic concept of the GMDSS

The basic concept of the GMDSS(Fig. 1 – 1) 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 that they can assist in a coordinated SAR operation with the minimum delay. The system also provides for urgency and safety communications and the promulgation of Maritime Safety Information (MSI)—navigational and meteorological warnings and forecasts and other urgent and safety information to ships. In other words, every ship is able, irrespective of the area in which it operates, to perform those communication functions which are essential for the safety of the ship itself and othose f other ships operating in the same area.

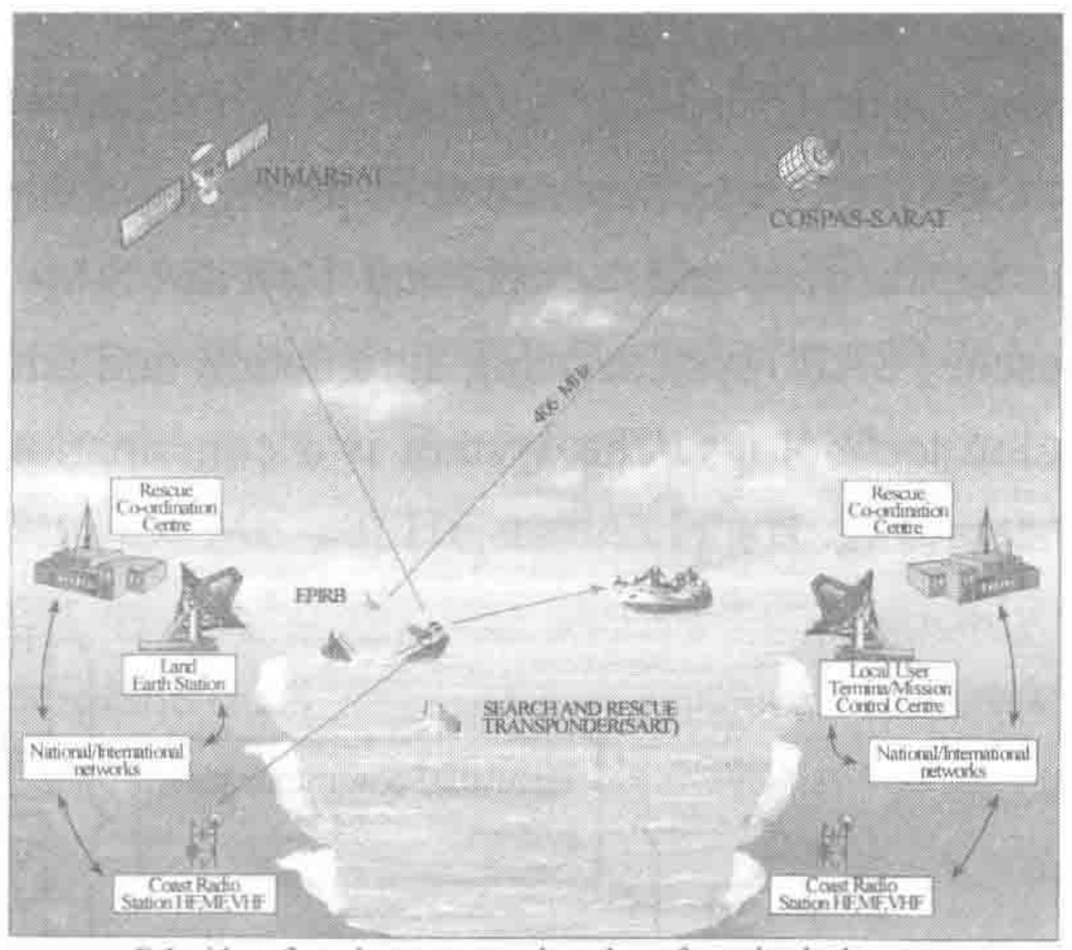
1.1.3 GMDSS Sea Areas

Recognizing that the different radio subsystems incorporated in the GMDSS system have individual limitations with respect to the geographical coverage and services provided, the equipment required to be carried by a ship is determined in principle by the ship's area of operation, which is designated as follows :

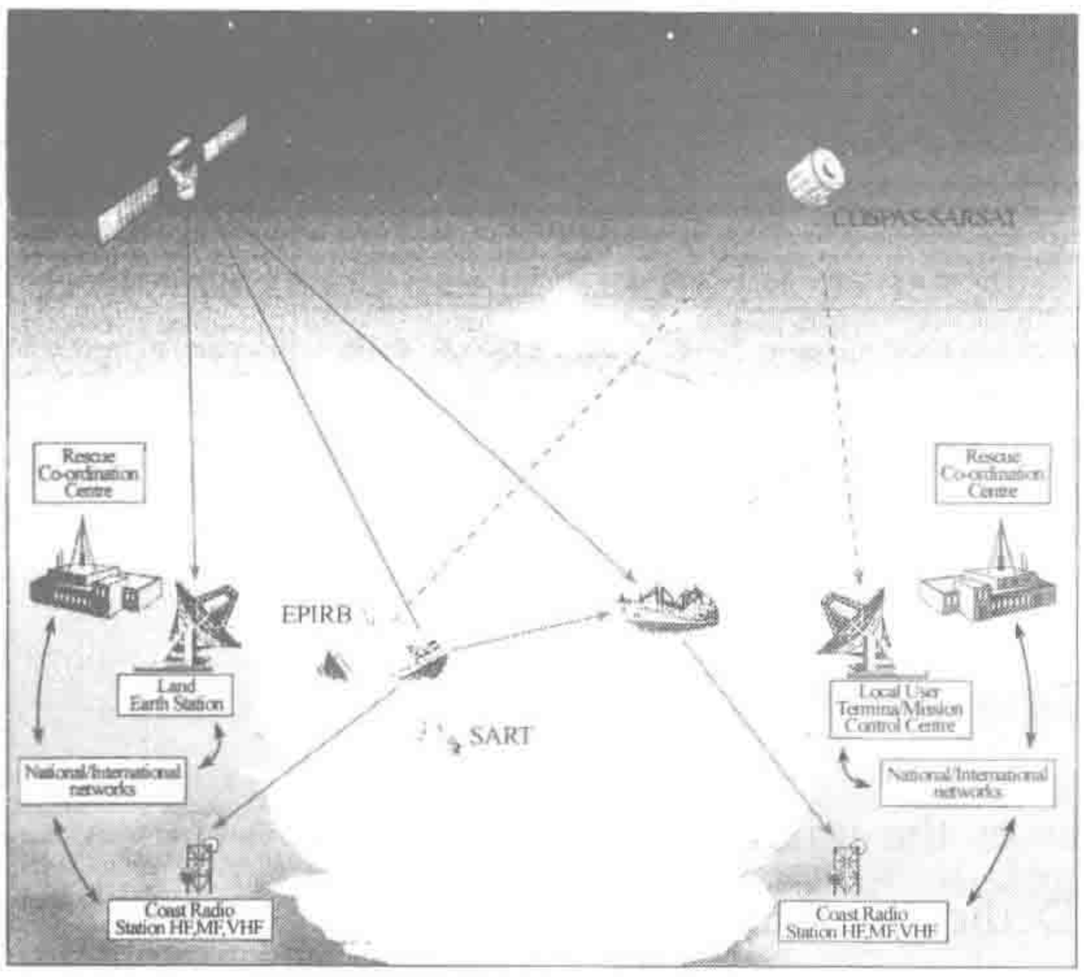
• Sea Area A1—an area within the radiotelephone coverage of at least one VHF(Very High Frequency) Coast Station in which continuous Digital Selective Calling(DSC) alerting is a-



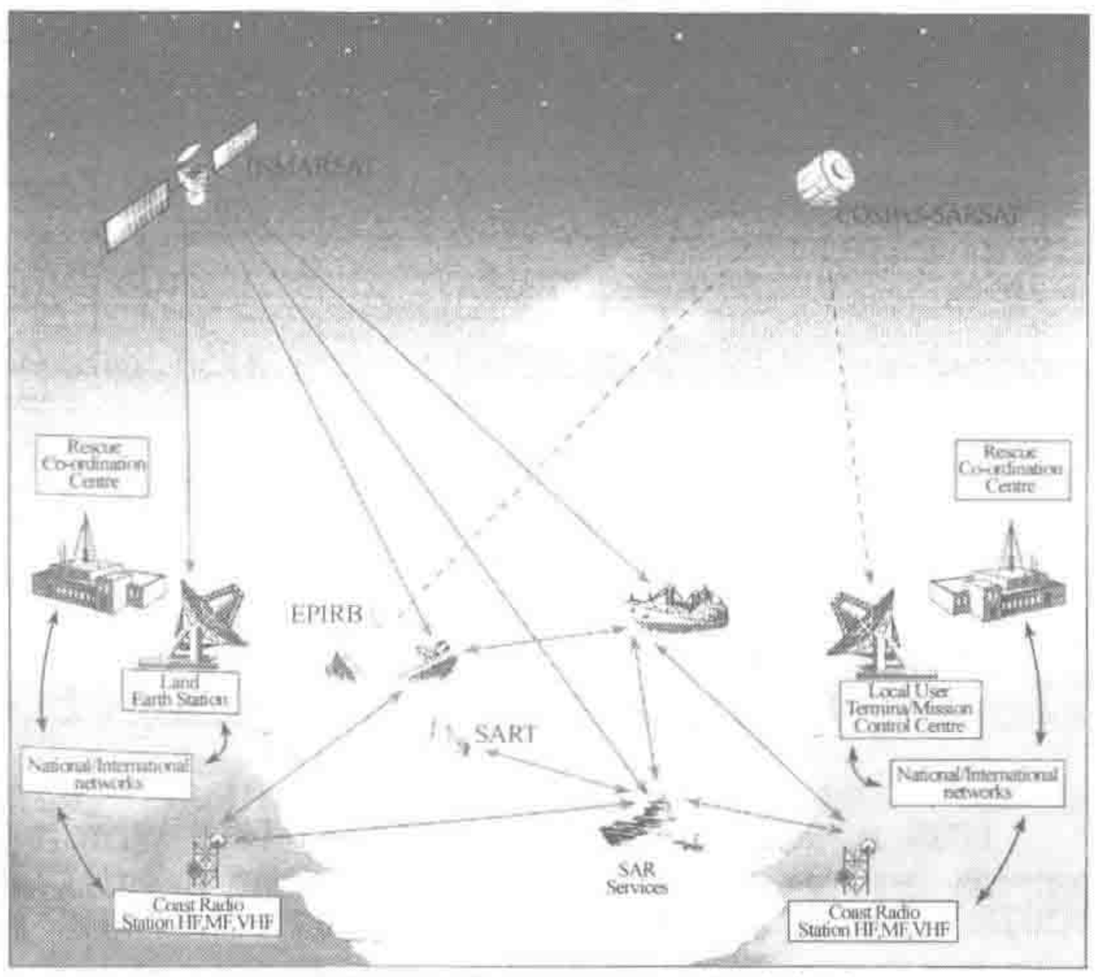
A.Integral facilities of the GMDSS



B.Incident:first alert messages broadcast from the deployment of emergency locating equipment



C.Emergency alert messages passed to Mission Control and Rescue Co-ordination Centres,Land Earth and Coast Radio Stations and vessels in the area.



D.GMDSS operational:emergency rescue services deployed, on-scene communications.

Fig. 1 – 1 Basic concept of GMDSS

vailable. Such an area could extend typically 30 ~ 50 nautical miles from the Coast Station.

• Sea Area A2—an area, excluding Sea Area A1, within the radiotelephone coverage of at least one MF Coast Station in which continuous DSC alerting is available. This area typically extends to up 150 ~ 250 nautical miles offshore.

• Sea Area A3—an area, excluding Sea Areas A1 and A2, within the coverage of an INMARSAT geostationary satellite in which continuous alerting is available. This area lies between about latitudes 70°N and 70°S.

• Sea Area A4—an area outside Sea Areas A1, A2 and A3.

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1.2 Sub-systems of GMDSS

GMDSS was introduced to provide a comprehensive communication system available for the use for distress and Search and Rescue (SAR) operations. GMDSS is an enhanced Search and Rescue (SAR) system using automation and advanced satellite and MF/HF/VHF radio communication technology. The system is a combination of terrestrial system and satellite communication system (Fig. 1 – 2) .

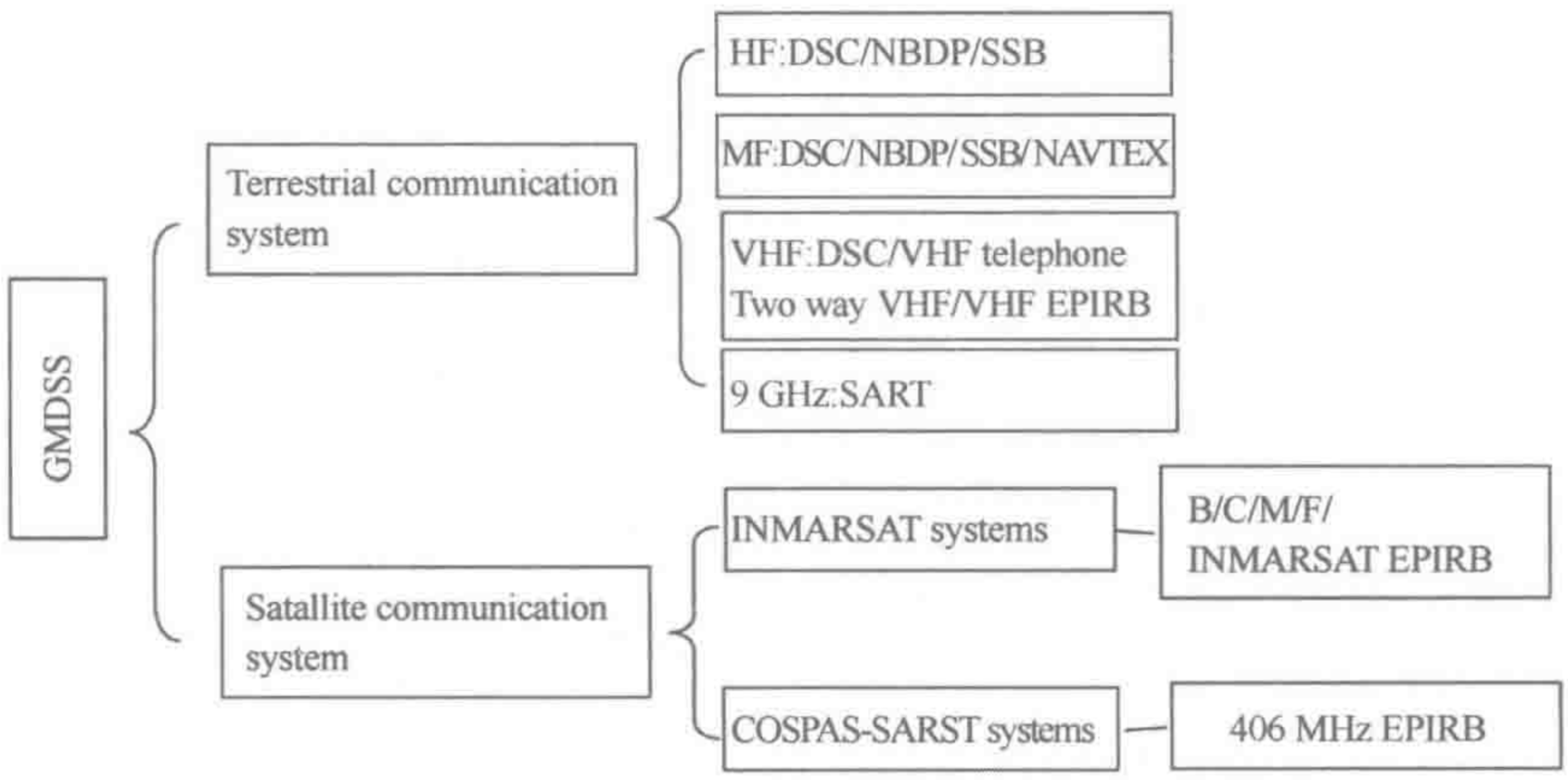

Fig. 1 – 2 Sub-systems of GMDSS

1.2.1 The Digital Selective Calling(DSC) system

This is an automatic calling system which makes the initial contact between two stations(or groups of stations or stations in a selected area) . Dedicated radio frequencies have been allocated for this purpose in the VHF, MF and VHF bands for short, medium and long ranges respectively. The received information is displayed on a screen and an alarm is sounded, in rather a similar way as an SMS message is received by mobile telephones. The received information indicates the purpose of the call and directs the operator to a radiotelephone or radiotelex channel for subsequence communications.

Various types of DSC calls are available, being broadly either distress and safety-related calls or "commercial" calls(to indicate that a commercial communication, e. g. a telephony or telegraphy call, etc. , is required) . In the case of VHF, automatic connection to the public network can also be established through suitably equipped Coast Stations. If the caller is in distress , the ship's name, position and nature of distress are included in the DSC message. For distress and urgency alerts, the alarm sounds continuously until the received information has been read by the operator. DSC distress alerts received by shore stations may be automatically and immediately routed to the nearest Rescue Coordination Center (RCC) .

1.2.2 Narrow Band Direct Printing(NBDP) system

Marine telex is also referred to as "Narrow Band Direct Printing" (NBDP) or sometimes Radio Teletype(RTTY). Telex(Teletypewriter Exchange) is an international, dial-up data communications service developed in the U. S. and other European countries in the 1930s. It was the first data communications service that used typewriter—like terminals(teletypewriters). Telex is available both in satellite communications and terrestrial system. The information in this part will mainly relate to the terrestrial radio telex services in the MF and HF marine bands. This system, substituting the Morse code signals, is transmitted by keyboards and can be automatically received, recorded and stored even if there is no recipient.

1.2.3 Maritime mobile radio telephone

Radiotelephone is a system of radio communication set up for the transmission of speech over a radio link or circuit. This capability can be carried out by satellite system and terrestrial system. The two major sub-systems mainly concerned on in terrestrial system are VHF and Single Side Band(SSB). SSB is a technology used in MF/HF radio telephone. This technology reduces unnecessary radio radiation as far as possible, and compress or reduce the emission signal frequency band . It has occupied narrow frequency band, high power utilization, selective fading resistance and good antiinterference performance characteristics.

1.2.4 Search and Rescue Radar Transponder(SART)

The SART is a portable radar transceiver, primarily intended to be deployed on survival craft. When it receives a 9 GHz(3 cm) radar signal(i. e. from searching radar), it switches on its transmitter and broadcasts its own special signal. This is seen as a series of 12 dots on all radar screens within range. The dot nearest to the screen center is the SART's location. Aircraft are sometimes fitted with 9 GHz marine radar for marine SAR operations.

1.2.5 Maritime Safety Information(MSI) system

MSI includes navigational and meteorological warnings, meteorological forecasts, and other urgent or safety-related messages of importance to all vessels at sea and may also include electronic chart correction data. Broadcasts are transmitted by MF telex(known as NAVTEX) for local MSI, and by INMARSAT-C(known as EGC) or HF telex for long-range MSI(i. e. , Navarea warnings, etc.)

1.2.6 INMARSAT system

INMARSAT—satellite communication network gives users access to the whole means of communication: voice, fax, email, data transfer, the Internet. The INMARSAT network was launched in 1982 and counts now more than 400,000 users all over the world. Anywhere within

the four Ocean Regions, the INMARSAT communications structure comprises three major components: the space segment; the ground segment; the Ship Earth Stations (SESs), Land-mobile Earth Stations (LESs), and Aircraft Earth Stations (AESs). A Ship Earth Station (SES) is a device installed on a ship (or on fixed installation in a maritime environment) to enable the user to communicate to and from shore-based subscribers, via a selected satellite and CES (Coast Earth Station), It includes INMARASAT-B/C/M/F. The INMARSAT-B digital mobile satellite communication system provides two-way direct-dial phone, telex, facsimile and data communications at rates up to 9.6 kbit/s to and from anywhere in the world with the exception of the polar regions. The INMARSAT-C system does not provide voice communications, but does provide a means of sending text messages or data to and from an SES, using store-and-forward messaging. For the time being, INMARSAT-M system is not in compliance with the requirements of GMDSS. Therefore the system is not approved by IMO's Maritime Safety Committee (MSC) as a subsystem in GMDSS. The services possible on an INMARSAT-M SES include two—way global telephone, fax and computer data communications. In 2002, INMARSAT introduced new Family of Fleet Services: F77, F55 and F33. The Fleet range of services and solutions provides both ocean-going and coastal vessels with comprehensive voice, fax, and data communications. Fleet F77 offers connectivity including access to e-mail and the Internet, weather updates, video conferencing and an advanced voice distress safety system.

1.2.7 Emergency Position Indicating Radio Beacon (EPIRB)

EPIRB alerting via satellite is available through INMARSAT and COSPAS-SARSAT. The INMARSAT system provides coverage between 70°N and 70°S via 4 geostationary satellites. The EPIRB's position is transmitted after being entered into the EPIRB either manually or by GPS. INMARSAT EPIRB's operate at L-band (1.6 GHz).

The COSPAS-SARSAT system provides full global coverage via both polar orbiting and geostationary satellites. The EPIRB's position can be determined by Doppler method (which does not require position input at the EPIRB) or by having the position entered manually or by GPS. COSPAS-SARSAT EPIRB's operate on 406 MHz and include a 121.5 MHz signal to provide a homing signal for searching aircraft.

The carriage requirement for satellite EPIRBs came into effect on 1 August 1993, and is mandatory for all vessels subject to SOLAS.

1.3 GMDSS Functions

The GMDSS requires ships to have a range of equipment capable of performing seven radio communication functions of the GMDSS. Hence , no matter where the ship is sailing or intends to navigate, she always has the ability of carrying out these functions as follows.

1.3.1 Alerting

Distress alerting is the rapid and successful reporting of a distress incident to a unit which can provide or coordinate assistance. This would be a Rescue Coordination Center (RCC) or another ship in the vicinity. When an alert is received by an RCC, normally via a Coast Station or Coast Earth Station, the RCC will relay the alert to SAR units and to ships in the vicinity of the distress incident. A distress alert should indicate the ship's identification and the position of the distress and, where practicable, its nature and other information which could be used for rescue operations .

The communication arrangements under the GMDSS are designed to enable distress alerting to be performed in all three directions: ship-to-shore, ship-to-ship and shore-to-ship. The alerting function is based on both satellite and terrestrial means and the initial distress alert is primarily transmitted in the ship-to-shore direction. When the distress alert is transmitted by DSC on VHF, MF or HF, ships within DSC range of the ship in distress will also be alerted (ship-to-ship alerting).

A distress alert is normally initiated manually and all distress alerts are acknowledged manually. When a ship sinks, a float-free satellite Emergency Position-Indicating Radio Beacon (EPIRB) is automatically activated. Ships operating exclusively in Sea Area A1 may, in lieu of satellite EPIRBs, use VHF EPIRBs on Channel 70.

The relaying of a distress alert from an RCC to ships in the vicinity of a distress incident is made by satellite communication or by terrestrial communication, using appropriate frequencies. In either case, to avoid all ships in a large sea area being alerted, an "area call" is normally transmitted so that only those ships in the vicinity of the distress incident are alerted. On receipt of a relayed distress alert, ships in the area addressed are required to establish communication with the RCC concerned to enable the assistance to be coordinated.

1.3.2 SAR coordinating communications

In general, these are the communications necessary for the co-ordination of ships and aircraft participating in a search and rescue operation following a distress alert and include communications between RCCs [and any "On-Scene Commander(OSC)"] or ["Coordinator Surface Search(CSS)"] in the area of the distress incident.

For SAR operations, messages are transmitted in both directions, as distinct from "alerting", which is generally the transmission of a specific message in one direction only, and distress and safety traffic by radiotelephony and directprinting telegraphy will normally be used for passing such messages.

The techniques which are available for SAR coordinating communications are radiotelephony or directprinting telegraphy or both. These communications can be carried out by terrestrial or satellite means, dependent upon the equipment fitted on the ship and the sea area in which the in-

cident occurs.

1.3.3 On-scene communications

On-scene communications normally take place in the MF and VHF bands on frequencies designated for distress and safety traffic by radiotelephony or directprinting telegraphy. These communications between the ship in distress and assisting units relate to the provision of assistance to the ship or the rescue of survivors. When aircraft are involved in On-scene communications they are normally able to use 3,023 kHz,4,125 kHz and 5,680 kHz. In addition,SAR aircraft can be provided with equipment to communicate on 2,182 kHz or 156.8 MHz or both,as well as on other maritime mobile frequencies.

1.3.4 Locating

Locating is the finding of a ship/aircraft in distress or its survival craft or survivors. In the GMDSS,this function is performed by means of 9 GHz SAR radar transponders(SARTs)carried by the ship in distress or its survivors,whose position is indicated when the SART is interrogated by the searching unit's 9 GHz radar. The use of the frequency 121.5 MHz in most satellite EPIRBs is provided for homing by aeronautical SAR units.

1.3.5 Promulgation of maritime safety information

Ships need to be provided with up-to-date Navigational Warnings and meteorological warnings and forecasts and other urgent Maritime Safety Information (MSI). MSI is made available by narrowband directprinting telegraphy broadcasts,using forward error correction,on the frequency 518 kHz (International NAVTEX service) and,for ships which navigate beyond the NAVTEX coverage,by broadcasts via the INMARSAT Enhanced Group Call (EGC) system (known as the International SafetyNET system). A high-seas MSI broadcast system by HF directprinting telegraphy is under development.

1.3.6 General radiocommunications

General radiocommunications in the GMDSS are those communications between ship stations and shore-based communication networks which concern the management and operation of the ship and may have an impact on its safety . These communications can be conducted on any appropriate channel,including those used for public correspondence. Examples are orders for pilot and tug services,chart replacement,repairs,etc.

1.3.7 Bridge-to-bridge communications

Bridge-to-bridge communications are inter-ship safety communications conducted from the position from which the ship is normally navigated,normally performed by VHF radiotelephony.

1.4 GMDSS Requirements

1.4.1 Carriage requirements of ship stations

Part C of the SOLAS Amendments, 1988 provides information on the equipment required by GMDSS ships and the alternative arrangements permitted in the various sea areas.

Carriage requirements for GMDSS ships may be summarized as follows:

- Sea Area Al: VHF equipment and either a VHF EPIRB or a satellite EPIRB.
- Sea Area A2: VHF and MF equipment and a satellite EPIRB.
- Sea Area A3: VHF, MF, a satellite EPIRB and either HF or satellite communications equipment.
- Sea Area A4: VHF, MF and HF equipment and a satellite EPIRB.
- All ships will carry equipment for receiving MSI broadcasts.

Example of carriage requirements for Area A3 is given as follows:

(a) VHF radiotelephone.

(b) VHF DSC on Channel 70.

(c) VHF DSC watch receiver.

(d) SART(Two).

(e) NAVTEX receiver.

(f) Enhanced Group Call(EGC) and printer required if outside NAVTEX coverage.

(g) 406 MHz EPIRB float free or 1.6 GHz EPIRB float free.

(h) 2182 kHz watch receiver plus an Automatic Signal Generating Device(ASGD) required until 1 February 1999.

(i) MF radiotelephone with DSC.

(j) MF watch receiver dedicated to 2,187.5 kHz on item(in) below.

(k) MF DSC encoder/decoder(this may be combined with items(i), and(m).

(l) INMARSAT-MES or instead of(m) above.

(m) MF/HF plus DSC(scanning watch) receiver plus Narrow Band Direct Printing(NB-DP).

1.4.2 Radio personnel certificate requirement

The provision of the radio regulations defines four classes of radio personnel certificate in GMDSS. Every ship shall carry personnel qualified for distress and safety radio communication purposes to the satisfaction of the administration. The personnel shall be holders of certificates specified in the radio regulations, any one of whom shall be designated to have primary responsibility for radio communication during distress incidents.

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