Chapter 11

Global Maritime Distress and Safety System

11.1 Introduction

It may seem a little strange to include a chapter about distress communications in a book dedicated to radio navigation, but the Global Maritime Distress and Safety System (GMDSS) is of prime importance to all maritime personnel. The system has been developed to provide mariners with a global communications and locating network, elements of which are capable of being operated by an individual with minimum communications knowledge and yet enable alerting and Search and Rescue (SAR) to be reliably achieved and controlled. A simplified description of the GMDSS and its navigational elements follows. For a full and detailed description of the system, refer to our book *Understanding GMDSS*.

11.2 The system

After a lengthy implementation period, the GMDSS became fully operational on 1 February 1999. The basic concept, shown in Figure 11.1, shows that a ship in distress is effectively inside a highly efficient radio net. If the casualty is correctly fitted with GMDSS equipment it will be in a position to alert and communicate with a wide range of ship- and shore-based radio stations and through them initiate a co-ordinated SAR operation based on a rescue co-ordination centre (RCC).

GMDSS relies heavily on digital selective calling (DSC), an electronic system enabling automatic 24-h watchkeeping on specific frequency channels ensuring that a distress call is received and acknowledged.

Two-way global communications with shore stations is via the International Maritime Satellite Organization's (INMARSAT) geostationary satellites or on the HF terrestrial bands. One-way distress alerting may be achieved via the polar orbiting COSPAS/SARSAT satellites.

Navigation elements of the GMDSS include NAVTEX, providing on-board navigation data and meteorological warnings and the new Inmarsat-3 satellites encompassing navigation payloads designed to enhance the accuracy, integrity and availability of both the GPS and the GLONASS systems.

11.2.1 Carriage requirements

Whilst the GMDSS is a global system it is not necessary for all ships to carry a full range of communications equipment. Vessels trading solely in coastal water, for instance, may carry less equipment than ocean-going ships. The equipment to be carried is determined by the declared area of

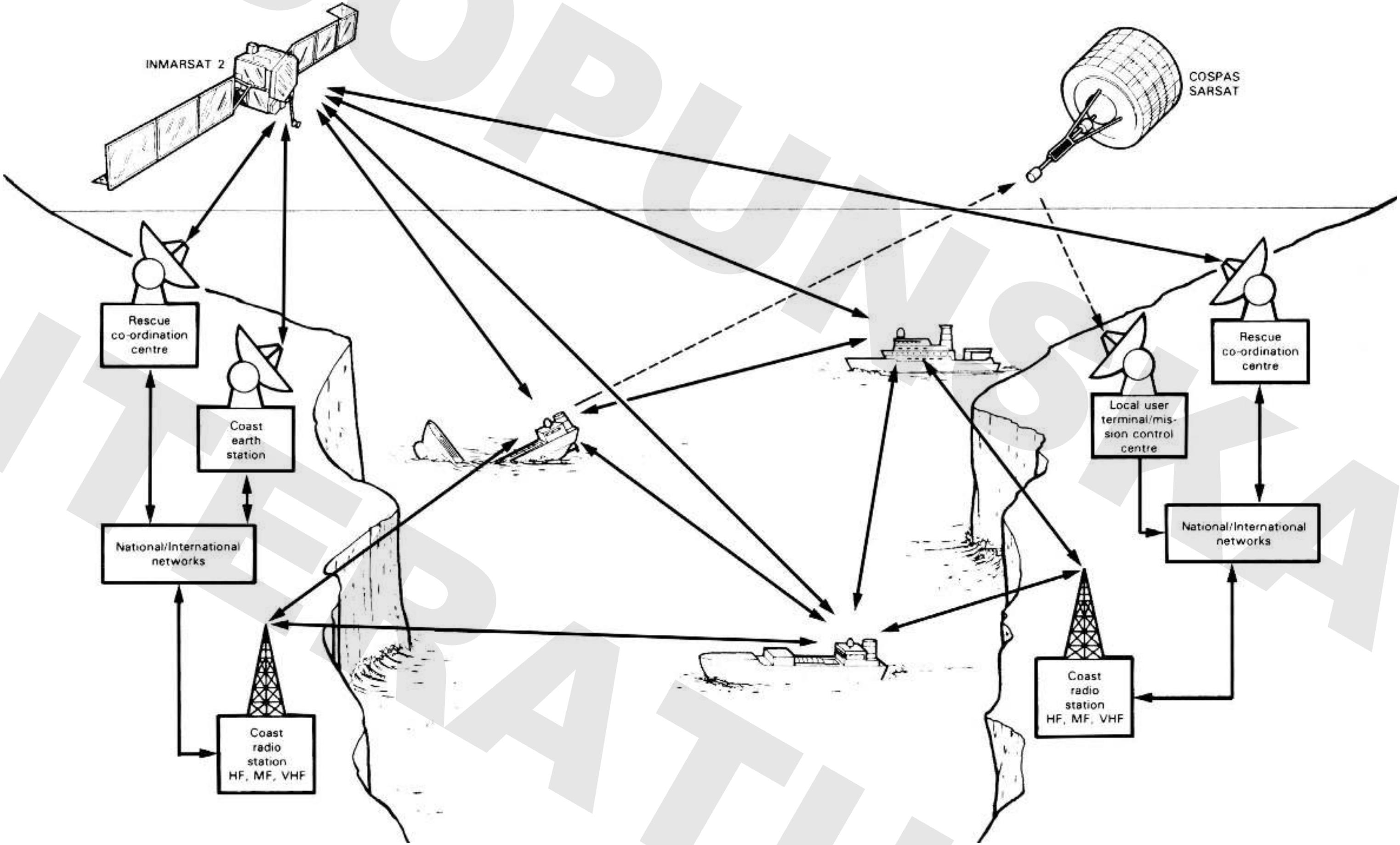


Figure 11.1 General concept of the GMDSS. (Reproduced courtesy of the IMO.)

operation of a vessel within the regions of the GMDSS radio net. The designated areas are as follows.

- Area Al is within the radio range of shore-based VHF coastal radio stations. Typically 20–30 nautical miles, although many countries do not provide sufficient radio stations to guarantee total radio coverage around their coastline. For this reason some countries have not declared an A1 designated area. For example, the UK has declined to do so and vessels trading in UK waters must be fitted with radio equipment to satisfy area A2 requirements.
- Area A2 is within the radio range of shore-based MF coastal radio stations, typically 100–150 nautical miles.
- Area A3 is within the coverage area of Inmarsat satellites, generally defined as the temperate regions of the world between the limits 70° North and 70° South.
- Area A4 is designated as all other remaining areas or defined as full global coverage for those ships not fitted with satellite communications equipment. This assumes that a terrestrial HF communications system is fitted.

In the event of an emergency the first concern of any radio communications operator is that of alerting, which must take precedence over all other communications. Under GMDSS regulations all vessels must be provided with two totally independent methods of distress alerting (see Figure 11.2). Of course when alerting in a distress situation any method or available equipment may be used to attract attention.

If time permits, a GMDSS alert is normally initiated and acknowledged manually using the primary communications system. Such an alert is easily initiated by using the DSC equipment or simply by pressing the distress alarm button on an Inmarsat mobile earth station (MES) terminal. In the event that a disaster overwhelms a vessel before the DSC system can be used or a manual alert sent, a float free satellite emergency position-indicating radio beacon (EPIRB) is automatically released and activated. The alert message is then received by a COSPAS/SARSAT satellite, the position of the casualty calculated and the data transmitted to earth when the satellite next passes within range of a download station.

Once the RCC for an ocean region has been advised of a distress position it will use either terrestrial or satellite communications to alert other vessels in the area of the casualty. This again implies the use of DSC.

Because DSC forms such an integral part of GMDSS a description follows. Readers should remember that DSC is a highly complex electronic calling system and only a relatively brief organizational description can be provided here.

11.2.2 Digital Selective Calling (DSC)

GMDSS distress alerting relies heavily on the automated DSC system fitted in shore-based radio stations and carried on all GMDSS equipped ships. DSC effectively enables a 24-h radio watch to be maintained on specific terrestrial frequency channels. For ships at sea, DSC radio watch must be maintained on the following frequencies.

- VHF channel 70
- MF 2187.5 kHz – in A1 and A2 areas
- HF 8414.5 kHz and at least one other HF DSC frequency appropriate to the time of day and the location of the ship in a A4 or/and A3 area for those ships not fitted with an Inmarsat MES.

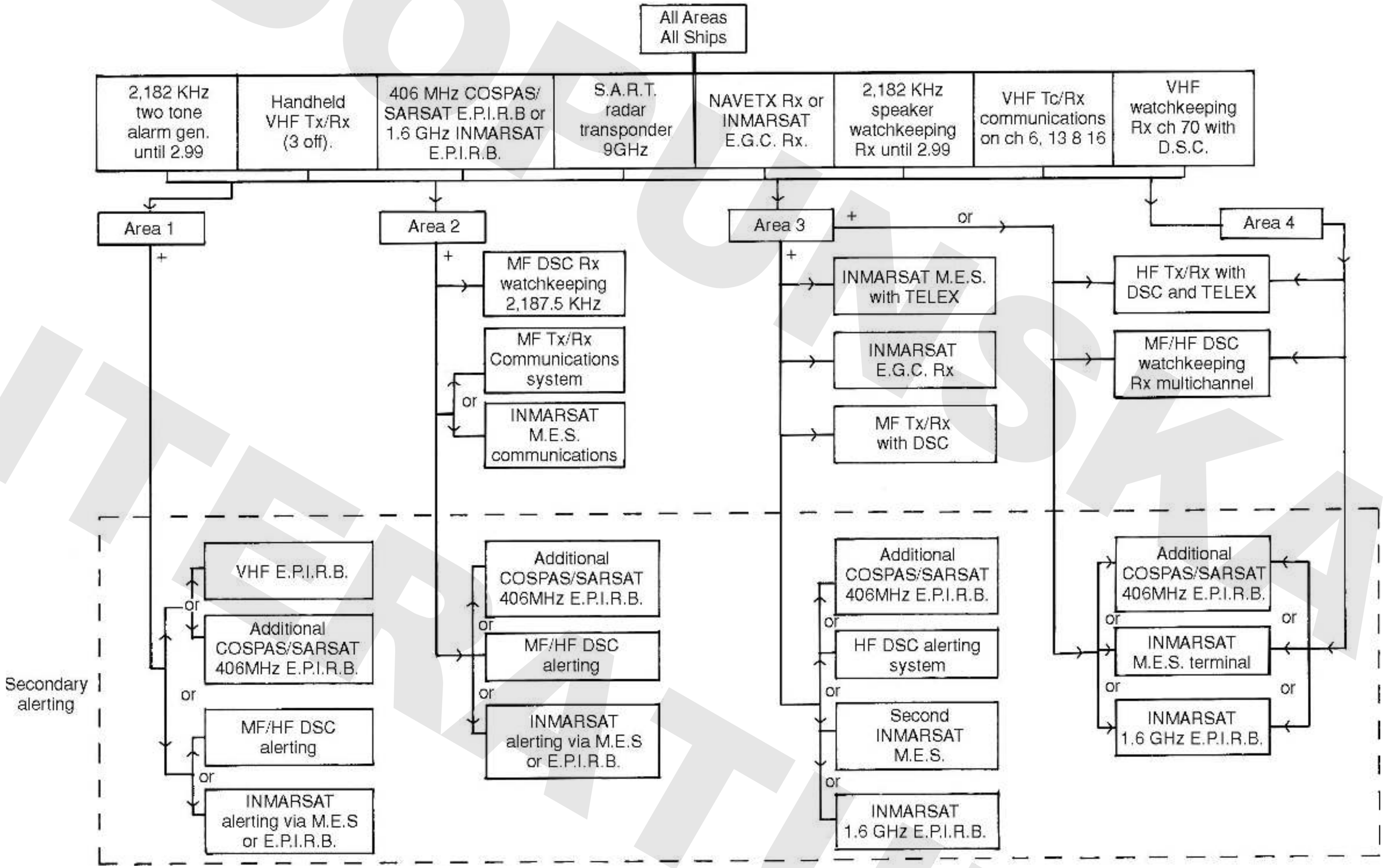


Figure 11.2 GMDSS equipment carriage requirement table.

DSC terrestrial distress alerts should be transmitted on one or more of the following terrestrial frequency channels depending upon the time of day and position of the vessel: VHF channel 70, MF 2187.5 kHz, HF 4207.5 kHz, HF 6312 kHz, HF 8414.5 kHz, HF 12577 kHz or/and HF 16804.5 kHz. For further information on the selection of a frequency band for terrestrial communications refer to Chapter 1.

GMDSS distress alerting and communications may also be carried out using the MES if the vessel is fitted with satellite communications equipment. Under international regulations all transmitting stations must identify themselves and consequently each station is provided with a selected code. For DSC this is a group of nine digits unique to a single vessel.

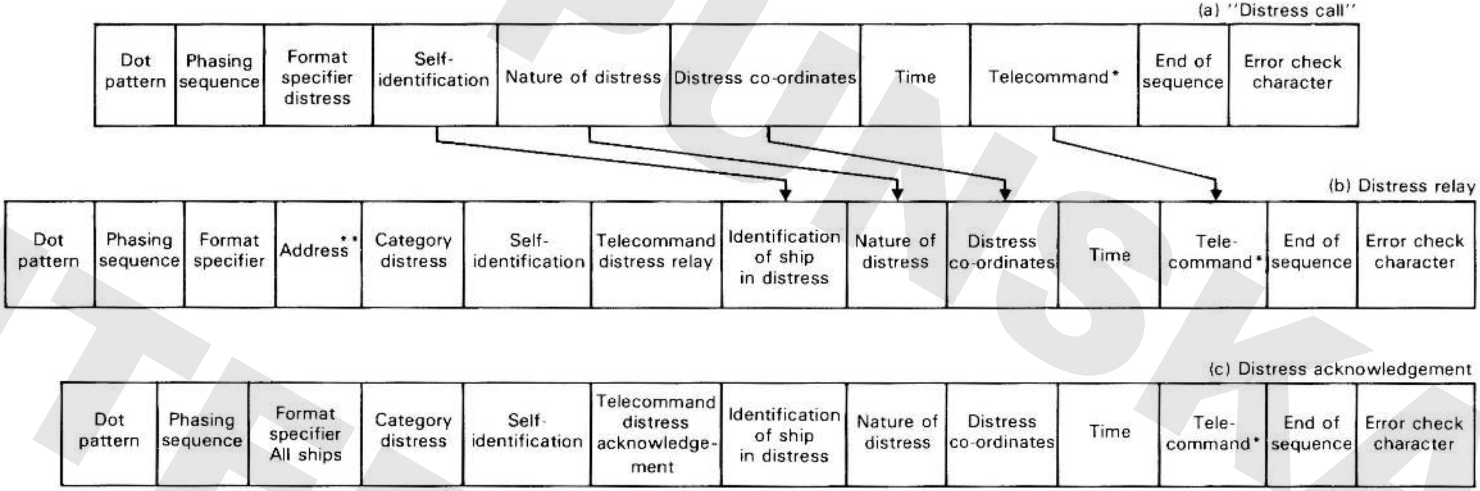
By using the ship's call number, a coastal radio station is able to call a selected vessel. Collective calls may also be made to all ships, or ships belonging to one company or trading in one area of the world. Selective calling is, depending upon the propagational characteristics of the radio wave, a reliable way of automatically calling ships. Although the ship's call number is shown in decimal format, DSC uses a sequence of seven unit binary combinations. Whilst DSC calls are of primary importance for distress alerting and acknowledgement, the system is also capable of handling other more routine communications.

Figure 11.3 shows the sequence and content of the data blocks used for distress alerting, relay and acknowledgement. A distress call is initiated simply by pressing the distress button on the DSC equipment. An incoming distress call will trigger the printer along with audio and visual alarms.

With all methods of automatic digital transmission it is necessary to include error correction coding in the transmission. This is necessary to provide the receiving apparatus with a means of identifying, and in some cases, correcting errors. A DSC sequence transmits each single character twice and uses an overall message check at the end. The transmission speed of a DSC call varies depending upon the frequency band used. On MF and HF it is fairly slow at 100 bauds, but on VHF it is 1200 bauds. A single call on MF or HF therefore varies between 6.2 and 7.2 s, whereas on the faster baud rate of VHF it is between 0.45 and 0.63 s depending upon message content. To increase further the chances of a DSC call or alert being received it is automatically transmitted for five consecutive attempts. Additionally when a DSC alert is made on MF or HF it is transmitted up to six times over any or all of the frequencies available (one on the MF band and five on HF).

Once the DSC distress button has been activated the automatic transmission format shown in Figure 11.3 is transmitted. The first two blocks permit the receiving DSC unit to synchronize with other equipment and then, as an example, the following data is sent signifying a distress alert.

- Format specifier. A distress code will automatically be sent.
- Self-identification. The unique nine digit number (in binary form) identifying the vessel in distress.
- Nature of distress. This is selected by the operator from one of nine codes, i.e. fire or explosion, flooding, collision etc. In the absence of a front panel input, the system defaults to 'undesignated distress'.
- Distress co-ordinates. Automatically included from the interfaced satellite navigation data or defaults to 'no position' information.
- Time. The time at which the distress co-ordinates were valid.
- Telecommand. Indicates whether subsequent distress communication will be by radiotelephony or Narrow Band Direct Printing (NBDP) telegraphy. The system defaults to radiotelephony. When a valid alert is received and acknowledged by a regional RCC, SAR operations are immediately initiated.



*Type of subsequent communication (radiotelephony or teleprinter)
**Address is not included if the format specifier is ''all ships''
(courtesy I.M.O.)

Figure 11.3 DSC sequence of (a) a distress call, (b) a distress relay call and (c) a distress acknowledgement. (Reproduced courtesy of the IMO.)

On-scene SAR communications are, by definition, short range and will normally take place on VHF between the casualty and other ships or aircraft. Locating a casualty may be done in a number of ways.

- At long range by precise latitude and longitude co-ordinates sent in the alerting message or by using COSPAS/SARSAT fix co-ordinates.
- At short range using VHF radio direction finding triangulation (not a required part of the GMDSS) or, if the casualty has activated a search-and-rescue radar transponder (SART), by using the assisting vessel's radar. A SART generates a series of signals that are easily identified by a 9 GHz shipboard or aircraft radar. The radar display shows a line of 20 blips extending outwards for 8 nautical miles along the bearing line of the SART.

11.2.3 The space segment

Satellite communications play a crucial role in the operation of GMDSS. Using satellites, suitably equipped vessels are able to send a distress alert and receive an acknowledgement instantly and reliably from virtually anywhere in the world.

To ensure full global coverage for alerting purposes, two satellite segments, the Inmarsat system and the COSPAS/ SARSAT system, are in operation. The Inmarsat system uses geostationary equatorial orbiting satellites whereas COSPAS/SARSAT uses polar orbiting satellites. Communication via the Inmarsat system is instantaneous and two-way whereas the COSPAS/SARSAT system is outward from the ship only.

COSPAS/SARSAT

COSPAS/SARSAT (Space system for search of distress vessels/Search and Rescue Satellite-aided Tracking) is an international satellite-aided search and rescue system established and operated by Canada, France, the USA and the USSR.

COSPAS/SARSAT satellites receive digital signals on 406 MHz (for maritime GMDSS EPIRBS) from a casualty, electronically process them and then transmit the data back to a Mission Control Centre (MCC). Various parameters including Doppler frequency shift are used to determine the position of an alert transmitted from a maritime EPIRB, an aeronautical ELT (Emergency Locating Transmitter) or a PLB (Personal Locator Beacon). When a COSPAS/SARSAT satellite passes over an MCC, the data are transmitted to earth for onward transmission to an RCC where the distress position is computed. Depending upon the relative position of a satellite with respect to the casualty there may be some delay in downloading the information but this is insignificant when one considers that the system allows for truly global distress alerting. See Figure 11.4 for the basic concept of this alerting system.

INMARSAT

To give the reader an understanding of Inmarsat's involvement in the GMDSS, a brief outline of the satellite communication system follows. A full description of satellite communications and Inmarsat can be found in the book *Understanding GMDSS*.

Over 40 countries are signatory members of Inmarsat and each one appoints an organization to represent its investment and interests in the system. Inmarsat signatories are responsible for the establishment and operation of the land earth stations (LES) that are the downlink stations communicating with Inmarsat satellites. Mobile users, on the other hand, purchase, install and operate Mobile Earth Station (MES) equipment that has been constructed to Inmarsat-approved standards by approved suppliers.

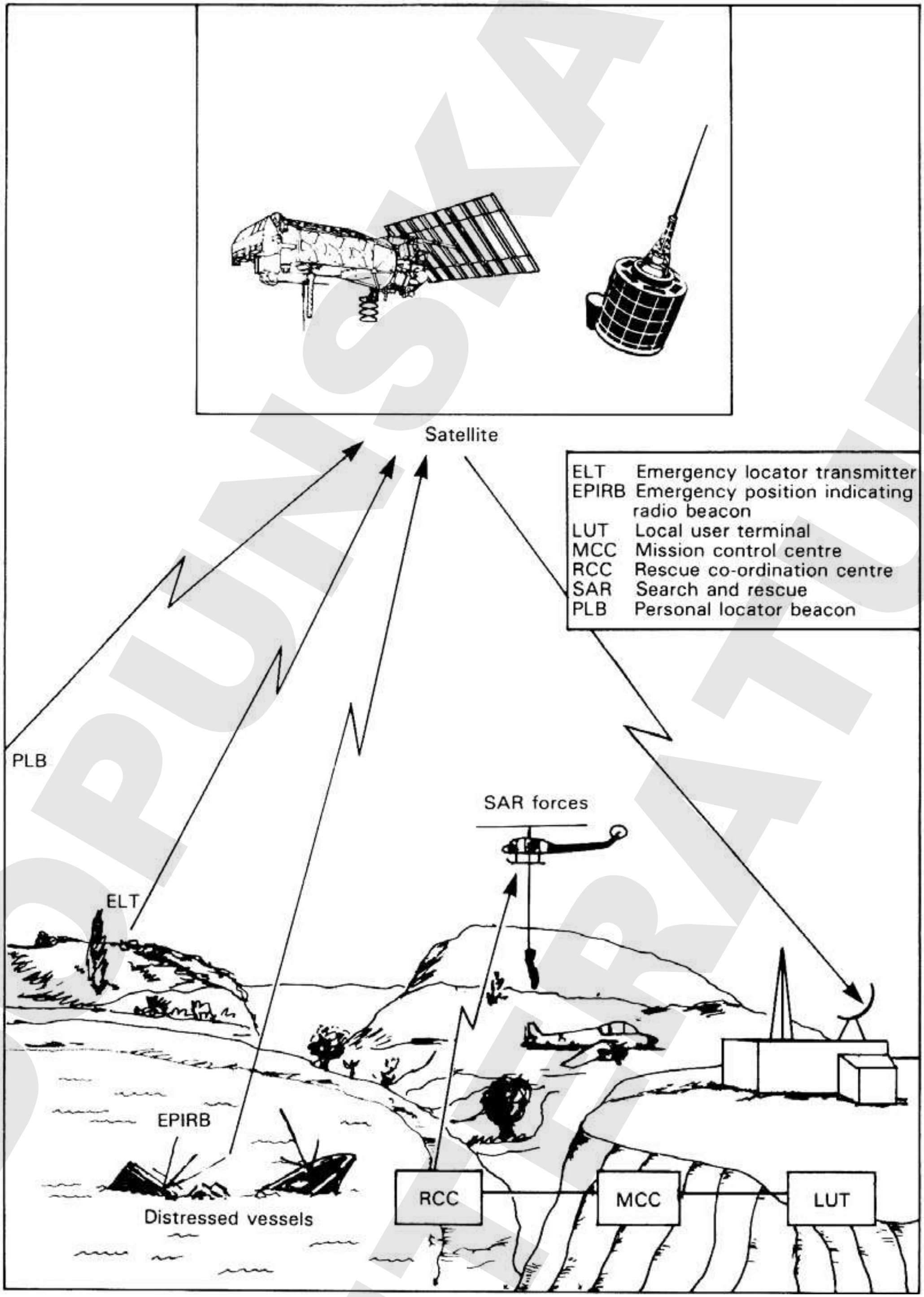


Figure 11.4 Basic concept of the COSPAS/SARSAT alerting system. (Reproduced courtesy of the IMO.)

Inmarsat's operations control centre (OCC) forms the nucleus of the system's control. It is located on the outskirts of London, England from where technical operators monitor the network for all three ocean regions. Each of the ocean regions, Atlantic (AOR E/W), Indian (IOR) and Pacific (POR), is served by one or more satellites in geostationary orbit approximately 36 000 km above the equator. Currently there are four satellites in each region, some are active and others are available for standby, producing coverage 'footprints' as shown in Figures 11.5 and 11.6.

There are several classes of MES and equipment available in the Inmarsat system of interest to mariners.

- Inmarsat-A. This is physically the largest and oldest of the four and, although the technology has been improved upon in the new digital Inmarsat-B MES, it still provides a good service for the many ships that carry it. It is an analogue system providing two-way direct-dial phone, fax, telex, electronic mail and data communications at 9.6 kbit s^{-1}, although a high speed data (HSD) option is sometimes fitted giving rates up to 64 kbit s^{-1}. The above-decks parabolic antenna is easily recognized on a ship by the large radome in which it is enclosed. Certified for use within the GMDSS.

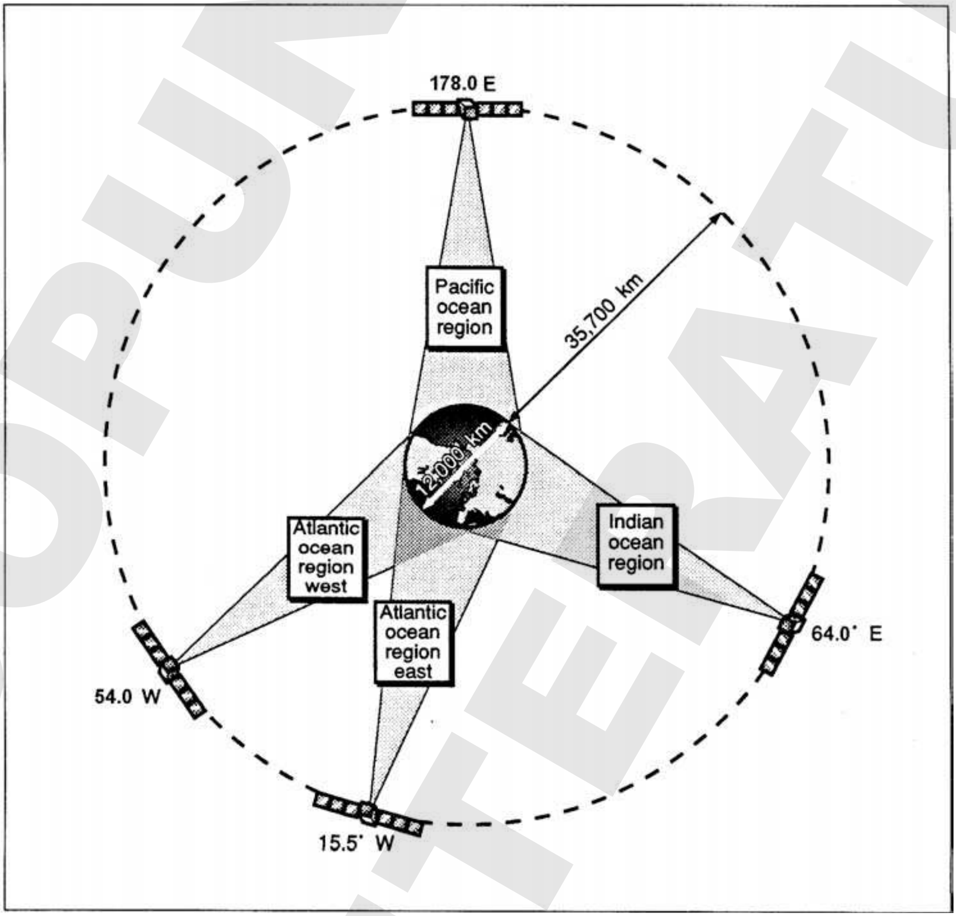


Figure 11.5 Earth total coverage from Inmarsat's four geostationary satellite configuration. (Reproduced courtesy of Inmarsat.)

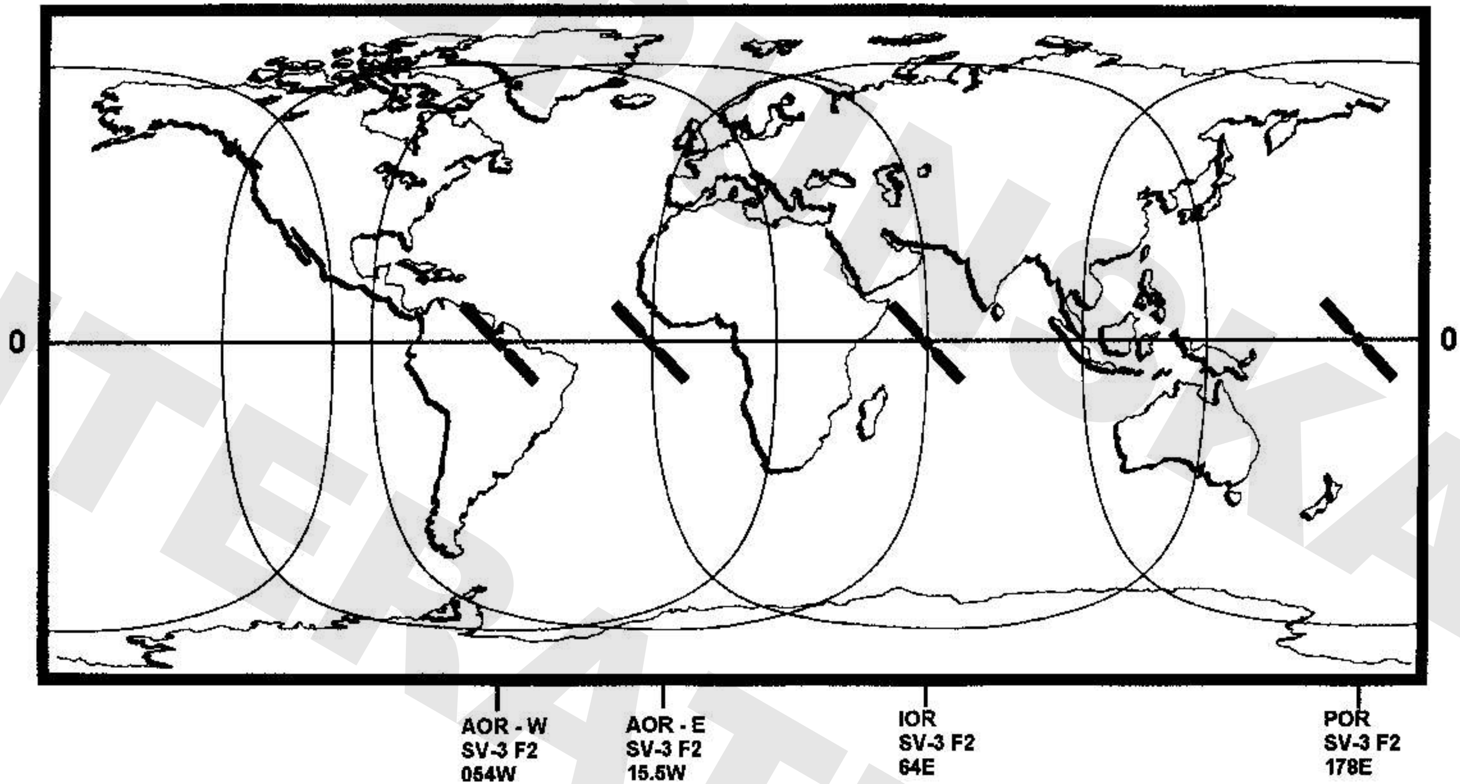


Figure 11.6 Footprint coverage of the earth's surface from Inmarsat-3 four geostationary satellites. (Reproduced courtesy of Inmarsat.)

- Inmarsat-B. This MES is a smaller and more compact digital version of Inmarsat-A and may eventually replace the older analogue system. Because of its use of digital technology, an Inmarsat-B MES is able to communicate more efficiently and at much faster rates than an Inmarsat-A MES. Its services include, two-way direct-dial high-quality phone, Group 3 facsimile, telex, and 64 kbit s^{-1} and 56 kbit s^{-1} high sped data. Enhanced terminals are also able to offer multiple channel access and other high speed networks. Certified for use within the GMDSS.
- Inmarsat-C. A smaller and cheaper MES providing two-way data communications at 600 kbit s^{-1}. It does not handle voice but provides two-way communications via telex or computer data services. The electronics unit can be very small, similar in size to a laptop computer, and uses a small omnidirectional antenna. Inmarsat-C has been approved for use within the GMDSS and supports Enhanced Group Calling (EGC), the SafetyNET and FleetNET services. Other services include, two-way messaging, data reporting and polling, position reporting, safety/emergency alerting and Internet email. Certified for use within the GMDSS.
- Inmarsat-D and D+. Using equipment as small as a personal hi-fi system, Inmarsat-D offers two-way data communications within the full coverage of Inmarsat satellites. It is a data-only system that is able to store and display up to 40 messages of up to 128 characters each and is used for personal paging and group calling as well as two-way communications. When a unit is integrated with a GPS receiver, then labelled Inmarsat-D+, it is able to transmit position information for tracking and tracing services.
- Inmarsat-E. In the GMDSS system, the Inmarsat-E system provides global alerting, via Inmarsat satellites, from Emergency Position Indicating Radio Beacons (EPIRBs). A float-free EPIRB may also incorporate a GPS receiver that is interfaced with the transmitter to provide location data.
- Inmarsat mini-M. Designed to use the spot beam power of Inmarsat-3 satellites, Inmarsat mini-M equipment offers two-way digital phone, voice, fax and data services. Inmarsat mini-M equipment is small and cheap to operate but it is not certified for use within the GMDSS service.

Inmarsat provides the following services as part of the GMDSS radio net.

Ship-to-shore distress alerting

The Inmarsat system provides instant priority access to shore in emergency situations. A maritime operator is provided with a distress button which when activated instantly sends a distress alert. The message is recognized at a LES and a priority channel is allocated. The system is entirely automatic and once activated will connect a ship's operator directly with an RCC. Because the MES is interfaced with the vessel's satellite navigation equipment, the geographical location of the distress will also be automatically transmitted.

Shore-to-ship distress alerting

This may take one of three forms.

- An All Ships Call made to vessels in one ocean region.
- A Geographical Area Call made to vessels in a specific area. Areas are based on the IMO NAVAREA scheme. A MES will automatically recognize and accept a geographical area call only if it carries a specific code.
- A Group Call to Selected Ships alerting ships in any global area again providing specific codes have been input to the MES. Calls are made using the Enhanced Group Calling (EGC) network.

Enhanced Group Calling

The EGC system has been designed by Inmarsat to provide a fully automated service capable of addressing messages to individual vessels, pre-determined groups of ships, or all ships in specified geographical areas. EGC calls may be addressed to groups of ships designated by fleet, flag or geographical area. A geographical area may be further defined as a standard weather forecast area, a NAVAREA, or other pre-determined location. This means that in addition to efficient GMDSS shore-to-ship alerting, the system is also able to provide automated urgency and safety information, as well as fleet calls made by the owner.

11.3 The NAVTEX system

11.3.1 Introduction

NAVTEX is not a position fixing system, it is an information network. The service forms an integral part of both the Global Maritime Distress and Safety System (GMDSS) and the World Wide Navigational Warning Service (WWNWS) operated by the International Maritime Organization (IMO). These broadcast systems are designed to provide the navigator with up-to-date navigational warnings in English and, using the EGC SafetyNET message service, provide a means of shore-to-ship alerting announcing distress and urgency traffic (Figure 11.7).

NAVTEX services are based on the IMO's 16 global NAVAREAS chart shown in Figure 11.8. Each NAVAREA is subdivided and covered by a number of transmission stations, A to Z. This geographical spread of transmitters minimizes the risk of interference between transmitting stations in adjoining areas.

The transmission schedule for NAVAREA1, Western Europe, is shown in Table 11.1 and the transmitting station locations and coverage areas in Figure 11.9. Similar station groupings occur in other parts of the world.

11.3.2 System parameters

Messages are transmitted on a frequency of 518 kHz using narrow band direct printing (NBDP) techniques. Modulation is by FM, F1B designation, using a 7-unit forward error correcting (FEC or Mode B) at 100-bauds frequency shift keying (FSK) with a carrier shift of 170 Hz. The centre frequency of the audio spectrum is 1700 Hz and the receiver bandwidth 270–340 kHz (at 6 dB).

Table 11.1 European TDM schedule for NAVTEX transmissions

Code	*Name*	*Times of transmission*					
H	Harnosand	0000	0400	0800	1200	1600	2000
S	Niton	0018	0418	0818	1218	1618	2018
U	Tallin	0030	0430	0820	1230	1630	2030
G	Cullercoats	0048	0448	0848	1248	1648	2048
F	Brest-le-Conquet	0118	0518	0918	1318	1718	2118
O	Portpatrick	0130	0530	0930	1330	1730	2130
L	Rogaland	0148	0548	0948	1348	1748	2148
T	Oostende	0248	0648	1048	1448	1848	2248
R	Reykjavik	0318	0718	1118	1518	1918	2318
J	Stockholm	0330	0730	1130	1530	1930	2330
P	Scheveningen	0348	0748	1148	1548	1948	2348
B	Bodo	0018	0418	0900	1218	1618	2100

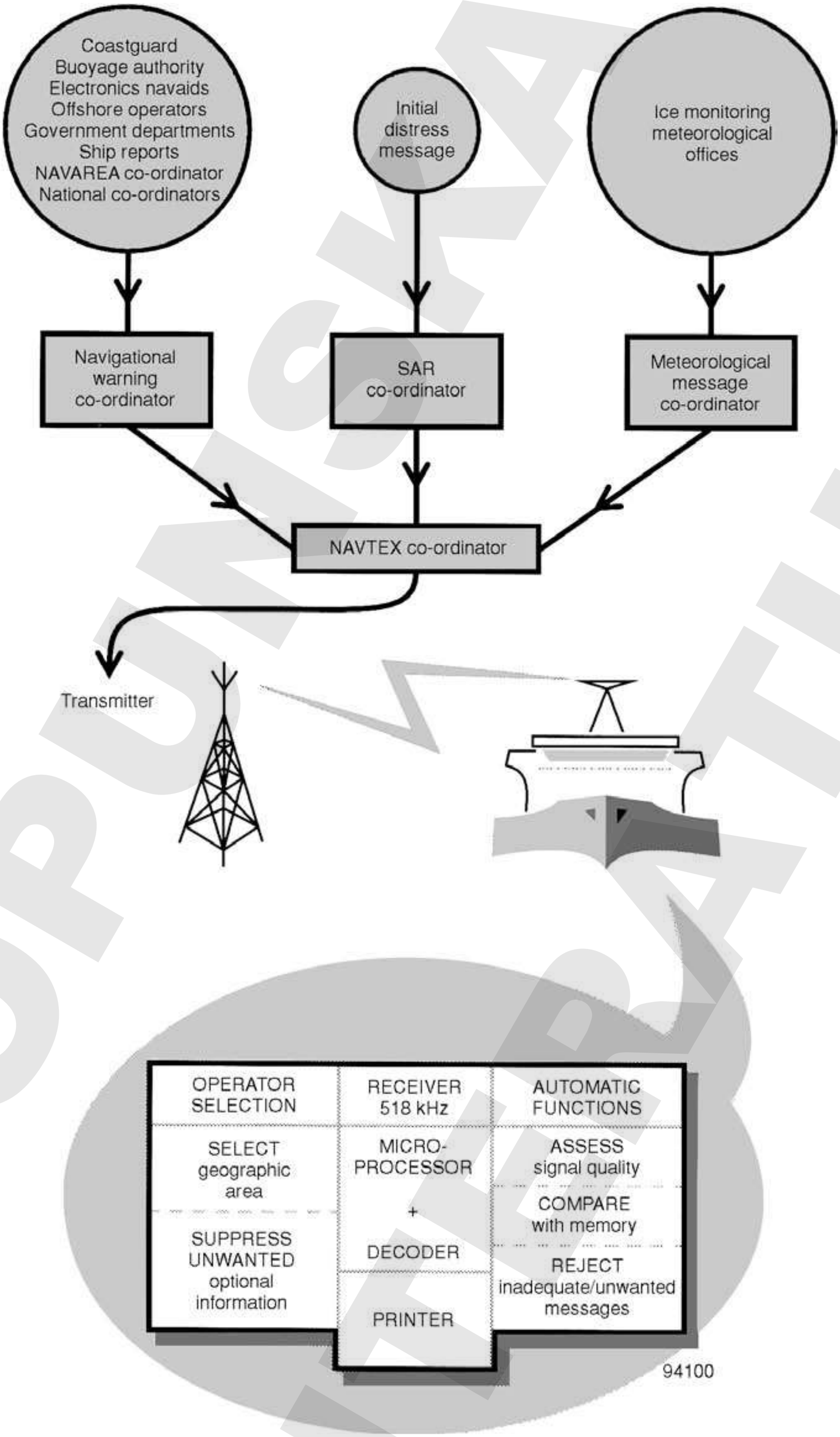


Figure 11.7 Structure of the NAVTEX service. (Reproduced courtesy of the IMO.)

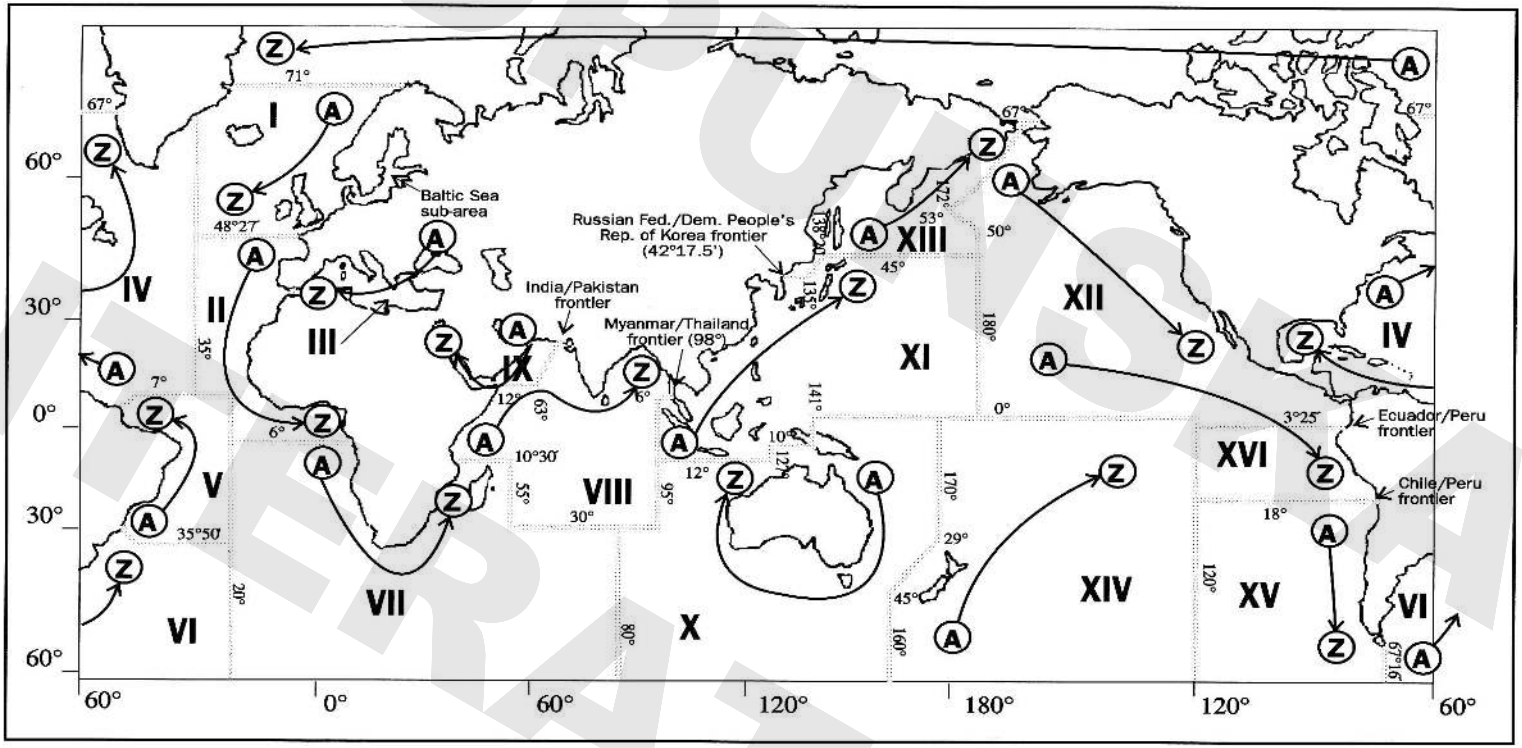


Figure 11.8 NAVAREAS of the World Wide Navigational Warnings Service (WWNWS) showing the basic scheme for allocation of transmitter identification characteristics. (Reproduced courtesy of the IMO.)

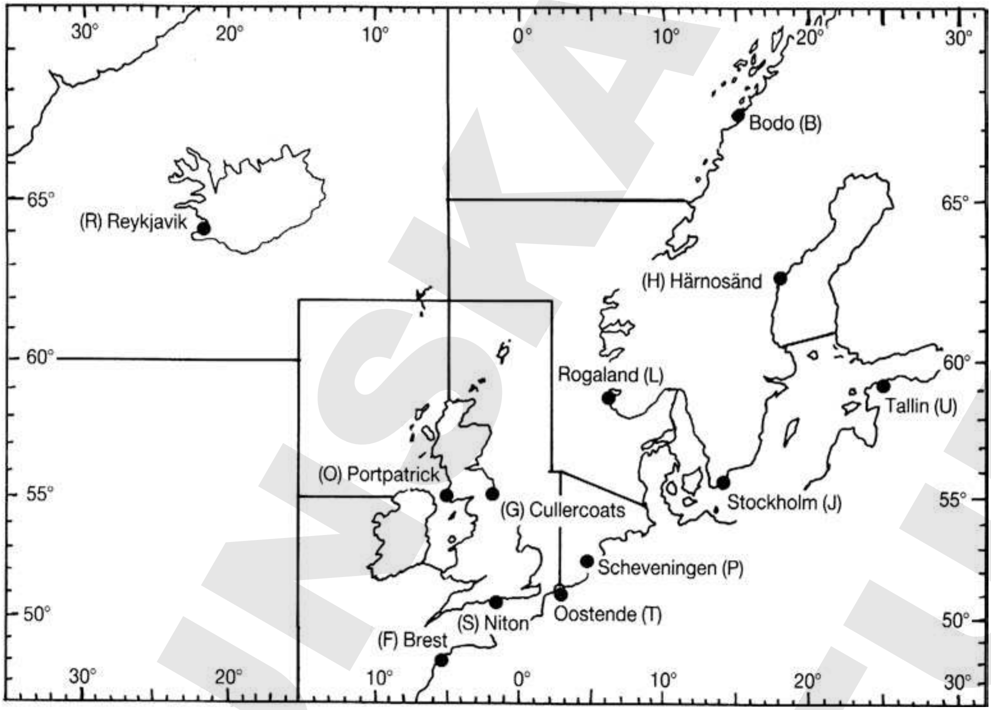


Figure 11.9 NAVTEX coverage areas within NAVAREA1.

Marine safety information (MSI) is also transmitted by NBDP with FEC on 490 kHz, in tropical areas and there are future plans to use 4209.5 kHz to extend the service.

The NAVTEX primary frequency 518 kHz propagates mainly by surface wave and, if all other factors remain constant, its range is determined by carrier power at the transmitter. NAVTEX transmitters are designed to have an effective range of 400 nautical miles. This figure has been based upon a transmitter carrier power of 1 kW and a receiver input sensitivity better than 1 μV and a 10 dB signal-to-noise ratio. The accepted range for reception of NAVTEX broadcasts may be greatly increased when the sky wave is returned from the ionosphere. Naturally the system is not designed for sky wave reception and messages received via that route may be unreliable. In addition to limiting range by capping the transmitted power, time division multiplex (TDM) of the carrier frequency is also used to limit the chance of interference from neighbouring stations. A simple organizational transmission matrix is used as shown in Figure 11.10.

NAVAREAs are subdivided into four groups each containing six transmitters each with a 10-min allocated transmission slots every 4 h. It should be noted that the matrix is designed for the broadcasting of routine navigational information and that a large volume of data can be transmitted in 10 min at a rate of 100 bauds. It is unlikely that all time slots will be allocated within one frame in any one NAVAREA. Distress and vital warnings are transmitted upon receipt.

11.3.3 Signalling codes

Every NAVTEX message is preceded by a four-character header B_1, B_2, B_3, B_4 and every NAVTEX receiver is able to read the codes and take action accordingly.

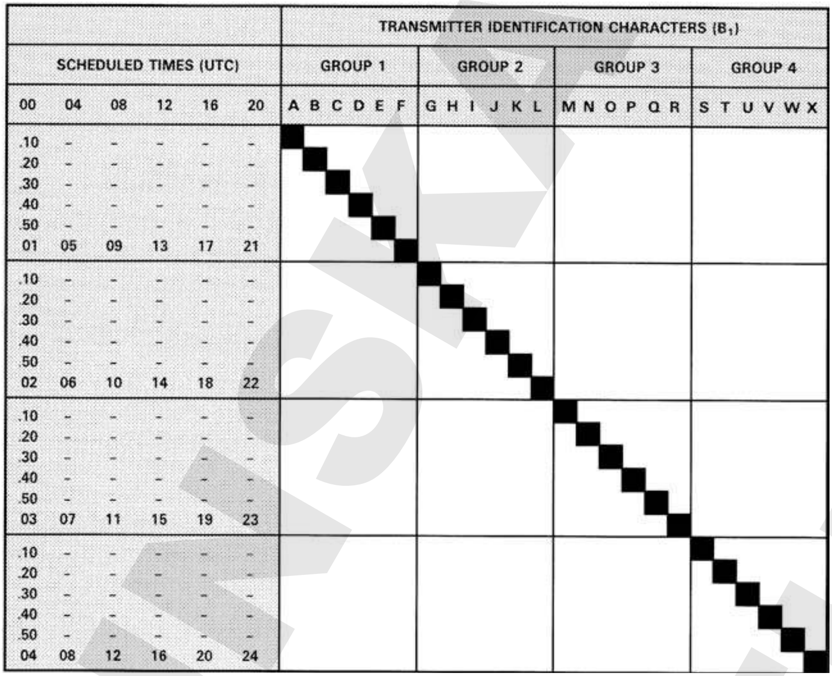


Figure 11.10 Scheme for the allocation of transmission schedules. (Reproduced courtesy of the IMO.)

- B_1 is an alpha character identifying a specific transmitting station that is used by a receiver to determine messages to be accepted or rejected. In order to prevent erroneous reception by a receiver that happens to be in a position to receive two transmissions using the same B_1 code, each code's allocation is based on the NAVAREAS shown in Figure 11.8. Transmitters are allocated, according to an IMO-adopted strategy, an alphabetical listing in sequence through each NAVAREA with no two transmitters, in ground wave range of each other, bearing the same alphabetical character.
- B_2, another alpha character, identifies the different classes of message available (Table 11.2). The B_2 code is used by the receiver to reject unwanted messages.
- Subject indicators B_3 and B_4 indicate the numbering of the messages transmitted commencing with 00 and ending at 99. The use of the number 00 indicates a message that will be printed by all receivers. This number is reserved for distress alerting.

11.3.4 Message format

A NAVTEX transmission data frame is shown in Figure 11.11. A 10-s synchronizing frame is followed by the sequence ZCZC indicating the end of the phasing period. The B code characters indicate coverage area, message type and numbering. Carriage return and line feed are included for NBDP control. The message follows and is concluded with NNNN. More printer control signals follow before the entire sequence is repeated.

11.3.5 Signal characteristics

FSK modulation is used to encode message data onto the 518 kHz carrier frequency. The FSK modulator shifts the carrier frequency either side of 518 kHz by ±85 Hz. Thus to encode a logic 0, the

Table 11.2 NAVTEX subject indicator characters for code B_2

Code	*Meaning*
A	Navigational warnings*
B	Meteorological warnings*
C	Ice reports
D	Search and rescue information and pirate warnings*
E	Meteorological forecasts
F	Pilot service messages
G	Formerly DECCA messages (This service is no longer in use)
H	LORAN-C messages
I	Formerly OMEGA messages (This service is no longer in use)
J	SATNAV messages – GPS and GLONASS
K	Other electronic navaid messages
L	Navigational warnings additional to letter A*
V	Notices to fishermen (USA only)
W	Environmental messages (USA only)
Z	No messages to hand

* Messages that cannot be rejected by a receiver.
Note: Subject indicator letters B, F and G are not normally used in United States waters because the US National Weather Service includes weather warnings as part of a forecast. NAVTEX meteorological warnings are broadcast under the subject character E.
Indicators V, W, X and Y are allocated by the NAVTEX Panel for special services.

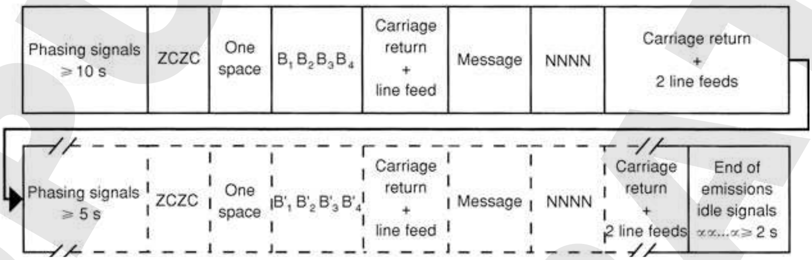


Figure 11.11 Data format of NAVTEX transmissions. (Reproduced courtesy of the IMO.)

carrier is retarded to 517.915 kHz and for a logic 1, it is advanced to 518.085 kHz conforming to CCIR recommendation 540. In the receiver the 517.915 kHz signal is demodulated to an audio frequency of 1615 Hz representing logic 0 and the 518.085 kHz signal is demodulated to a logic 1 of 1785 Hz.

Each alphanumeric character is serially encoded as a 7 data-bit word (7-unit SITOR code) with a data rate of 100 bauds.

Table 11.3 shows the complete NAVTEX coding standard that conforms to CCIR recommendation 476. There are, however, only 35 possible combinations using this code and consequently each data string represents two possible characters. For instance, data string 0010111 may represent a T or a 5. To eliminate this error, each 7-bit data character is preceded by the letter or figure shift codes.

To eliminate errors caused by noise in the transmission path the system employs the same transmission protocol as that used by marine radiotelex services, i.e. forward error correction (FEC). Each symbol is transmitted twice, the first time known as DX (direct) and the second as RX (repeat).

Table 11.3 NAVTEX coding standard

Data input	*Hex*	*Meaning*	
		Letters	*Figures*
0001111	OF	Carriage return	
0010111	17	T	5
0100111	27	8	?
1100011	47	0	9
0011011	13	Line feed	
0101011	28	No perforation	
1001011	48	H	
0110011	33	Phasing signal q	
1010011	53	L	>
1100011	63	Z	+
0011101	1D	Space	
0101101	2D	Letter shift	
1001101	4D	N	‘
0110101	35	E	3
1010101	55	R	4
1100101	65	D	$
0111001	39	U	7
1011001	59	I	8
1101001	69	S	
1110001	71	A	–
0011110	1E	V	=
0101110	2E	X	/
1001110	4E	M	.
0110110	36	Figure shift	
1010110	56	G	@
1100110	66	Phasing signal b	
0111010	3A	Q	1
1011010	5A	P	0
1101010	6A	Y	6
1110010	72	W	2
0111100	3C	K	(
1011100	5C	C	:
1101100	6C	F	%
1110100	74	J	BEL
1111000	78	Phasing signal a	

By referring to the coding standard it can be seen that all the 7-bit codes possess four logic 1s and three logic 0s. This enables the demodulator to identify and correct a single bit error in the received signal. If either the DX or RX words are corrupted, the processor will print the other as the correct character. If both are corrupted, an ‘*’ is printed to indicate that the character is unreliable.

11.3.6 Messages

A NAVTEX receiver is designed with the ability to select the messages to be printed. However, various messages including distress alerts cannot be excluded. The message printed is determined by the four-character header code that appears in all message preambles or alternatively may be selected by an operator. An example of a routine message printed by a NAVTEX receiver may be as follows.

ZCZC SB03 (phasing and identity information)

041402 UTC APR 02 (date and time)

NAVAREA 1 156 (Series identity and consecutive number)

Dover Wight SW winds expected

storm force ten imminent.

NNNN (end of message)

where:

ZCZC	=	phasing sequence
S	=	the transmitting station (Niton Radio)
B	=	category of message (meteorological warning)
	=	message number
041402	=	04 (date) 14 (hour) 02 (minutes)
UTC	=	Universal Time Co-ordinated
APR	=	month
	=	year (2002)
NAVAREA1	=	series identity
	=	consecutive number (identifies the source of the report. Not the same as the NAVTEX serial number B_3 B_4)

Message text

NNNN = end.

Full and complete details of the NAVTEX system can be found in the International Maritime Organization's NAVTEX Manual available from their office. See the web site www.imo.org

Table 11.4 Definition symbols for classes of modulation

A3E	Double sideband (DSB)
H3E	Single sideband (SSB) full amplitude carrier
R3E	Single sideband (SSB) reduced carrier amplitude
J3E	Single sideband (SSB) fully suppressed carrier
J2E	SSB suppressed carrier NBDP and DSC
G2E	Phase modulation (PM) DSC channel 70 VHF
G3E	PM radio telephony VHF
F1B	FM direct printing telegraphy DSC