Inmarsat
Maritime Handbook

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Chapter 1

Inmarsat satellite communication systems

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1.1 Introduction

Inmarsat was established in 1979 to serve the maritime industry by developing satellite communications for ship distress, safety and management applications. Today it operates a global satellite network for maritime, land and aeronautical users. The network is accessed via independent land earth station operators who offer a range of communications including voice and multimedia.

The Inmarsat communications system has three major components:

- The space segment
- The ground segment
- The mobile earth stations (MESs) for maritime and land operation and aeronautical earth stations (AESs) for aircraft operation.

1.1.1 The space segment

The space segment is provided by Inmarsat and consists of four operational satellites, with back-up satellites in orbit and ready to be used if necessary. The family of satellites includes the earlier Inmarsat-2 series and the more recent Inmarsat-3 constellation.

The third-generation Inmarsat-3 satellites have been in service since 1997. They offer coverage using a global beam and spot beams. Each Inmarsat-3 satellite is eight times more powerful than an Inmarsat-2 satellite. The flexibility offered by the Inmarsat-3 satellites makes it possible to reallocate both RF power and bandwidth between the global beam and spot beams, allowing a more efficient use of the available spectrum. Each Inmarsat-3 satellite also carries a navigation transponder, designed to enhance the accuracy, availability and integrity of the Global Positioning System (GPS) and Glonass satellite navigation systems.

The Inmarsat-2 series of satellites was launched during 1990-92.

Inmarsat's network uses L-band (1.5/1.6GHz) frequencies from the ship direction.

Each satellite's global beam covers approximately one-third of the Earth's surface (including land and sea) from a geostationary orbit nearly 36,000 kilometres above the Equator. In this orbit each satellite moves at exactly the same rate as the Earth rotates, so remaining in the same position relative to the Earth's surface.

Figure 1-1 shows the four satellites in space and their coverage areas, which correspond to the four ocean regions:

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

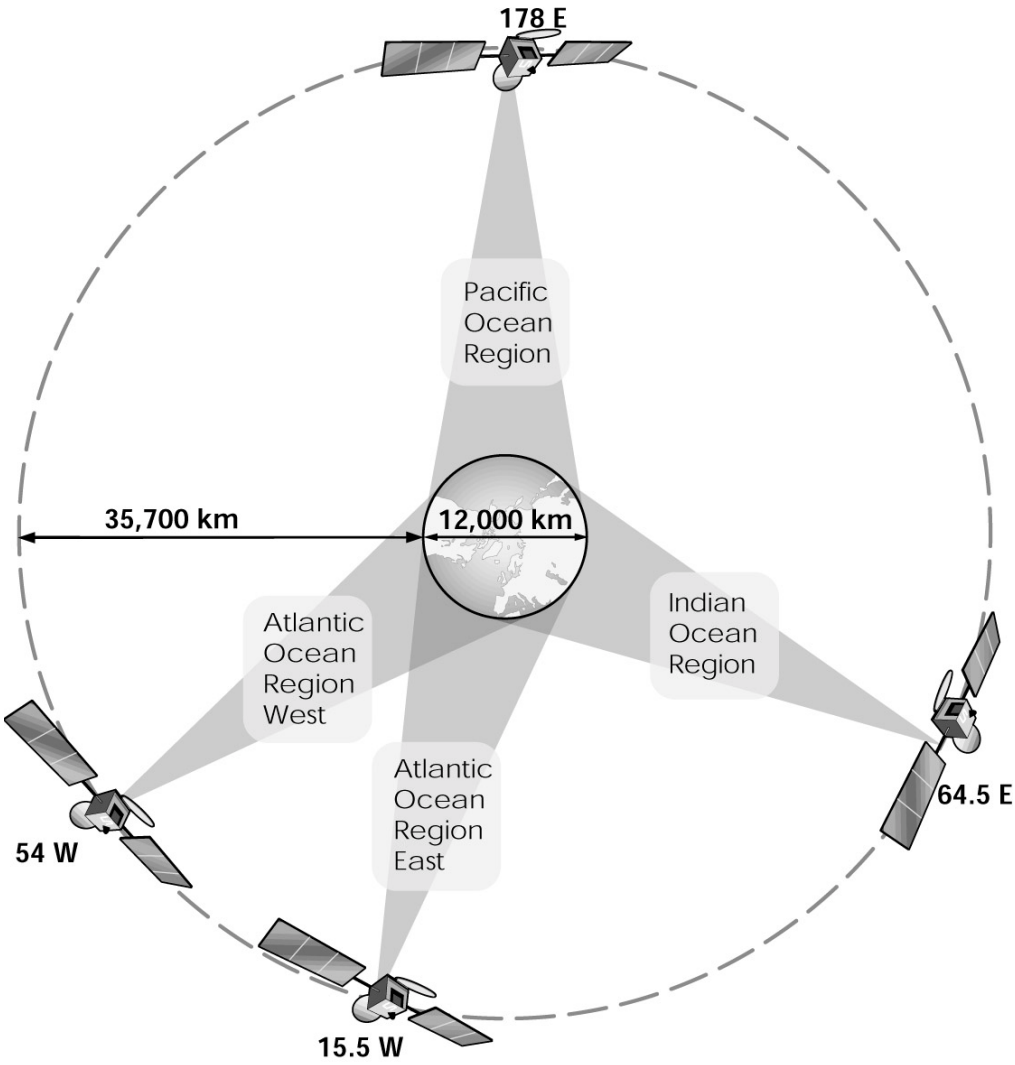

Figure 1-1 Location of the Inmarsat satellites in geostationary orbit

1.1.2 The ground segment

The ground segment comprises a network of land earth stations (LESs) which are operated by land earth station operators; network co-ordination stations (NCSs); and a network operations centre (NOC).

Each land earth station operator provides a link between the satellite network and the international telecommunication network. An LES is capable of handling many calls to and from MESs simultaneously, over the different Inmarsat networks.

LESs are owned by telecommunications operators which act as land earth station operators and provide a wide range of communications services to the MES user. At present there are

about 40 land earth station operators around the world. Many land earth station operators now offer service in all four ocean regions, through a global sharing agreement with other land earth station operators in ocean regions which cannot be seen from their own location.

For each Inmarsat system and ocean region there is a network co-ordination station (NCS) which monitors and controls all communications. Each NCS communicates with the land earth station operators in its ocean region, the other NCSs and the network operations centre (NOC) located at Inmarsat's London headquarters, making it possible to transfer operational information throughout the system.

The NCSs are involved in setting up calls between an MES and a land earth station operator. Figure 1-2 illustrates in general terms how the NCS responds to a request from an MES for a communications channel, by assigning a channel to which both the MES and land earth station operator must tune for the call to proceed.

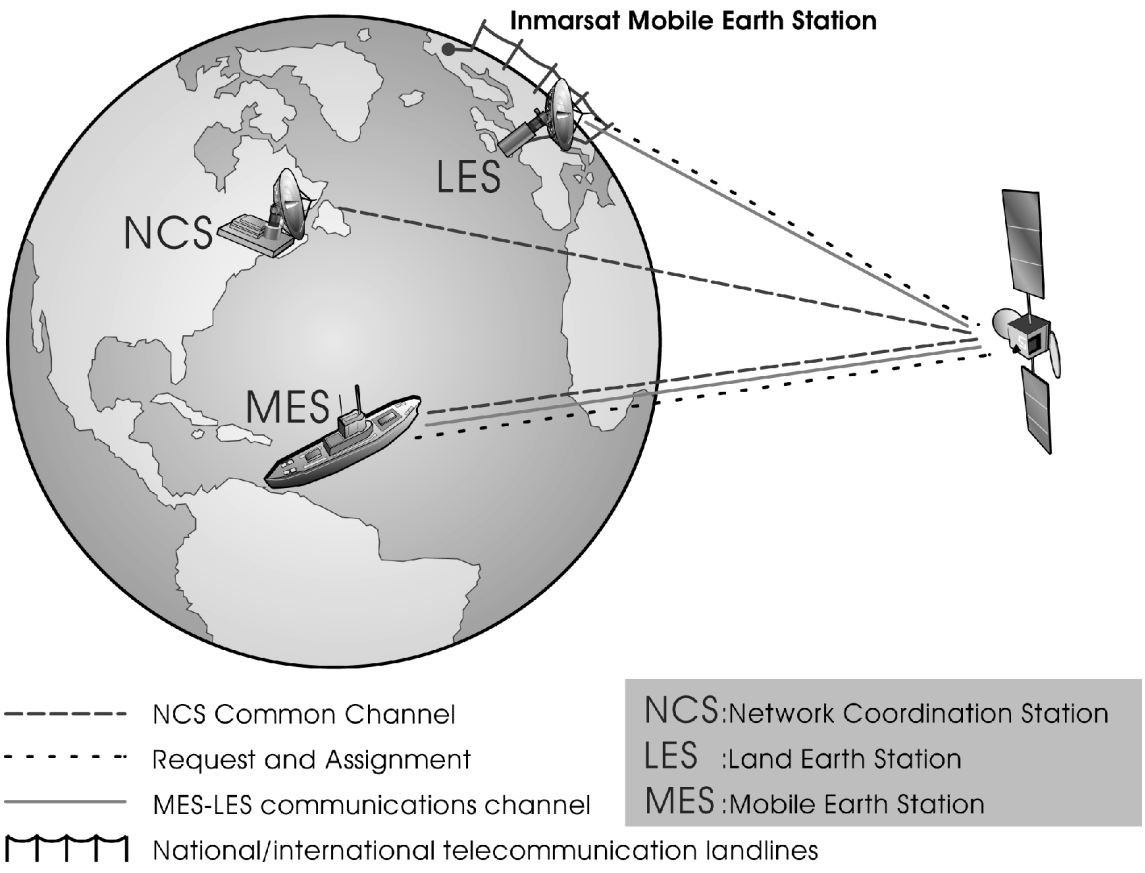

Figure 1-2 Setting up a communications channel for a ship-to-shore call

1.1.3 The mobile earth stations

A mobile earth station (MES) is a device installed on a ship (or on a fixed installation in a maritime environment) to enable the user to communicate with land-based subscribers via the Inmarsat satellites. Inmarsat does not manufacture such equipment itself, but permits independent manufacturers to produce models which are type-approved to standards that have been set by Inmarsat and other international bodies such as the International Electrotechnical Commission (IEC). Only type-approved terminals are permitted to communicate via Inmarsat's satellites.

1.2 The Inmarsat-A system

Inmarsat-A was the first service to be introduced, becoming commercially available in 1982. An analogue system, it provides two-way direct-dial phone, fax, telex and electronic mail and data communications at rates of up to 9.6 kilobits per second (kbit/s). Later models make possible high-speed data communications at 56/64 kbit/s. With recent developments in data compression techniques, it is now possible to send high-definition still photographs, slow-scan video and video conferencing via an Inmarsat-A MES.

The relatively large size and weight of the Inmarsat-A antenna, as shown in Figure 1-3, mean that, generally, Inmarsat-A MESs are fitted only on larger ships.

1.3 The Inmarsat-B system

The Inmarsat-B system was introduced in 1994 and uses digital technology to provide high quality telephone, fax, telex, e-mail and data communications, with the antenna size and weight being approximately the same as for Inmarsat-A. Like Inmarsat-A, Inmarsat-B is capable of high-speed data communications (at up to 64 kbit/s), making it especially suitable for data-intensive users such as oil and seismological companies which need to exchange large amounts of data on a regular basis.

1.4 The Inmarsat-C system

Inmarsat-C was introduced in 1991 to complement Inmarsat-A by providing a global low-cost two-way data communications network using a small terminal that could be fitted on either a large or small vessel. Its compactness makes it especially suitable for smaller vessels such as yachts, fishing vessels or supply craft.

The Inmarsat-C system does not provide voice communications but is a means of sending text, data and e-mail messages to and from shore-based subscribers using a store-and-forward technique. This requires the user to prepare the message prior to sending it; it is then transmitted via the land earth station operator who sends it on to its intended destination.

The global communications capability of the Inmarsat-C system, combined with its Maritime Safety Information (MSI) broadcasts and distress-alerting capabilities, has resulted in the Inmarsat-C system being accepted by the International Maritime Organisation (IMO) as meeting the requirements of the Global Maritime Distress and Safety System (GMDSS).

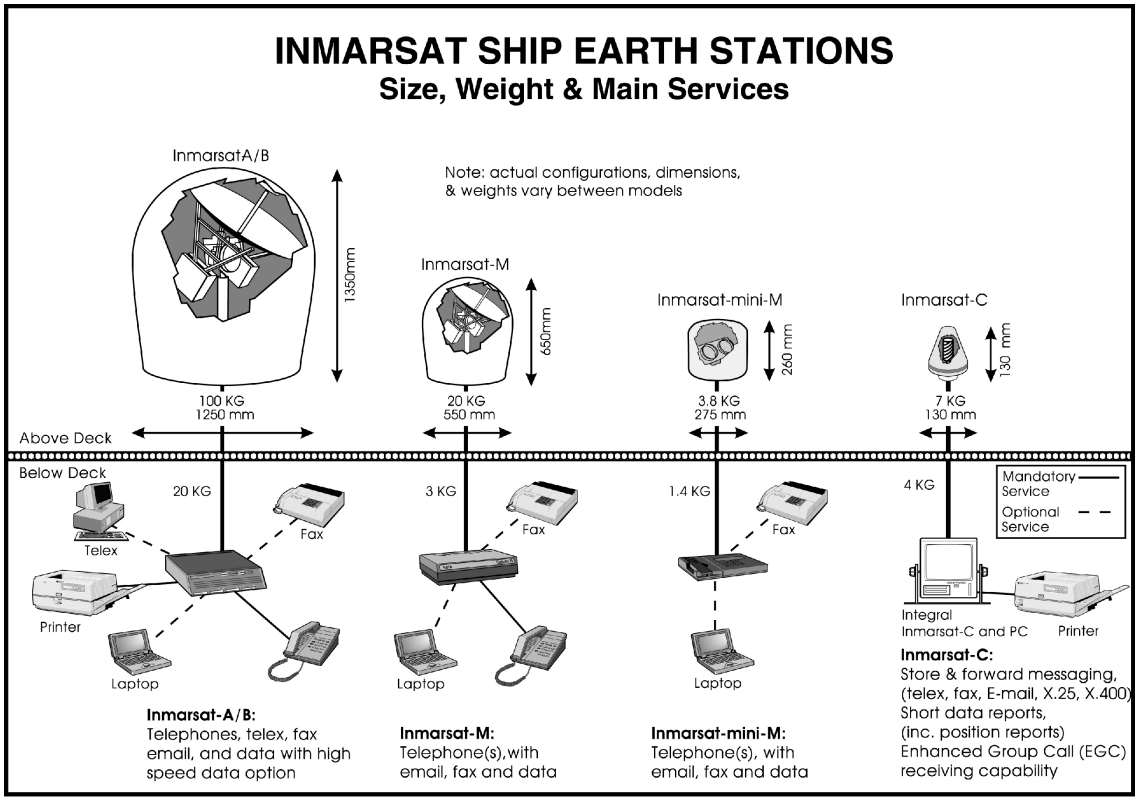

Figure 1-3 Comparative sizes of the different Inmarsat systems

The GMDSS carriage requirements are mandatory for all merchant ships of over 300 gross registered tonnes (grt) and all passenger vessels which make international voyages. Fitting an Inmarsat-C MES is a cost-effective way for a ship to meet GMDSS carriage requirements; which accounts for many ships having Inmarsat-C MESs.

1.5 The Inmarsat-E system

The Inmarsat-E distress alert system has been globally available since 1997. Inmarsat-E combines the position determining capacities of GPS with the geostationary satellite technology of the Inmarsat communications system. It complies fully with GMDSS regulations, provides reliable coverage between latitudes 80^{o} North and 80^{o} South for both SOLAS and non-SOLAS vessels, and is available free of charge to users. The system features both float-free buoy-type EPIRBs (Emergency Position Indicating Radio Beacons), as well as hand-portable versions for smaller vessels.

1.6 The Inmarsat-M system

Inmarsat-M was introduced in 1993 to complement the existing Inmarsat-A system by providing global telephone/fax and data communications on an MES which is inexpensive and compact in size. As shown in Figure 1-3, the Inmarsat-M MES is smaller and lighter than an Inmarsat-A MES, making this network suitable for smaller vessels such as fishing vessels and yachts.

1.7 The Inmarsat mini-M system

The Inmarsat mini-M system was launched in January 1997 and offers the same services as Inmarsat-M, but in a smaller, more lightweight and compact unit. This MES can be made smaller because it operates only in the spot-beam coverage of the latest Inmarsat-3 satellites. With internal batteries, the typical talk time is about 1.5 - 2.5 hours and up to 50 hours on standby. However, most maritime installations have external power supplies which allow for continuous operation.

It is possible to operate an Inmarsat mini-M with a Subscriber Identity Module (SIM) card. This can be easily installed and removed, making it possible for a number of individuals to make calls on a shared Inmarsat mini-M, while allowing for individual billing.

1.8 The Inmarsat Fleet system

The Inmarsat Fleet (F77) system was launched in November 2001. It offers a unique high-performance service for high-speed shore-to-ship and ship-to-shore communications. Fleet F77 introduces a new Mobile ISDN and Mobile Packet Data Service (MPDS) delivering voice, fax and data at speeds of up to 64 kbit/s. Inmarsat Fleet F77 is equipped to satisfy the latest distress and safety requirements of the GMDSS. It offers more efficient data-driven communications for applications such as technical management and crew rostering, accessing a head office intranet, and obtaining updates of weather and chart information. Store-and-forward video is also available for onboard diagnostics and telemedicine.

1.9 Multi-channel operation

The standard operation of an Inmarsat MES is as a single-channel unit, with each MES able to make only one call at a time (Single Call Per Channel or SCPC). But (except for Inmarsat-C) it is possible to operate multi-channel MESs. Because of their greater power, these are generally larger pieces of equipment and have larger antennae than single-channel MESs.

1.10 Using Inmarsat in the shore-to-ship direction

This handbook is aimed primarily at those using the Inmarsat network from onboard a ship, but it is useful to know how a shore subscriber sends a message to an Inmarsat-fitted ship.

Although the procedure for calling an Inmarsat-fitted ship may differ between countries, the shore subscriber should generally not experience any difference from land-based communication when making a phone, fax, e-mail or data call to a ship equipped with an Inmarsat-A, B, M or mini-M MES, or sending telex messages to an Inmarsat-A or B MES.

Different procedures apply when a shore subscriber is sending a message to an Inmarsat-C MES.

Further information on sending messages to an Inmarsat mobile satellite unit is in Chapter 11. Information is also available on the Inmarsat website: *www.inmarsat.com*, which includes the *Inmarsat Ship Directory*.

Chapter 2

Inmarsat distress and safety services

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2.1 Introduction

After many years of international consultation, the International Maritime Organisation (IMO), and its member governments developed the new Global Maritime Distress and Safety System (GMDSS) with the co-ordination and co-operation of the International Telecommunications Union (ITU), World Meteorological Organisation (WMO), International Hydrographic Organisation (IHO), Inmarsat, and COSPAS-SARSAT. The GMDSS was incorporated into Chapter 4of the SOLAS (Safety of Life at Sea) Convention. Ships subject to the SOLAS Convention began implementing the GMDSS in 1992 and full implementation took place on 1 February 1999.

All ships use the same safety system, but some will carry equipment on a mandatory basis. Although the carriage of equipment for GMDSS operations is mandatory for SOLAS Convention ships (cargo ships of 300 gross registered tonnes and over and passenger ships making international voyages), other ships will fit equipment to the GMDSS standard on a voluntary basis or as required by their national administration. Most ships (whether SOLAS or not) will find it desirable and convenient to install Inmarsat type-approved equipment which will provide advantages for commercial communications and the added benefit of acceptance for GMDSS operation.

2.2 The role of Inmarsat in the GMDSS

This section is based on the second edition of the *GMDSS Handbook*, which was published by the IMO in 1995.

2.2.1 Ship-to-shore distress alerting

The Inmarsat system provides priority alerting for use in distress emergency situations (except for Inmarsat mini-M). Distress priority alerting applies not only with respect to satellite channels but also to the automatic routing of the call to the appropriate Rescue Co-ordination Centre (RCC). Each LES in the system provides reliable communication with an RCC; these national RCCs are known as associated RCCs.

The means of LES-RCC interconnection may vary from country to country. It may also include the use of dedicated lines or public switched networks. Thus, any distress-alerting message received at the LES is automatically processed and passed to the associated RCC. Some LESs, due to national considerations, may also take one of the following actions:

- Pass distress priority messages to special operators, who are responsible for the subsequent routing of the call to the appropriate RCC;
- In the Inmarsat-A and Inmarsat-B systems, these LESs may provide an option which allows the shipboard operator to contact any RCC once a satellite channel has been assigned on the distress priority basis.

The pink page at the front of each chapter relating to the different Inmarsat services (except Inmarsat mini-M) explains the procedure for initiating a distress call. It is advisable to keep copies of these pages, plus the relevant ones on how to operate an MES when in distress, in a prominent position near your MES. In this way, rapid assistance will be available to anyone who may need to send a distress alert. You should also ensure that anyone who may need to make a distress call is familiar with the operation of the MES and the procedures indicated in Figure 2-1.

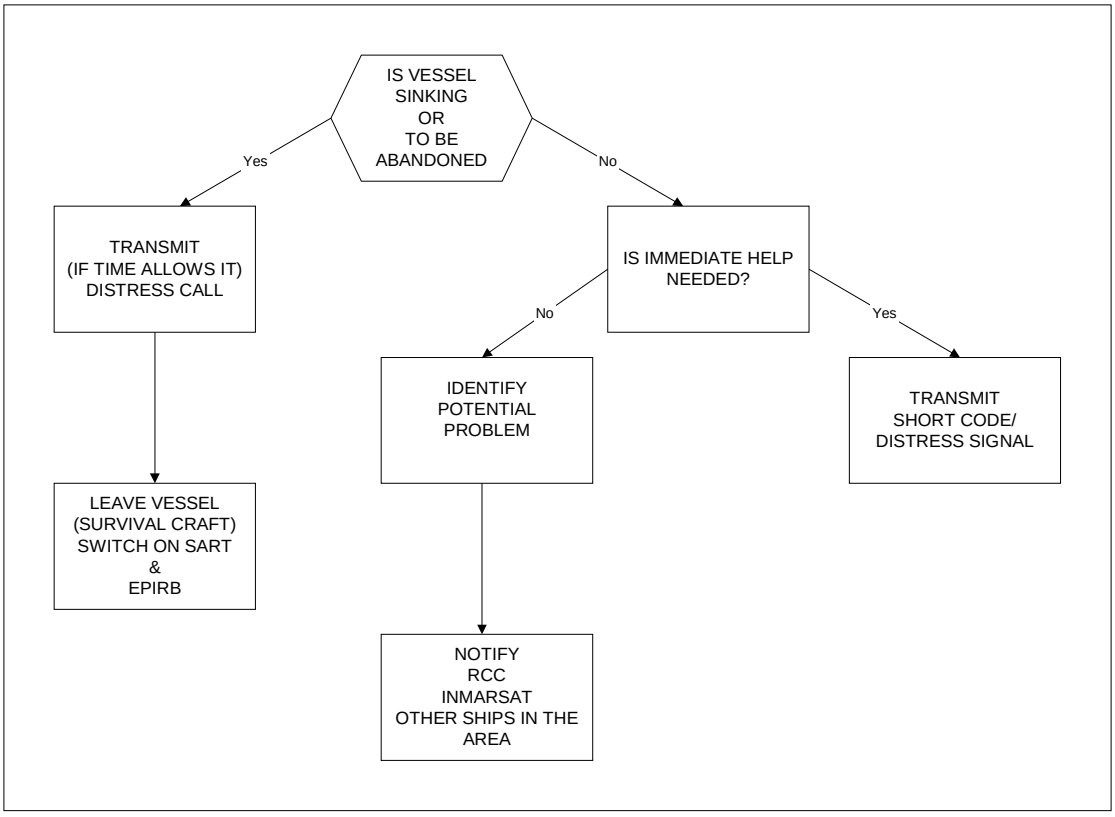

Figure 2-1 GMDSS operating guidance for masters of ships in distress situations

2.2.2 Inmarsat-A distress alerting

Each Inmarsat-A MES is capable of initiating a 'request' message with distress priority indication. This is automatically recognised at the LES and a satellite channel is instantly assigned. If all satellite channels happen to be busy, one of them will be pre-empted and allocated to the MES which initiated the distress priority call. The processing of such calls is completely automatic and does not involve any human intervention. The LES personnel,

however, are notified by audio-visual alarms of the reception and passing on of a distress priority message.

To ensure the correct treatment of distress priority requests, the NCS in each ocean region automatically monitors the processing of such calls by all other LESs in that region. In the event that any anomalies in processing are detected, the NCS will take appropriate action to establish the end-to-end connection. In addition, the monitoring NCS also checks the identity of the LES contained in the distress priority message and automatically accepts the call if the identity of a non-operational LES has been detected (which may happen due to operator error aboard the vessel in distress).

In some MESs the initiation of a distress priority message is made by using the 'distress button' on the unit. In other models, however, the distress button changes the priority of the call to distress priority (Priority 3), but does not initiate the distress message. On this type of MES, the operator must still initiate the 'request' from the MES.

Most MES manufacturers provide instructions for the initiation of distress priority calls. These instructions should be mounted close to the MES operating position and should be studied by all potential users.

On generation of a 'request', by whichever means used, the MES transmits a priority request via the satellite to an LES. In most countries, the LES which receives the request automatically makes a direct and assured connection to a competent Rescue Co-ordination Centre (RCC), so avoiding the need for an MES operator to enter the telex or telephone number of the RCC.

If, however, a distress call is placed through an LES without automatic connection to an RCC, and the MES operator does not know the number of the RCC or is delayed in entering the number, an operator alerted by the ocean region NCS will intervene and offer any assistance required. This ensures that no distress priority call will go unanswered.

Inmarsat has issued technical guidelines to manufacturers for a Distress Message Generator (DMG), which consists of MES software which, after the connection has been established, transmits the distress message in a standardised format. This provides information on the vessel's identification, its position and the particular emergency.

2.2.3 Inmarsat-B and M distress alerting

Inmarsat-B MESs are capable of initiating both telephony and telegraphy distress calls. The set-up and clearing procedures are identical for both types of call. For ship-originated distress alerts, the MES maintains the ID of a particular LES in its memory, which has been previously selected by the MES operator. This is modified automatically as necessary to conform with the current ocean region and LES status which is contained in the MES Network Status Record (derived from the NCS Bulletin Board).

If, during a ship-originated distress call (either telephony or telegraphy), the NCS determines that the MES distress 'access request' message contains an invalid LES ID, or that the addressed LES has not sent a channel assignment message to the MES (after the expiry of a timer for

telephony), the NCS will replace the called LES ID field in the received distress 'access request' message with the ID of the back-up LES (and the return MES ID with the forward MES ID) and then transmit a 'distress access request relay' message to the back-up LES. Upon receipt of this message, the back-up LES proceeds to set up the call as for any ship-originated telephony or telegraphy distress call.

A mandatory Distress Message Generator (DMG) facility is provided in Inmarsat-B MESs with telex capability (Class 1 MES). A pre-programmed telex distress message (containing the MES ID, position, course, speed, times of position update and activation) is maintained in the MES memory. Once a duplex telex call is established on a Priority 3 (distress) basis by pressing the distress button, and the MES receives the **GA+** signal, the operator can start to type the distress message or use the stored message facility (DMG). (For more information, refer to your MES manufacturer's instructions.)

Where the DMG facility is provided, the format of the DMG message will comply with the requirements of the International Maritime Organisation (IMO).

The selection of distress priority for telephony and telegraphy services is obtained by pressing (and holding for six seconds) a 'distress button'.

Note : The procedure for Inmarsat-M is the same as for Inmarsat-B, except that Inmarsat-M does not offer the telegraphy service.

2.2.4 Inmarsat-C distress alerting

Inmarsat-C MESs use the signalling channel for distress alerting. Using the distress button, a short pre-formatted alert is transmitted directly to an LES or to an NCS as a back-up. Distress priority ensures special processing at the LES for rapid transmission to the associated RCC.

The distress-alerting format in an Inmarsat-C MES may be updated manually from the terminal keyboard. Automatic position updating, however, may be provided by an integrated electronic navigation receiver (such as GPS) or by direct input from the ship's electronic navigation system.

2.2.5 Inmarsat-E distress alerting

Inmarsat-E is a fully GMDSS compliant emergency alert system. It covers virtually all the world's ocean areas, is highly reliable for both SOLAS and non-SOLAS vessels, and is available free of charge.

This system combines GPS with Inmarsat geostationary satellite technology, and features both float-free buoy-type Emergency Position Indicating Radio Beacons (EPIRBs) for use on large vessels and hand-portable versions. The distress signal can be triggered manually or automatically as soon as it is submerged (for the float-free terminals).

Both types of EPIRB include a GPS receiver so that the position of the unit is constantly

updated to an accuracy of better than 200m. This information is transmitted via an Inmarsat satellite to an LES, where it will trigger an alarm, while at the same time it is automatically relayed to an RCC.

Once triggered, EPIRB terminals will continue transmitting for 48 hours unless de-activated manually. Some terminals also feature a Search and Rescue Radar Transponder (SART) beacon.

2.2.6 Inmarsat Fleet distress alerting

Inmarsat Fleet F77 offers the most comprehensive GMDSS functions of all the Inmarsat family. Fully compliant with IMO Resolution A.888 (21), it offers call prioritisation to four levels (see Figure 2-2) and real-time, hierarchical call pre-emption in both directions. This means that Inmarsat land earth stations (LESs) must be capable of offering this valuable safety addition.

With Inmarsat Fleet F77, the rescue authorities will always get a call through to a ship, even if the voice or data channel is being used continuously.

FLEET F77				
Distress	**Priority - P3** A distress (P3) will pre-empt all other communications			
Urgency		**Inmarsat Priority - P2** An urgency (P2) call will pre-empt both safety (P1) and routine (P0) calls		
Safety			**Inmarsat Priority - P1** A safety (P1) call will pre-empt a routine (P0) call	
Others Routine				**Inmarsat Priority-P0**

Table 2-1: Four levels of priority

A distress call from the Fleet 77 system is a voice call, which means that you will be connected to an operator in the RCC (Rescue Co-ordination Centre). When the distress call is connected, the ship's position and MES ID is sent to the RCC.

To make a distress call, the user presses the distress button on the cradle. The call will be cancelled if the button is released within five seconds. If no distress LES is selected, the system

will use the default one. The user can opt out of the distress mode by pressing the 'distress stop' button.

Once the call is received by the RCC, the operator at the Centre can generate a distress alert priority call to the ship. Any calls with lower priority will be pre-empted and a busy tone will be heard.

2.2.7 Distress communications

The procedures described above are the primary means of ship-to-shore distress alerting using Inmarsat systems. It should be noted, however, that Inmarsat MES-equipped ships can also contact any RCC of their choice by following the call procedure for routine calls. In this case, the complete international telephone or telex number has to be selected. Inmarsat mini-M may be used for this purpose, although the communication is not guaranteed as this system is not equipped to generate distress alerts.

A major benefit of Inmarsat distress priority systems is to render it unnecessary to allocate dedicated frequencies for distress and safety communications. Distress messages transmitted through Inmarsat systems are sent through the general communication channels on a priority basis to ensure rapid receipt.

2.3 Shore-to-ship distress alerting

Shore-to-ship distress alert relays can be transmitted via the Inmarsat-C SafetyNET™ service; see 2.4 below.

However, shore-to-ship alerting to groups of ships with Inmarsat-A or Inmarsat-B MESs, but without Inmarsat-C SafetyNET™ capabilities, can be performed in the following modes:

All ships call - Calls to all ships in the ocean region concerned. It should be noted, however, that due to the large coverage zones of geostationary satellites, such alerting is not very efficient, although it may be justified under exceptional circumstances;

Variable geographical area calls - Inmarsat-B MESs can accept calls to rectangular or circular areas, provided a navigational position is entered into the terminal.

Group calls to selected ships - This service is provided by a number of LESs in the operator-assisted mode, and allows alerting of a pre-determined group of vessels. This service could be very useful for alerting e.g. search-and-rescue (SAR) units.

As long as they are not engaged in traffic, MESs accept all incoming messages without any differentiation of priority.

2.4 Shore-to-ship alerting through Inmarsat SafetyNET™

The Enhanced Group Call (EGC) receiver is normally an integral part of an MES, though it can be a completely separate unit. It ensures a very high probability of receiving shore-to-ship

distress alert messages. When a distress priority message is received, an audible alarm sounds which can only be reset manually.

Accessing the Inmarsat SafetyNET™ service by RCCs requires arrangements similar to those needed for shore-to-ship distress alerting to an MES. Those RCCs unable to obtain a reliable terrestrial connection to a land earth station can install an Inmarsat MES at the RCC. The RCC will then transmit the distress alert relay via this MES to an Inmarsat LES, from where it is relayed by means of a broadcast through the SafetyNET™ service. (See Paragraph 6.4 in Chapter 6 for more information on the SafetyNET™ service.)

2.5 Search and Rescue (SAR) co-ordination communications

For the co-ordination and control of SAR operations, RCCs require communications with the ship in distress as well as with units participating in the operation. The methods and modes of communication used will be governed by the capabilities available onboard the ship in distress, as well as those onboard the rescue units. Where ships are equipped with MESs, the advantages of the Inmarsat system: rapid, reliable communications, including the receipt of Maritime Safety Information (MSI), can be exploited.

Reliable links among RCCs are important for the GMDSS, since a distress message may be received by an RCC thousands of miles away from where assistance is needed, and it may not be the RCC best suited to provide the necessary assistance. In such cases, prompt relay of the distress message to the appropriate RCC by any communications means, whether landlines, terrestrial radio networks or satellite links, is essential.

To increase the speed and reliability of inter-RCC communications, some RCCs have installed MESs, which allow them to communicate via the Inmarsat system. These facilities are useful for long-distance communications with SAR organisations, especially when dedicated lines or public switched networks are unavailable or unreliable, as well as for communications with ships.

2.6 On-scene SAR communications

On-scene communications are those between SAR vessels and the on-scene commander (OSC), or the co-ordinator, surface search (CSS). These are normally short-range communications made on the VHF or MF distress and safety frequencies in the GMDSS. However, Inmarsat MES-fitted ships can, if necessary, use satellite communications to supplement their VHF and MF facilities.

2.7 Promulgation of Maritime Safety Information (MSI) via Inmarsat

In the Inmarsat system, promulgation of MSI for the International SafetyNET™ service is performed by means of the Inmarsat-C EGC capability. If uninterrupted receipt of MSI is required, or the Inmarsat-C MES is used for above-average amounts of general communication,

it is essential for the ship to have a dedicated EGC receiver for MSI broadcasts. An EGC receiver is usually an integral part of an Inmarsat-C MES, but may also be installed as a separate unit. Please refer to Chapter 6 for more information.

Chapter 3

Inmarsat service activation procedures

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3.1 Introduction to service activation

Service activation is the term used by Inmarsat to define the formal process of registering a new or modified Inmarsat MES to service. With the exception of the Inmarsat-A system, service activation does not now require any technical testing of the equipment.

The first stage of service activation is the administrative registration of customers and their equipment details. The second stage is the 'switching on', or connection of the MES to the space segment, by the LESOs.

3.2 What are the requirements for service activation?

All operational MESs must satisfy the following requirements:

- **Financial:** The customer must be able to pay the charges for the use of the Inmarsat system. He must select either an Inmarsat land earth station operator (LESO) or else an Inmarsat service provider (ISP) or an accounting authority (AA) which will liaise with the LESOs for billing purposes***. Maritime customers who use the MES for distress and safety purposes shall not use an ISP for billing purposes***.
- **Legal:** The operation of each new MES must meet the legal requirements of the country of registration from which the MES is to be installed or operated.
- **Contractual:** The MES operator and/or owner must sign the Inmarsat Terms and Conditions for the utilisation of the Inmarsat space segment. Any violation of these could result in the suspension or permanent withdrawal of access to the space segment.
- **Technical:** The MES must be an Inmarsat type-approved model and, in the case of Inmarsat-A, must have passed the service activation test.

3.3 Who is involved in service activation?

The following parties are involved in the process of activating an Inmarsat MES.

3.3.1 The applicant

This may be the owner of the MES or someone acting on behalf of the owner. This person, who should be familiar with the piece of equipment, is the point of contact for any issues concerning its registration and activation. The applicant:

- chooses an appropriate AA or ISP;
- completes the Service Activation Registration Form;
- signs and dates the completed form or passes it to the owner for signature;
- signs and dates the Inmarsat Terms and Conditions or passes it to the owner for signature;
- forwards the form by mail or fax to the appropriate point of service activation (PSA) for the country of registration of the MES installation, or to an ISP selected by the applicant.

3.3.2 Point of service activation (PSA)

The PSA is an entity which has concluded a contract with Inmarsat for the activation and maintenance of MES's records and accounts. A PSA is a one-stop-shop for service activation, terminal equipment provision and customer support.

The PSA:

- acts as the interface between the applicant or MES user and Inmarsat in all matters relating to service activation;
- accepts and authorises the Service Activation Registration Form from the applicant;
- ensures that all the financial, legal and contractual requirements for registration are met;
- ensures that the Inmarsat Terms and Conditions have been signed;
- assigns an Inmarsat Mobile Number (IMN) to Inmarsat-B, M, mini-M, C and Inmarsat Fleet MESs (in the case of Inmarsat-A, IMNs are assigned by ESAS). Assignment of IMNs must meet the national requirements of the country where a ship is registered, particularly the use of maritime mobile system identifiers (MMSIs) within the IMN;
- enters the application remotely on the Electronic Service Activation System (ESAS) .

After an MES has undergone service activation, the PSA is responsible for continuing to act as an interface between the owner/user and Inmarsat. If any changes are made to the details of the MES, it is the responsibility of the owner to advise the PSA of these changes so that the ESAS and the Inmarsat network can be updated.

3.3.3 The land earth station operator (LESO)

The land earth station operator (LESO) is responsible for conducting service verification (for Inmarsat-C if required by maritime agencies) or service activation tests (for Inmarsat-A MESs).

The LESO is also responsible for adding an MES to, or removing an MES from, the MES authorisation table that allows or disallows access to the space segment.

3.3.4 The Inmarsat network co-ordination stations (NCSs)

The NCS is a specially equipped LES, appointed as the NCS for each Inmarsat system and ocean region, which monitors and co-ordinates the operation of all the MESs and LESOs within that ocean region. The NCS performs its functions by transmitting on a special channel known as the NCS Common Signalling Channel and is responsible for disseminating the activation data to the LESOs in the Inmarsat-C system.

3.3.5 Settlement of call charges

An MES owner is required to enter into an agreement with a billing entity which is authorised to settle any call charges that may be made by an MES. This billing entity can be either an accounting authority (AA) or an Inmarsat service provider (ISP) contracted with a Land Earth Station Operator (LESO). Further information regarding Inmarsat billing procedures is available in Chapter 4.

3.4 The application process

Figure 3-1 and the following stages indicate the process that needs to be followed when completing a service activation request.

The owner of the equipment should:

- check to ensure that all national and international licensing regulations applicable to the MES have been met;
- check to ensure that an agreement for settling any call charges has been agreed;
- make sure that the hardware serial number (ISN) is a correct one;
- complete a Service Activation Registration Form (SARF), sign the Inmarsat Terms and Conditions agreement and send them to the PSA.

The PSA checks that:

- the SARF has been completed correctly and all national regulations have been met;
- the Inmarsat Terms and Conditions agreement has been signed by the applicant or owner;
- the MES has been type-approved by Inmarsat.

Equipment that has not been type-approved by Inmarsat will not be accepted for service activation and will not be allowed to use the Inmarsat network.

- For Inmarsat-B, M, mini-M, C and Fleet systems, the PSA assigns the IMN numbers for the different services.
- For Inmarsat-A MESs, ESAS will assign a number at the end of the application procedure. At the same time, once the application is finished successfully, ESAS will send an electronic notification to the nominated land earth station operator (LESO) which is to conduct the service activation test. Once these tests have been completed the status of the Inmarsat-A will change from ‘unregistered’ to ‘active’.

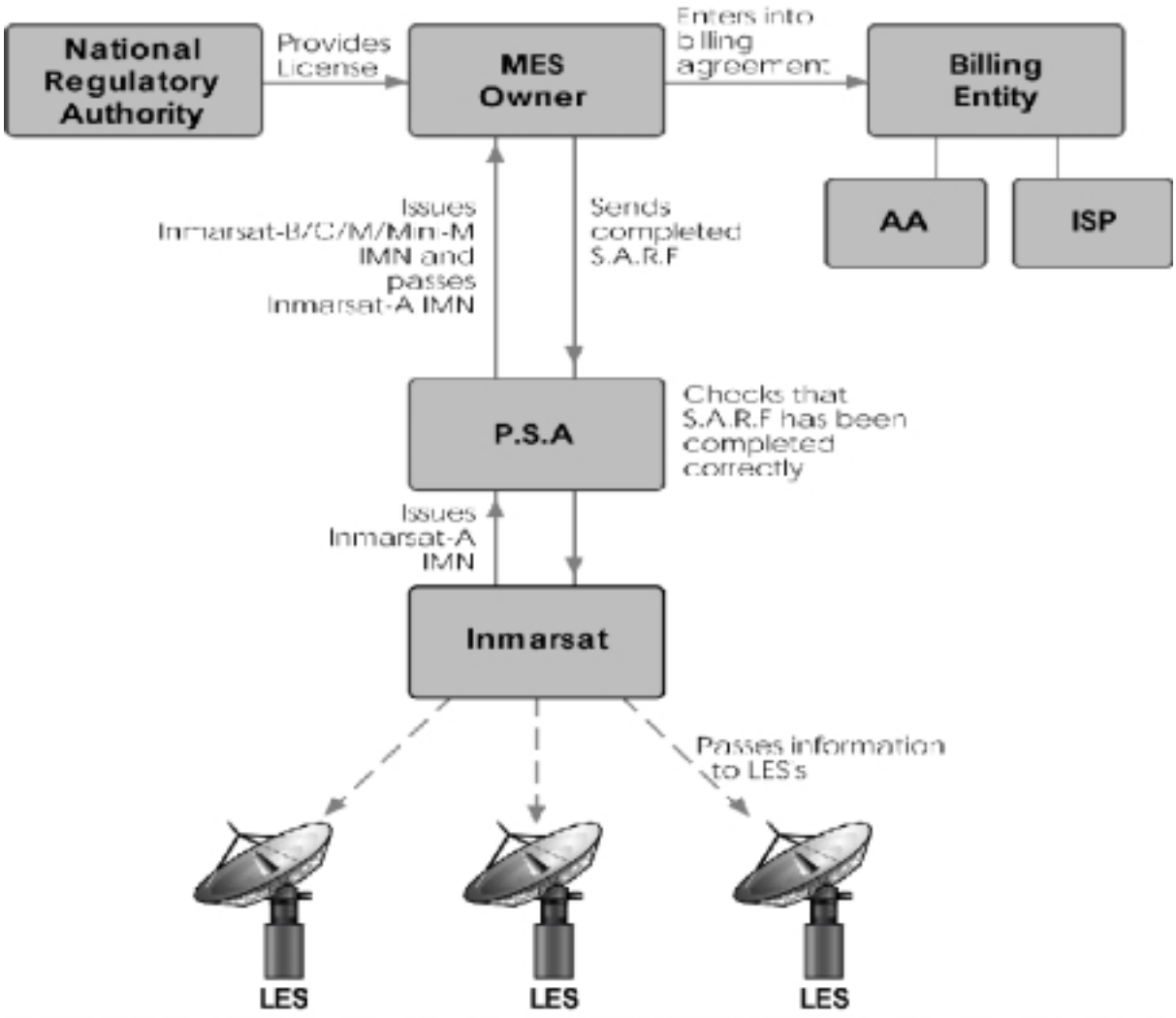

Figure 3-1 Inmarsat service activation procedure

The detailed numbering scheme for each of the different Inmarsat networks is summarised in Table 3-1.

For further details on service activation procedures, please contact the Inmarsat Customer Activation Group (see Appendix A for contact details)

3.5 GMDSS considerations (maritime MESs only)

If an MES is to be fitted on a sea-going ship to comply with carriage requirements for GMDSS [Safety of Life at Sea (SOLAS) convention Chapter 4], it must meet the type- approval requirements for GMDSS. National administrations may choose to accept Inmarsat type approval as proof that an MES model meets some or all of their own national type acceptance requirements for radio equipment used in GMDSS installations.

It is very important for owners of ships which design GMDSS installations to contact the national administration of the country in which the ship is being registered to determine the precise GMDSS carriage requirements for that country.

Further information on GMDSS or SOLAS is available from:

The International Maritime Organisation (IMO)
4 Albert Embankment
London
SE1 7SR
UK
Tel: +44 (0)20 7735 7611
Fax: +44 (0)20 7587 3210
Telex: + 51 23588 IMOLDN G
Website: *www.imo.com*
E-mail: *info@imo.com*

3.6 Electronic Service Activation System (ESAS 2000)

ESAS (Version 2000) is the electronic system used by Inmarsat to:

- maintain a central database with up-to-date information about all Inmarsat MESs;
- facilitate the processing of applications and related transactions at Inmarsat;
- facilitate the electronic interchange of service activation applications and related transactions by the various PSAs;
- facilitate the electronic interchange of service activation and billing information between Inmarsat and the land earth station operator (LESO)s for billing purposes;
- send global notifications.

3.7 Changes to MES details

MES owners must advise all changes to an activated MES to the PSA, who will enter the changes into the Inmarsat network. This changes will subsequently be passed on to the LESOs.

The following list is a summary of changes that must be advised to Inmarsat via a PSA or ISP:

- change of ownership: the old owner's and new owner's names;
- the change to a vessel's name;
- any change to accounting details;
- extra INM numbers or a change to services;
- any change of MES details (e.g. MES serial numbers)

An MES does not require reactivation in the event of administrative changes such as revised contact names and addresses or changes to AAIC.

3.8 Circumstances that require de-activation and re-registration

Re-registration of an MES is required when:

- the MES has been moved from one installation or ship to another;
- the MES is being modified or updated;
- the billing entity is changed from an AA to an ISP or vice versa.

De-activation of an MES is required:

- prior to a transfer or moving of an MES to another installation or ship;
- when the country of registration of an MES or ship has been changed;
- when transferring from one ISP to another;
- when it is being taken out of service to make way for a newer model;
- if operation or persistent malfunction of the MES degrades the performance of the space segment;
- if there is a change of PSA;
- if there is a change of telex answer back letters.

3.8.1 Field repairs

When an MES goes through a series of repairs without being removed from the installation point, the procedure can go ahead without the need for de-activation of the MES. Repairs can only be done on a terminal if it is not subject to either mandatory or discretionary barring. This is because if the repair produces a change of FRLPs (forward and return link pairs) a barring will stop those from being notified through the Inmarsat network and therefore will make the MES inoperable. In this case the FRLPs taken from the terminal will be totally withdrawn from the system and can never be used again to prevent debt or fraud.

3.9 Barring and unbarring

Barring of an MES will temporally stop a MES from using the Inmarsat network *but will not affect distress communications.*

Barring of an MES can be due to the following reasons:

Discretionary barring - this occurs when a service provider bars an MES via its LES and is usually due to outstanding payment of bills;

Mandatory barring - when an MES is totally barred from operating through all LESs/SPs on the Inmarsat network. A mandatory barring can be due to non-compliance with the Inmarsat terms and conditions of utilisation of the space segment, causing interference to the Inmarsat network, non-payment of any outstanding call charges or because the MES has been reported lost or stolen by the owners.

In the case of an MES used for GMDSS, the nominated barring authority (NBA) of the land earth station operator (LESO) should inform the operator of the maritime MES before raising a mandatory barring. The MES owner/operator will be notified 14 days before the barring takes place.

In a distress situation, all MESs can access any LES, irrespective of any barring in force.

In general, most barring is caused by non-payment of traffic invoices. Once payments have been received, the MES will be unbarred from the network.

Occasionally, in serious cases of bad debt, two service providers will request a Proposed Mandatory Barring (PMB03) to be put in place by the LESOs. When this happens the Electronic Activation System (ESAS) will automatically put a mandatory barring on the affected MES. Only when those two proposed mandatory barrings are lifted will the mandatory barring be lifted.

Customers can request information about barrings by calling their PSA or Inmarsat's Customer Services Group. Owners of MES registered with ISPs can only get the information from the LESOs.

3.10 Inmarsat numbering scheme

The IMN assigned to your MES is similar to a telephone or telex number and will have been allocated by the PSA. Table 3-1 indicates the different numbering schemes for each of the Inmarsat services.

Table 3-1 Inmarsat numbering scheme

Inmarsat service	Inmarsat Mobile Number (IMN)
Inmarsat-A	1xxxxxx
Inmarsat-B	3xxxxxxxx
Inmarsat-C	4xxxxxxxx
Inmarsat-M	6xxxxxxxx
Inmarsat mini-M	76xxxxxxx
Inmarsat Fleet	76xxxxxxx 60xxxxxxx (HSD)

3.10.1 Inmarsat-A numbering scheme

The Inmarsat-A network number uses seven octal digits beginning with a 1. The first IMN is known as the primary number and is the same for voice and telex communications. The second IMN, where allocated, is available only for voice communications and generally used with a fax terminal.

3.10.2 Inmarsat-M/B and mini-M numbering scheme

The IMNs allocated to this group of Inmarsat systems are nine-digit numbers. The first one or two digits (known as T digits) identify which Inmarsat system is being used (3 = Inmarsat-B, 6 = Inmarsat-M and 76 = Inmarsat mini-M). The IMN is used to identify the desired end terminal (telephone, fax machine, computer or telex machine) to the user and the person contacting the MES. The last two digits of the IMN identify the end terminal on a MES.

The Inmarsat network allocates the IMN numbers to a particular Inmarsat Serial Number (ISN) which is programmed into the MES and identifies the end terminal by using two hexadecimal values called the Origination and Destination Identification Numbers (OIDs and DIDs). The OID/DID numbers are programmed into the MES at the factory using a scheme recommended by Inmarsat. The OID is used to identify which end terminal is originating the call; the DID is used to route incoming calls to the correct end terminal.

The ability for an MES to identify and label the end terminals is important for billing purposes, particularly when split billing is desired.

3.10.3 Inmarsat-C numbering scheme

The Inmarsat-C system uses a nine-digit number beginning with 4. Only one IMN is allocated to each MES and is assigned to the serial number of the unit. The same IMN is used for all types of message communications, whether telex, data, e-mail or fax.

3.10.4 Inmarsat Fleet numbering scheme

The digit allocations for the Fleet services are exactly the same as the corresponding services in the mini-M and the GAN systems.

3.11 Access Authorisation Certificates (AAC)

In certain parts of the world, e.g. Port of Conakry (Guinea), local port authorities have requested original copies of AACs which, if not produced, can lead to fines being imposed.

Copies of AACs can be obtained free of charge for all MESs fitted onboard ships by applying to the Inmarsat Customer Activation Group and giving the following information:

- the vessel's name;
- the call sign;
- the Inmarsat Mobile Number;
- the name of the vessel's owner.

These certificates will not expire and are sent to the owner of the MES unless otherwise requested.

Chapter 4
Inmarsat traffic accounting and billing arrangements

Contents

Figure

4.1 Introduction

With vessels of different nationalities travelling across international waters and communicating with other ships or countries, a unique problem appears in the accounting, billing and settling of communication charges.

To deal with this problem the maritime community devised a special billing and settlement process which has also proved suitable for Inmarsat satellite communications.

This chapter explains the Inmarsat accounting, billing and settlement process from a ship making a call to an end user on land.

4.2 Call charge settlement

When an MES sends a message or makes a call via a land earth station operator (LESO), that LESO will invoice the total cost of the call to the company which has been contracted to act as intermediary by the MES owner/shipping company. This intermediary company can be either an accounting authority (AA) or an Inmarsat service provider (ISP). For details, contact the AA or ISP directly.

If an ISP is selected, the MES operated by the customer is allowed to use only the LESs that have a contract with that ISP in the mobile to fixed direction. In the fixed to mobile direction, all LESs will provide access to all MESs assigned with an ISP billing arrangement.

If an AA is selected, the customer is allowed access to all LESs, and AAs are required as a matter of procedure to pay all the LESs where the traffic was generated. Maritime customers who intend to use the MES for distress and safety must select an AA.

When completing a Service Activation registration form for submission (via the point of service activation – PSA) to Inmarsat, the customer must nominate an accounting authority or Inmarsat service provider.

4.2.1 The accounting authority (AA)

An accounting authority (AA) is an organisation, commercial or non-commercial, which administers the billing and settlement of the communication charges for the MES. The purpose of the AA is to act as an intermediary between the customer and the various land earth stations (LESs) which supply communication services to the MES. The LES identifies the AA by the Accounting Authority Identification Code (AAIC). This takes the form of a four-digit alphanumeric code which includes a two-character country code.

Inmarsat accepts only those accounting authorities that have been officially notified to the International Telecommunication Union (ITU) for the country of registration of the MES. Normally each country has an administrative body or licensing authority such as the Ministry of Communications, which approves who can be an Accounting Authority and informs the ITU of whom it has approved.

The ITU regularly publishes a *List of Ship Stations* which lists the names and addresses of all approved AAs.

Enquiries can be made to verify the name and details of an AA through the use of the ITU website MARS (*www.itu.int/MARS*)

4.2.2 The Inmarsat service provider (ISP)

An Inmarsat service provider (ISP) is an entity which has established a contract with one or more LESOs to promote and retail the services of the contracted LESO to end users. It can be used as an alternative to an AA for all MESs that are intended solely for commercial use and not to be used for distress and safety purposes. Inmarsat will only accept ISPs that have been authorised by at least one LESO.

4.3 The billing and settlement process: ship-to-shore calls

The billing and settlement process in use today for a ship-to-shore call via the Inmarsat system is described below and is also illustrated in Figure 4.1.

- When a ship makes a call via the Inmarsat network, routing through several different stages is involved. These stages include the satellite link to a selected LESO (known as the 'space segment'), the land earth station operated by an LESO and the terrestrial lines (possibly in more than one country) to the final destination.

- When a ship makes a call through an LESO, the LESO checks the MES in its database to determine with which accounting company the MES has an agreement. The LESO calculates the cost of the call including the space segment and landline charges and then invoices that accounting company.

  Details of the charging policy of an LESO can be obtained directly from the appropriate customer services department at the contact details given in Appendix E.

- The accounting company invoices the MES owner for the total consolidated amount plus any handling charge that has already been agreed with the owner. Details of the charges made by an accounting company for its service may be obtained directly from the billing entity (AA or ISP).
- The accounting company pays the individual amounts due to each LESO and the owner must pay the billing entity.
- Inmarsat separately invoices each LESO for the use of the space segment.

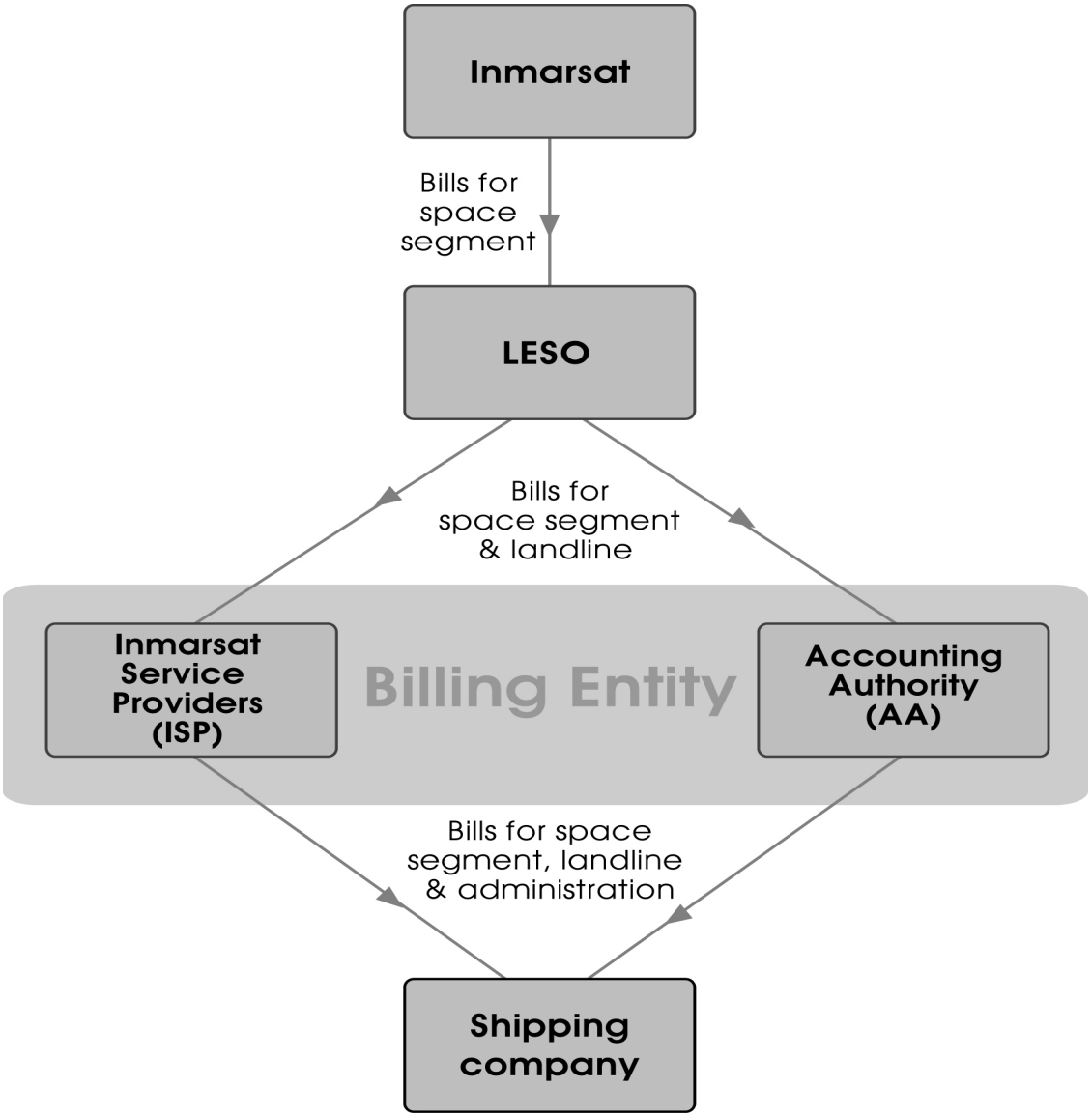

Figure 4-1 Inmarsat billing process

Note the following important comments:

> Inmarsat is not involved in the billing process between a ship, its AA and any LESO used to pass traffic.
>
> Any queries regarding settlement of charges for a particular MES should be referred to the appropriate LESO by the AA acting for the owner.

4.4 Factors involved in the cost of a call

A question often asked is, 'How much does it cost to make a call via the Inmarsat system?' There is no direct answer to this; the cost depends on many different factors, including:

- When and how the call is made, and via which LESO.
- The minimum chargeable duration applicable: whether three minutes, one minute, six seconds or one second; check the LESO charges for details.

> **Note** that, in general, only '"connect' time and not 'holding' time is chargeable. For example, in a telex call, the only time chargeable to the end user is from receiving the answer back of the called subscriber until the end of communication. The user is not charged for the time that the system takes to connect his or her call. Further details can be obtained from the LESO, whose contact details are in Appendix E.

- An automatic call is normally cheaper than an operator-assisted call.
- In the ship-to-shore direction, and depending on which LESO is used, off-peak rates are generally available in periods of reduced traffic for calls made on a telephony channel (telephone, data and facsimile calls) but generally off-peak rates are not available for telex calls. Details of the standard and off-peak rates and times are obtainable from the LESO.

4.5 Currencies and exchange rates used in Inmarsat billing

To overcome problems of bills being issued or settled in many different currencies, some SPs use special 'nominal' currencies, such as the Gold Franc (GF) and the Special Drawing Right (SDR).

An LESO calculates the traffic invoices for a ship using one of these nominal currencies and then converts the charge to an agreed currency (for example the US$ or GB£), in order to invoice the accounting company.

The conversion rate from the nominal currency (GF or SDR) to the agreed currency depends on the current exchange rate. **Check with your billing entity for the latest exchange rates that are to be used.**

4.6 Charging units used by the Inmarsat systems

Not many years ago, the only two units used in radio traffic accounting were **'words'** for radio-telegrams, with a seven-word minimum for international traffic, and **'minutes'** for radiotelephony, with a three-minute minimum and increments of one minute.

The Inmarsat network charges for calls made via the Inmarsat-A, B, M and mini-M services in a similar way to HF/MF radiotelephony, for which calls are charged by the length of the call. The charging unit used by land earth station operators is either six seconds or one minute. An Inmarsat-C message is charged by the size of the message and not the duration and is charged in units of either 256 bits or 1,024 bits.

To find approximately how long a data message will take to send using a standard ASCII 8 bit format, divide the total number of bits in the message by the data throughput for the Inmarsat service; this will give you the time in seconds. This is valid only once the call has been established and the modems have finished negotiating (approximately 20 seconds):

1 character = 8 bits = 1 byte.

Computer data (for example, a message comprising text and numbers) is often measured in kilobits, where:

1 kilobit (kbit) = 1,024 bits = 128 characters (bytes) = (approx) 25 words.

1 A4 page full of text = (approx) 2,500 characters = 20 kbits.

Telex communication uses a different set of character codes, known as ITA2 (International Telegraph Alphabet 2). Each ITA2 character consists of five data bits, plus one start bit, and 1.5 stop bits (7.5 bits in all). At the standard rate of 50 bits per second, this makes the speed of telex communication 400 characters per minute.

For more information, contact the Inmarsat Customer Care Department at the address given in Appendix A.

4.7 Shore-to-ship calls

When a land-based subscriber makes a call to an Inmarsat MES, the call will be routed via his or her local telecommunications supplier to an LESO with which the supplier has an agreement. If the local supplier is also an LES operator, the call will be directly connected through its own LES. Unlike a ship-originated call, the local supplier to which the caller subscribes is responsible for calculating and invoicing the total cost of the call.

4.8 Traditional methods and future developments in traffic accounting

Traditional methods of ship-board traffic accounting are based on an official on-board keeping record (an abstract) of all calls made, which includes the LESO selected, the national and international land-line call route, the destination, duration, originator and estimated cost. This record may be used by the owner or shipping company to bill individual passengers and crew members or the charter company for their calls. The record is also sent to the billing entity, typically from the first port of call after the end of the month.

Separately, during this time, the billing entity will have received call charges from the different LESOs which the ship has been using, and produces a consolidated total of the ship's calls for the given period. The billing entity compares this amount with the amount in the abstract and makes the required adjustments.

Several billing entities and other organisations have developed automated call-logging systems. A typical system is based on special call-logging computer software which holds up-to-date charging information for each LESO through which the ship may call. A suitable interface between the MES and the call-logging software records every call made and calculates its cost. At the end of a given period, the call data is transferred automatically, via the Inmarsat satellite

system, directly into the billing entity's computer. The billing entity is then able to rapidly calculate the call charges, itemised if required to individuals or end-terminals, and send the bill to the owner. Thus the cost of calls is provided quickly, enabling early settlement, and eliminating the inaccuracies of traditional methods. Changes in charging information can be transferred easily from the billing entity to the ship over the satellite link.

Existing Inmarsat-A and Inmarsat-C MESs can be modified for automatic call logging while new Inmarsat-M, mini-M and Inmarsat-B MESs can have this facility fitted as standard.

A related development in automated traffic accounting is the introduction of the credit-card satellite telephone. To operate it, the user simply swipes a credit card through the card reader and makes the call. The call-logging software calculates the charge and automatically debits the card for the amount.

It is also now becoming possible to fit pay phones on an Inmarsat MES, for which a crew caller needs to purchase a card with a set number of pre-paid units. When the all the units on the card have been used, it is simply thrown away and the caller purchases a new card.

The new Inmarsat Fleet F77 offers a more convenient and cost-effective digital technology for seafarers with the introduction of the Mobile Packet Data Service (MPDS). This technology splits up data into small packets sent through channels shared by other users. The users are charged by the amount of data sent not by the time they spend online using the connection. In this way it is possible to be connected all the time and pay only for the data transmitted.

Chapter 5

The Inmarsat-A system

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Figure

Table

How to send a DISTRESS call by telex or telephone using an Inmarsat-A MES

When you are in grave and imminent danger, you may use your mobile earth station (MES) to send a distress alert. The alert is routed automatically through a land earth station (LES) to a land-based rescue co-ordination centre (RCC). The procedure for sending a distress alert is outlined below:

1. **Select telex or telephone mode of operation.**
2. **Select Distress Priority.**
3. **Select the required LES access code, referring to Table E-2 in Appendix E.**
4. **Initiate the request according to the equipment manufacturer's instructions.**
5. **If you do not receive any response within approximately 15 seconds, repeat the distress call.**
6. **When contact has been established, send your message in the following format:**

MAYDAY MAYDAY MAYDAY

➨ **THIS IS** *[ship's name/callsign]* **CALLING ON INMARSAT-A FROM POSITION** *[latitude and longitude, or relative to a named point of land]*.

➨ **MY INMARSAT MOBILE NUMBER IS** *[IMN for this channel of your MES]*. **USING THE** *[Ocean Region]* **SATELLITE**.

➨ **MY COURSE AND SPEED ARE** *[course and speed]*.

You should then give:

The **NATURE OF YOUR DISTRESS**, for example:

- Fire/explosion
- Flooding
- Collision
- Grounding
- Listing
- Sinking
- Disabled and adrift
- Abandoning ship
- Attack by pirates

➨ **ASSISTANCE REQUIRED**

➨ **ANY OTHER INFORMATION** to help rescue units

7. **DO NOT CLEAR THE CALL UNTIL INSTRUCTED BY THE RCC TO DO SO. Then keep your MES clear so that the RCC can call you back when necessary**.

How to send an URGENCY or SAFETY telex or telephone call using an Inmarsat-A MES

It is possible to obtain medical advice, medical assistance and maritime assistance from many LESs by using two-digit codes as described below.

Note: Not all LESs support all the two-digit codes listed below.

Follow the procedure for your MES on how to select the required telex or telephone mode of operation.

1. Select **routine priority** (also known as **Priority 0**).
2. Select the required LES access code (Appendix E, Table E-2).
3. Initiate call to selected LES and, on receipt of the **PTS** (proceed to select) tone or GA+, dial or key the appropriate two-digit code indicated below, followed by **'#'** or **'+'**.
4. **When you have established communications, identify whether the call is of an** URGENCY **or** SAFETY **nature and give the information listed below:**

Service	Two-digit code	Remarks	Information required
Medical advice	32	Most LESs automatically connect all calls using this code directly to a local hospital.	Give the word MEDICO, plus the following information: • The name of the ship. • The ship's radio call sign and identification number. • The ship's exact position (latitude/longitude). • The condition of the ill or injured person. • Any other relevant information.
Medical assistance	38	Most LESs connect these calls directly to associated RCCs so that they can be dealt with immediately. This code should only be used when immediate assistance is required, such as the medical evacuation of a patient.	Give the following information: • The name of the ship. • The ship's radio call sign and identification number. • The ship's exact position (latitude/longitude). • The condition of the ill or injured person. • Any other relevant information.
Maritime assistance	39	Most LESs connect these calls directly to associated RCCs so that they can be dealt with immediately. This code should only be used when immediate assistance is required, such as man overboard, steering gear failure, oil pollution or for a request for towage.	Give the following information: • The name of the ship. • The ship's radio call sign and identification number. • The ship's exact position (latitude / longitude). • Particulars of the incident. • Any other relevant information.

5.1 Preparing your MES to access the Inmarsat-A system

Once your MES has been installed and commissioned, it can then be used to access the Inmarsat network. Before making any calls, ensure that the antenna is pointed correctly at the chosen satellite for your location. Refer to Appendix C for an explanation of how to find the required azimuth and elevation settings and to your MES equipment manufacturer's handbook for how to point the antenna according to these values.

5.1.1 Setting the correct TDM channel

It possible for an Inmarsat-A terminal to operate on one of two common signalling channels (TDM). The IMN which has been assigned to your terminal will determine to which common signalling channel your MES will need to be synchronised.

Where the **fourth digit** of the MES's **main IMN** is an **even number** (0, 2, 4 or 6), you will not be required to change the TDM channel. This is because all assignments for these IMNs are transmitted on **TDM0**, which is the default setting.

Where the **fourth digit** of the MES's **main IMN** is an **odd number** (1, 3, 5 or 7), the MES will need to be re-tuned to **TDM1**, from which all assignments for these IMNs are transmitted. (The fourth digit of the second IMN has no influence on which common signalling channel is used.)

For example, a main IMN of 123**4**567, which has a fourth digit which is an **even** number, will use TDM0 and will not need to be changed.

But where the main IMN is 176**5**432, which is an **odd** number, it will need to be changed to TDM1.

Instructions on how to change the TDM channel settings for your MES can be found in the MES manufacturer's handbook. If you require further assistance, please contact any LES, using the two-digit code 33 (technical assistance) or the Inmarsat Customer Care Centre (please see Appendix A).

Note: Some terminals will automatically revert to TDM0, either after a power failure or after being switching off. If the power to your MES has been interrupted, please check that your MES is tuned to the correct TDM channel in accordance with the fourth digit of the main IMN.

5.2 Telex services

An Inmarsat-A MES can be used to send a telex message from any ocean region to any subscriber who is connected to the international telex network. Some of the possible advantages of using telex over telephone communications are:

- Your message can be prepared in advance, ensuring that it contains all the correct information.
- Telex is regarded as a legal written document.
- The exchange of answerbacks acts as a confirmation that the message has been received at the destination.
- Messages can be sent or received at any time.
- Many LESs offer 'store-and-forward' facilities whereby a telex message can be sent to the land earth station operator for onward transmission later to either a single or to multiple addresses.
- Many LESs offer services whereby messages are accepted from ships over the telex network for onward delivery by radio-telegram, e-mail or special letter service.
- Many LESs offer special services using two-digit codes as listed in Appendix D, Table D-1.
- Please note that some countries no longer support the telex service, eg:. New Zealand, Canada, Norway… Check with the land earth station operator for more information.

5.2.1 Preparations for making a telex call

Always prepare your message in advance, either by pre-punching a tape or by typing the message into the memory of the telex terminal in local mode.

All telex messages should ideally include the following information:

- The destination company and/or name of the addressee.
- The name and title of the person sending the message.
- A message reference number and/or the subject of your message.
- The Inmarsat ocean region through which your recipient should contact your ship if a reply is required.
- The text of the message.

5.2.2 Choose your time

Consider the following factors when deciding the best time to make your call.

- Although the ship's local time may be 'local office hours', it may not be a convenient time at the destination;

- The urgency or importance of the message;
- Can you avoid possible call congestion by calling outside 'peak hours' at the call destination?

5.2.3 Establishing a telex communications channel

Before making a telex call, ensure that your MES is properly set up for the required ocean region as described in Section 5.1.

The following instructions are of a general nature and not specific to any particular make of MES. These instructions are only to be used for guidance; for specific instructions please refer to your MES operating handbook.

Making a telex call is divided into two separate stages:

Stage A. Setting up a communications channel between your terminal via the satellite to an LES within your ocean region.

Stage B. Establishing a communications channel from the LES via the international telex network to the final destination, either on another ship or onshore.

The procedures for these different stages are outlined below:

Stage A. Setting up a telex communication channel via a satellite to an LES

1. Select the telex mode on your MES.
2. Check that 'routine priority' is selected (this is normally the default).
3. Select the LES through which you wish to route your call, ensuring that it is operational in your current ocean region. Particular care should be taken in areas where different ocean regions overlap, for example in the North Sea, which is covered by three different ocean regions (the AOR-E, AOR-W and IOR). See Appendix E for a list of the land earth stations which operate in each ocean region and for a coverage map.
4. Initiate a telex request in accordance with your MES manufacturer's instructions.
5. Within approximately 12 seconds the following should happen:
    - Your MES should receive a telex channel assignment and complete 'handshaking' with the LES.
    - The LES's header will be printed on your telex terminal (or VDU), and will request a 'Who are you?' (WRU), followed by '**GA+'**. This indicates that the communications channel between your MES and the LES has been set up.

5. If after approximately 20 seconds you have not received any reply from the LES, you should try again to initiate the call.

Stage B. Establishing a communication channel from the LES via the international telex network to the final destination

When you have received the **GA+** from the LES, you must immediately enter the service required and subscriber's details, in the following sequence:

Telex service code	Telex country code	Called Subscriber's Number	End of Number Selection

Where: The **telex service code** is the two-digit telex service code, as given in Appendix D, Table D-1.

The **telex country code** is the access code for the country where the intended recipient of your message is (Appendix G, Table G-1) or a telex ocean region access code if you are sending a message to another MES (Chapter 11, Table 11-2).

The **Called Subscriber's Number** is the telex number for the subscriber you are calling. This can be either a subscriber's telex number, for a land-based subscriber, or the IMN of another MES, if you are making a ship-to-ship call.

End of Number Selection is the **+** character, which must be entered to signify the end of the dialling sequence.

Once you have received the answerback of the destination telex terminal you may proceed to send your message.

5.2.4 Example of setting up a telex call

To set up an automatic call to the Inmarsat telex maritime helpline in London, using number + (51) 920327 INMHLP G:

1. Set up a communication channel to your chosen LES as described in Section 5.2.3.
2. When you have received **GA+** from the LES, you should immediately enter 00 51 920327+, as indicated below:

00	51	920327	+

Where: **00** is the two-digit telex service code for an automatic telex call, as given in Appendix D, Table D-1.

51 is the telex country code for the UK, as given in Table G-1.

920327 is the telex number of the Inmarsat maritime telex helpline.

(Note that you do not include the answerback characters.)

+ is the End of Number Selection character.

3. Within approximately 15 seconds you should receive the answerback of the called subscriber (in this example, **920327 INMHLP G**). This means that the telex link to the subscriber has been established.
4. You may now proceed with your call; in this example following the prompts you receive from the helpline.

5.3 Telephone services

The Inmarsat-A telephone service allows you to make or receive any of the following types of calls:

- ship-to-shore and shore-to-ship telephone calls
- ship-to-ship telephone calls
- ship-to-shore and shore-to-ship facsimile calls
- ship-to-ship facsimile calls
- ship-to-shore and shore-to-ship data calls
- ship-to-ship data calls.

Telephone communication via the Inmarsat satellite network offers many advantages over conventional HF and VHF radio telephony, including:

- immediate connection from anywhere in the world to any other location.
- good audio quality, free from interruptions, interference and atmospheric noise.

Many LESs offer other services using special two-digit access codes which are listed in Appendix D, Table D-4.

5.3.1 Preparations for making a telephone call

Before making a telephone call, ensure that your MES is ready as per the manufacturer's operating handbook.

It is always advisable to prepare any notes about your conversation in advance (bearing in mind that English is the general language used in maritime radio communication).

Your notes should include such key items as:

- your ship's name and identification number;
- the ID code of the LES you intend to use, as listed in Appendix E, Table E-2;
- the ocean region and/or satellite through which your ship can be contacted if a reply is required;
- the two-digit code for the telephone service you require, as listed in Appendix D Table D-4;
- the telephone number (including the telephone country code and area code) of the subscriber you wish to call;
- the key points you wish to raise during your conversation.

5.3.2 Choose your time

If you have a choice, consider the best time to make your call, considering the following points:

- Can you avoid possible call congestion by calling outside what are 'peak hours' at the destination of the call?
- Although the ship's local time may be 'local office hours', it may not be a convenient time at the destination;
- The urgency or importance of the message;

- Refer to the LES's charging information about 'off-peak' rates and times for telephone calls.

5.3.3 Establishing a telephone communication channel

Before making a telephone call, ensure that your MES is properly set up for the required ocean region as described in Section 5.1.

The following instructions are of a general nature and are not specific to any particular make of MES. These instructions are only to be used for guidance; for specific instructions please refer to the manufacturer's operating handbook.

Making a telephone call is divided into two separate stages:

Stage A. Setting up a communication channel between your terminal and an LES via the satellite.

Stage B. Establishing a communication channel from the LES via the international telephone network to the final destination, either on another ship or onshore.

The procedures for these different stages are outlined below:

Stage A. Setting up a telephone communication channel via a satellite to an LES

1. Select the telephone mode on your MES.
2. Select routine priority and channel type 01. (Note: this is normally the default setting and does not require any special selection.)
3. Select the LES through which you wish to route your call, ensuring that it is operational in your current ocean region. Particular care should be taken in areas where different ocean regions overlap. For example, three different ocean regions (the AOR-E, AOR-W and IOR) cover the North Sea. See Appendix E for a list of LESs which operate in each ocean region and for a coverage map.
4. If placing a fax or data call, you should request an **uncompanded channel**. For further information please see Paragraph 5.4.1 of this chapter.
5. Initiate a call request in accordance with your MES manufacturer's instructions.
6. Within 12 seconds, the following should occur:
    7. Your MES should receive a telephone channel assignment.
    8. Your MES should complete its 'handshaking' with the LES.
    9. You should hear the PTS (proceed to select) tone in the earpiece of your handset.
10. If you do not receive any indication from the LES within 20 seconds, you should re-try.

    Note: The receipt of the PTS tone indicates the successful completion of the first stage of making a telephone call; this is the setting-up of a telephone communication channel between your MES and the LES.

Stage B. Establishing a communications channel from the LES to the final destination

When you receive the PTS tone from the LES, you should immediately enter the service and subscriber details in the format indicated below:

Telephone service code	Telephone country code	Called Subscriber's Number	End of Number Selection

Where: The **telephone service code** is the two-digit telephone service code as given in Appendix D, Table D-4.

The **telephone country code** is the telephone country access code for a land-based subscriber (Appendix F, Table F-1), or a telephone ocean region access code for another MES (Chapter 11, Table 11-1).

The **Called Subscriber's Number** is the telephone number of the subscriber you are calling. This can be either a subscriber's telephone number for a land-based subscriber or the IMN number of another MES if you are making a ship-to-ship call.

The **End of Number Selection** is the **#** character, which must be entered to signify the end of the calling sequence.

5.3.4 Example of setting up a telephone call

To set up an automatic telephone call to the Inmarsat Customer Care Centre in the UK on number +44 20 7728 1777.

1. Establish a communications channel via your chosen satellite and LES as described in Stage A.
2. When you receive the PTS tone from the LES, immediately dial the following numbers:

00	44	20 7728 1777	#

Where: **00** is the two-digit service code for an automatic telephone call (Appendix D, Table D-4).

44 is the destination code/telephone country access code for the UK, as given in Appendix F, Table F-1.

20 7728 1777 is the Called Subscriber's Number (Note: the leading zero is omitted from the area code.)

is the End of Number Selection character.

3. Within approximately 20 seconds, you should receive a ringing indication from the called subscriber. When the subscriber answers, the telephone link to that person is established and you can begin your conversation.

   Note**:** The charging period begins from when the subscriber answers, and continues until either you or s/he disconnects the link. (For more information about charging, see Chapter 4.)

5.4 Data and facsimile communications

It is possible to use the Inmarsat-A network for sending medium-speed data and facsimile messages.

To send data and facsimile messages does not require any special equipment to be fitted to the MES or special authorisation from Inmarsat but only that a suitable data modem or facsimile equipment is connected.

It is also possible to send messages at higher data speeds using the high-speed data (HSD) service (64 kbit/s). This service does require special authorisation from Inmarsat and is available only through certain LESs.

5.4.1 Use of uncompanded channels for data and facsimile calls

It is now possible to allocate either dedicated voice or data/fax channels.

It is strongly recommended that when an MES is sending a facsimile or medium-speed data message it always specifies an ***uncompanded channel*** or ***channel type 2*** in its initial request burst.

It is also possible for shore-originated calls to request uncompanded channels. This is accomplished by placing the digits **'81'** after the ocean region access code and before the ship's IMN (ID number).

Example: 00 871 ***81*** 1234567

It is essential that any voice communication when using uncompanded channels be kept to an *absolute* minimum.

Inmarsat is constantly in liaison with all LESs to ensure that the optimum line levels from the terrestrial networks are maintained and to continually provide a quality service for data/fax transmissions.

5.4.2 Data transmission

Sending messages using the data service allows for information to be sent in electronic format to another computer.

To send electronic messages via an Inmarsat-A MES requires that a modem is connected between a computer and the Inmarsat-A MES. A detailed description of the Inmarsat data services can be found in Chapter 12.

Such data equipment should preferably be installed on the second IMN (ID number) of the MES and the data modem be set to 'auto-answer' mode (if only a single IMN has been assigned to the MES, the data equipment may be installed on the main IMN, but without enabling the 'auto-answer' mode on the modem).

It is also possible to use an Inmarsat-A MES for HSD operation (56/64kbit/s) if your MES is suitably equipped. Please see Chapter 12 for further details.

5.4.3 Facsimile (fax) transmission

A fax converts images on a sheet of paper or stored on a computer into a suitable format for transmission over a telephone system. At the receiving end, a fax machine converts the information sent back to the original image. The types of images that can be transmitted include either hand-written or typewritten text and graphical images.

Fax transmission can be two-way, where either the MES operator or the shore-based user can initiate a call.

Fax equipment should preferably be installed on the second IMN (ID number) of the MES, and set to auto-answer mode. (If only a single IMN has been assigned to the MES, the fax may be installed on the main IMN and the 'auto-answer' mode disabled.)

It may also be possible to use an automatic fax XXXXX on a single IMN, for automatic fax reception.

Another option is to install an auto-answer facsimile or modem on an Inmarsat-A telephone line, although this is not recommended on the primary number. If the MES has dual capability, the second channel is often used for this purpose (See Paragraph 5.5)

5.4.3.1 Equipping your Inmarsat-A terminal for facsimile operation

Equipping your Inmarsat-A terminal for facsimile services requires the following:

- suitable facsimile equipment (CCITT Group 3 is recommended);
- the relevant interconnection cables;
- the correct installation by an service agent who is experienced in your MES, to ensure that audio levels to and from the MES are matched correctly to the facsimile equipment.

5.4.3.2 How to send a fax

1. Ensure that the documents and header sheet are placed in the feeder of the fax machine in accordance with the manufacturer's instructions.
2. Establish a call to the subscriber via the selected LES as described in Section 5.3.3, ensuring that an **uncompanded channel** is requested. When the called subscriber answers, proceed as follows:

    i) When you hear the fax tones from the remote answering facsimile equipment, press the 'start' key (or similar) on your fax machine to start the transmission. (For detailed instructions on how to operate your fax machine, refer to the operating instructions). Your fax transmission should then proceed to send your message.

ii) If someone answers the phone, you should say that you have a fax to send and ask to be connected to their fax machine. Remember to keep all voice conversation as short as possible. When you hear the tones of the remote fax machine, press the 'start' key as above.

It is possible to programme some fax equipment to initiate calls automatically at pre-defined times. Further details can be found in your fax equipment's operating handbook. Remember to programme in 'wait' periods between the LES access code and the subscriber's number to allow for reception of the PTS tone.

5.5 Dual identity of an Inmarsat-A MES

It is possible to upgrade a single-IMN MES to operate with two IMNs. On a dual-IMN MES, it is recommended that the second IMN be used for medium-speed data and/or facsimile operation, with the equipment left in 'auto-answer' mode. This allows the main IMN to be left available for distress and normal communications.

Note: Only one IMN can be used at any time.

For further information on whether your MES can be upgraded to dual IMN, you should consult the agent or manufacturer of your MES.

5.6 Terrestrial Network Identity (TNID)

In the Inmarsat-A network, the LESs are identified by a four-bit access code in the initial message request which is transmitted by the MES. This field can be used to provide up to 15 unique LES identifications. However, in some ocean regions there are now more than 15 LESs.

To accommodate the extra LESs within any one ocean region without having to make any changes to an installed MES, the Inmarsat network makes use of a field within the MES request message. Known as the 'terrestrial network' field, it was not used until recently, but it enables Inmarsat to extend the number of LES access codes in a particular ocean region.

LESs which have been allocated one of these new access codes can be identified by the access code beginning with a '13-x' (octal) or '11-x' (decimal) where x = any digit between 0 to 7.

For details on how to access LESs with one of these new codes, refer to your MES operator's handbook, or directly with the LES or with Inmarsat's Customer Care Centre.

5.7 Two-digit access codes

It is possible to send messages to special services which are offered by some LESs by using special two-digit codes, as indicated in Appendix D.

Some LESs and manufacturers refer to the two-digit codes as 'special access codes' or SACs.

To find out if an LES supports a particular SAC, contact the relevant LES's customer service department (Appendix E) or the Inmarsat Customer Care Centre (Appendix A).

Note: Some two-digit codes are free of charge for ship operators.

5.7.1 How to obtain operator assistance

If you are experiencing problems in trying to contact a particular subscriber, you may obtain assistance from a shore-based operator by using one of the following two-digit codes (not all LESs support these codes).

To use a two-digit code, enter the required code followed by a hash [#].

Table 5-1 Two-digit codes for telephone operator assistance

Two-digit code	Service	Remarks
11	International operator	Use this code to obtain information from the international operator of the country in which the LES is situated.
12	International information	Use this code to obtain information about subscribers in countries other than that in which the LES is situated.
13	National operator	Use this code to obtain assistance to connect to subscribers in the country in which the LES is situated. In countries which do not have an international operator, use this code instead of Code 11.
14	National information	Use this code to obtain information about subscribers in the country in which the LES is located.
33	Technical assistance	Use this code to obtain technical assistance regarding the operation of your MES or of the LES.

5.8 How the Inmarsat-A system works

Figure 5.1 shows how different services are connected via the Inmarsat-A system.

Unlike the newer Inmarsat services, the Inmarsat-A system uses a single IMN number for all services, whether telex, fax, data or telephone. It is possible to fit a second optional IMN number to the terminal; this is generally used for fax and data traffic.

The Inmarsat-A telex service has a dedicated telex interface which is mandatory for all maritime installations.

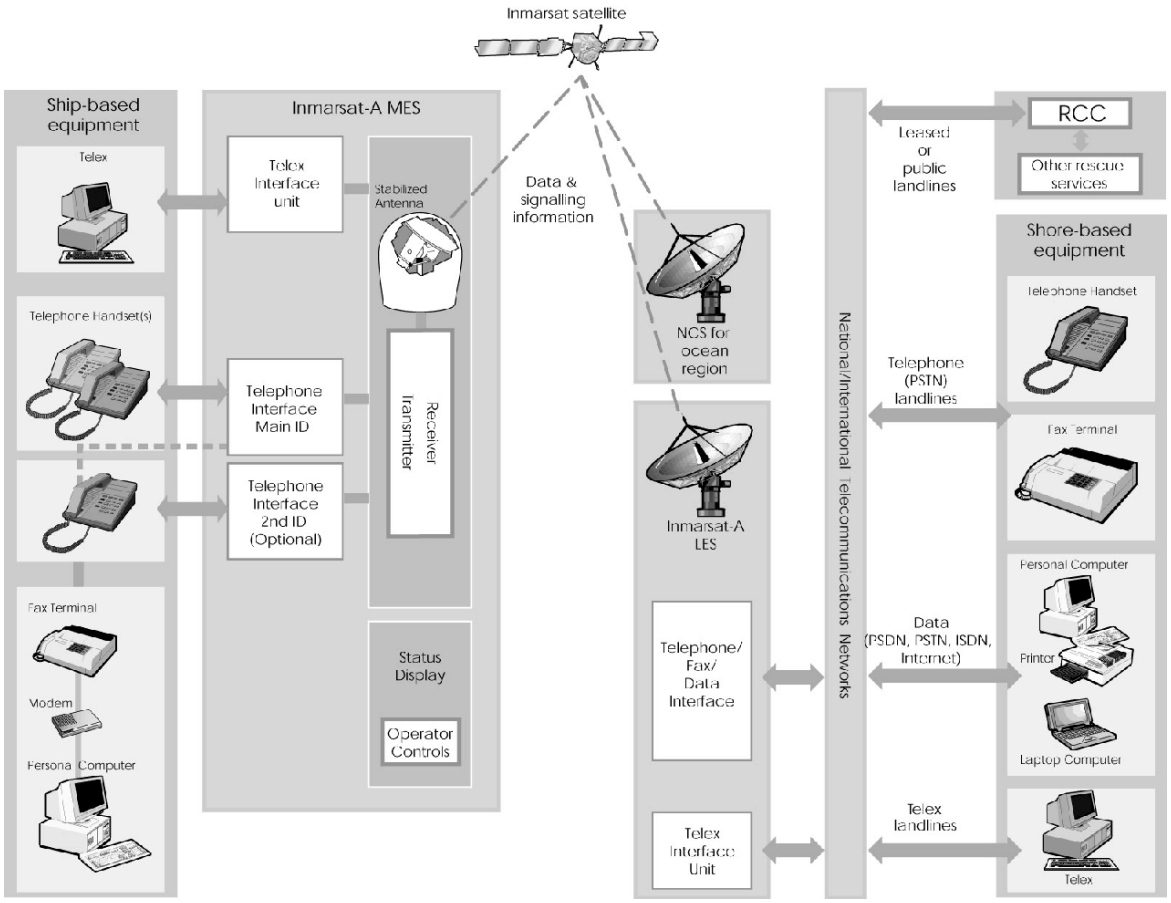

Figure 5.1 A simplified schematic of the Inmarsat-A system

Inmarsat-A is the oldest service in current operation in the Inmarsat network and uses analogue technology for sending information. Some of the later models offered by manufacturers may be upgraded to offer the 56/64kbit/s HSD service.

To be able to make or receive calls, the MES antenna must have a clear and unobstructed view of the satellite and be pointed toward the satellite. Some MESs automatically try to find the strongest signal, but other models have to be manually pointed (see Appendix C). The maritime antenna is stabilised in all planes and reacts to changes of heading from a compass or gyro; this means that the antenna is always pointed toward the satellite.

When a distress call is initiated on either a telex or a telephone terminal, the call is routed directly to an RCC via a direct connection from the LES.

Chapter 6

The Inmarsat-C system

Figures

Tables

How to send a DISTRESS call
Using an Inmarsat-C MES

When you are in grave and imminent danger, you may use your mobile earth station (MES) to send a distress alert. This alert is routed automatically through a land earth station (LES) to a land-based rescue co-ordination centre (RCC) which will establish communications with you to organise the search and rescue (SAR) services you may need.

1. **Methods for sending a distress alert:**
   You may send a distress alert to an RCC by using your MES terminal menu or by pressing the dedicated distress button(s) if you have one (or more) fitted to your MES.

2. **To send a distress alert using the dedicated distress button(s) (if fitted):**
   If your terminal is fitted with a dedicated distress button (or a combination of buttons), you may send a distress alert simply by pressing the button(s) and holding down for the required number of seconds (typically five seconds).

3. **To send a distress alert using your MES terminal menu:**

i. ***Access the distress alert menu on your MES terminal.***

ii. ***Fill in the selections on the menu presented, entering first your vessel's position and then as much other information as you can in the time available (unless this information is supplied automatically from navigational instruments, e.g. the GPS receiver). Select the nature of the distress from the list provided.***

iii. ***Select an LES, preferably the one nearest to your vessel within your ocean region. (You may, however, select*** **any** ***LES within your ocean region).***

iv. ***Send the distress alert.***

v. ***Wait for an acknowledgment from the LES. If you do not receive one within five minutes, repeat the above.***

After the distress alert has been sent and confirmed, a more detailed distress priority message can be sent giving more information about the distress and asking for assistance required. The distress priority message is also automatically routed to the RCC.

QUICK REFERENCE GUIDE TO OPERATING YOUR INMARSAT-C MES

The steps below summarise how you should use your Inmarsat-C MES for distress and safety purposes and to send and receive messages.

Prepare your MES	***Comment***
1. Make sure your MES antenna has an unobstructed view of the sky in all directions.	
2. Switch on your Inmarsat-C MES and all associated equipment.	*Refer to the equipment manufacturer's instructions.*
3. Log in to the ocean region you have selected.	*See Section 6.3.1 for more information.*
4. Decide on the LES through which you are going to communicate.	*Refer to Appendix E for the LESs in each ocean region. Section 6.3.2 tells you more.*
5. Confirm that your MES is logged in and receiving a strong NCS Common Channel signal.	*Check the indications on your MES monitor.*

Routine checks	
• Throughout your journey, make sure that your MES is receiving a strong signal and all associated equipment is working properly.	
• If you are going to sail outside the ocean region to which you are currently logged in, make sure your MES is logged in either manually or automatically to the new ocean region and receiving a strong signal.	*See Section 6.3.5 for more information.*

Sending a distress call	
• You may use your MES to send a brief distress alert or a more detailed distress priority message to an RCC.	*For a summary of the distress call procedures, refer to page 6-1: 'How to send a distress call using an Inmarsat-C MES'.*

Receiving MSI broadcasts	
• Your MES can receive broadcasts of Maritime Safety Information (MSI) within an ocean region	*See Sections 6.2.3 and 6.5 for more.*

Sending a message *(ship-to-shore)*	
1. Create your message on the MES text editor or edit an existing message.	*Refer to the MES manufacturer's instructions for details.*
2. Select transmit (send) mode.	*The destination number you enter, and the transmission type and format, depends on whether the destination is a telex, fax or computer terminal or another Inmarsat mobile. See Section 6.3.8 and Table 6-1 for more information.*
3. Insert the destination of your message.	*The transmission type is determined at the time of inserting the destination, as it is part of the address.*
4. Select the LES through which you want your message routed.	*See Section 6.3.2 for more information.*
5. Select the time of your message and whether you want confirmation of delivery and hard copy.	*Routine priority is selected by default. See Sections 6.3.8 and 6.3.9 for more information.*
6. Before sending your message check that all the details you have entered are correct.	*Any errors in the details entered could result in your message not being delivered. See Sections 6.3.8 and 6.3.9 for more information.*
7. Enter the command to transmit (send) your message.	*Your MES should now start to transmit your message, and proceed automatically until complete.*

Receiving messages *(shore-to-ship)*	
• Make sure that everyone who may need to contact you knows how to do so.	*See Consideration 1 in Section 6.3.2 for more information.*
• Provided your MES is logged in and receiving a strong NCS Common Channel signal, it should automatically receive all messages intended for it.	*At regular intervals, check your MES receive log and EGC log for any messages received.*
• Make sure that your MES is set to store and/or print all received messages.	*Refer to the MES manufacturer's instructions for details.*
• Note that some EGC messages may be sent frequently and could fill up your MES's memory or disk storage.	

IMPORTANT OPERATING PROCEDURES FOR AN INMARSAT-C MES

Note the following important operating procedures, which you should observe at all times to ensure your own safety. For more information refer to the relevant sections of Chapter 6.

DURING A DISTRESS CALL

DISABLE AUTOMATIC SCANNING ON YOUR MES

When you make a distress call, the Inmarsat-C system uses the NCS Common Signalling Channel for the ocean region into which you are logged so as to establish a communications channel from your MES to an RCC. To ensure your MES remains tuned to this channel, you should disable the **automatic scanning facility** on your MES to stay **in the ocean region into which you are logged** and to make it your preferred ocean region. Doing so ensures that the RCC can communicate with you while you are within that ocean region.
For more information, see Sections 6.3.3 - 6.3.5.

Note that automatic scanning is NOT allowed on GMDSS-compliant MESs.

WHEN RECEIVING MARITIME SAFETY INFORMATION:

IF YOU WISH TO CONTINUE RECEIVING MARITIME SAFETY INFORMATION (MSI) FROM YOUR CURRENT OCEAN REGION, YOU SHOULD DISABLE THE AUTOMATIC SCAN ON YOUR MES.

Note that automatic scanning is NOT allowed on GMDSS-compliant MESs.

Log out before you switch off!

If possible, keep your MES switched on at all times and logged in to an ocean region.

When switching off your MES, follow the important points below:

If you intend not to use your MES for a prolonged period of time (for example, to conserve battery power) and it is currently logged into an ocean region, **you must log out before switching your MES off (see Section 6.3.6)**

6.1 Introduction to the Inmarsat-C system

An Inmarsat-C mobile earth station (MES) is a small and power-efficient terminal which provides global communications, is inexpensive to purchase and simple to install and use. The Inmarsat-C network can be used to send and receive text or data messages only.

6.1.1 A summary of the operation of the Inmarsat-C network

The Inmarsat-C network is a digital network whereby messages containing text, numeric data or other information are converted to a digital format before being transmitted over the system. The technique used for sending a message is known as store-and-forward messaging. It is not possible to use this network for any voice communication.

When sending a ship-to-shore message, the message is initially prepared locally and then transmitted via the Inmarsat satellite in a series of data packets to an Inmarsat-C land earth station (LES). The LES acts as an interface (or gateway) between the Inmarsat space segment and the national/international telecommunications networks. If the LES receives any data packets with errors, it signals back to the MES to re-transmit those packets and the procedure is repeated until the LES has received the complete message with no errors. The LES stores the message briefly before forwarding it over the telecommunication networks to the intended destination (hence the term store-and-forward).

Users should be aware of the brief delay which occurs with the store-and-forward technique used in the Inmarsat-C system.

When sending an average-size message - 10/15 kbit/s or ½ A4 size page - in either direction, the typical delay from a message being sent to it being received at its destination without any errors is two to five minutes.

A similar procedure happens when a shore-based correspondent sends a message through an LES to your terminal.

The Inmarsat-C system is very flexible, allowing for a wide variety of equipment to be connected. Figure 6-1 shows a general overview of the system, indicating some of the different types of equipment that may be connected at either end. The actual equipment and the associated communications services depend on individual circumstances. The following sections discuss some of the possibilities.

6.1.2 Equipment which may be connected to the MES

Inmarsat permits only type-approved MES models to be used. As shown in Figure 6-1, an MES has two parts: the DTE (data terminal equipment) and the DCE (data circuit terminating equipment).

The DTE interfaces external input/output devices to the MES, such as:

- A keyboard, screen and printer for message processing. In some MES models these are built in to the DTE, while in other models they are separate.

- An external computer such as a laptop or desktop model. This computer may be used to format and store messages before they are sent or to run specialised software (for example formatting the data into a data report for sending to a reporting centre or compressing input data to save transmission time). Ideally, the computer should be dedicated solely to operating the Inmarsat-C MES but in some installations may task other functions.

Note the following precaution about interfacing with other systems onboard:

When the Inmarsat-C MES is a part of the GMDSS station, no other programmes or external interfaces (except GPS/NMEA) can be connected to the MES.

The Inmarsat-C DCE is a 'satellite modem' which provides an interface between the MES and the satellite system using a transmitter, receiver and an antenna (similar to a computer modem which links a computer to the telephone network.)

The antenna must be able to maintain a line-of-sight to the selected satellite.

A maritime Inmarsat-C antenna is omni-directional and can transmit and receive messages from the satellite when the vessel is pitching and rolling in heavy seas. (Note that this type of antenna has no moving parts, unlike the larger Inmarsat-A, B, M and mini-M directional antennae, which move constantly to counter the motion of the ship.)

6.2 Basic description of Inmarsat-C communication services

Both the MES and the LES must support the communications service that you select. To find whether your MES supports a particular service or needs to be upgraded, contact the manufacturer at the address given in Appendix B. To find whether an LES supports a particular service, contact the LES customer service using the numbers given in Appendix E, Table E-1.

The following services are available via the Inmarsat-C network:

- Store-and-forward messaging and data services (Section 6.2.1);
- Distress alerting and distress priority messaging (Section 6.2.2);
- Reception of EGC (Enhanced Group Call), SafetyNET™ and FleetNET™ broadcasts (Section 6.2.3).
- Data reporting, polling and SCADA (Section 6.5).
- Operator-assisted and value-added services (Section 6.6).

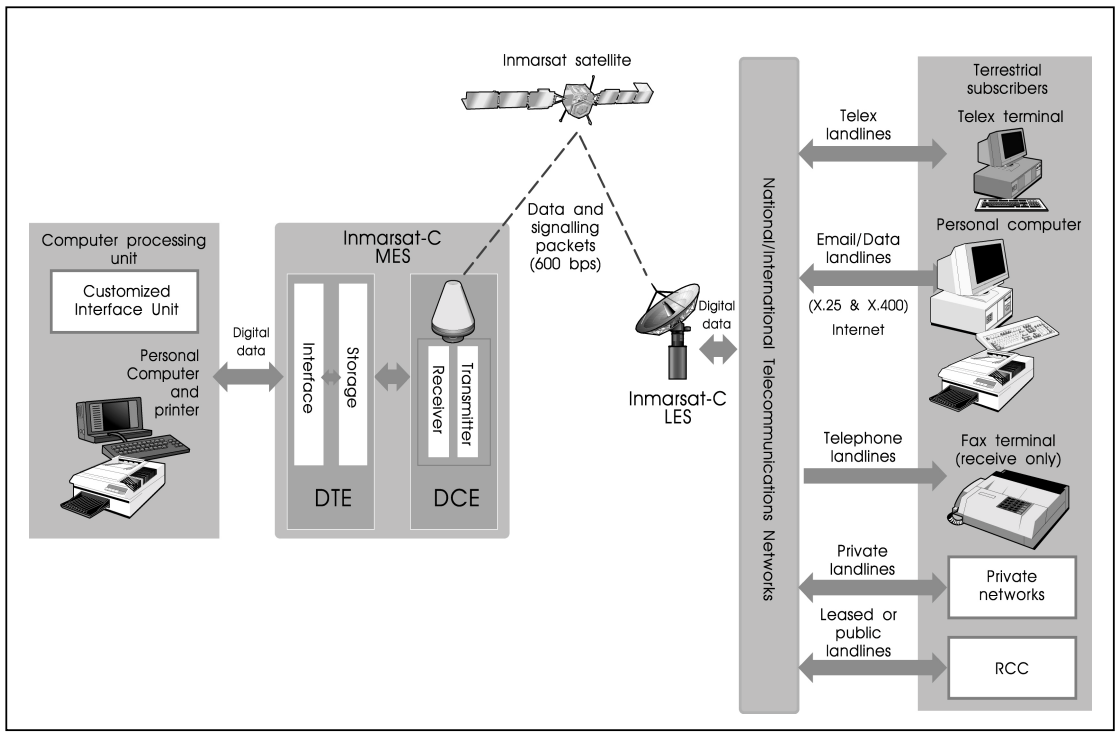

Figure 6-1 An overview of the Inmarsat-C communications system

6.2.1 Store-and-forward messaging services

The Inmarsat-C network can be used for sending different types of store-and-forward messages:

- Telex message service: you can send and receive messages between your MES and any telex terminal connected to the national/international telex network;
- Fax messaging service: this allows an MES to send text messages to a shore-based fax machine. It is not possible for a shore-based fax user to send messages directly to an MES. A fax message can only be sent as a text message via a fax bureau service: see Section 6.6.5;
- Messages to and from a computer: you can send and receive messages between your MES and any computer terminal connected to the PSTN or PSDN network. For shore-to-ship traffic you need to be registered with an Inmarsat service provider to get access to the service required.
- Electronic mail (e-mail) services: messages can be sent via either the Internet or hub services. See Section 6.6.4 for more information;
- Dedicated data processing systems connected via a private network (such as a leased line);
- Ship-to-ship communications;
- Short access code or 2-digit code messaging.

6.2.2 Distress alerting and distress priority messaging

Every Inmarsat-C LES is connected by a reliable telecommunications link to a rescue co-ordination centre (RCC) known as the ‘associated RCC’. RCCs are equipped with facilities to organise search and rescue activities in response to a distress alert or distress priority message

being received from an MES. Each associated RCC is connected by the international telecommunication networks to other RCCs around the world and is also equipped with Inmarsat terminals, enabling it to communicate with other rescue centres and ships in the vicinity to ensure that rapid assistance is given.

You can make two different types of distress call with your MES:

- A brief **distress alert** which contains summarised information on your distress circumstances;
- A more detailed **distress priority message** in which you can send your distress circumstances and ask for the assistance you require.

Either of the above types of distress call will be automatically routed through the Inmarsat-C network with top priority to an RCC, which will establish communications with you to organise the rescue services you may require.

If you accidentally send a distress alert, you should notify the appropriate RCC to cancel the alert by sending a distress priority message via the same LES through which the false alert was sent.

Example of message:

NAME, CALL SIGN, IDENTITY NUMBER, POSITION

Cancel my Inmarsat-C distress alert of DATE, TIME UTC

= MASTER

Please note the following points when using the dedicated distress button(s):

Note 1: Sending a distress alert by pressing the dedicated distress button(s) sends a pre-programmed alert containing the MES ID, date, time, position, course and speed dating only from when the information was last updated, providing that there is no automatic position input. The nature of the distress will be 'undesignated' as the default set-up. If your position, course and/or speed have changed from the information stored in the MES and there is no automatic position update, you should update it manually, select the nature of the distress from the list provided in the MES and send the alert by pressing the dedicated distress button(s). If a new nature of distress is selected, this selection will remain for one hour. After that it will revert to default.

Note 2: Pressing the dedicated distress button(s) sends a distress alert immediately via the Inmarsat system to an RCC irrespective of whether your MES is engaged in message transfer or logged into an ocean region.

To avoid sending false distress alerts, do not press the dedicated distress button(s) except in the case of a real emergency when you are in grave and imminent danger.

6.2.3 Enhanced Group Call (EGC) services

The SafetyNET™ service allows an information provider (e.g. a meteorological or hydrographical office or an RCC) to broadcast Maritime Safety Information (MSI) to all vessels in fixed geographical areas such as the IMO-defined NAVAREAs or METAREAs or to pre-determined areas.

The FleetNET™ service allows information providers such as shipping companies or governments to broadcast commercial information addressed to a selected group of EGC receivers belonging to a closed user group (a special list of subscribers/customers).

Section 6.4 gives more information on the SafetyNET™ and FleetNET™ services offered via the EGC services.

6.2.4 Two-digit access codes

It is possible to send messages to special services offered by LESs by using special two-digit codes as indicated in Appendix D, Table D-1.

Some LES operators and MES manufacturers more usually refer to the two-digit codes that are available for maritime safety services and general utility as 'special access codes' or SACs.

To find whether an LES supports a particular SAC, contact the LES's customer service department (see Appendix E) or Inmarsat's Customer Care Centre (Appendix A).

Note: some two-digit codes are free of charge for ship operators.

6.3 How to use your Inmarsat-C MES

Once your MES has been installed and successfully activated as described in Chapter 3, you may prepare it for use.

Check at frequent intervals that your antenna has an unobstructed view of the sky to the horizon in all directions. If your antenna's view to one satellite is obstructed and you are in the overlapping area of more than one satellite, you should select another satellite.

6.3.1 Logging in to an ocean region

The Inmarsat-C differs from the other systems in that your MES must first be logged in to an ocean region before it can send or receive any messages. Logging-in informs the network that your MES is available for communications and tunes your MES to the correct NCS Common Signalling Channel (also known as the NCS Common Channel) for that ocean region. When your MES is tuned to the NCS Common Channel, it means that the MES is synchronised with the NCS or is in idle mode. Some MESs may automatically log in to the Inmarsat-C network when first switched on, selecting the strongest NCS Common Channel signal if they are in an overlapping area. Other MESs must be manually logged in to the selected ocean region or NCS. Refer to your manufacturer's instructions on how to perform a manual log-in.

After a few minutes your MES should indicate that it has successfully logged in to the selected ocean region and also indicate signal strength received from the NCS. The signal

strength should be at least the minimum required by the manufacturer. If not, refer to the manufacturer's instructions on what action you should take.

6.3.2 Selecting an ocean region and a land earth station operator (LES)

Many parts of the world are covered by more than one Inmarsat satellite. For example, the Inmarsat coverage map shows that the AOR-W, AOR-E and the IOR satellites cover the North Sea. Within such an area it is possible for an antenna to have line-of-sight to each of these satellites. You should be aware of the following considerations before selecting an ocean region to log in to:

Consideration 1: Can your shore-based correspondents contact you in the ocean region you have selected?

For a shore-based subscriber to be able to call your MES, a routing arrangement must exist between the national telecommunications carrier in that country and an Inmarsat-C LES operator or service provider serving the required ocean region. The LES operator or Inmarsat-C service provider then transmits the call via an LES to your MES in the requested ocean region. This call from a shore-based correspondent does not require an ocean code as the Inmarsat-C LES knows already which ocean region the terminal is logged into, and will route the message accordingly. A subscriber based in a country with limited routing arrangements for some of the ocean regions can contact the MES when it is logged in to one of those ocean regions, but not if it is logged in to a different ocean region. In these circumstances, to enable communications from such subscribers, you should, if possible, log in to an ocean region served by the routing arrangement. Subscribers who are based in a country with no routing arrangement may be able to communicate with you by a special arrangement with a service provider.

Further information about fixed to mobile routing and two-stage access can be found in Chapter 11.

Consideration 2: Does the LES you select support the communication services you want?

Your choice of ocean region will determine which LESs you can select and the services that they can offer.

Most LESs provide all Inmarsat-C communication services but for more information please contact their customer services department at the numbers given in Appendix E.

Consideration 3: How to receive Maritime Safety Information (MSI) for a particular NAVAREA or METAREA

For a given NAVAREA or METAREA that is covered by more than one ocean region (see Figure 6-2), scheduled broadcasts of MSI are made only via the nominated ocean region. **To receive scheduled broadcasts of MSI for a particular NAVAREA or METAREA, your MES must be tuned to the nominated ocean region at the scheduled time of broadcast.** Full description of the SafetyNET™ service together with the appropriate transmission schedules can be found in the Admiralty *List of Radio Signals Volume 5*, Chapter 5, SafetyNET™ section, published by the UK Hydrographic Office, or a relevant national publication.

6.3.3 Automatic scan and log-in

Your MES has a facility known as automatic scan and log-in which, when initiated, causes your MES to scan through the list of ocean regions searching for the strongest NCS Common Signalling Channel. The automatic scan facility may be initiated either automatically every 24 hours from when first switched on and logging in to a ocean region, or manually by issuing a command from the MES. For further details, refer to your MES manufacturer's operating instructions.

When the automatic scan facility finds a stronger NCS signal than your current ocean region, it automatically performs a log-out from that ocean region and then performs a log-in to the new strongest ocean region signal it has found.

Note that automatic scanning is not allowed on GMDSS-compliant MESs.

6.3.4 Routine operational tasks

It is recommended that you undertake the following tasks on your MES at regular intervals:

- Check into which ocean region you are logged. If your MES has automatically re-tuned to a different ocean region from that which you were using previously, make sure that the new one is suitable for your requirements. Refer to Section 6.3.2.
- Advise any shore correspondents who use an ocean region code to contact you of your new ocean region.
- Check that the signal strength indicated on your MES is above the minimum level recommended by the manufacturer. If not, log in to another ocean region.
- If the MES does not have automatic position input, e.g. an integrated GPS receiver, check that the current position is correct and, if necessary, update it manually.
- If you need to switch off your terminal, ensure that you first log out of your current ocean region.

6.3.5 Logging in to a different ocean region

As you sail towards the edge of the ocean region into which you are logged, the signal strength indicated on your MES will start to decrease. As long as the signal strength remains above the minimum advised by the manufacturer, you may remain logged in to that region. If the signal strength falls below the minimum signal strength, your MES will not be able to continue to communicate via the satellite for that ocean region. To maintain communication, your MES must be logged in to another ocean region with a stronger signal. Some manufacturers include a visual or audio alarm to let you know when the signal strength is below minimum.

Note: When your MES logs in to a new ocean region, the new NCS uses this information to update the network. You do not need to log out from the previous ocean region.

6.3.6 Logging out when not using your MES

If you are not expecting to use your MES for a prolonged period of time, **it is recommended that you log out of your current ocean region before switching off your MES**. Logging out informs the NCS that your MES is no longer available for communication. The NCS in your ocean region updates its database with this information. The system knows not to accept any messages intended for your MES and informs would-be callers that your MES is not available.

If, however, you do not log out before you switch off and a remote caller tries to send you a message, the system will repeatedly attempt to send the message via the selected LES to your MES. Eventually (after a number of re-tries which depend on the particular LES) the LES will stop trying to send the message and will send a non-delivery notification (NDN) back to the message originator. Table D-3 in Appendix D lists some of the common NDN failure codes and their meanings.

Some MESs automatically log out when they are switched off; check with your manufacturer's instructions as to whether your MES has this facility. If your MES does not have an automatic log-out facility or if you are not sure whether it does, you should always initiate a manual log-out every time before switching off.

The message originator may also be charged by the national or international telecommunication authorities for the time spent accessing the network (even if your MES does not receive the message). If your MES remains switched off for a long time but still logged in, this could prove expensive to the remote caller!

6.3.7 Upgrading your MES software version

The version of software installed in your Inmarsat-C MES may affect the services and facilities available for your use.

To be able to access these services and facilities, you may need an upgrade to the software installed on your MES. Further information is available from your manufacturer directly at the addresses given in Appendix B.

6.3.8 How to send a ship-to-shore message

Your MES can communicate using the different services listed in Section 6.2, providing that the following conditions are met:

- Your MES must support the communications service required; refer to the manufacturer's handbook.
- Your MES must be logged in to an ocean region and indicate received signal strength greater than the minimum required by the manufacturer.
- The LES selected must support the service and network that you wish to use (see Table 6-1 for types of networks).
- The shore-based equipment (telex, fax or computer as appropriate) must be capable of receiving the particular type of message.

To send a message from your MES via the international telecommunications networks (telex, fax, mobile, special, PSTN, X.25, e-mail), follow the suggested procedure:

1. Create your message either by using the MES text editor or by editing an existing message.
2. Select transmit (send) mode.
3. Enter the details of the destination to which you want to send the message either by selecting a destination whose details are already stored in the MES or by entering a new destination in the form:

Name (optional)		**Destination number**		**Answerback (optional) (telex only)**

Where: **Name** is an optional name you may enter to identify your correspondent.

Destination number: depends on the destination type as given in Table 6-1.
Answerback: applies only to telex destinations and is optional.

4. Select the LES through which you want to send your message considering the factors discussed in Section 6.3.2.
5. Select the time at which the message should be sent (if time selection is an option on your MES). If time is not specified, the transmission starts immediately as default set-up.
6. Remember that routine priority is the default selection for all communications except for distress.

   If you select Distress Priority your message will be routed only to an RCC associated with the LES selected, regardless of the destination.
7. If required, select the option to receive a confirmation of delivery of your message at the destination (remember that the LES may charge for this service). If confirmation of delivery is not selected, you will still have a notification that the message has been received by the LES.
8. Before issuing the command to send the message, confirm that you have entered all the correct information. If everything has been put in correctly, enter the command to transmit the message.
   - Your MES should now start transmitting the message and will proceed automatically until complete.
   - Within a few minutes of your MES transmitting the message the LES should return an acknowledgment stating that the message has been successfully received at the LES (this is not the same as confirmation of delivery of the message at the destination).
   - If you have requested confirmation of delivery of your message, this should be received from the LES within three to five minutes.
   - If the LES is unable to deliver the message, it will send a Non-delivery Notification (NDN) with a failure code identifying the reason (this is a non-chargeable service provided by all LESs). Table D-3 in Appendix D lists some common NDN failure codes and their meanings.

6.3.9 Message status information

LESs send confirmation messages at two levels:

1. Confirmation of the message transmission from the MES to the LES; this is a mandatory service for all LESs;
2. Confirmation of the message delivery from the LES to the final destination; this is an optional and chargeable service. Most MESs offer the option to request a confirmation.

LESs will automatically inform you if a message is not delivered to the final destination; this service is free of charge. All other status information mentioned above may appear on your screen without further status request.

If a message is addressed to a mailbox, the status 'confirmation OK' will be given only when the message has been retrieved from the mailbox. The message status will remain 'confirmation requested' if the message has been delivered to the mailbox but has not yet been retrieved by the addressee.

Table 6-1 Accessing different networks

Destination type Inmarsat system	**Destination number**	**Presentation code** (see Note 1)
Telex	Telex country code + subscriber's telex number (given in Appendix G, Table G-1)	5-bit or 7-bit
Mobile (telex message) Inm-A – telex terminal Inm-B – telex terminal Inm-C – telex terminal	Telex ocean region access code + IMN (given in Chapter 11, Table 11-2) IMN - Inmarsat Mobile Number	5-bit or 7-bit
Mobile (fax message) Inm-A – fax terminal Inm-B – fax terminal Inm-M – fax terminal	Telephone ocean region access code + IMN (given in Chapter 11, Table 11-1) IMN - Inmarsat Mobile Number See Note 2	5-bit, 7-bit or 8-bit
Mobile (data message) Inm-A – computer Inm-B – computer Inm-C – computer Inm-M – computer	DNIC + Inmarsat Mobile Number (given in Appendix F, Table F-2) DNIC – Data Network Identification Code See Note 2	8-bit
PSDN (X.25) (data message)	DNIC + subscriber's X.25 (data) address (given in Appendix F, Table F-2) See Note 2	5-bit, 7-bit or 8-bit
Fax	Telephone country code + subscriber's fax number (given in Appendix F, Table F-1) See Note 2	5-bit, 7-bit or 8-bit
PSTN - PC + modem **PSTN - modem + printer** **PSTN – mailbox**	Telephone country code + subscriber's modem address or number of the mailbox (given in Appendix F, Table F-1) See Note 2	5-bit, 7-bit or 8-bit
e-mail	Address information to be included in message. (Refer to e-mail service provider guides.) See Note 2.	7 bit or 8-bit
Two-digit code **Telex service**	Special Access Codes (SAC) (given in Appendix D, Table D-1) See Note 2	5-bit or 7-bit

Note 1: The term 'presentation code' used here is also known as 'format'. Some MESs and LESs use different terms as listed below. All LESs support 7-bit (ASCII) code but not all can support 5-bit and/or 8-bit codes. For more information refer to the MES manufacturer's instructions and to LES operators.

Note 2: Check that the selected LES supports the required service.

5-bit: also known as **telex** or **ITA2** (International Telegraph Alphabet 2) or **5-bit Packed**. This is an alphanumeric character set based on a 5-bit code which is generally used for sending valid telex characters only over telex networks. Note that this character set supports only UPPER CASE characters, so any lower case characters entered on your MES will be received as UPPER CASE. Files created using 5-bit codes are smaller than those using 7- or 8-bit codes, and therefore about one third cheaper to send.

7-bit: also known as **ASCII** or **IA5** (International Alphabet 5). This is an alphanumeric character set based on a 7-bit code which is generally used for sending text messages over the PSTN networks to a computer or fax terminal. This character set supports both UPPER and lower case characters, so any lower case characters entered on your MES will be received correctly.

8-bit: also known as **data**, is based on an 8-bit code. This is generally used to send binary-encoded data over the PSDN (data) land-lines, for example numerical data from instruments, encoded text from a word processor or from software which supports non-Western (Roman) characters such as Arabic, Chinese, Japanese or Russian.

Message status information may vary according to the MES used, but most MESs give the following status information on a screen:

Table 6-2 Message status information

Sending	Message transmission to the LES is in progress
Acknowledged	Message has been received by the LES
Confirmation requested	Message has been received by the LES but not delivered to the final destination
Confirmation OK	Message has been delivered to the final destination
Failed	The LES failed to deliver the message (the failure code should be given on the print-out)
Rejected	The LES rejected transmission (no message was sent)
Pending	The LES has postponed the onward transmission, e.g. terrestrial lines from the LES are busy

The status '**confirmation requested**' and '**confirmation OK**' will be given only if you have requested confirmation when sending the message.

6.4 The Enhanced Group Call (EGC) services

The Inmarsat-C system operates an information broadcast service known as Enhanced Group Call (EGC) which enables authorised information providers to broadcast messages through an LES and NCS to groups of MESs which are fitted with an EGC receive capability.

Two types of EGC services are available: SafetyNET™ for the broadcast of Maritime Safety Information (MSI) and FleetNET™ for the broadcast of commercial information to defined groups. MESs with an EGC receive capability can receive both SafetyNET™ and FleetNET™ messages.

6.4.1 EGC SafetyNET™ service

The EGC SafetyNET™ service provides those information providers so authorised by the International Maritime Organisation (IMO) under the Global Maritime Distress and Safety System (GMDSS) with the means to distribute Maritime Safety Information (MSI) to ships at sea.

The following table list the MSI which can be broadcast via the EGC SafetyNET™ service.

Table 6-3 The EGC SafetyNET™ MSI service

• Shore-to-ship distress alerts to circular area
• Urgency message, meteorological and navigational warnings to circular area • Urgency message and navigational warnings to rectangular area
• Meteorological and NAVAREA warning and meteorological forecasts to NAVAREA/METAREA
• Search and rescue co-ordination to circular and rectangular areas
• Chart correction services

Coastal warning	
Message prefix (B2 character)	*Message content*
A	Navigational warnings
B	Meteorological warnings
C	Ice reports
D	Search and rescue information
E	Meteorological forecasts
F	Pilot service messages
G	DECCA messages
H	LORAN messages
I	OMEGA messages
J	SATNAV messages
K	Other electronic navaid messages
L	Additional navigational warnings
Z	No message on hand

The coastal warning broadcast facility is used for the transmission of coastal information to areas where NAVTEX is not provided.
Authorised information providers include:

- Hydrographic offices: for navigational warnings and electronic chart correction data;
- National weather services: for meteorological warnings and forecasts;
- RCCs: for shore-to-ship distress alerts and other urgent information;
- International Ice Patrol: for North Atlantic ice hazards.

There are no charges for receipt of SafetyNET™ messages or Inmarsat system messages.

6.4.2 EGC FleetNET™ service

The FleetNET™ service allows authorised information providers, such as commercial subscription services, shipping companies and governments, to broadcast messages to selected groups of MESs which are registered with the information provider and which have been added to a FleetNET™ EGC closed network (ENID).

The FleetNET™ service is a closed network of which an MES must be a member. Typical applications of FleetNET™ include:

- Fleet or company broadcasts
- News broadcasts
- Commercial weather services
- Market quotations
- Government broadcasts to all vessels on a country's register.

Charges may be made for the receipt of FleetNET™ messages depending on the arrangement with the FleetNET™ information provider.

6.4.3 The EGC SafetyNET™ MSI service, GMDSS/SOLAS and NAVTEX

The EGC SafetyNET™ Maritime Safety Information (MSI) broadcast service is included by the International Maritime Organisation (IMO) as an element of the Global Maritime Distress and Safety Service (GMDSS). By February 1999 all SOLAS compliant ships should have implemented the requirements of GMDSS as required by Chapter 4 of the Safety of Life at Sea (SOLAS) Convention.

Provided that its installation meets the GMDSS requirements of the administration of the country of registry, an Inmarsat-C MES with EGC receive capability can be used as a primary means to meet the SOLAS carriage requirements for the receipt of MSI in Sea Areas A1, A2 and A3 which are not served by the NAVTEX system.

The Sea Areas are defined as below:

Sea Area A1 is defined as an area within range of a shore-based VHF station fitted with DSC (Digital Selective Calling).

Sea Area A2 is defined as an area within range of a shore-based MF station fitted with DSC and excluding Sea Area A1.

Sea Area A3 is defined as an area within coverage of the Inmarsat satellite system and excluding Sea Areas A1 and A2.

Sea Area A4 is defined as all areas outside Sea Areas A1, A2 and A3.

The combination of 518 kHz NAVTEX and the international SafetyNET™ service through the Inmarsat EGC service provides a highly reliable method of distributing navigational warnings, weather forecasts and other urgent information all over the world.

6.4.3.1 Selecting an ocean region with consideration to MSI

To receive a scheduled broadcast of an MSI for a particular NAVAREA or METAREA, you should be logged in to the appropriate ocean region at the time of broadcast, but the following limitation on the reception of MSI in some areas should be considered:

For a given NAVAREA/METAREA that is covered by more than one ocean region (e.g. NAVAREA/METAREA 1, which is covered by AOR-W, AOR-E and IOR satellites), the scheduled broadcast of MSI is made via a single nominated ocean region. If an MES is logged in to a different ocean region, it will not receive any of the scheduled broadcasts for that particular NAVAREA/METAREA, even if it is located within the required area. The MES would, however, receive any unscheduled broadcasts, such as gale warnings or distress alert relay messages, which are made via all satellites that cover the area. Information on the transmission schedule is available in the List of Radio Signals published by various countries or in the Admiralty *List of Radio Signals (Volume 5)* published by the UK Hydrographic Office. Further information in respect of the EGC SafetyNET™ service can be obtained from:

The Chairman, International SafetyNET™ Co-ordinating Panel
International Maritime Organisation (IMO)
4 Albert Embankment
London SE1 7SR
UK
Tel: +44 (0)20 7735 7611
Fax: +44 (0)20 7587 3210
Telex: + 5123588 IMOLDN G
Website: www.imo.org
E-mail: info@imo.org

6.4.3.2 Priority levels for MSI messages

EGC SafetyNET™ MSI messages are broadcast using one of three priority levels: Safety, Urgency or Distress.

The position of your ship must be updated in the MES at least once every 12 hours otherwise all SafetyNET™ messages with priorities higher than routine will be printed.

Updating the position can be done either manually as per the instructions in the manufacturer's operators' handbook or automatically from either the ship's electronic navigation system or from a GPS receiver connected to or integrated into the MES.

6.4.4 Receiving SafetyNET™ broadcasts

The EGC receiver continuously monitors the Inmarsat-C broadcast channel (NCS common channel) when the MES is idle and processes any messages that are received (Class 1 MESs do not have an EGC function).

The EGC receiver receives all SafetyNET™ messages but may not automatically print all these messages, including, for example:

- messages concerning subject matter of no relevance to the ship;
- messages directed to geographical areas (rectangular or circular) outside that where the ship is sailing.
  The receiver also inhibits the receipt of multiple broadcasts of the same EGC message when it has already been received error-free and printed. It is not possible to reject navigational warnings, SAR information and shore-to-ship distress alerts directed to a geographical area within which the EGC receiver is situated. If the MES receives a distress or urgency priority message it will raise audible and visual alarms.

Although reception of SafetyNET™ traffic is automatic, the shipboard operator must initially set up the EGC receiver correctly at the start of the voyage to ensure the selected ocean region is appropriate for the scheduled broadcast. A transmission table of these schedules is contained in national *Lists of Radio Signals*.

The operator also has control over current and planned NAVAREA/METAREA and coastal service coverage areas for which the MSI information is required. The options that may be pre-programmed into a MES are indicated below.

- MES's position;
- Current and planned NAVAREA/METAREA;
- Current and planned coastal service coverage area.

For details on programming, refer to the MES manufacturer's manual.

The ship's position on the MES may be entered automatically from an external navigation aid or integrated GPS receiver or may be entered manually. It is recommended that the ship's position be updated at least every four hours. The MES will notify the operator if the position is not updated within this time. If the ship's position has not been updated for more than 12 hours, all SafetyNET™ messages with priority higher than routine within the entire ocean region will be received and printed.

In order to ensure that all necessary MSI is available before sailing, it is recommended that the EGC receiver remains switched on and tuned to the correct ocean region while the ship is in port.

If the ship's EGC receiver shares a directional antenna with an Inmarsat-A or Inmarsat-B MES, any MSI sent through it will be received via the satellite which the antenna is tracking. Therefore the MES antenna must track the correct satellite at the time of the scheduled broadcast.

When preparing a message for broadcast, the information provider includes addressing information which specifies the area in which the message is to be received. The address may specify one of the following:

- EGC receivers within an open network, such as all ships within a given geographical area. The area could be a specific NAVAREA/METAREA, a circle around a vessel in distress, a rectangular area or coastal area;
- EGC receivers within a closed network, for example, all ships belonging to a fleet, identified by a single ENID code;
- Individual EGC receivers;
- All EGC receivers in an ocean region.

EGC SafetyNET™ messages are broadcast at frequent intervals and could fill the message storage capacity of your MES. To avoid any problems and missing important messages relating to a distress, you should check the EGC log regularly, print out any wanted messages and clear any unwanted messages.

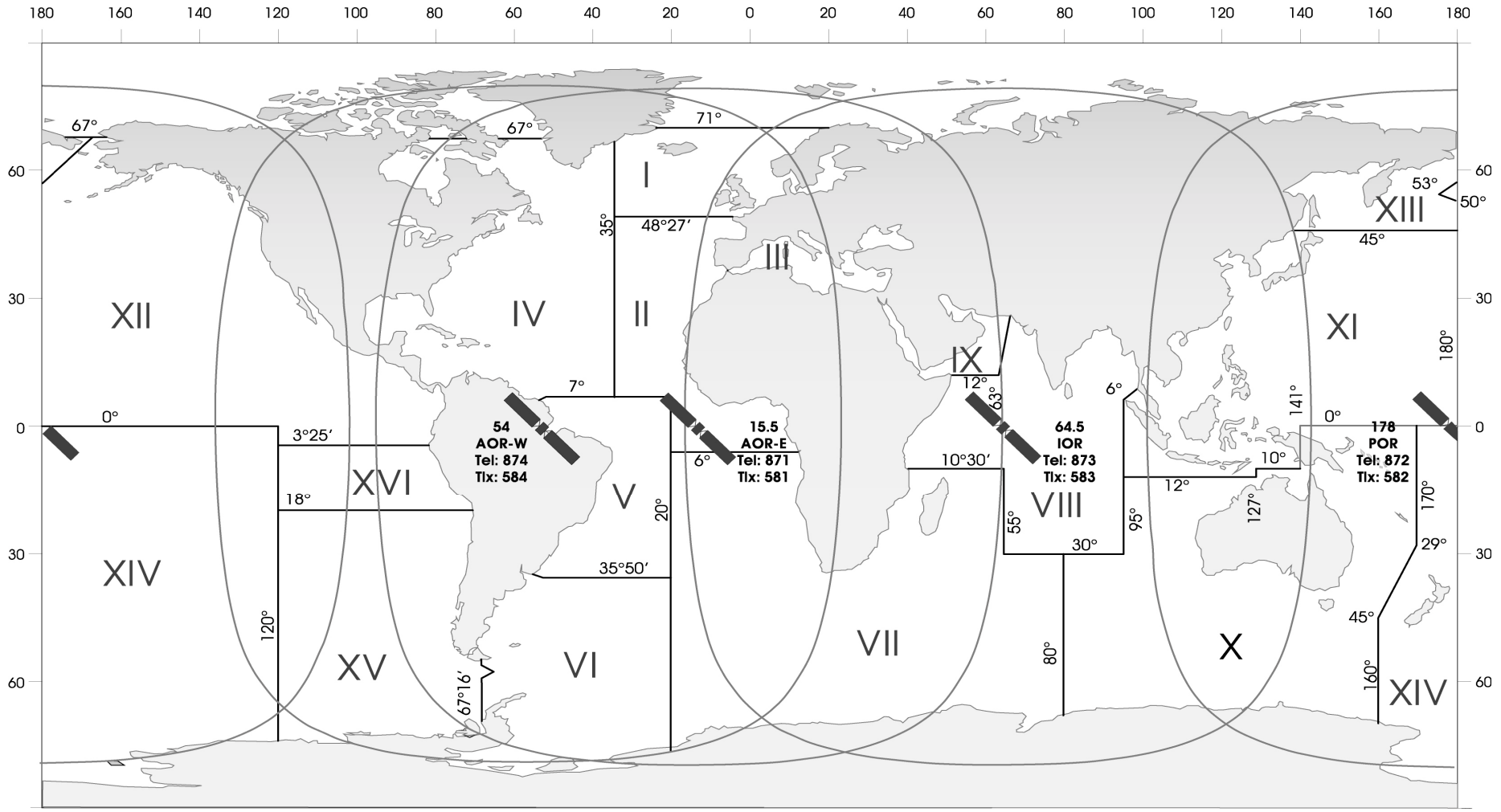

Fig ure 6-2 NAVAREA/METAREA used for MSI broadcasts via SafetyNET™ service

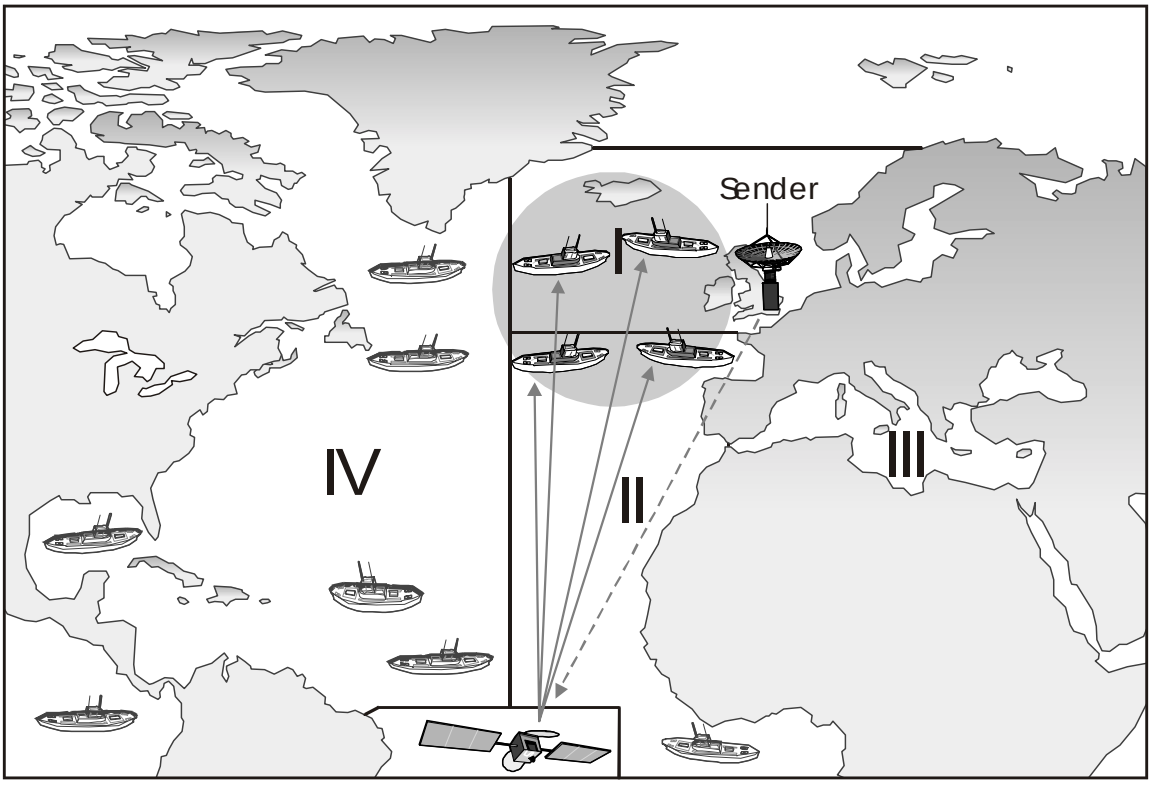

Figure 6-3 SafetyNET™ call to a circular area around an emergency

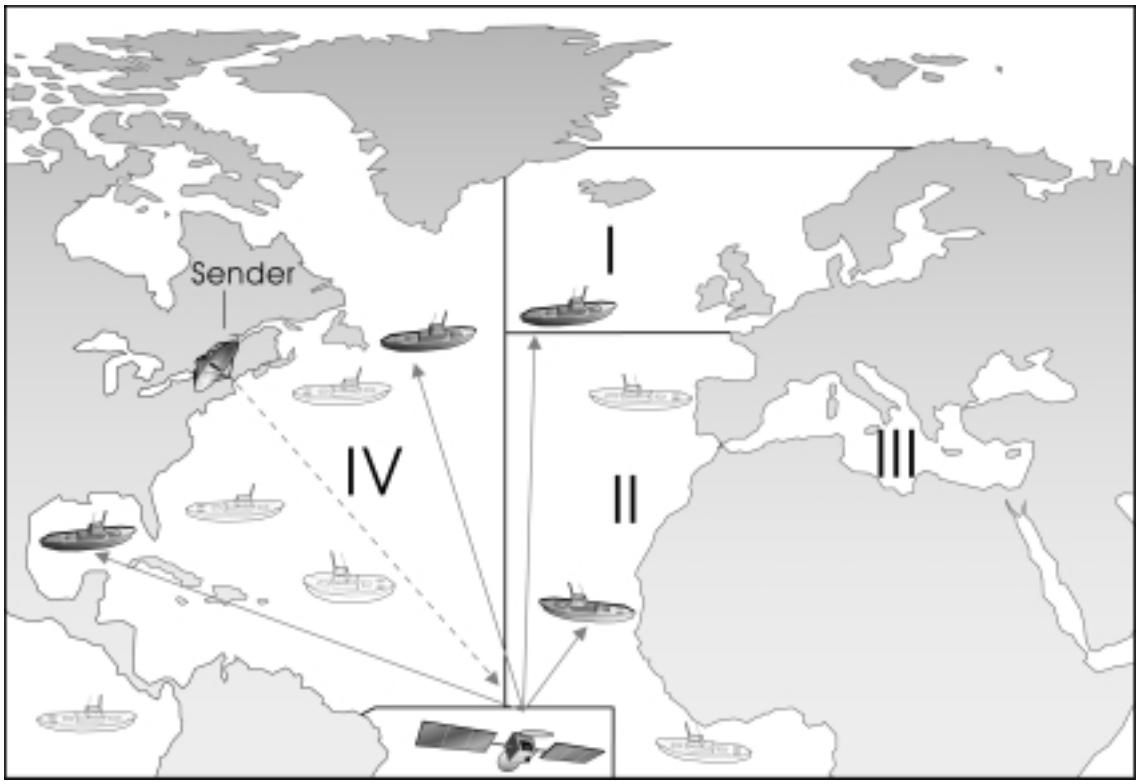

Figure 6-4 FleetNET™ call to a selected group of vessels

6.4.5 Pre-programming an MES for FleetNET™ message reception

To be able to receive FleetNET™ messages you must first have your MES programmed by the relevant LES in conjunction with the authorised FleetNET™ information provider. To join the FleetNET™ service (for example a commercial news service), an MES must first be registered with a FleetNET™ information provider.

The FleetNET™ service operates as a closed user group and the MES requires a unique receiver address provided from the LES to ensure secure transmission of messages. To add an MES to a FleetNET™ closed user group, the LES initially downloads an EGC network identification (ENID) code which is stored in the MES.

Messages sent using FleetNET™ will be received simultaneously by all members of the user group which has been programmed with the ENID. The MES remains able to receive all FleetNET™ messages addressed to that user group until the MES ceases the service by disabling the ENID. The information provider is also able to cancel the service by downloading a deletion command to that particular MES.

Note: An MES is not limited to receiving broadcasts from just one FleetNET™ information provider but may register with several. The MES operator is not able to change the ENID information but may be able to inhibit the reception of FleetNET™ messages if desired.

6.4.6 Inmarsat system messages

The Inmarsat Network Operations Centre (NOC) and Customer Care Centre regularly broadcast service messages providing information about the Inmarsat-C system, for example:

- regular service announcements about new LESs or services being offered;
- advance notice of changes to be made to the system;
- information on planned outages.

6.4.7 Classes of Inmarsat-C MES and their EGC reception

Inmarsat specifies four different classes of Inmarsat-C MESs which differ in their ability to receive EGC messages:

Class 1 – MES for Inmarsat-C message transfer only (no EGC receiver);

Class 2 - MES can receive EGC messages, when not engaged in normal (non-EGC) message transmission and reception.

Class 3 - MES has two receivers, one for Inmarsat-C message transfer at any time and the other for EGC reception at any time. So the uninterrupted operation of both modes is possible.

Class 0 - MES is for stand-alone EGC reception only.

Figure 6-5 shows the configuration of the different classes of Inmarsat-C MESs. A Class 2 MES shares the receiver between the EGC message processor and the non-EGC message processor. EGC message reception is determined by the operating mode selected for the MES. To change the operating mode, refer to the MES manufacturer's instructions.

The two operating modes which can be selected on a Class 2 MES are:

Shared message mode: when the receiver is able to receive either normal or EGC messages. When the MES is engaged in normal message transfer, the MES receiver will be tuned to the LES messaging channel for the duration of the message transfer. As EGC messages are sent on the

NCS Common Channel, the MES is not able to receive any of them. Once the normal message transfer is complete, the receiver will automatically re-tune back to the NCS Common Channel and will then be ready to receive EGC messages (most SafetyNET™ MSI messages are repeated with a six-minute echo).

Exclusive EGC mode: when the receiver is available only for the reception of EGC messages and not for normal Inmarsat-C messages. If you want to be certain of receiving a particular EGC message, you should SWITCH FROM NORMAL MESSAGE MODE TO EXCLUSIVE EGC RECEPTION MODE. The Inmarsat system will then know not to send you any messages until you resume normal (shared message) mode. Once you have received the EGC messages you want, it is advisable to return to the normal message mode.

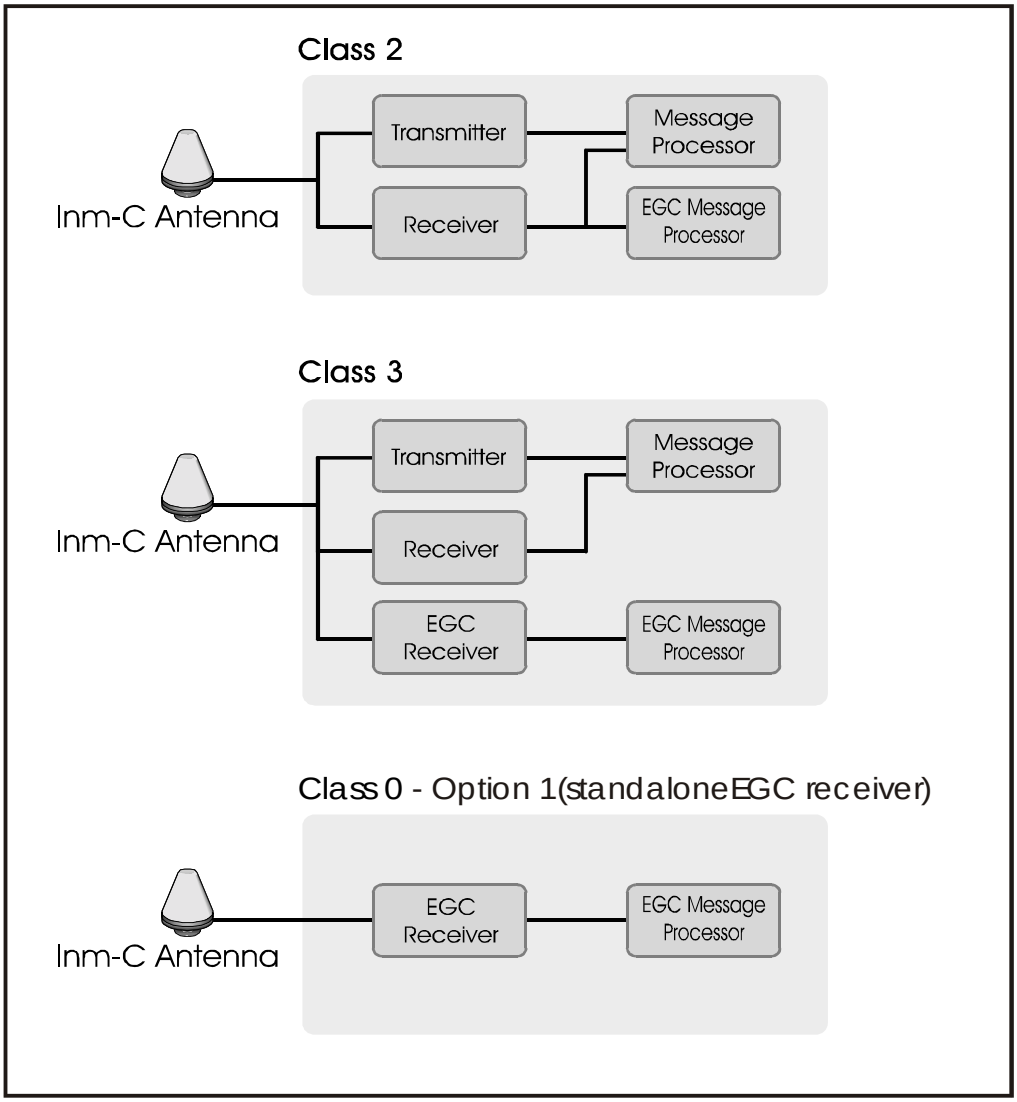

Figure 6-5 Different classes of Inmarsat-C MESs

6.4.8 Language used for EGC SafetyNET™ and FleetNET™ broadcasts

International EGC SafetyNET™ messages are broadcast in English using an alphanumeric character set known as the International Alphabet 5 (IA5), or 7-bit ASCII, as required by the IMO.

EGC FleetNET™ messages may be broadcast in English using 7-bit ASCII or 8-bit data format; alternatively the messages may be broadcast in another language using a non-Roman script, for example Arabic, Chinese, Japanese or Russian characters, providing that the following conditions are met:

- The FleetNET™ information provider must prepare the messages in 8-bit data presentation code;
- The LES through which the FleetNET™ message is to be routed must support 8-bit data presentation code;
- The MES which is to receive the message must be equipped with suitable software to interpret the 8-bit coded message sent in non-Roman characters.

6.5 Data reporting, polling and SCADA services

The data reporting service allows MESs to send short data reports to an operational centre. A typical data report could be a ship's position, read from external navigational instruments or an integrated GPS receiver, or engine room data monitored by sensors.

Data reports may be sent regularly, randomly or in response to a polling command from a shore-based operational centre.

Sending short data reports makes efficient use of the Inmarsat-C network and saves both time and costs over the conventional Inmarsat-C store-and-forward messaging system. Data reporting allows the use of an efficient data-encoding technique, which allows more information to be fitted into a data report.

The Inmarsat-C system allows for an operational centre to send a polling command to selected MESs. A typical polling command may instruct an MES to send a data report immediately or at a defined start time with particular repetition intervals or to perform a defined task.

When used together, the data reporting and polling services offer a Supervisory Control and Data Acquisition (SCADA) service to which the MES is interfaced. A typical SCADA application, for example, is to control the operation of an ocean-going buoy; the data collected from the different sensors is applied via an interface to the MES, from which the information is sent in a data report over the Inmarsat system to the operational centre. In response, the centre could return polling/control commands to operate control devices to regulate the system.

An MES may send data reports:

- automatically at regular pre-programmed intervals;
- automatically in response to a signal from an external sensor;
- manually under control of the MES operator;
- on demand in response to a polling command from a remote operational centre.

The efficient use which the data reporting service makes of the Inmarsat-C system results in fast throughput times and consequently is of economic benefit.

6.5.1 Macro-encoded messages (MEMs)

In order to include as much information as possible in a data report, macro-encoded messages (MEMs) can be used to represent general terms by assigning a pre-defined code. For example, a MEM code could be assigned to mean, 'We require fuel at our next port of call'.

6.5.2 Maritime ship reports

Many different types of maritime information can be formatted into data reports. For example, position information obtained from navigational instruments may be used for position-reporting systems such as AMVER, AUSREP and JASREP. Other reports which are considerably longer than position reports, such as the Dangerous Goods Report, Hazardous Substances Report, Marine Pollution Report, Weather Data Report and Fish Catch Report, may be adapted to the data reporting format by the use of MEMs and binary coded data.

6.5.3 Registering an MES into a data reporting network

To enable its data reports to be identified, the MES must include an unique identification with the report. The MES obtains this identification information when it first registers with an operational centre and LES for data reporting and polling service. The LES assigns a Data Network Identification (DNID) code to the network to which the MES will belong, plus a Member Number for the MES within that network. This type of network is closed because it is limited to the particular MESs registered as being on it.

The centre subsequently arranges with an LES to download the DNID and Member Number which is uniquely addressed to the particular MES. On receiving the DNID and Member Number, the MES stores them in its memory.

6.5.4 Transmitting a data report

To transmit data reports, the MES should have DNID(s) and Member Number(s) downloaded which identify closed network(s) through which to send data reports.

The MES then transmits the report either automatically or manually over the satellite network to the LES. The LES stores the report in the appropriate DNID file, along with any other reports from other MESs belonging to the same DNID group for further retrieval, or delivers it directly to the final destination (note that an MES may have several different DNIDs for different reporting networks).

The method by which the data reports are stored in the DNID file and transferred to the operational centre depends on the arrangements made between the LES operator and the operational centre. The LES may send the DNID file over the public networks at pre-set times or when the file is full. Alternatively, the LES may allow the centre to access the file and download the data at any time. Arrangements may also be made to send reports immediately to the final destination over telex, PSTN or PSDN networks or the Internet and these should be checked with the LES operator at the time of registration.

6.5.5 The polling service

The Inmarsat-C polling service allows the following different types of polling:

Individual polling: The operational centre prepares a polling command, including the DNID plus a list of the Member Numbers that are to be polled. If required, the centre may also include a short text message with the polling command.

To receive the polling command, each MES must be logged in and not be engaged in message transfer. If the MES is busy, the NCS will not send the command but will store it briefly and try again later. This method is very effective for ensuring that individual MESs receive the polling command.

On receipt of the command, each MES will respond as instructed; for example, by returning a data report or performing a SCADA task.

Group polling: The operational centre prepares the polling command including the DNID for the closed network but does not specify individual MESs.The polling command is then accepted by all MESs belonging to that DNID group which are synchronised to the NCS Common Channel and are not busy at that time. To avoid the system being overloaded by many MESs responding at the same time, the NCS includes a random interval number in its broadcast, causing the MESs to return their reports at different random times.

If an MES is not synchronised to the NCS Common Channel when the message is broadcast, or it is busy at the time, it will not receive the command. This form of polling the Inmarsat-C closed network will not re-broadcast the message to those MESs which have not received the message, unless specifically requested by the operational centre.

Area polling: This type of polling is similar to group polling. The operational centre sends a command with details of the DNID group but also defines the geographical area which is to receive the command. The centre does not specify any individual MESs.

When the NCS broadcasts the polling command, it includes both the DNID information and the geographical information. The polling command is accepted only by those MESs which belong to the DNID group, are not busy at that time and are also within the defined geographical area – whether that is NAVAREA/METAREA or a circular, rectangular or coastal area. If any of the addressed MESs is busy, it will not receive the command. The NCS will not re-transmit the message to those MESs which have not received the message, unless specifically requested by the operational centre to do so.

6.6 Operator-assisted and value-added services

It is possible to obtain some operator-assisted services and value-added services as listed below.

To find out more about the services offered by an LES service provider, contact its customer services centre (Appendix E) or contact the Inmarsat Customer Care Centre (Appendix A).

6.6.1 Operator-assisted services

Operator-assisted services offered by some land earth station operators include:

- Sending a text message from your MES to an operator to be forwarded as a voice message to a telephone number, answering machine or voice mailbox;
- Sending a text message from your MES to an operator to be sent through the post as a letter

- The LES will accept a message from your MES addressed to a destination on the national or international network for delivery at a later time;
- Directory services: the LES operator will find a number on the national/international network;
- Translation services: the LES operator will arrange to have your message translated into another language and forwarded to a specified destination;
- Access to databases: the LES operator will find the information you require and call you back.

6.6.2 How to obtain operator assistance

If you require operator assistance or suspect a problem with the terrestrial connection, you can obtain assistance by using a two-digit code, as listed in Table 6-4 (provided that the LES through which you are communicating offers this).

Table 6-4 Two-digit access codes for operator assistance

Two-digit code	Service	Remarks
11	***International operator***	Use this code to obtain information from the international operator of the country within which the LES is situated.
12	***International information***	Use this code to obtain information about subscribers located in countries other than that in which the LES is situated.
13	***National operator***	Use this code for assistance to connect to subscribers in the country in which the LES is situated. In countries which don't have an international operator, use this code instead of Code 11.
14	***National information***	Use this code to obtain information about subscribers located in the country in which the LES is located.

6.6.3 Value-added Services (VAS)

Value-added services provided by some land earth station operators are:

- Two-stage access to enable shore-based subscribers to send messages to an MES from a country which does not have a routing arrangement. The subscriber must register with an LES which provides the service. The LES service provider will notify the subscriber of the user name, PIN and access procedure which should be used to send a message to an MES.
- E-mail services to enable your MES and your shore-based correspondents to access the international e-mail networks or Internet to exchange text messages and data files all over the world. See Section 6.6.4 for more information.
- Fax bureau services to enable a shore-based subscriber to send text messages from a fax terminal to an MES. See Section 6.6.5 for more information.
- Two-digit code services to allow your MES to access a wide range of special maritime safety and general services. See Section 6.2.4 and Appendix D for more information.

6.6.4 Ship-to-shore and shore-to-ship access via e-mail

It is now possible to send a message from a ship via a dedicated e-mail service or the Internet to e-mail addresses all over the world. But to send an e-mail message in the shore-to-ship direction, your e-mail address must be registered with an Inmarsat-C LES service provider. These services allow you and your shore-based subscribers to exchange text messages and data files in both ship-to-shore and shore-to-ship directions. No alterations to the MES are necessary in order for it to use the service.

To find out which LESs provide an e-mail service and access arrangement, contact the LES's customer services department directly; the relevant numbers are given in Appendix E. The LES service provider will also advise shore-based subscribers on how to access the service. Details of how to send messages via the Internet can be found in Chapter 12.

6.6.5 Shore-to-ship fax bureau services (text only)

A different procedure is required for sending a fax message in the shore-to-ship direction. Sending a fax in the shore-to-ship direction is not a straightforward procedure and requires a third party to provide a fax bureau service. Some Inmarsat-C LES land earth station operators and other third parties offer this service. To find their addresses and access arrangements, contact either the LES service provider directly (Appendix E) or Inmarsat's Customer Care Centre (Appendix A).

It is only possible to send a text message and the shore subscriber should include in the message the following information:

- the ship's name;
- the Inmarsat mobile number;
- the ocean region in which the MES is logged in (if known).

On receipt of the message, the bureau operator will convert it to the necessary format and forward it to the Inmarsat-C MES as a store-and-forward message.

Chapter 7
The Inmarsat-B and M systems

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How to send a DISTRESS call by telephone using an Inmarsat-B/M MES

When you are in grave and imminent danger, you may use your mobile earth station (MES) to send a distress call. Pressing the distress button initiates a distress call which is routed automatically through a land earth station (LES) to a land-based rescue co-ordination centre (RCC). The procedure for making a distress call is outlined below:

B. Lift the telephone handset and listen for the dialling tone (or switch the handset to the TALK position, as appropriate).

C. Press and hold down the Distress 'push-button' for at least six seconds.

D. Initiate your call in accordance with your MES manufacturer's instructions.

E. When the RCC operator answers, speak clearly and give the following message:

MAYDAY MAYDAY MAYDAY

➨ **THIS IS** *[ship's name/callsign]* **CALLING ON INMARSAT FROM POSITION** *[latitude and longitude, or relative to a named point of land]*.

➨ **MY INMARSAT MOBILE NUMBER IS** *[IMN for this telephone channel of your MES]*. **USING THE** *[Ocean Region]* **SATELLITE**.

➨ **MY COURSE AND SPEED ARE** *[course and speed]*.
You should then give:
The **NATURE OF YOUR DISTRESS**, for example:

- Fire/explosion
- Flooding
- Collision
- Grounding
- Listing
- Sinking
- Disabled and adrift
- Abandoning ship
- Attack by pirates

➨ **ASSISTANCE REQUIRED**

➨ **OTHER INFORMATION** to help rescue units

5. Follow the instructions given by the RCC operator, and only when requested should you replace the handset to wait for further calls.

6. Keep the telephone line clear at all times so the RCC can contact you when necessary.

How to send a DISTRESS message by telex using an Inmarsat-B MES

When you are in grave and imminent danger, you may use your MES to send a distress alert. Pressing the Distress button generates a distress alert message which is routed automatically through an LES / SP to a land-based RCC. The procedure for sending a distress alert is outlined below:

1. **Press and hold down the Distress 'push-button' for at least six seconds.(It may be necessary to initiate the alert by other means; refer to your MES manufacturer's instructions).**

2. **Wait for automatic connection to the RCC.**

   Then either:

   A. Type your distress message using the following format:

> **MAYDAY MAYDAY MAYDAY**
>
> ➨ **THIS IS** *[ship's name/callsign]* **CALLING ON INMARSAT FROM POSITION** *[latitude and longitude, or relative to a named point of land]*.
>
> ➨ **MY INMARSAT MOBILE NUMBER IS** *[IMN for this telephone channel of your MES]*. **USING THE** *[Ocean Region]* **SATELLITE**.
>
> ➨ **MY COURSE AND SPEED ARE** *[course and speed]*.
> You should then give:
> The **NATURE OF YOUR DISTRESS**, for example:
>
> - Fire/explosion
> - Flooding
> - Collision
> - Grounding
> - Listing
> - Sinking
> - Disabled and adrift
> - Abandoning ship
> - Attack by pirates
>
> ➨ **ASSISTANCE REQUIRED**
>
> ➨ **OTHER INFORMATION** to help rescue units

   B. Select the distress message stored in the Distress Message Generator (DMG) in your terminal. (Refer to your MES manufacturer's instructions.)

4. **Send your message to the RCC.**

7.1 Introduction

This chapter explains the Inmarsat-B and Inmarsat-M digital systems. These two systems share the same basic system architecture, including the land earth stations (LESs) and mobile earth stations (MESs). Although operation of an Inmarsat-B and Inmarsat-M MES is similar, there are some specific services such as facsimile and data which differ. The Inmarsat-M system does not offer a telex facility and is not GMDSS-compliant due to its small antenna.

7.2 Preparing to use your Inmarsat-M or Inmarsat-B MES

The information in this chapter will help you to prepare your MES to send and receive calls under the following circumstances:

- after your MES has been installed and commissioned, as explained in Chapter 3;
- if your MES has been without power for several days or has suffered a power failure.

7.2.1 Checking your MES

Before using your MES for the first time or after a period without use, you should undertake the following checks. For detailed instructions, refer to the manufacturer's handbook.

- Check that your MES antenna has a clear view of the satellite and is not obstructed (e.g. by the ship's structure). If your view of the satellite is obstructed, you may be able to select a different satellite through which to communicate.
- Check that all equipment connected to the MES (e.g. telephone handsets, fax terminal, computer, printer and navigational equipment) is switched on and ready for use.
- Check that your selection of default **LES for distress calls** in each ocean region is suitable, as discussed in Section 7.2.2.
- Check that the selection of **ocean region** is suitable for your communication purposes, as discussed in Section 7.2.3.
- Check that your MES is displaying **Ready** and that you can hear a dialling tone when you lift a telephone handset.
- Check that your MES is displaying signal strength greater than the minimum recommended by the manufacturer.

7.2.2 Selecting a default LES for distress calls in each ocean region

Before using your MES you must first select a default LES for making distress calls in each of the ocean regions. The default LES is the one through which any distress call you make will be automatically routed without your having to specify an LES at the time of making the distress call.

To help you select an LES for distress call routing in each of the ocean regions, refer to the following points. For information on how to specify the selected LES on your MES, please refer to the MES manufacturer's instructions.

1. All LESs must have distress handling capability. On any occasion when an LES stops offering this service or there is a problem at the LES, for example when it is being upgraded or is temporarily out of service, all distress calls will automatically be re-routed to a back-up LES.

IMPORTANT WARNING FOR YOUR SAFETY

!

The Inmarsat-M and B systems continually broadcast update information about the status of the network for automatic storage in your MES. This broadcast includes information about the distress handling capability of an individual LES. If your MES receives information from the system that your selected distress LESs is not available, your MES will give a warning indication indicating that your default LES selection is **'incompatible with current network status'**. See the manufacturer's instructions for the nature of the warning indication given.

If your MES does give this warning indication, you should change your default LES selection to an LES which does has distress handling capability. F**ailure to do so could result in your distress calls not being handled correctly.**

2. You may select any LES for distress handling, but it is advisable to select an LES which is geographically near your current location as this will assist the rescue services.

7.2.3 Selecting an ocean region and an LES for routine calls

In some parts of the world it is possible to use more than one ocean region; for example, the North Sea is covered by three ocean regions (AOR-W, AOR-E and IOR). Within such an area, your antenna can be pointed at any of those satellites, enabling you to communicate through a particular ocean region.

Selecting a particular satellite or ocean region has consequences. You may wish to consider the following points when selecting an ocean region and an LES on your MES:

A. Selecting an ocean region and LES which supports the services you want

It is possible to send messages in a ship-to-shore direction only via an LES which operates in the ocean region you have selected. To find out if a particular LES operates in your current ocean region, refer to the list of land earth station operators (LESOs) in Appendix E. (Note: most LESs now offer services in more than one ocean region.)

B. Can shore-based correspondents contact you in your selected ocean region?

To enable your correspondents to call your MES from their country, a **routing arrangement** must exist between that country's telecommunications authority and an Inmarsat-M/B SP operating an LES in the required ocean region. See Chapter 11 for further information.

To find out if a routing arrangement exists, your correspondents should contact their national telecommunications authority (or their local telephone company), for information on how to make a call to an Inmarsat-B or M MES.

C. Can you see more than one ocean region?

In some parts of the world it is possible to 'see' more than one Inmarsat satellite. It is then best to choose the satellite that will offer the best option regarding communication with managers, owners and agent at both ports of departure and destination.

7.3 How to make a ship-to-shore call

Before making a ship-to-shore call, make sure your MES is ready for communication as described in your MES operator's handbook.

7.3.1 Selecting an ocean region and an LES for your call

To make a call, you must first select an ocean region/satellite and an LES through which to communicate. Your selections should be appropriate for the services that you require: please refer to Section 7.2.3.

7.3.2 How to make a ship-to-shore telephone call

The following procedure explains how to make a ship-to-shore telephone call:

1. On your MES, select the LES you are going to use by entering its three-digit access code, as given in Appendix E. It is possible to select a default LES, through which all your calls will be automatically routed, without having to specify an LES each time. For information on how to enter the code, refer to your MES operator's handbook.
2. Lift the telephone handset and listen for a dialling tone or switch the handset to the TALK position. Some MESs allow you to dial the number without first having to lift the main control handset.
3. Enter the required telephone number in the following sequence:

00		**Telephone Country code**		**Area Code**		**Subscriber's Number**		**#**

Where:
00 is the two-digit code to make an automatic call,

Telephone country code is as given in Appendix F,

Area code is as supplied and

Subscriber's number is as supplied,

is the key to initiate the call.

4. Once you have selected your LES, or if you are using the default LES, the procedure is similar to making a call from a shore-based telephone. If the number you are calling answers, proceed with your call. If the number is busy, hang up and try again later.
5. On completion of your call, simply replace the telephone handset. Your MES is now ready to send (or receive) further calls.

7.3.3 How to send a facsimile (fax)

To make a call to a fax number:

1. Ensure that the LES you have selected supports a fax service; you can do this by contacting the LES directly using the two-digit code 33 for technical assistance.
2. Ensure that your fax equipment is properly prepared, as advised in the manufacturer's instructions, and load the pages that you want to transmit.
3. On your MES, select the LES you want to use by entering its three-digit LES access code, as given in Appendix E. (It is possible to select a default LES, through which all your calls will be automatically routed, without having to first specify an LES each time.) For information on how to enter the LES code, refer to your MES operator's handbook.
4. On your fax equipment, select the dialling mode and enter the subscriber's fax number as follows:

(It is possible to include the land earth station operator's access code into the dialling sequence below, prior to the two-digit code).

00		**Telephone country code**		**Area code**		**Fax number**		**#**

Where:

00 is the two-digit code to make an automatic call,

Telephone country code is as given in Appendix F,

Area code is as supplied and

Fax number is as supplied,

is the key to initiate the call.

5. Once you have selected your LES, the dialling procedure is similar to sending a fax from a shore-based fax machine. If the number you are calling is free, your transmission should proceed normally. If the number is engaged, you should try again later (or, if the fax terminal has an automatic re-dial facility, it may re-try several times).
6. In most cases, on completion of the call, the fax equipment will automatically re-set once it has finished sending all the pages; otherwise, it may be necessary to replace the telephone handset to return the fax equipment to the 'ready' state. Your MES will then be ready to send or receive further calls.

7.3.4 How to obtain operator assistance

If you are having problems contacting a particular number or the number you are calling appears to be incorrect, you can obtain assistance from a shore-based telephone operator by using one of the two-digit codes given below.

Note: not all LESs support these codes; for further information, contact the LES using the two-digit code 33 for technical assistance, or at the number given in Appendix E.

To use a two-digit code, enter the required code followed by a hash (#).

Two-digit code	Service	Remarks
11	***International operator***	Use this code to obtain information from the international operator of the country where the land earth station operator is situated.
12	***International information***	Use this code to obtain information about subscribers located in countries other than that in which the land earth station operator is situated.
13	***National operator***	Use this code to obtain assistance to connect to subscribers in the country where the land earth station operator is situated. In those countries which do not have an international operator, use this code instead of Code 11.
14	***National information***	Use this code to obtain information about subscribers located in the country where the land earth station operator is.

Table 7-1 Two-digit codes for telephone operator assistance

7.4 How the Inmarsat-M and B systems work

Figure 7-1 shows how different equipment may be connected to the Inmarsat-B and M systems. Several terminals may be connected to the MES; these may include one or more telephone handsets, fax machines, personal/laptop computers and telex machines (the latter for Inmarsat-B MESs only). The options available at an MES are dependent on its manufacturer and the specification and/or options required when the equipment was commissioned. In addition, not all services are supported by all LESs; to find out which services are supported, consult your MES operator's handbook and contact the LES at the numbers given in Appendix E.

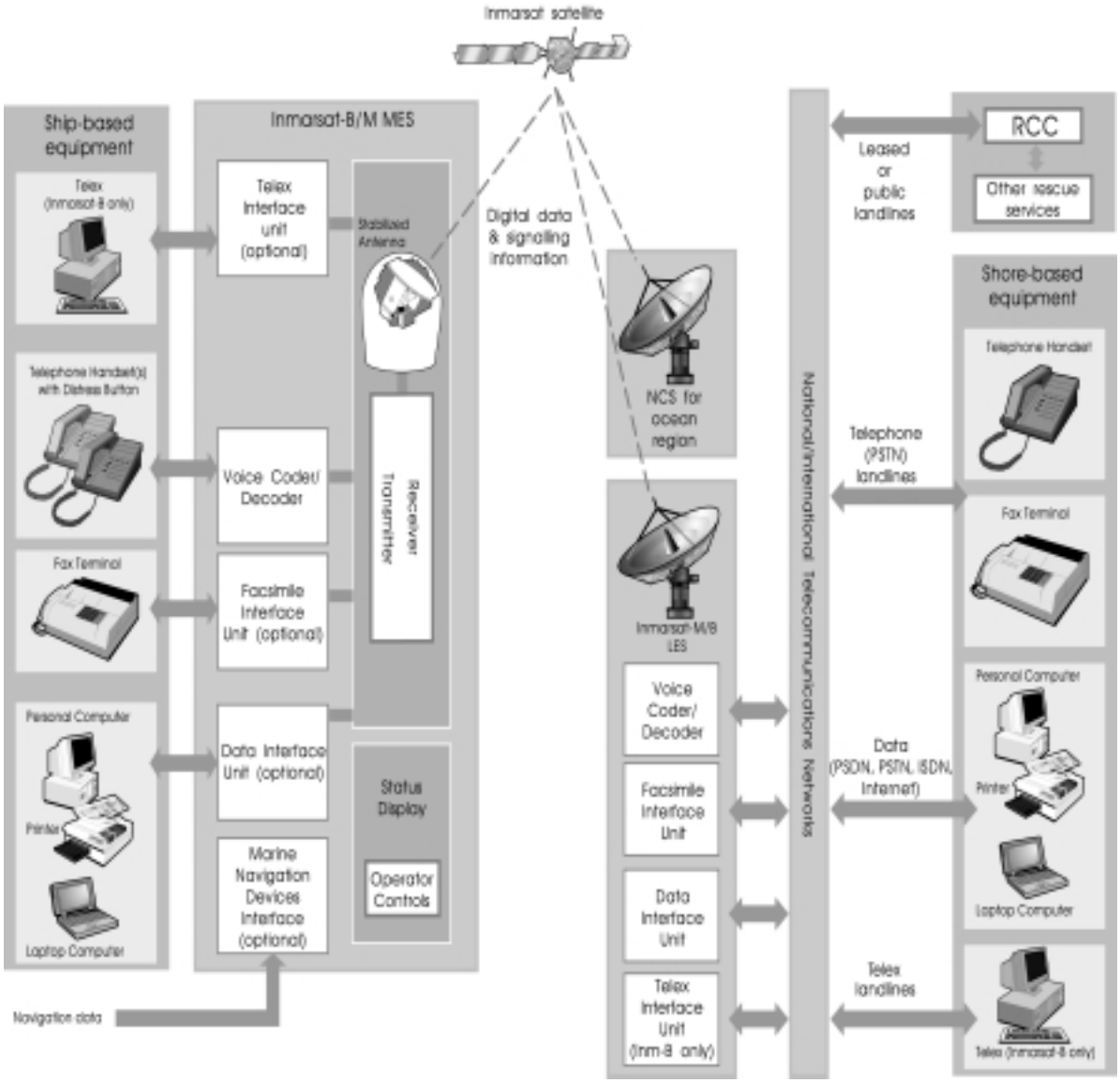
Note: the telephone, fax and data terminal connections to an MES are not interchangeable.

The land earth station operator connects all calls to the public switched telephone network (PSTN) for the routing calls to and from shore-based subscribers.

Inmarsat-B/M is a digital service. This means that all communications including telephone calls must first be converted into a digital format. To do this, the system uses special coder/decoders (codecs) at the MES and LES. At the transmitting end (MES or LES), a codec samples the incoming signal (audio) and converts it into digital information. This is then transmitted over the satellite link. At the receiving end, a similar codec decodes the

received digital information and re-builds it into a representation of the original signal (audio).

Figure 7-1 A simplified schematic of the Inmarsat-M and B systems



This means that you are listening to a synthesised version of your correspondent's voice which is virtually indistinguishable from the original. Due to the operation of the codecs, any sounds other than voice (such as music) may sound strange or even may not be heard because the codecs analyse only a certain portion of the audio bandwidth (300Hz-3KHz.).

To be able to make or receive calls, the MES antenna must have a clear and unobstructed view of the satellite and point directly at the satellite. Most MESs can automatically search for the satellite and then use 'step-track' to obtain the strongest signal and track the satellite, but other models may have to be manually pointed (see Appendix C). The maritime antenna is stabilised in all planes and reacts to any changes of heading from a gyro compass or fluxgate compass.

The digital information transmitted over the satellite link contains unique coding and addressing information which ensures that only the intended LES can decode the information. The methods used for addressing ship-to-shore calls and shore-to-ship calls are described in the next section.

7.5 Medium-speed data services (MSD)

An Inmarsat-B/M terminal which is equipped for MSD communications can access a wide range of information services, including the Internet. These services are available from many different sources, in the same way that they are available to terrestrial users. The nominal data service for the Inmarsat-B system is 9.6 kbit/s and for the Inmarsat-M system 2.4 kbit/s. To determine whether a particular LES can support this service, contact the LES using the two-digit code 33 for technical assistance or directly at the numbers given in Appendix E. Further details about the Inmarsat data service can be found in Chapter 12.

7.6 Inmarsat-B MES specific services

7.6.1 Making a telex call

To illustrate the process for initiating a telex call, the following describes the procedure for setting up an automatic call to the Inmarsat maritime telex helpline on UK (51) 920327:

1 Set up a telex communication channel via the satellite to your chosen LES in your ocean region, as per instructions in your MES operator's handbook, or use the default LES.

2 When you have received **GA+** from the LES, you should immediately establish a communication channel from the LES, via the international telex network, to the required telex number, by keying in the following:

00		51		920327		+

Where:

00 is the two-digit telex service code for an automatic telex call, as given in Appendix D, Table D-1,

51 is the telex country code for the UK, as given in Appendix G, Table G-1,

920327 is the called subscriber's number for the Inmarsat maritime telex,

+ is the End of Number Selection character.

3 Within approximately 15 seconds you should receive the answerback of the called subscriber (in this example, **920327 INMHLP G**). This means that the telex connection to the called subscriber has been established.

4 You may now proceed with your telex call; in this example, follow the prompts you receive from the helpline system.

7.6.2 The Inmarsat-B high-speed data (HSD) service

An Inmarsat-B terminal equipped for the optional HSD data communications service offers much higher digital data rates than that of the MSD service: either 56 or 64 kbit/s. This type of service can be used, for example, to access computer networks. For more information on whether a particular LES can support this service, contact the LES using the two-digit code 33 for technical assistance or at the number given in Appendix E.

Further details about the Inmarsat HSD service can be found in Chapter 12.

Chapter 8

The Inmarsat-E system

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8.1 General overview of the Inmarsat-E system

The Inmarsat-E system makes use of the existing Inmarsat infrastructure to provide a reliable means of distress alerting. An Inmarsat-E EPIRB (emergency position-indicating radio beacon) is an L-band satellite EPIRB approved by the International Maritime Organisation (IMO) as complying with the requirements of SOLAS Chapter 4 for a satellite EPIRB.

Distress alerts from the Inmarsat-E EPIRB are received by all Inmarsat satellites in geostationary orbit and re-transmitted to specific land earth stations (LESs).

The alerts are received at all Inmarsat-E-equipped LESs within satellite coverage and are passed to a Digital Receiver Processor (DRP) for decoding and onward transmission to an associated (maritime) rescue co-ordination centre (M)RCC.

The Inmarsat-E system design allows for very low signal power and the effects of ocean motion. Each alert consists of a transmission of 60 information frames, each of which lasts five seconds and contains all the distress alert information. Once the distress alert has been decoded, it is automatically routed to the associated (M)RCC using the international packet switching network (X.25). The time taken for a distress alert to be delivered to the RCC from transmission time by the EPIRB is typically within two minutes.

8.1.1 Inmarsat-E EPIRBs

The Inmarsat-E EPIRB contains:

- an integrated GPS receiver accurate to within 200 metres;
- an audible alarm indicating that the beacon has been activated;
- a low duty cycle flashing light;
- an optional 121.5MHz homing beacon;
- an optional Search and Rescue Radar Transponder (SART) operating in the 9GHz radar band.

Each EPIRB model is subject to type-approval by each country's administration. In the case of the European Community, the European Marine Directive applies where approval by one European administration, known as 'wheel marking', is accepted by other members of the European Community. Inmarsat also tests each EPIRB model to ensure that the EPIRB meets Inmarsat system definition manual specifications and will not cause interference to other users of the Inmarsat network.

8.1.2 Technical description of an Inmarsat-E EPIRB

Distress alerts are transmitted within the frequency range of 1645.6 to 1645.8 MHz. Transmissions consist of 60 repeated transmissions of the 160-bit message frame throughout each five-minute activation period.

EPIRBs are designed to 'float free' from a sinking vessel and will normally be activated either automatically by immersion in sea water when released from their cradle, manually by local control or remotely from the ship's bridge when using the optional remote control unit. This unit also allows manual entry of the 'nature of distress' to be entered into the distress alert.

The EPIRB contains an EPFD (electronic position-fixing device) which is a built-in GPS receiver. If using the remote control option, the output from the EPFD is displayed on the remote control unit in the form of the vessel's latitude, longitude, course and speed. A remote control unit may also accept information from the ship's navigational instruments which is input to the EPIRB. External power may also be supplied to the EPIRB in order to retain use of the EPIRB's battery for distress purposes only.

The EPIRB transmits a distress message in the format shown in Table 8-1. In the case of failure of the ship's power or data interface, the last update stored within the EPIRB is included in the Distress Message Generator for transmission in the initial distress alert. Subsequent alerts will obtain information calculated by the integral EPFD.

8.1.3 EPIRB configurations

In general, an Inmarsat-E EPIRB consists of a buoy, which carries antennae and necessary electronic equipment, power supplies, control switches and an interface to an optional remote control unit through which external power and navigational and additional distress information may be supplied. The buoy is held securely in place until it is released manually or by the hydrostatic release mechanism. This interface may use conventional plugs and sockets or a non-physical connection.

Inmarsat-E EPIRB installations provide the means to test the equipment without access to the space segment, to indicate current emission of a distress alert and any fault in the equipment.

Along with the L-band satellite transmitter, Inmarsat-E EPIRBs are also equipped with a flashing light with a low duty cycle. Some EPIRBs may also include an optional 9GHz Search and Rescue Radar Transponder (SART) and an optional 121.5MHz homing beacon for locating purposes.

8.2 Inmarsat-E distress alerting networks

Eight Inmarsat-E land earth stations (LESs) and their associated (M)RCCs form the Inmarsat-E distress alerting network. There is full redundancy within the Inmarsat-E network with each ocean region satellite being covered by two LESs.

	AOR-E	**AOR-W**	**IOR**	**POR**
LES	GOONHILLY (UK)	SANTA PAULA (USA)	RAISTING (GERMANY)	PERTH (AUSTRALIA)
(M)RCC	FALMOUTH (M)RCC	USCG ALAMEDA	BREMEN (M)RCC	RCC AUSTRALIA

LES	RAISTING (GERMANY)	GOONHILLY (UK)	PERTH (AUSTRALIA)	SANTA PAULA (USA)
(M)RCC	BREMEN (M)RCC	FALMOUTH (M)RCC	RCC AUSTRALIA	USCG ALAMEDA

Table 8-1 Inmarsat-E distress message format

IMO description	**Contents description**
System code	Unique code issued to each EPIRB
Longitude	Degrees and minutes
Latitude	Degrees and minutes
Time of position update	Hours Minutes
Nature of distress	Fire/explosion Flooding Collision Grounding Listing/danger of capsizing Sinking Disabled and adrift Unspecified nature of distress (default) Abandoning ship Piracy Man Overboard Test
Course	Degrees
Speed	Knots

8.3 EPIRB registration

The purpose of registration is to facilitate effective and rapid assistance to people in distress. This depends on the availability of essential information related to registered EPIRBs. The information also enables the (M)RCC to identify the vessel to which the EPIRB has been fitted, validate the distress situation and take appropriate action to resolve the situation.

The registration form is available from either the Inmarsat Customer Activation Group (CAG) or the Inmarsat-E EPIRB manufacturer (see Appendices A and B).

A copy is normally enclosed with each EPIRB supplied and can also be found in Appendix I. The registration form should be completed by the vessel's owner or his agent to include all the information requested. The completed form must be sent to the Inmarsat CAG. It is essential that the following data is available to rescue authorities on the Inmarsat-E central (back-up) and RCC main databases:

- General details about the registration and owner/manager's emergency contact details.
- Details of the vessel including its name, radio call sign, MMSI (Maritime Mobile Service Identity), gross tonnage, vessel length and the number of passengers and crew on board.
- EPIRB details including system code in decimal form, set-up frequencies, manufacturer, model and type, approval certificate number and serial number.

The Inmarsat CAG will check that the system code submitted on the registration form matches a system code within the database of system codes issued to EPIRB manufacturers. It will then add the following registration information to the system code record:

- the name of the vessel;
- all relevant details about the vessel and its owner/operator to enable any search and rescue (SAR) operation that may be required;
- emergency contact information, including a 24-hour contact;
- the date and time of the registration;
- the date and time of issue of the 'authorisation for access' to the Inmarsat-E system included in the database.

The Inmarsat CAG also issues the Inmarsat-E Access Authorisation Certificate. This reproduces the registration information provided by the applicant; one copy is sent to the vessel, another to the owners.

The issue of an Access Authorisation Certificate confirming the approval for access to the Inmarsat-E system is the culmination of the registration process. If the EPIRB equipment is transferred to another vessel or the ship's particulars (such as change of owners or flag) are changed, an application for re-registration must be resubmitted containing all updated details as if it were a new registration application.

8.4 Operation and handling of an Inmarsat-E EPIRB

There are four important points to note when using and maintaining EPIRBs on board ship:

- A lanyard is provided to enable survivors to attach the EPIRB to a survival craft after both have floated free of the ship. The lanyard must never be tied to the ship's superstructure as, in the event of sinking or capsize, the EPIRB will not be able to float to the surface.
- Care must be taken that no part of the EPIRB installation is painted or altered in any way. There have been reports of plastic bolts on the hydrostatic release mechanism being replaced by stainless steel bolts, thus preventing the release of the EPIRP at the time of an emergency.
- Care must be taken, when cleaning or painting in the vicinity of an EPIRB, to ensure that no action is taken which could activate it. For instance, removing an EPIRB from its mounting and placing it anywhere near water (e.g. a scupper) could inadvertently cause activation and the transmission of a false distress alert.
- The ship's staff should be made aware of all the methods of activating and operating the EPIRBs fitted on board the vessel.

Chapter 9

The Inmarsat mini-M system

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9.1 Introduction

The operation of an Inmarsat mini-M MES is similar to that of an Inmarsat-M, but it operates in an area covered by the spot beams. Telex is not available on this service. Also note that **this service is not part of the GMDSS and therefore should not be relied on for distress and safety purposes.**

9.2 Preparing to use your Inmarsat mini-M MES

You should use the information contained in this chapter to prepare your MES for sending and receiving calls:

- after your MES has been installed and activated, as explained in Chapter 3;
- if your MES has been left without power for several days.

9.2.1 Checking your MES

Before using your MES for the first time or after a period without use, you should undertake the following checks. For detailed instructions, refer to the manufacturer's handbook.

1. Check that the antenna of your MES has a clear view of the satellite and is not obstructed by any part of the ship's structure.
2. If the view of the satellite is obstructed, you may be able to select a different satellite.
3. Check that all equipment connected to the MES is switched on and ready for use (e.g. telephone handsets, the fax terminal and computer).
4. Check that the selected ocean region is suitable for your communication purposes, as discussed in Section 9.2.2.
5. Check that you have selected the land earth station operator (LESO) with which you have your use agreement. If you are not certain which LESO to use, contact your Inmsarsat service provider (ISP) or supplier.
6. Check that your MES is displaying signal strength greater than the minimum recommended by its manufacturer.
7. Check that your MES has 'Ready' status and that you can hear a dialling tone when you lift the telephone handset.

9.2.2 Selecting an ocean region and an LESO

Many parts of the world are covered by more than one ocean region (eg the North Sea: AOR-W, AOR-E and IOR), each with its corresponding satellite. In such areas it is possible to point your antenna towards any of the available satellites.

When selecting a particular ocean region and/or LESO, you may wish to consider the following points:

A. Does the LESO offer the services you require?

When selecting an LESO for use in a particular ocean region you must ensure it supports the communication services you require. Not all LESOs offer coverage in all ocean regions. Where one cannot actually 'see' a satellite from its own country, it may use a sharing agreement with one or more LESOs in the other ocean regions. To find out

which services are supported by a particular LESO, contact the appropriate customer services centre at the number given in Appendix E.

B. Can shore-based correspondents contact you in your selected ocean region?
For shore-based correspondents to make a call to your MES from their country, a special routing arrangement must exist between that country's telecommunications authority and an Inmarsat mini-M LESO. See Chapter 11 for more information.

9.3 How to make a ship-to-shore telephone call

The general procedure for making a ship-to-shore call via the Inmarsat mini-M service is similar to making an international telephone call onshore:

1. Ensure that your MES indicates the LESO which you are authorised to use. For information on how to enter the correct LESO, refer to the MES manufacturer's instructions. If you are uncertain which LESO to select, contact your Inmarsat service provider (ISP) or supplier for advice.
2. Dial the number of the subscriber you wish to contact and press either the "#" symbol or the off hook/call button, as indicated below:

00		**Telephone country code**		**Area code**		**Subscriber's number**		**#**

Where: **00** is the two-digit code to make an automatic call,
Telephone country code is as given in Appendix F,
Area code is as supplied (dropping the first digit, which is generally an 0),
The **subscriber's number** is as supplied and
is the key to initiate the call.

3. If the number you are calling answers, proceed with your call, but if it is engaged you should hang up and try again later.
4. On completion of your call, simply replace the telephone handset. Your MES is now ready to send (or receive) further calls.

9.3.1 How to send a facsimile (fax) message

Sending a fax message to a number connected to the national and international telephone networks is similar to sending a fax from a shore-based fax machine:

1. Ensure that your fax terminal is properly prepared and ready to send messages, as advised in the manufacturer's instructions.
2. Ensure that you select the LESO you are authorised to use. For information on how to select the LESO and which one to use, contact your ISP or supplier for advice**.**

   Note: some MESs are pre-programmed with an LESO which cannot be changed.
3. On your fax terminal select the dialling mode, as advised in the manufacturer's instructions, and key in the following sequence:

00		**Telephone country code**		**Area code**		**Fax number**		**#**

Where: **00** is the two-digit code to make an automatic call,
Telephone country code is as given in Appendix F,
Area code is as supplied (dropping the first digit, which is generally a 0),
The **fax number** is as supplied,
and **#** is the key to initiate the call.

4. If the number you are calling is free, your transmission should proceed normally. If the number is engaged, you should try again later (or, if your fax terminal has an automatic re-dial facility, it may try again several times, depending on its facilities).
5. On completion of your call, simply replace the telephone handset on your fax machine to return your fax terminal to the 'ready' state; otherwise your fax terminal will reset the line when it has finished sending. Your MES is now ready to send or receive further calls.

9.3.2 How to obtain telephone operator assistance

If you require an operator to confirm that the number you are dialling is correct, or if you suspect a problem with the terrestrial connection, you can obtain assistance by using a two-digit code as listed in table 9-1 (provided that the LESO through which you are communicating offers this).

To use a two-digit code, just enter the required code followed by a hash (#).

Table 9-1 Two-digit codes for telephone operator assistance

Two-digit code	Service	Remarks
11	International operator	Use this code to obtain information from the international operator of the country in which the LESO is situated.
12	International information	Use this code to obtain information about subscribers located in countries other than that in which the LESO is situated.
13	National operator	Use this code to obtain assistance to connect to subscribers in the country in which the LESO is situated. In countries which do not have an international operator, use this code instead of Code 11.
14	National information	Use this code to obtain information about subscribers located in the country in which the LESO is situated.

9.4 The Inmarsat mini-M system

Figure 9-1 shows the type of equipment that may be connected to either end of the Inmarsat mini-M service. At the MES end, several end terminals may be connected to the MES, which may include one or more telephone handsets, fax terminals or personal/laptop computers.

Note: The telephone and fax terminal connections to a MES are not interchangeable.

The LESO interfaces with the public switched telecommunication networks (PSTNs) to route calls to and from shore-based subscribers. These subscribers can send and receive messages from their telephone handsets, their fax terminals or personal/laptop computers.

9.4.1 How the Inmarsat mini-M system works

The Inmarsat mini-M system is a digital service. This means that all communications including telephone calls must first be converted into a *digital format*. To do so, the system uses special *coder/decoders (codecs)* at the MES and LES. At the transmitting end (MES or LES), a codec samples the incoming information (eg voice), and analyses it into its component parts which it converts into digital information. This information is then transmitted over the satellite link. At the receiving end, a codec decodes the received digital information, and re-builds it into a representation of the original information. In the case of a voice call you are listening to a synthesis of your correspondent's voice which is virtually identical to the original. (A feature of this process is that, when making a voice call which includes music, the music may sound rather strange or even not be audible at all -- because the codecs try to analysis the signal as a human voice.)

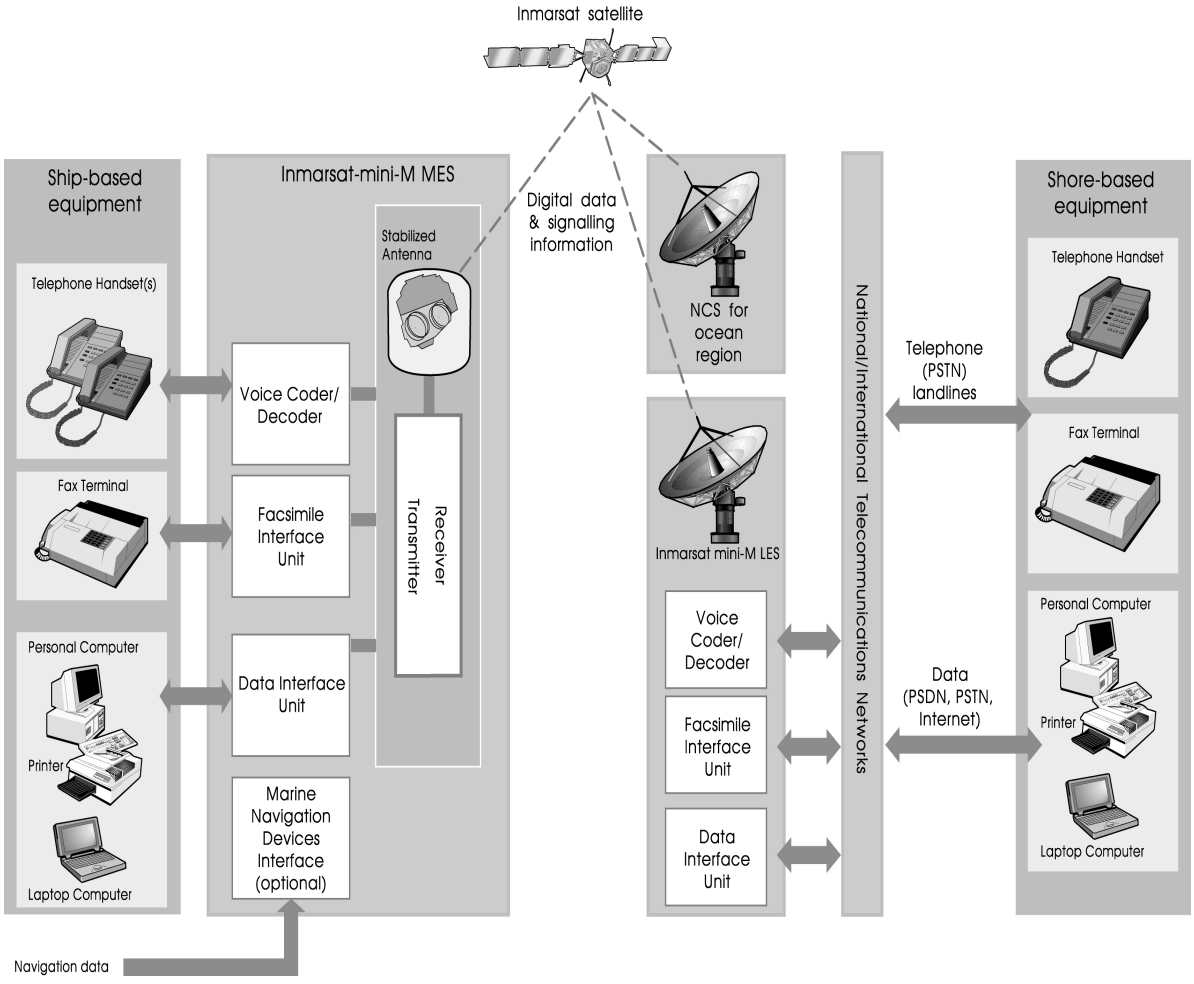

Figure 9-1 An overview of the Inmarsat mini-M network

To be able to transmit or receive calls, the MES antenna must have a clear and unobstructed view of the satellite and always be 'pointed' towards the satellite. Some models of MES automatically try to find the strongest signal from a satellite, but others may have to be manually pointed (Appendix C). The maritime antenna is stabilised in all planes and takes changes of heading information from either a compass (gyro or internal fluxgate) or from GPS/NMEA, which allows the antenna to always point at the satellite while under way.

So that the Inmarsat mini-M service can operate using very small antennae, Inmarsat has increased the strength of the signals from the satellite in certain areas, called 'spot beams'. Therefore the Inmarsat mini-M service offers a reduced coverage area rather than the same global coverage that the other Inmarsat networks do. Only the areas covered by these spot beams can be used to pass messages.

The digital information transmitted over the satellite link contains unique *addressing information*, which is used to ensure that only the intended party receives the call.

9.5 Medium speed data (MSD) services

An Inmarsat mini-M terminal equipped for MSD communications can access a wide range of information services, including the Internet. These services are available from many different sources, in the same way that they are available to terrestrial users. The nominal data service for the Inmarsat mini-M system is 2.4 kbit/s. For information on whether a particular LESO can support this service, contact the LESOs directly at the numbers given in Appendix E.

Further details about the Inmarsat data service can be found in Chapter 12.

9.6 SIM cards (Subscriber Identity Modules)

The Inmarsat mini-M service allows for a SIM card to be inserted into the MES. A SIM card is allocated its own set of Inmarsat mobile numbers (IMNs) in a similar way to the main MES unit and has its own separate billing information. Depending on how the MES has been activated, it may be able to make outgoing calls only when using a SIM card. Separate SIM cards can be used by different people to allow for individual billing, but each SIM card holder receives his or her own bill for any calls he or she has made.

It is possible to receive calls on the main MES IMNs even if the MES unit is not allowed to make outgoing calls or has a SIM inserted.

Chapter 10

The Inmarsat Fleet system

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10.1 Introduction

The Inmarsat Fleet F77 family of terminals is the next generation in mobile wireless communications for maritime services. It supports the trend towards increased use of Internet-based applications and data services.

Inmarsat Fleet is a development of the Inmarsat mini-M and GAN systems in terms of services and functionality, but will have the additional capability to operate in a global beam, made possible by the increased MES EIRP and antenna size. It will also incorporate facilities for distress and safety services, as well as various enhancements for operation with future generations of satellites.

The Inmarsat Fleet is designated to operate in the global beam and spot beam for both traffic channels and signalling channels. The F77 antenna was prepared for the new generation of Inmarsat-4 satellites and is compatible with third-generation (3G) cellular systems. The current third generation of Inmarsat satellites provides a limited number of spot beams (up to seven) but future generations could provide as many as 254.

Unlike other Inmarsat systems (M, mini-M and GAN), the Fleet system uses an enhanced spot beam selection method which reduces spot beam selection time considerably, and also allows for continued spot beam selection during calls and other operations. The enhanced spot beam selection method allows an MES to accurately determine which spot beam to select, by combining knowledge about its own position with spot beam boundary information which is contained in the Bulletin Board.

For F and future systems, spot beam selection may be done by the network, rather than by the MES. This is to optimise utilisation of the satellite segment with regard to bandwith as well as power. In this case, the MES will merely provide its geographical position using appropriate signalling, rather than the selected spot ID.

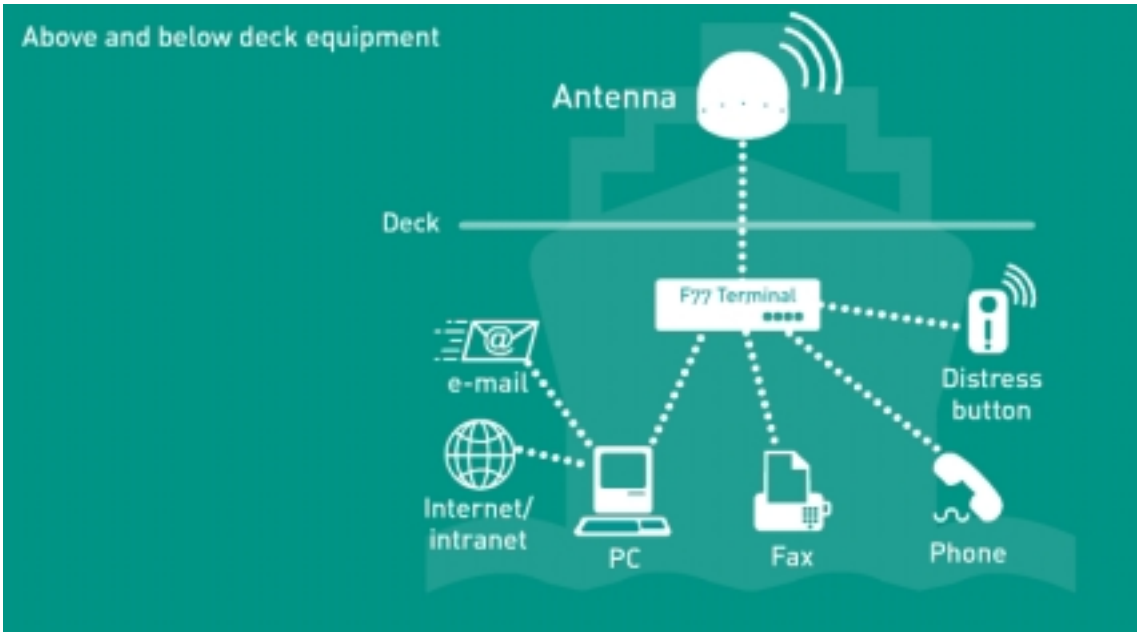

Figure 10 -1 Above and below deck equipment (Fleet 77)

10.2 Range of communication services

As explained before, Inmarsat Fleet is a development of the mini-M and GAN systems and the range of communications offered is directly comparable.

The voice service is the same as the mini-M Advanced Multi-band Excitation (AMBE) voice service, using a voice coding rate of 4.8 kbit/s (including error detection/correction).

The high-speed data (HSD) service is the same as the HSD services defined for GAN, namely a circuit-switched 64 kbit/s channel and associated services, as well as the mandatory Inmarsat Packet Data Service (IPDS). An asynchronous data service will be provided through this channel, which is the same as a Group 3 facsimile rate (2.4 kbit/s). Inmarsat Fleet does not support hybrid class MESs.

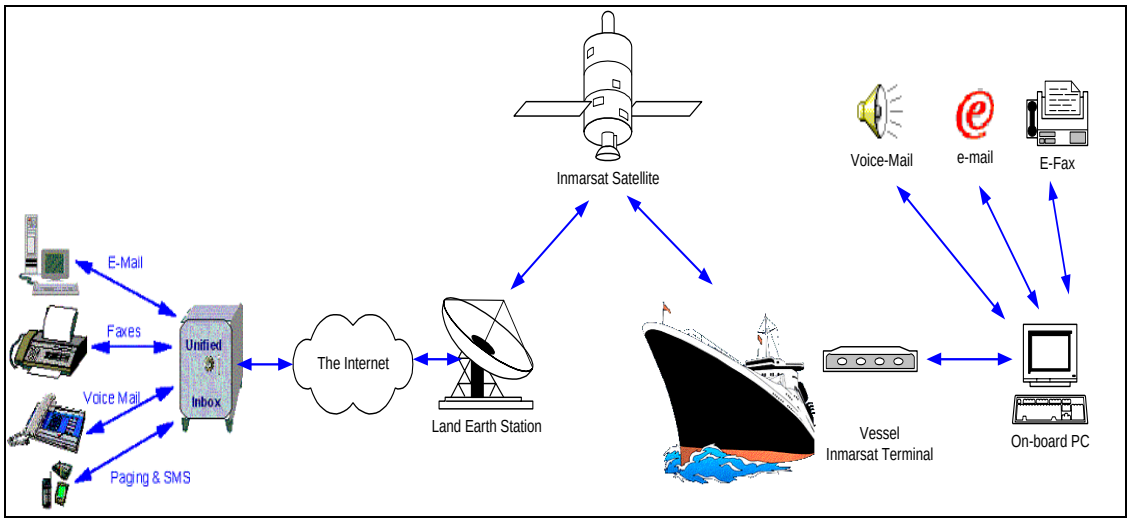

Figure 10.2 – Fleet Services

Main features are:

High-speed data services:

- 64 kbit/s Mobile ISDN
- 56 kbit/s
- speech (64 kbit/s)
- 3.1 kHz audio
- Mobile Packet Data Service (MPDS)

Low-speed services:

- voice 2.4 kbit/s
- fax 2.4 kbit/s

The Inmarsat Fleet system will support priority calls as well as differentiating between personal and professional calls.

10.2.1 64 kbit/s Mobile ISDN

The 64 kbit/s data service supports applications between ISDN terminals using ISDN protocols such as V.120 or X.75. It will support any 64 kbit/s data stream and is the service used for implementing ISDN applications such as video conferencing, LAN routing, file transfer, broadcast- quality audio transmission and secure telephony.

The service is accessed primarily through the RJ-45 connector on the Mobile Satellite Unit (MSU). Multiple ISDN devices (up to eight) can be attached to the MSU.

A point-to-point protocol (PPP) modem data service, suitable for file transfer, e-mail or Internet access, may also be available via an RS-232 interface, USB port or infrared port.

With Inmarsat Mobile ISDN, the customer uses a dedicated line or channel between the mobile equipment and the satellite. This channel provides up to 64 kbit/s of bandwidth. Users are charged by the length of time this dedicated channel is allocated.

Because of the global growth of ISDN, a whole range of telecommunications applications that were once the domain of large corporations have now become cost-effectively available to even the smallest of businesses. Dial-up networking using ISDN enables any number of Local Area Networks (LANs) to be quickly and easily linked. Other services available through the Mobile ISDN are video conferencing and broadcast-quality audio.

An ISDN call typically takes less than five seconds to connect, which is something to take into account when the call is over a satellite communications system.

With the introduction of the Inmarsat Mobile ISDN service, there is no longer any reason why people working in remote locations should not enjoy the sophisticated IT solutions that are taken for granted in today's office.

10.2.2 Speech

The speech service supports high-quality telephony, primarily between ISDN telephones. It may also be used to support an analogue telephone connected to the MSU using an ISDN terminal adaptor, a DECT handset on the MSU, or a corded handset.

10.2.3 3.1 kHz Audio

This service supports connections between analogue devices generally used over the Public Switched Telephone Network (PSTN). Such devices may include V.34 modems operating at speeds of up to 33.6 kbit/s with V.42 and V.42bis, Group 3 fax machines at speeds up to 14.4 kbit/s and secure telephone systems such as STU-III, STU-IIB and STE. The service is normally accessed by attaching the analogue device to the MSU via an ISDN terminal adaptor.

10.2.4 56 kbit/s

This service supports connections to terminals in Switched 56 networks which are found primarily in North America. This service is supported by V.110 rate adaptation at 56 kbit/s. Access to the service is provided through the RJ-45 connector on the MSU.

10.2.5 Mobile Packet Data Service (MPDS)

When you are using a computer on a network, the information is not constantly being transmitted on the network in both directions. Instead, the information is being sent and received in bursts, with gaps in between the bursts. The reason for this is that the majority of applications used over a network use the so-called 'query/response' mechanism. See Figure 10-3 below.

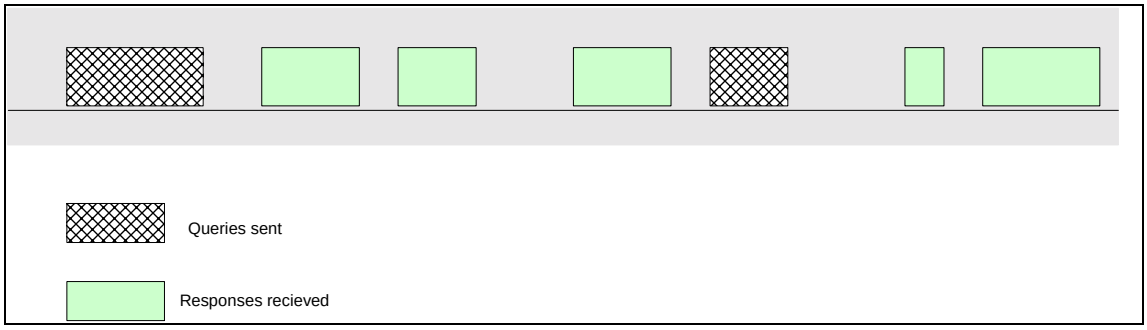

Figure 10-3 Burst of information : query/response mechanism.

These bursts of information are called *packets of data*. Since this is the method of transferring data on the Internet, it is called Internet Protocol or IP for short. Each of the packets sent contains both the sender's Internet address and the receiver's Internet address.

Because a message is divided into a number of packets, each packet can, if necessary, be sent by a different route across the Internet. Packets can arrive in a different order than they were sent in. The Internet Protocol just delivers them. It is up to another protocol (normally the Transmission Control Protocol or TCP) to put them back in the right order.

The Inmarsat MPDS service has been developed to provide a way of sending packet data over Inmsarsat's network of satellites, thereby giving our customers a more efficient and flexible data communications service.

MPDS users are only charged by the amount of data they send and receive, rather than by how long the application takes or how long they are connected. The data is packaged in a way that allows it to be sent through a channel simultaneously shared with other applications or users' data being transmitted under the same satellite in that spot beam. As more users connect, they too are shared among the available channels. Because the bandwith of each channel is fixed, the more users connect the more the available bandwith gets reduced, and therefore the speed decreases. This way of operating is based on a 'best efforts' or undefined bit rate (UBR) basis. In future Inmarsat will look to provide more constant bit rate (CBR) services, where the user will be guaranteed a minimum service level.

This system operates on 64 kbit/s satellite channels, in both the to-mobile and from-mobile direction. These channels are allocated depending on the level of traffic that is being generated. The individual terminal sends and receives data but only when there is data to be transferred. During the quiet periods, e.g. when you are reading a web page or typing an e-mail, the channels are free to be used by other mobiles. Short maintenance bursts are sent to keep the system informed of the mobile's status. The MPDS-enabled terminal becomes simply a terminal

connected to the Internet. When using MPDS, your LESO is effectively acting as your Internet Service Provider (ISP) as well.

Mobile IP is the perfect solution for applications such as Web browsing, interactive e-mail sessions, database enquiries, web mail, IP/LAN connectivity, Intranet access, etc. Speed or throughput can be irrelevant for a specific data size in some applications.

The Inmarsat IP network can be configured to route packets for certain addresses over one type of network, and packets for all other addresses over another type of network.

Users should be aware that any application using Public Network Access is not necessarily secure, due to the very nature of the Internet. Encryption would always be recommended and where highly confidential information is being transferred Private Network Access would be the best solution. Private networks can be accessed through Inmarsat Mobile IP by setting up a Virtual Private Network (VPN) which maintains privacy through the use of a tunneling protocol and security procedures. Using a VPN involves encrypting data before sending it through the public network and decrypting it at the receiving end. An additional level of security involves encrypting not only the data but also the originating and receiving network addresses.

10.3 System interfaces

The Inmarsat Fleet system supports the following range of interfaces (including computer system access):

10.3.1 Mobile ISDN

This uses the ISDN NT1 (Physical Network Termination Type 1) interface, that is an RJ-45 socket on the MES.

Computer system access is via standard dial-up networking (DUN) capability. The IP address will be supplied by your Internet service provider (ISP) and the interfacing will be achieved by the use of a terminal adaptor (TA). This has many of the functions of a modem and can be internal to a PC (e.g. PCI, ISA, PCMCIA) or stand-alone for use with a variety of devices (e.g. RS232, USB). Mobile ISDN supports the Euro ISDN protocol.

Popular TA manufacturers include Eicon, Zyxel, AVM, Elsa, Controlware, 3Com/US Robotics, TDK, IBM, Psion Dacom and Xircom.

10.3.2 MPDS

This uses the standard RS232 9-pin interface, supporting an enhanced standard AT command set.

Computer system access is via dial-up networking (DUN), similar to shore-based Internet users. The IP address will be dynamic, although static ones are an option.

Other computer access systems are routers (connected directly or via a PC), PABXs (fax and voice sharing), POTS (phones, cordless phones, DECT phones and facsimiles), USB support (offered by manufacturers as an alternative to RS232 and RJ45 for accessing MPDS or ISDN services) and PCMCIA (an interface supplied to provide enhancements like Bluetooth, 802.11b or Secure STU capabilities).

10.4 Priority and pre-emption (GMDSS services)

Inmarsat Fleet77 offers call prioritisation to four levels and real-time, hierarchical call pre-emption in both directions (see Chapter 2, Section 2.2.6)

It also offers significant safety improvements in satellite communications with the GMDSS. With this system, the rescue authorities will always get a call through to a ship, even if the voice or data channel is being used continuously. Not only will pre-emption work seamlessly, it will always work in a clearly hierarchical way.

For more information about our Fleet services please log into our website www.inmarsat.com/fleet.

Chapter 11

Using Inmarsat in the shore-to-ship direction

Contents

Tables

11.1 Introduction

This handbook is aimed primarily at those users accessing the Inmarsat network from onboard a ship, but it is also useful to know how a shore subscriber makes a call to an Inmarsat-equipped ship.

Although international calling procedures may differ between countries, a shore subscriber should not notice any difference from calling any other international telephone number when making a telephone or facsimile (fax) call to a ship equipped with an Inmarsat-A, B M or mini-M MES. The same is also true when sending a telex message to a ship equipped with an Inmarsat-A or B MES.

Only data and text-based messages may be sent to ships equipped with Inmarsat-C MESs, as this network uses a 'store-and-forward' technique whereby the service provider stores the message at its LES before forwarding it to the ship.

11.2 Information needed to contact an Inmarsat-fitted ship

To contact an Inmarsat-equipped ship, shore-based subscribers will need the following information:

- the international calling procedure from their country;
- the Inmarsat ocean region access code;
- the type of mobile terminal used on the ship (Inmarsat-A, B, C, M or mini-M);
- the ship's IMN (Inmarsat mobile number).

11.2.1 The calling procedure from a particular country

Many countries operate an automatic direct dialling procedure which complies with the procedures shown in Sections 11-3 to 11-7.

For those countries where no automatic service is available, please refer to Section 11.8 on two-stage access.

11.2.2 The Inmarsat ocean region access code

The ocean region access code that you need to dial identifies which of the Inmarsat satellites your call will be routed through (similar to a country code) and depends on two factors:

- Whether the subscriber is contacting the ship by telephone or by telex: Table 11-1 shows the telephone ocean region access codes and Table 11-2 shows the telex ocean region access codes.
- The ship's position: if the ship is in an area covered by more than one satellite, the shore subscriber should keep a record of the ocean region access code which was last successfully used to contact the ship. It is advisable for the MES operator to inform shore subscribers of any change to the ocean region. This information will enable them to use the correct access code when trying to send a message.

11.2.3 Identifying the type of terminal being contacted

Each Inmarsat system can be identified by the first digit (or T digit) of the Inmarsat Mobile Number (IMN):

- Inmarsat-**A** **1**XXXXXX
- Inmarsat-**B** **3**XXXXXXXX
- Inmarsat-**C** **4**XXXXXXXX
- Inmarsat-**M** **6**XXXXXXXX
- Inmarsat **mini-M** **76**XXXXXXX

11.2.4 The ship's IMN (Inmarsat mobile number)

The IMN is the telephone number which has been allocated to a particular MES or ship. The IMNs are publicly available in the *Inmarsat Ship Directory* (published by Lloyds Ship Management) and from Inmarsat's Customer Care Center (see Appendix A).

Up-to-date information on IMNs can be obtained from the Inmarsat helpline and web site. (See Appendix A for details.)

11.3 Calling a ship by telephone

To contact an Inmarsat-equipped ship by telephone, follow the procedure below:

International access code		**Inmarsat telephone ocean region access code**		**IMN**

Where: the **international access code** is the dialling code used when making an international call;

The **Inmarsat telephone ocean region access code** is as given in Table 11-1;

The **IMN** is the Inmarsat mobile number of the MES being called on the ship.

Where no automatic service is available (see Section 11.8), or it is different from the above example, contact your national telecommunications operator for advice.

11.4 Sending a fax or data message to an Inmarsat-B/M or mini-M

The procedure to send a fax or data to an Inmarsat-B/M- or mini-M-equipped ship is similar to the above, but you should ensure you dial the correct IMN number for the particular service you require. Each service, whether fax or data, is allocated a separate and different IMN number.

11.5 Sending a fax or data message to an Inmarsat-A

For you to be able to send a fax or data message to an Inmarsat-A-equipped ship, a special fax/data channel must be assigned. To request one, you must include the digits 81 in the dialling sequence after the ocean region access code and before the MES's IMN. This service is not available in all countries and it is advisable to contact your local national or international telecommunications operator.

On some Inmarsat-A-fitted ships, the fax/data IMN may be the same as the telephone IMN. When a ship has two IMNs, the fax or data equipment is generally connected to the second IMN.

Table 11-1 Inmarsat telephone ocean region access codes

Ocean region	**Telephone ocean region access codes**
Single Network Access Code (SNAC)	870
Atlantic Ocean Region - East (AOR-E)	871
Pacific Ocean Region (POR)	872
Indian Ocean Region (IOR)	873
Atlantic Ocean Region – West (AOR-W)	874

11.6 Single Network Access Code (SNAC)

Some national and international telecommunications operators offer a single access code (870) to allow for easy contact to Inmarsat-B/M or mini-M terminals, irrespective of the ocean region in which the terminal is located. A limited but growing number of operators offer this service. To find out whether you can use this code, contact your local national or international telecommunications operator.

This service is not available for contacting Inmarsat-A MESs or for sending telex messages.

11.7 Sending a telex to a ship

The automatic calling procedure for sending a telex to a ship equipped with an Inmarsat-A/B MES follows the procedure indicated below:

International access code		**Inmarsat telex ocean region access code**		**IMN**		**+**

Where:

the **international access code** is the code used in making international calls (usually '00');

the **Inmarsat telex ocean region access** code is as given in Table 11-2;

the **IMN** is the Inmarsat mobile number of the MES being called on the ship;

+ is the **End of Number Selection** character.

The above procedure may vary when sending a telex message to a ship equipped with an Inmarsat-C terminal. It is advisable to contact your local telecommunications operator for the correct procedure to be observed in such a case.

All messages should finish with NNNN at the end of the text message.

An acknowledgment that a message has been delivered to the ship may be obtained, generally by placing an 'ack' at the end of the message after the NNNN.

These guidelines should be considered as general rules only.

Table 11-2 Inmarsat telex ocean region access codes

Ocean region	**Telex ocean region Access code**
Atlantic Ocean Region - East (AOR-E)	581
Pacific Ocean Region (POR)	582
Indian Ocean Region (IOR)	583
Atlantic Ocean Region - West (AOR-W)	584

11.8 Two-stage access

Where there is no routing arrangement in place for making a call to an Inmarsat terminal, it is possible to contact an LESO directly and ask to be manually connected to the Inmarsat terminal in question.

When this service is used, the LESO will usually add an extra charge to the call. Further details may be obtained directly from the customer services centre of the LESO concerned (see Appendix E).

Chapter 12

Inmarsat Data Services

Contents

Table

Figures

12.1 Introduction to Inmarsat's data services

It is possible to send messages in many different ways via the Inmarsat network. One increasingly popular method is to use 'data', sending messages in an electronic format from one computer to another.

It has been possible to send electronic messages via the Inmarsat network for many years but, with the increasing use of the Internet and computers, not only within the office environment but also now on board ships, it is becoming easier to exchange information in this way.

All the Inmarsat networks offer a data service whereby messages can be sent to another PC electronically. This chapter describes the basics of this method of communication and gives examples of how it can be used, looking not only at medium-speed data (or asynchronous data/ASD) but also at the Inmarsat high-speed data (HSD) services.

There are many advantages of using data communications, such as ease of use and direct access to the person you want to reach, but the greatest are the cost benefit and time saving.

It is more cost-effective to send messages in an electronic format, because files can be compressed to make them smaller and so more information can be sent in the same time as an equivalent telex or fax message. It is also possible to send messages which contain spreadsheets, databases, etc rather than having to wait until they can be posted from the next post of call.

For example, at 9,600 bit/s, a page of text containing an average of 2,500 characters (=20,000 bits) can be transmitted in about two seconds (after the 'hand-shaking' phase between the data equipment has been completed, which can take 20 to 30 seconds). If data compression is used, this amount of data can be transmitted even more quickly.

It is now possible to send messages by many means including the Internet; to make a vessel a remote part of a company's local computer network; and to have a video-conference call with someone in a remote location.

12.2 The Inmarsat medium-speed data (MSD) service

The Inmarsat MSD service enables data to be sent from one computer to another using a modem via the public telephone network (PSTN).

12.2.1 Examples of MSD uses

Typical uses of data communications include:

- Information transfer between ship and head office relating to payroll, crew rostering, inventories, cargo planning, routing instructions, etc.;
- Access to specialised information databases, including weather bulletins, maritime chart corrections and technical maintenance information. Many of these databases are available on a subscription-only basis;
- Sending and receiving electronic messages between the company and ship;
- Co-ordinating ship movements for efficient cargo transportation:
  - Loading, stability and stowage plans for optimum loading of ships;

- Voyage accounting and crew payroll;
- Weather routing and route optimisation;

- Telemedicine: remote diagnosis of a patient's condition can be made by a hospital doctor viewing the patient's ECG, blood pressure, etc.;
- Using the Internet to send the types of messages mentioned above.

12.2.2 Inmarsat-A data services

To send and receive data messages via the Inmarsat-A network requires a computer and an 'external' modem connected to one of the telephone ports on the Inmarsat-A MES. When an MES has dual ID numbers, it is recommended you connect the computer to the second ID.

It is possible to operate reliable data communications at 9,600 bit/s via the Inmarsat-A system. Faster transfer speeds may be achieved by optimising the modem and terminal settings.

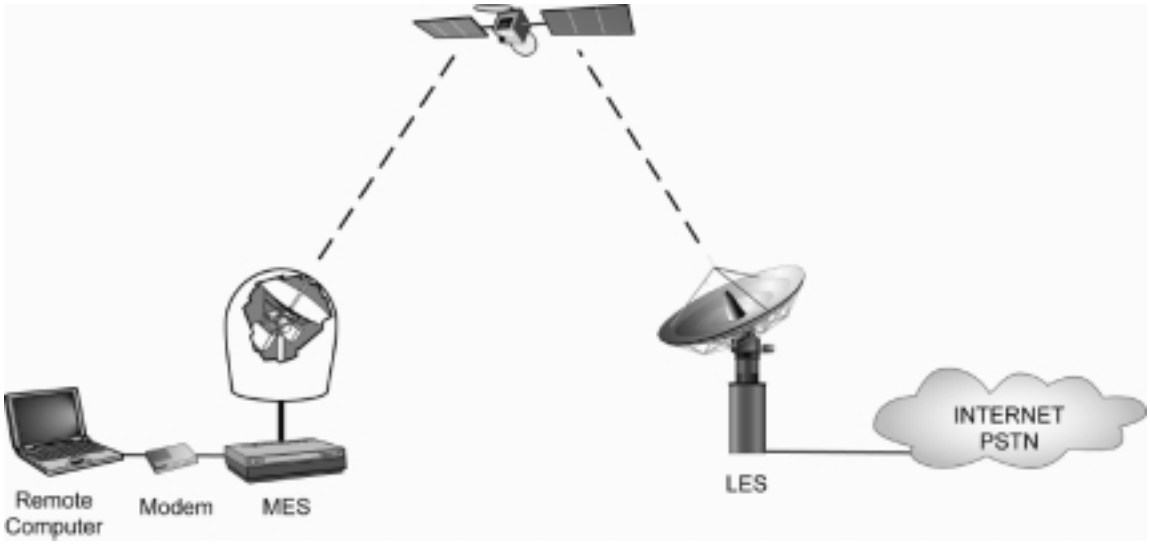

Figure 12-1 General connection details for an Inmarsat-A data system

The computer will be configured with the appropriate software required for the particular data communication. This can be either software specially supplied by a land earth station (LES) operator, or commercially available software.

12.2.3 Selecting an Inmarsat-A data channel

The Inmarsat-A network has special channels optimised for data operation and it is recommended that an MES should use these channels for all data communication. To select one of these data channels on your Inmarsat-A MES you must request an ***uncompanded*** or ***type 2*** channel. Further information on how to do this can be found in your manufacturer's handbook.

It is recommended that all shore-originated data calls also request a data channel. This is done by placing an '81' between the ocean region access code and the MES's ID number, eg.: *00 871* **81** *1234567*.

It is essential that a data channel should never be used for conventional telephone traffic.

Inmarsat is in constant liaison with all LESOs to ensure optimum level adjustment from the terrestrial networks to continually provide high quality services for data communications.

12.3 Inmarsat-B/M and mini-M digital services

The Inmarsat-B/M and mini-M digital networks differ from the Inmarsat-A network in the way the data service is connected. As mentioned in Chapter 3, the Inmarsat digital networks allocate different ID numbers for each of the services on the MES, unlike on an Inmarsat-A where one ID number can be used for any of the different services (telephone, telex, etc).

The table below indicates the data transfer rates available via the digital networks:

Table 12-1 Data transfer rates for Inmarsat-B/M and Mini-M

Inmarsat Network	**Data Service Available**
Inmarsat-B	9,600bit/s
Inmarsat-M	2,400bit/s
Inmarsat-mini-M	2,400bit/s

The Inmarsat-B/M and mini-M services use an internal modem which is built into the MES. This means you do not need any external modems and your computer's serial communication port is connected directly to the MES.

Not all Inmarsat-B/M MESs have been type-approved to offer Inmarsat's MSD service. Where an Inmarsat-B MES manufacturer does not offer this option, it is possible to connect a computer to the MES via one of the voice (telephone) channels in a similar way to the Inmarsat-A service, **but you will not achieve data transfer rates greater than 2,400bit/s.**

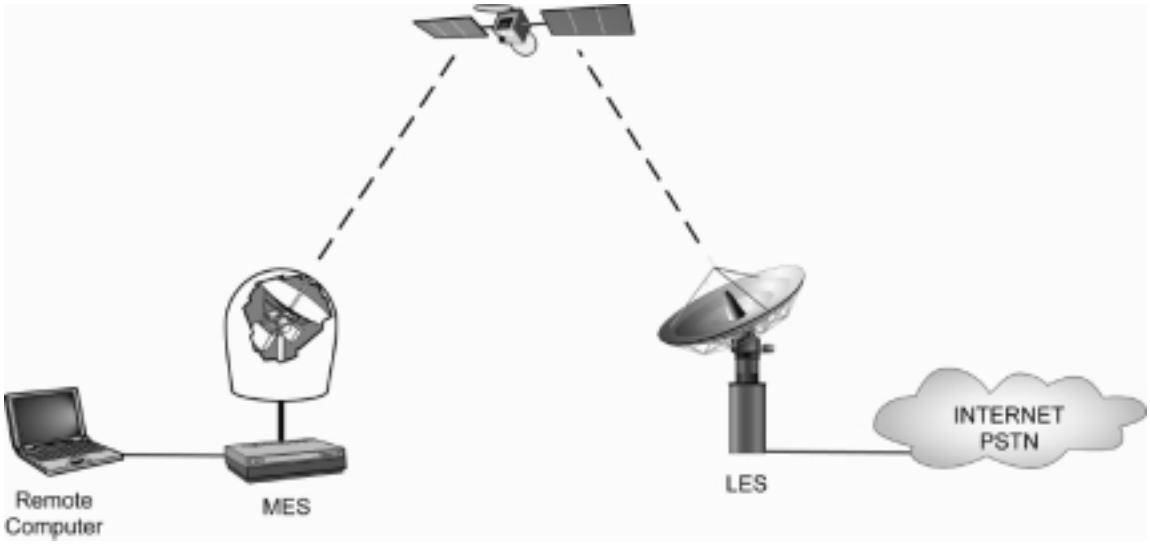

Figure 12-2 Data connection details for the Inmarsat digital network

12.4 Inmarsat high-speed data (HSD) services

The Inmarsat-A and Inmarsat-B networks also provide a high-speed data (HSD) service operating at either 56 or 64 kbit/s. These services allow for large amounts of data to be sent between the MES and a shore subscriber. Two different dial-up services are presently available from several LESOs:

- Simplex HSD (Inmarsat-A only)
  Digital data is transmitted at 56 or 64 kbit/s from the MES to the service provider while the return path (LES to MES) is supported by a low-speed data channel.
- Duplex HSD (Inmarsat-A and Inmarsat-B)
  Digital data is transmitted at 56 or 64 kbit/s in both directions between the LES and the MES.

For Inmarsat-A MESs, several manufacturers (see Appendix B) offer upgrades to existing MESs for 56 or 64 kbit/s simplex options. In most cases the addition of an external digital encoder/decoder is needed for duplex HSD operation.

On some Inmarsat-A-fitted ships, the fax/data IMN number may be the same as the telephone IMN. When a ship has two IMNs, the fax or data equipment is generally connected to the second IMN.

12.4.1 Requirements for the HSD services

To use the HSD services, the user must have an MES fitted with the HSD option and a high-speed communications interface suitable for connection to the MES. Further information can be obtained from your Inmarsat MES manufacturer.

A suitable HSD connection must be available between the LES and the final destination, such as an ISDN (integrated services data network) connection. The analogue public switched

telephone network (PSTN) as used for the MSD service is not suitable for operation with the Inmarsat HSD service.

In North America, 56 kbit/s connections are accessible, with 64 kbit/s becoming more commonly available within selected areas. In Europe and elsewhere, basic rate ISDN service at 64 kbit/s is used to provide the interconnection between the LES operator and the call destination (for example the company office).

A terminal adaptor (TA) or router is required to connect the equipment in the office to the high data-rate connection.

To use the Inmarsat HSD service, you will first need to have your MES's HSD service activated by the relevant point of service activation (PSA) even if the MES has already been commissioned. For further information contact your PSA.

12.4.2 High-speed data applications

The following are typical examples of HSD applications; more information may be obtained from an LES or from the Inmarsat Customer Care Centre at the address given in Appendix A.

HSD – STORE-AND-FORWARD VIDEO (56/64 KBIT/S)

With the aid of advanced video codecs, it is possible to digitise and compress video material locally, then forward it at 56 or 64 kbit/s to a central location, which decompresses and buffers the data. These video compression techniques allow news and sports reports to be transmitted from yachts, exploration vessels and other remote locations.

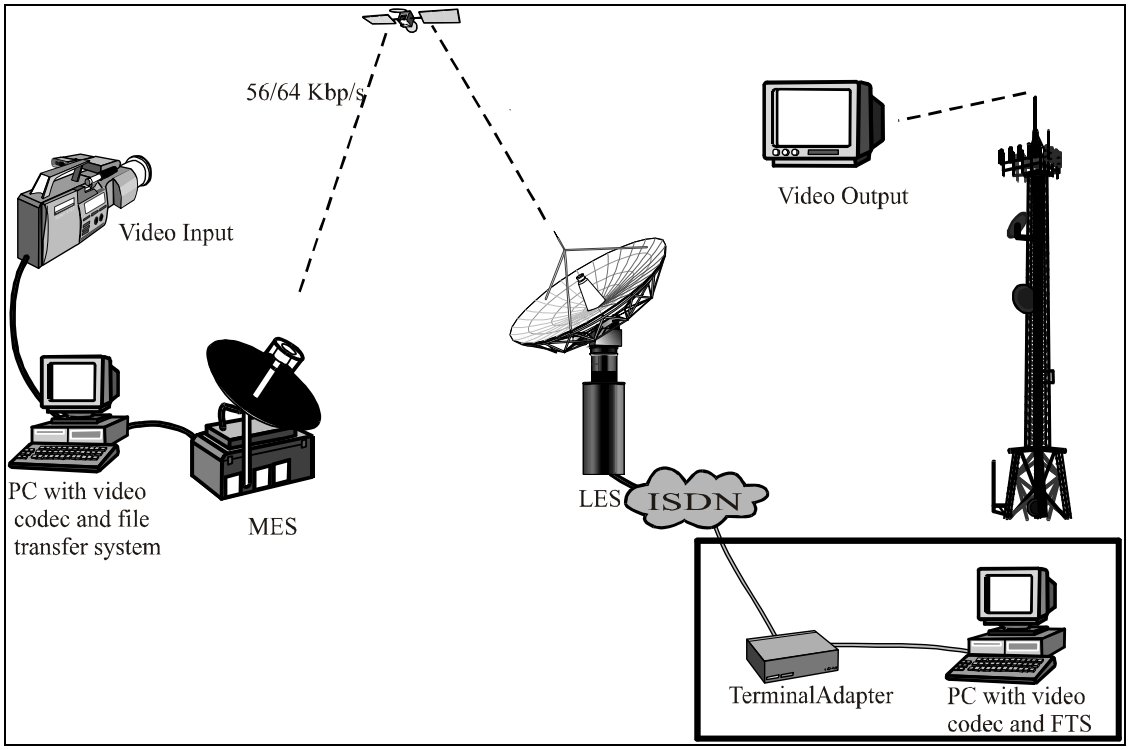

Figure 12-3 Store-and-forward video

HSD – HIGH-SPEED FILE TRANSFER (56/64 KBIT/S)

This service enables a computer-based file to be transferred from one location to another, such as a head office. It is ideal for users who send high volumes of data, such as seismic surveyors, oil and gas exploration firms and cruise liners.

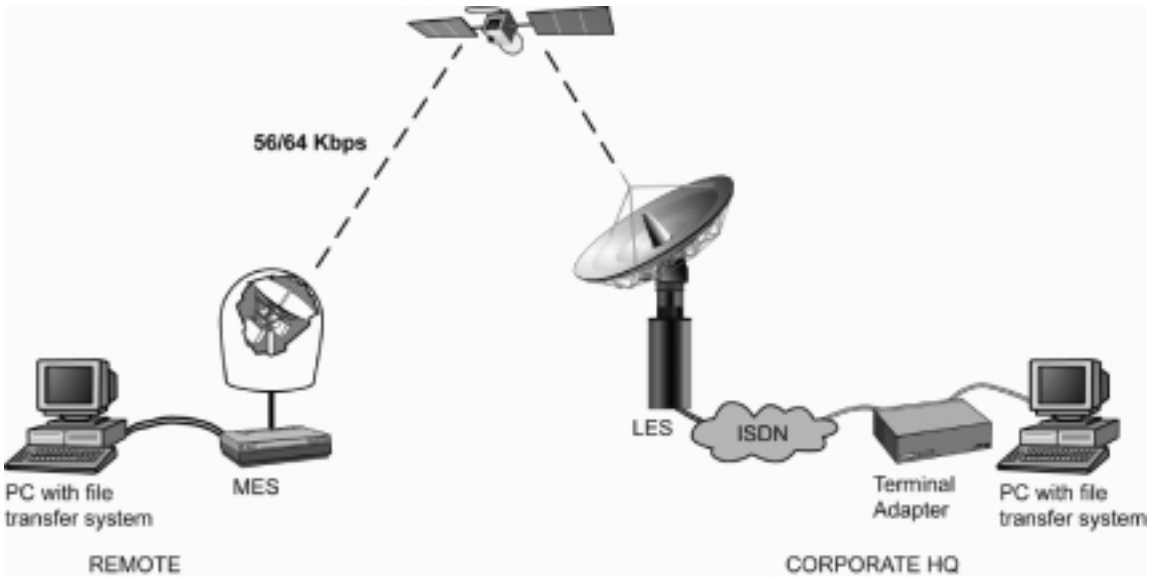

Figure 12-4 High-speed file transfer

MULTIPLEXED CHANNELS (56/64 KBIT/S)

A high-speed 64 kbit/s data channel can be used to carry up to six multiplexed (or combined) telephone, facsimile and medium-speed data circuits. This multi-channel capability is also suitable for cruise liners, seismic surveyors and oil and gas exploration firms.

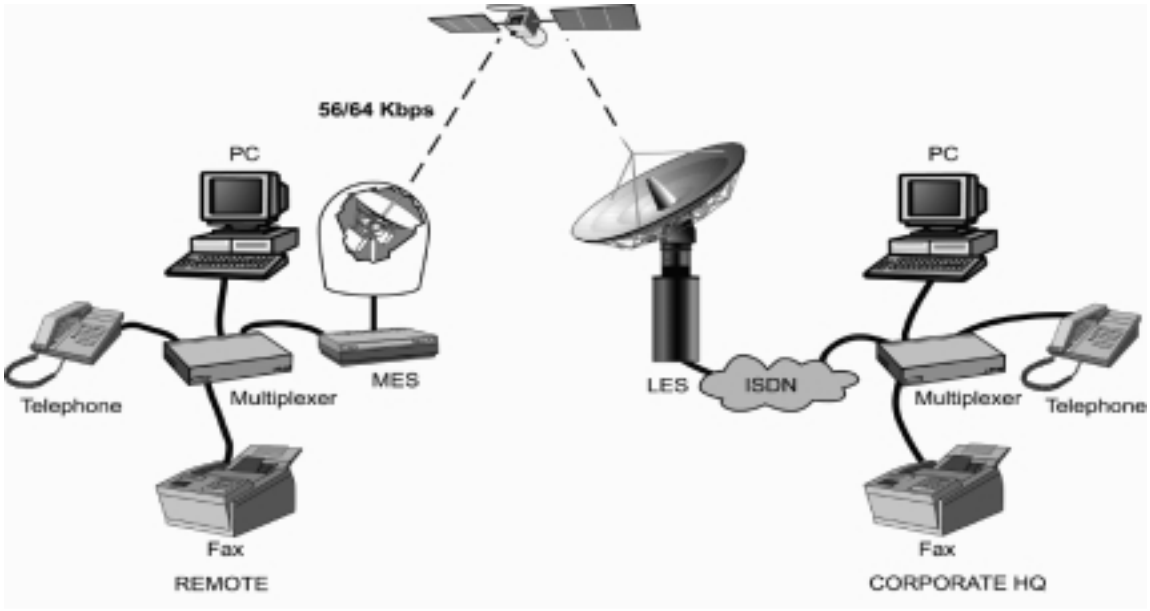

Figure 12-5 Multiplexed channels

VIDEO CONFERENCING (56/64 KBIT/S)

This service enables video-conferencing terminals and video phones to be used for face-to-face conversations with another person or to exchange documents and discuss their content.

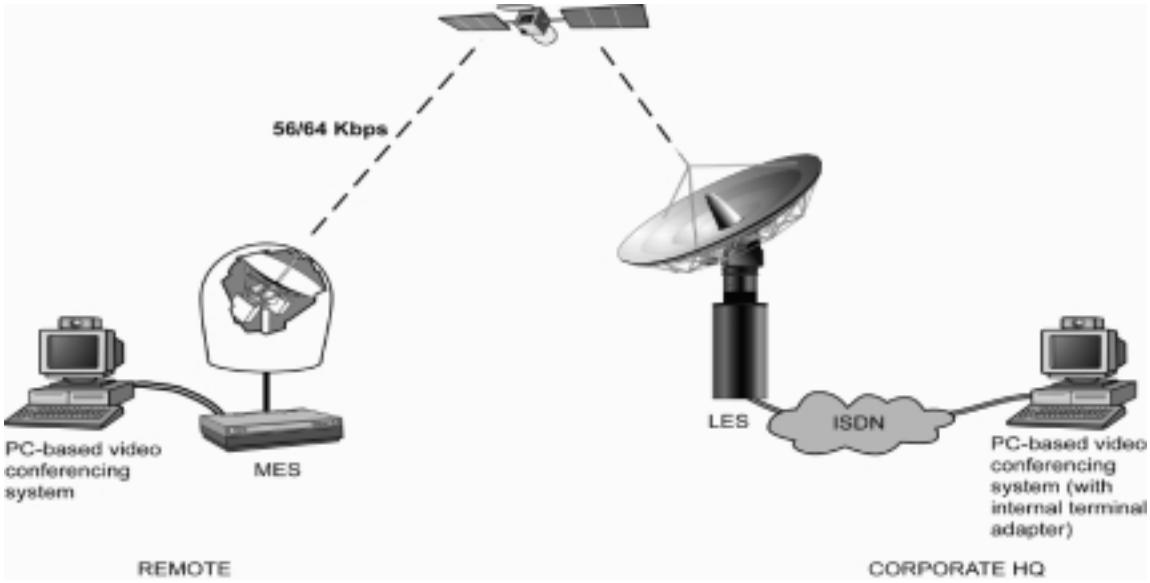

Figure 12-6 Video conferencing

COMPUTER NETWORKING (56/64 KBIT/S)

It is possible to connect local area networks (LANs) on board ships with other computer LANs in a central office. It is also possible to interconnect different networks using transparent protocols, for example TCP/IP.

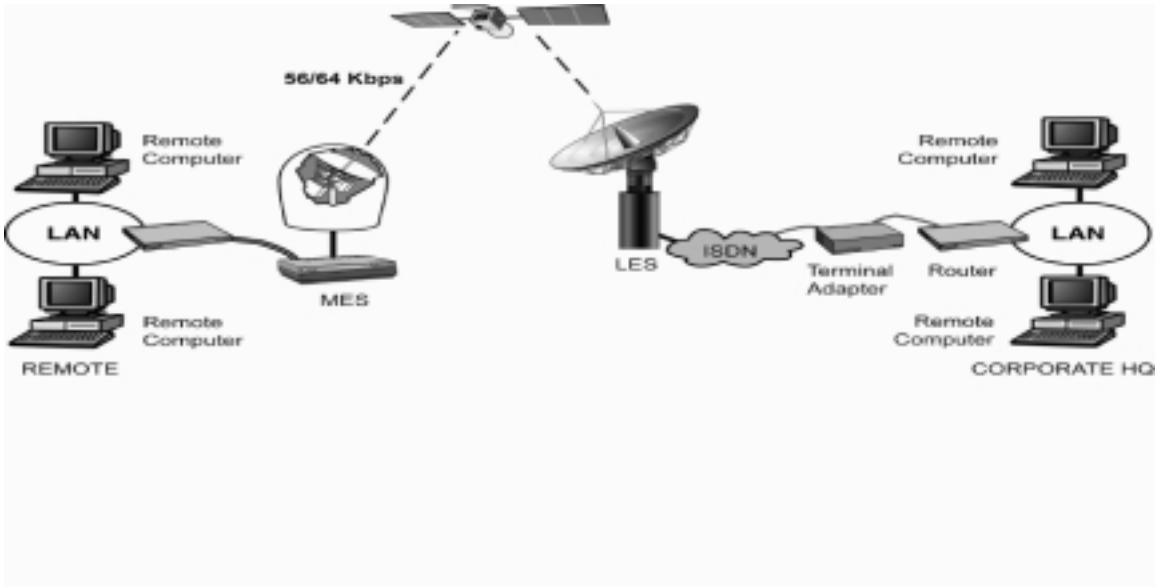

Figure 12-7 Computer networking

12.5 Inmarsat-C data services

As discussed in Chapter 6, the Inmarsat-C network offers a store-and-forward facility. Even though this does not allow for direct connection to the final destination, it does not stop the Inmarsat-C being used for sending data messages.

As well as messages being delivered via the conventional means of telex or fax, they can also be delivered via different data services.

Most LESOs operate most of the services indicated below on a subscription basis. Your terminal should be configured to use the special access code (SAC) or two-digit access code and format as advised by the LESOs with whom you have an agreement.

12.5.1 X.400

X.400 is a defined message-handling protocol for sending electronic messages across a data network, which uses a particular method of addressing. This network was first used to send electronic messages before the use of the Internet become widespread. Most modern proprietary e-mail systems can offer a connection to the X.400 network via a special gateway.

12.5.2 X.25 or Packet Switched Data Network (PSDN)

X.25 and PSDN are forms of data communication networks which can be used to send messages, broken into small packets of data, between an LESO and a subscriber. This service can be used to send messages to proprietary e-mail packages.

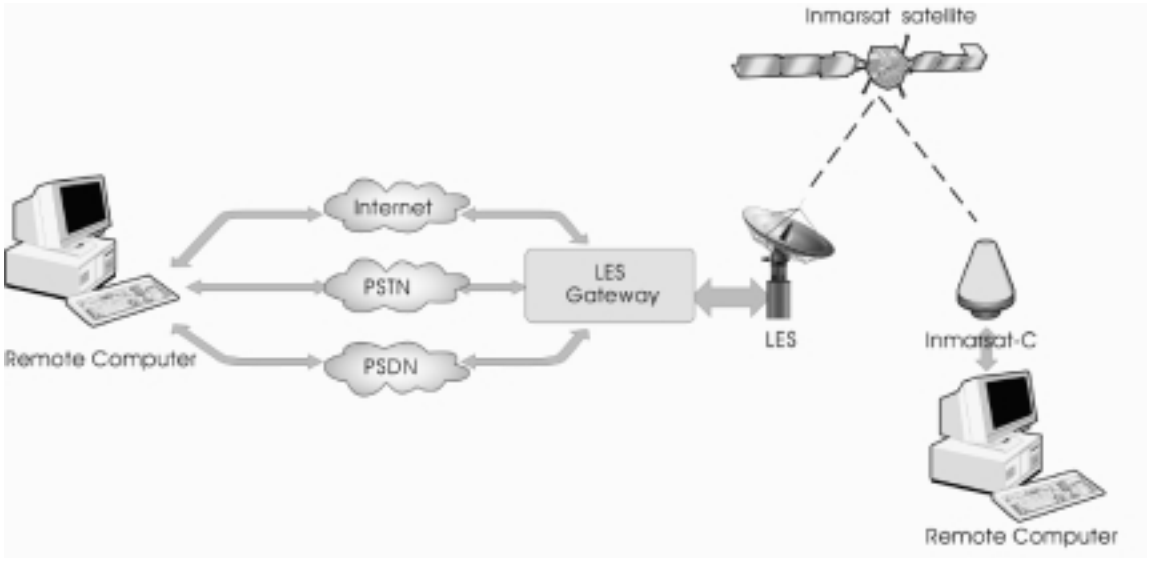

Figure 12-8 Inmarsat-C data transfer

12.5.3 Internet

The majority of messages sent electronically are transmitted via the Internet. It is possible to send e-mail messages from an Inmarsat-C terminal to any Internet e-mail address, but for the e-mail messages to be sent to an Inmarsat-C MES requires the MES to subscribe to an LESO which operates an Internet gateway. Once you have a subscription to an LESO, your Inmarsat-C terminal is issued with an e-mail address containing either the ship's ID number or its name, followed by the network address of your chosen LESO.

12.5.4 Public Switched Telephone Network (PSTN)

This service is used to send messages to the mailbox of the LESO to which an MES subscribes; the sender either collects or deposits the message via a telephone line and modem.

Further details of any of the services described above can be obtained from either your LESO, your MES manufacturer or the Inmarsat Customer Care Centre (see Appendix A).

Appendix C Antenna Positioning Tables

C.1 Introduction

To make communications possible, the directional antenna of an Inmarsat terminal (Inmarsat-A, B, M, mini-M or Fleet) must initially be *pointed* towards the required satellite. Subsequently, when the vessel moves, the antenna stabilisation electronics ensures that the antenna remains pointed towards the satellite.

Most of Inmarsat's terminals are capable of pointing their antennae automatically towards a selected satellite, provided they have been properly initialised. In certain circumstances, such as prolonged loss of power to the MES, however, the MES may be unable to point automatically at the satellite. The MES antenna must then be pointed manually. The information below tells you how to do this.

To be able to point an antenna manually, you must know the required *elevation* (vertical angle above the horizontal) and *azimuth* (horizontal angle from True North) for the antenna, then ensure that the antenna is set to these values.

The Inmarsat-A, Inmarsat-B, Inmarsat-C and Inmarsat Fleet systems are designed to work reliably within a minimum elevation of 5^{o}, and the Inmarsat-M system within a minimum elevation of 10^{o}.

These systems may work satisfactorily below these elevation angles, but if an alternative satellite is accessible, with a higher elevation angle, then this should be selected.

C.2 Re-pointing in case of satellite outage

In case of a satellite outage, the MES will react differently according to the type.

Inmarsat-A will lose NCS TDM or TDMI.
Inmarsat-B, M, mini-M and Fleet will lose NCSC.

Inmarsat operates spare satellites with which the service will continue after a delay of few minutes. Here is the description of how the different Inmarsat systems will proceed should a satellite outage occur in each of the ocean regions:

AOR-W
Inmarsat-A, Inmarsat-B, M and Fleet 77 services will be restored at 98^{o} W. Spotbeam MES users should change regions to the POR satellite at 178^{o}E or the AOR-E satellite at 15.5^{o} W as appropriate. Global coverage MES users may wish to make such a transfer to be able to access a wider range of LESOs.

AOR-E
All services will be restored at 25 ^{o} E. Users may also access AOR-W or IOR.

IOR
Inmarsat-A, M, C will be restored at 109 ^{o} E. Inmarsat mini-M, C and Fleet will be restored at 25^{o} E. Restoration of Inmarsat-C on 25 ^{o} E will be limited to both shore- and ship-originated calls via Burum and ship-originated calls via Psary, Goonhilly, Eik and Ata. Users may also access the AOR-E or POR to obtain a wider range of LESOs.

POR
Global systems services will be restored at 179 ^{o} E which is close enough to make it unnecessary to re-point the antenna. Users may also access the AOR-W or IOR to obtain a wider range of LESOs. Spotbeam system users should access the AOR-W or IOR satellites

C.3 How to use the antenna positioning tables

Given below is the general procedure for using the Antenna Positioning Tables (Tables C-2 to C-4) to find the *elevation* and *azimuth* required to point an MES antenna towards a selected satellite. Examples 1 to 4 on the following pages illustrate the use of the tables.

1. Find the ship's latitude and longitude, using the available navigational equipment.
2. Decide on the ocean region you are going to communicate through (referring if necessary to Section 6.3.2, 7.2.2 or 9.2.2 on selecting an ocean region and LES for Inmarsat-C, B/M or mini-M systems). For this ocean region, find the longitude of the satellite, referring to Table C-1.
   For example, if you are going to communicate through the AOR-W, Table C-1 shows the longitude of the satellite to be 54 ^{o} W.
3. Determine whether the ship is North and West of the satellite, or South and West, or North and East, or South and East. Use the appropriate table: Tables C-2 to C-6.
   For example, consider a ship's position of 57 ^{o} 34' North, 42 ^{o} 16' West (just south of the southern-most tip of Greenland), and a selected ocean region AOR-W. The ship's position is *North and East* of the satellite, therefore you would use Antenna Positioning Table C-2.
4. Calculate the difference between the ship's longitude (rounded to the nearest degree) and the satellite's longitude. Express this difference in longitude rounded to the nearest 5 ^{o}.
5. Round the ship's latitude to the nearest 5 ^{o}. In the above example, the ship's latitude of 57 ^{o} 34' North, rounded to the nearest 5 ^{o}, is 60 ^{o} North.
6. Apply the values obtained to the appropriate table, to find the required azimuth (the upper figure) and elevation (the lower figure). These are the settings required for the MES antenna. In the above example, the values obtained were:
   - Difference in longitude between ship and satellite, rounded to the nearest 5 ^{o} =10 ^{o}

- ship's latitude, rounded to the nearest $5^{o} = 60^{o}$

These values, applied to Table C-2, give an azimuth of 192^{o}, and an elevation of 21^{o}.

7. Set the MES antenna to the required values of azimuth and elevation, referring if necessary to the manufacturer's instructions. Check that the MES gives a 'ready' indication. If so, your MES is now ready to track the satellite as the vessel moves.

Table C-1 Ocean Regions and Satellite Longitude

OCEAN REGION	
Atlantic Ocean Region – West (AOR-W)	54^{o} West
Atlantic Ocean Region – East (AOR-E)	15.5^{o} West
Pacific Ocean Region (POR)	178.1^{o} East
Indian Ocean Region (IOR)	63.9^{o} East

In the event of a satellite failure the values change as follows:

OCEAN REGION	
Atlantic Ocean Region – West (AOR-W)	98^{o} West
Atlantic Ocean Region – East (AOR-E)	25^{o} East
Pacific Ocean Region (POR)	179^{o} East
Indian Ocean Region (IOR) For Inmarsat-A, B, C and M	109^{o} East
Indian Ocean Region (IOR) For Inmarsat C, mini-M and Fleet	25^{o} East

Example 1:

Ship's position: (*South of Greenland*)	57^{o} 34' North(= 58^{o} North to the nearest degree) 21^{o} 49' West (= 22^{o} West to the nearest degree)
Selected Ocean Region:	AOR-W
Satellite Longitude for selected Ocean Region:	54^{o} West (see Table C-1)
Difference in degrees of longitude between ship and satellite:	54^{o} West –42^{o} West= 12^{o} =10^{o} to the nearest 5^{o}
Ship's latitude:	57^{o} 34' North = 60^{o} North to the nearest 5^{o}
Referring to Antenna Positioning Table C-2:	*Azimuth* (upper figure) = 192^{o} *Elevation* (lower figure) = 21^{o}

Example 2:

Ship's position: (*due West of Ireland*)	55 ^{o} 17' North(= 55 ^{o} North to the nearest degree) 21 ^{o} 49' West (= 22 ^{o} West to the nearest degree)
Selected Ocean Region:	AOR-E
Satellite Longitude for selected Ocean Region:	15.5 ^{o} West (see Table C-1)
Difference in degrees of longitude between ship and satellite:	(22 ^{o} West –15.5 ^{o} West) = 6.5 ^{o} =5 ^{o} to the nearest 5^{o}
Ship's latitude:	55 ^{o} 17' North = 60 ^{o} North to the nearest 5^{o}
Referring to Antenna Positioning Table C-3:	*Azimuth* (upper figure) = 174 ^{o} *Elevation* (lower figure) = 22 ^{o}

Example 3:

Ship's position: *(east of the Cook Islands in the Pacific Ocean)*	19^{o} 38' South (= 20 ^{o} South to the nearest degree) 157^{o} 19' East (= 157 ^{o} East to the nearest degree)
Selected Ocean Region:	POR
Satellite longitude for selected Ocean Region	178 ^{o} East (see Table C-1).
Difference in degrees of longitude between ship and satellite:	(178 ^{o} East – 157 ^{o} East) = 21 ^{o}= 20 ^{o} to the nearest 5^{o}
Ship's latitude:	19^{o} 38' South= 20^{o} South to the nearest 5^{o}
Referring to Antenna Positioning Table C-4	Azimuth *(upper figure)* = 313 ^{o} Elevation *(lower figure)* = 57 ^{o}

Example 4

Ship's position: *(north of Madagascar)*	13 ^{o} 27' South (= 13 ^{o} South to the nearest degree) 50 ^{o} 09' East (= 50 ^{o} East to the nearest degree)
Selected Ocean Region:	IOR.
Satellite longitude for selected Ocean Region	64.5 ^{o} East (see Table C-1)
Difference in degrees longitude between ship and satellite:	(64.5 ^{o} East – 50 ^{o} East) = 14.5 ^{o}= 15 ^{o} to the nearest 5 ^{o}
Ship's latitude:	13 ^{o} 27' South = 15 ^{o} South to the nearest 5 ^{o}
Referring to Antenna Positioning Table C-5	Azimuth *(upper figure)* = 46 ^{o} Elevation *(lower figure)* = 65 ^{o}

Table C-2 Antenna Positioning Table - Ship located NORTH and EAST of selected satellite

Ship's Lat. Degs. North	Difference in degrees longitude between ship and satellite *Azimuth (= upper figure)* *Elevation (= lower figure)*																
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0	180	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270
	90	84	78	72	66	61	55	49	44	38	33	28	22	17	12	07	02
5	180	225	244	252	257	259	261	263	264	265	266	267	267	268	268	269	269
	85	82	77	71	66	60	55	49	43	38	32	27	22	17	11	06	01
10	180	207	225	237	244	250	253	256	258	260	262	263	264	265	266	267	268
	78	77	73	69	64	59	53	48	43	37	32	27	21	16	11	06	01
15	180	199	214	226	235	241	246	250	253	255	258	260	262	263	265	266	267
	72	71	69	65	61	56	51	46	41	36	31	26	21	16	11	06	01
20	180	194	207	218	227	234	239	244	248	251	254	257	259	262	263	265	267
	66	66	64	61	57	53	49	44	39	34	30	25	20	15	10	05	01
25	180	192	203	212	221	226	234	239	243	247	250	254	256	259	261	264	266
	61	60	59	56	53	50	46	41	37	33	28	23	19	14	09	05	00
30	180	190	199	208	216	223	229	234	239	243	247	251	254	257	260	262	265
	55	54	53	51	49	46	42	38	34	30	26	22	17	13	09	04	00
35	180	189	197	205	212	219	225	231	236	240	244	248	252	255	258	261	-
	49	49	48	46	44	41	38	35	31	28	24	20	16	12	08	04	-
40	180	188	195	203	210	216	222	227	233	237	242	246	250	253	257	260	-
	44	43	43	41	39	37	34	31	28	25	21	18	14	10	07	03	-
45	180	187	194	201	207	213	220	225	230	235	239	244	248	252	256	259	-
	38	38	37	36	34	33	30	28	25	22	19	16	12	09	05	02	-
50	180	187	193	199	205	211	217	222	228	233	237	242	246	250	254	258	-
	33	32	32	31	30	28	26	24	21	19	16	13	10	07	04	01	-
55	180	186	192	198	204	210	215	221	226	231	235	240	245	249	253	258	-
	27	27	27	26	25	23	22	20	18	16	13	11	08	05	03	00	-
60	180	186	192	197	203	208	214	219	224	229	234	239	243	248	253	-	-
	22	22	21	21	20	19	17	16	14	12	10	08	06	04	01	-	-
65	180	186	191	196	202	207	212	218	223	228	233	238	242	247	-	-	-
	17	17	16	16	15	14	13	12	10	09	07	05	04	02	-	-	-
70	180	185	191	196	201	206	212	217	222	227	232	237	242	246	-	-	-
	11	11	11	11	10	09	09	07	07	05	04	03	01	00	-	-	-
75	180	185	190	196	201	206	211	216	221	226	231	236	-	-	-	-	-
	06	06	06	06	06	05	04	04	03	02	01	00	-	-	-	-	-
80	180	185	190	195	200	205	210	-	-	-	-	-	-	-	-	-	-
	01	01	01	01	01	00	00	-	-	-	-	-	-	-	-	-	-

Table C-3 Antenna Positioning Table - Ship located NORTH and WEST of selected satellite

Ship's Lat. Degs. North	Difference in degrees longitude between ship and satellite *Azimuth (= upper figure)* *Elevation (= lower figure)*															
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0	180	090	090	090	090	090	090	090	090	090	090	090	090	090	090	090	090
	90	84	78	72	66	61	55	49	44	38	33	28	22	17	12	07	02
5	180	135	116	108	103	101	099	097	096	095	094	093	093	092	092	091	091
	85	82	77	71	66	60	55	49	43	38	32	27	22	17	11	06	01
10	180	153	135	123	116	110	107	104	102	100	098	097	096	095	094	093	092
	78	77	73	69	64	59	53	48	43	37	32	27	21	16	11	06	01
15	180	161	146	134	125	119	114	110	107	105	102	100	098	097	095	094	093
	72	71	69	65	61	56	51	46	41	36	31	26	21	16	11	06	01
20	180	166	153	142	133	126	121	116	112	109	106	103	101	099	097	095	093
	66	66	64	61	57	53	49	44	39	34	30	25	20	15	10	05	01
25	180	168	157	148	139	132	126	121	117	113	110	106	104	101	099	096	094
	61	60	59	56	53	50	46	41	37	33	28	23	19	14	09	05	00
30	180	170	161	152	144	137	131	126	121	117	113	109	106	103	100	098	095
	55	54	53	51	49	46	42	38	34	30	26	22	17	13	09	04	00
35	180	171	163	155	148	141	135	129	124	120	116	112	108	105	102	099	-
	49	49	48	46	44	41	38	35	31	28	24	20	16	12	08	04	-
40	180	172	165	157	150	144	138	133	127	123	118	114	110	107	103	100	-
	44	43	43	41	38	37	34	31	28	25	21	18	14	10	07	03	-
45	180	173	166	159	153	147	140	135	130	125	121	116	112	108	104	101	-
	38	38	37	36	34	33	30	28	25	22	19	16	12	09	05	02	-
50	180	173	167	161	155	149	143	138	132	127	123	118	114	110	106	102	-
	33	32	32	31	30	28	26	24	21	19	16	13	10	07	04	01	-
55	180	174	168	162	156	150	145	139	134	129	125	120	115	111	107	102	-
	27	27	27	26	25	23	22	20	18	16	13	11	08	05	03	00	-
60	180	174	168	163	157	152	146	141	136	131	126	121	117	112	107	-	-
	22	22	21	21	20	19	17	16	14	12	10	08	06	04	01	-	-
65	180	174	169	164	158	153	148	142	137	132	127	122	118	113	-	-	-
	17	17	16	16	15	14	13	12	10	09	07	05	04	02	-	-	-
70	180	175	169	164	159	154	148	143	138	133	128	123	118	114	-	-	-
	11	11	11	11	10	09	09	07	07	05	04	03	01	00	-	-	-
75	180	175	169	164	159	154	149	144	139	134	129	124	-	-	-	-	-
	06	06	06	06	05	05	04	04	03	02	01	00	-	-	-	-	-
80	180	175	170	165	160	155	150	-	-	-	-	-	-	-	-	-	-
	01	01	01	01	01	00	00	-	-	-	-	-	-	-	-	-	-

Table C-4 Antenna Positioning Table - Ship located SOUTH and EAST of selected satellite

Ship's Lat. Degs. South	Difference in degrees longitude between ship and satellite *Azimuth (= upper figure)* *Elevation (= lower figure)*																
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0	360	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270
	90	84	78	72	66	61	55	49	44	38	33	28	22	17	12	07	02
5	360	315	296	288	283	281	279	277	276	275	274	273	273	272	272	271	271
	84	82	77	71	66	60	55	49	43	38	32	27	22	17	11	06	01
10	360	333	315	303	296	290	287	284	282	280	278	277	276	275	274	273	272
	78	77	73	69	64	59	53	48	43	37	32	27	21	16	11	06	01
15	360	341	326	314	305	299	294	290	287	285	282	280	278	277	275	274	273
	72	71	69	65	61	56	51	46	41	36	31	26	21	16	11	06	01
20	360	346	333	322	313	306	301	296	292	289	286	283	281	279	277	275	273
	66	66	64	61	57	53	49	44	39	34	30	25	20	15	10	05	01
25	360	348	337	328	319	312	306	301	297	293	290	286	284	281	279	276	274
	61	60	59	56	53	50	46	341	37	33	28	23	19	14	09	05	00
30	360	350	341	332	324	317	311	306	301	297	293	289	286	283	280	278	275
	55	55	53	51	49	46	42	38	34	30	26	22	17	13	09	04	00
35	360	351	343	335	328	321	315	309	304	300	296	292	288	285	282	279	-
	49	49	48	46	44	41	38	35	31	28	24	20	16	12	08	04	-
40	360	352	345	337	330	324	318	313	307	303	298	294	290	287	283	280	-
	44	43	43	41	39	37	34	31	28	25	21	18	14	10	07	03	-
45	360	353	346	339	333	327	320	315	310	305	301	296	292	288	284	281	-
	38	38	37	36	34	33	30	28	25	22	19	16	12	09	05	02	-
50	360	353	347	341	335	329	323	318	312	307	303	298	294	290	286	282	-
	33	32	32	31	30	28	26	24	21	19	16	13	10	07	04	01	-
55	360	354	348	342	336	330	325	319	314	309	305	300	295	291	287	282	-
	27	27	27	26	25	23	22	20	18	16	13	11	08	05	03	00	-
60	360	354	348	343	337	332	326	321	316	311	306	301	297	292	287	-	-
	22	22	21	21	20	19	17	16	14	12	10	08	06	04	01	-	-
65	360	354	349	344	338	333	328	322	317	312	307	302	298	293	-	-	-
	17	17	16	16	15	14	13	12	10	09	07	05	04	02	-	-	-
70	360	355	349	344	339	334	328	323	318	313	308	303	298	294	-	-	-
	11	11	11	11	10	09	09	07	07	05	04	03	01	00	-	-	-
75	360	355	350	344	339	334	329	324	319	314	309	304	-	-	-	-	-
	06	06	06	06	05	05	04	04	03	02	01	00	-	-	-	-	-
80	360	355	350	345	340	330	210	-	-	-	-	-	-	-	-	-	-
	01	01	01	01	01	00	00	-	-	-	-	-	-	-	-	-	-

Table C-5 Antenna Positioning Table - Ship located SOUTH and WEST of selected satellite

Ship's Lat. Degs. South	Difference in degrees longitude between ship and satellite *Azimuth (= upper figure)* *Elevation (= lower figure)*															
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0	000 90	090 84	090 78	090 72	090 66	090 61	090 55	090 49	090 44	090 38	090 33	090 28	090 22	090 17	090 12	090 07	090 02
5	000 85	045 82	064 77	072 71	077 66	079 60	081 55	083 49	084 43	085 38	086 32	087 27	087 22	088 17	088 11	089 06	089 01
10	000 78	027 77	045 73	057 69	064 64	070 59	073 53	076 48	078 43	080 37	082 32	083 27	084 21	085 16	086 11	087 06	088 01
15	000 72	019 71	034 69	046 65	055 61	061 56	066 51	070 46	073 41	075 36	078 31	080 26	082 21	083 16	085 11	086 06	087 01
20	000 66	014 66	027 64	038 61	047 57	054 53	059 49	064 44	068 39	071 34	074 30	077 25	079 20	081 15	083 10	085 05	087 01
25	000 61	012 60	023 59	032 56	041 53	048 50	054 46	059 41	063 37	067 33	070 28	074 23	076 19	079 14	081 09	084 05	086 00
30	000 55	010 55	019 53	028 51	036 49	043 46	049 42	054 38	059 34	063 30	067 26	071 22	074 17	077 13	080 09	082 04	085 00
35	000 49	009 49	017 48	025 46	032 44	039 41	045 38	051 35	056 31	060 28	064 24	068 20	072 16	075 12	078 08	081 04	- -
40	000 44	008 43	015 43	023 41	030 39	036 37	042 34	047 31	053 28	057 25	062 21	066 18	070 14	073 10	077 07	080 03	- -
45	000 38	007 38	014 37	021 36	027 34	033 33	039 30	045 28	050 25	055 22	059 19	064 16	068 12	072 09	076 05	079 02	- -
50	000 33	007 32	013 32	019 31	025 30	031 28	037 26	042 24	048 21	053 19	057 16	062 13	066 10	070 07	074 04	078 01	- -
55	000 27	006 27	012 27	018 26	024 25	030 23	035 22	041 20	045 18	051 16	055 13	060 11	065 08	069 05	073 03	078 00	- -
60	000 22	006 22	012 21	017 21	023 20	028 19	034 17	039 16	044 14	049 12	054 10	059 08	063 06	068 04	072 01	- -	- -
65	000 17	006 17	011 16	016 16	022 15	027 14	032 13	038 12	043 10	048 09	053 07	058 05	062 04	067 02	- -	- -	- -
70	000 11	005 11	011 11	016 11	021 10	026 09	032 09	037 07	042 07	047 05	052 04	057 03	062 01	066 00	- -	- -	- -
75	000 06	005 06	010 06	016 06	021 05	026 05	031 04	036 04	041 03	046 02	051 01	056 00	- -	- -	- -	- -	- -
80	000 01	005 01	010 01	015 01	020 01	025 00	030 00	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Appendix D
Two-digit code services (telex and telephone) and fault codes

The following tables list the two-digit access codes which are available via the Inmarsat network and are supported by individual land earth station operators (LESOs).

Table D-1: Two-digit access codes for telex services (Inmarsat-A, B and C only)

Table D-2: Inmarsat-A and B telex fault codes

Table D-3: Inmarsat-C non-delivery notification (NDN) failure codes

Table D-4: Two-digit access codes for telephone services

Two-digit code	Service	Remarks
00	Automatic	Use this code to make automatic telex calls using the international telex country codes given in Appendix G.
11	International operator	Use this code to obtain information from the international operator about the country where the service provider is located.
12	International information	Use this code to obtain information about a subscriber in a country other than that where the service provider is located.
13	National operator	Use this code to obtain assistance to connect to a subscriber in a country where the service provider is. In any country which does not have an international operator, use this code instead of Code 11.
14	National information	Use this code to obtain information about subscribers in the country where the service provider is located.
15	Radio-telegram service	This code will connect the caller to the radio-telegram service position for the transmission of radio-telegrams originated via telex.
17	Telephone call booking	This code may be used via some LESOs to book telephone calls.
21	Store-and-forward (international)	This code is used to gain access to a store-and-forward unit (SFU) for international calls.
22	Store-and-forward (national)	This code is used to gain access to a store-and-forward unit (SFU) for national calls.
24	Telex letter service	This code is used for directly transmitting a message originated from an MES to a selected telegraph office for delivery by mail or other appropriate means (Inmarsat-C only).
31	Maritime enquiries	This code may be used for special enquiries such as ship location, authorisation, etc.

Table D-1- *Two-digit access codes for telex services (Inmarsat-A, B and C only)*

Two-digit code	Service	Remarks
32	Medical advice	Use this code to obtain medical advice. Some LESOs have direct connections with local hospitals for use with this code.
33	Technical assistance	Use this code if you are having technical problems with your Inmarsat-A terminal. Technical staff at the LESO are normally able to assist you.
36	Credit card call	Use this code to charge a telex call to a credit or charge card.
37	Time and duration	This code should be used at the start of a call instead of the code 00 for an automatic call. This service will enable the Inmarsat-A MES operator to be advised of the time and duration of the call being set up. This is normally a short telex message at the end of the connection, giving the time and duration of the call. Normally the MES operator terminates the telex call by using five full stops (.....). The time and duration of the call will be automatically returned.
38	Medical assistance	This code should be used if the condition of an ill or injured person aboard the vessel requires urgent evacuation ashore or the services of a doctor aboard the vessel. This code ensures the call is routed to the appropriate agency or authority ashore to deal with the situation.
39	Maritime assistance	This code should be used to obtain maritime assistance if the vessel requires assistance or towing or has encountered oil pollution, etc.
41	Meteorological reports	This code should be used by weather-observing vessels to send their observations. In most cases where this service is available the service is free of charge to the vessel, with the National Weather Authority paying the relevant charges.
42	Navigational hazards and warnings	This code provides a connection to a navigational office to transmit information from the vessel about any hazards which could endanger the safety of navigation, such as wrecks, derelicts, floating obstructions, defective radio beacons or light vessels, icebergs and floating mines.
43	Ship position reports	This code provides a connection to an appropriate national or international centre which is collecting ship movement information for search and rescue (or other) purposes, e.g. AMVER or AUSREP, etc.
51	Meteorological forecasts	This code is used for the retrieval of meteorological forecasts.
52	Navigational warnings	This code is used for the retrieval of navigational warnings.

Table D-1 *(contd.) - Two-digit access codes for telex services*

Two-digit code	Service	Remarks
6(x)	Administration specialised use	For use by administrations for specialised use. Often used for leased lines, etc. The 'x' digit following the 6 is allocated on a national basis and is not usually given to the same service or leased line for more than one LESO.
70	Databases	This code is normally used by a LESO to allow automatic access to its information retrieval database.
91	Automatic line test	This code should be used to obtain a telex receiver check. The LESO usually transmits the following: **THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG1234567890**
92	Commissioning tests	This code should be used when a vessel is ready to commence its Inmarsat-A commissioning tests. The code should be used for this purpose only, and then solely via the LESO through which the commissioning has been arranged.

Table D-1 *(contd.)* **Two-digit access codes for telex services**

Table D-2 Inmarsat-A and B telex fault codes

If a problem exists on the international telex network, after you have sent a telex using your Inmarsat-A or Inmarsat-B MES you may receive one of the following telex fault codes. These are allocated by the CCITT (Recommendation F131) and are internationally recognised.

Fault code	Description
ABS	Absent subscriber - this code is returned by the land-based telex network when the called subscriber's telex terminal is either switched off or is faulty.
DER	Out of order - this code is returned when the path to the called telex terminal is faulty, and the called tele-printer fails to respond to WRU signals.
NC	No circuits - this code is used when congestion occurs in the land-based network or switching circuits.
NP	No party - the called party is no longer a telex subscriber (used when an invalid subscriber number is called).
NA	Correspondence with this subscriber is not permitted - used if an unauthorised group call is attempted.
OCC	Subscriber engaged.

Table D-3 Inmarsat-C non-delivery notification (NDN) failure codes

Listed below is a selection of non-delivery notification (NDN) codes used by some Inmarsat-C LESOs. In addition to, or instead of, these codes, some LESOs may use their own codes or messages. To find out the particular NDN codes/messages used by a specific LESO, and their meanings, contact the LESO directly at its number given in Appendix E.

NDN code	Meaning
ABS	Absent subscriber. The mobile terminal is not logged in to the ocean region.
ACB	Access barred.
ADR	Addressee refuses to accept message.
ANU	Deleted. The message has not been delivered within an hour and is therefore deleted.
ATD	Attempting to deliver the message.
BK	Message aborted. Is used when a fax or PSTN-connection is cleared abnormally.
BUS	Busy.
CCD	Call cut or disconnected.
CI	Conversation impossible.
CIE	The LESO ran out of processing/communications capacity to process the message.
CNS	Call not started.
DTE	Data terminal equipment. Used when an X.25 subscriber has cleared the connection during the call attempt.
ERR	Error.
FAU	Faulty.
FMT	Format error.
FSA	Fast select acceptance not subscribed.
IAB	Invalid answer-back from destination.
IAM	Was unable to process the address information in the following message:
IDS	Invalid data from ship.
IDT	Input data time-out.
IFR	Invalid facility request.
IMS	Message size is invalid; 7,932 characters maximum.
IND	Incompatible destination.
INH	Was unable to establish the type of message from the following header:
INV	Invalid.
ISR	Invalid ship request.
LDE	Maximum acceptable message length or duration has been exceeded.
LEF	Local equipment failure.
LPE	Local procedure error.
MBB	Message broken by higher priority.

NDN code	Meaning
MCC	Message channel congestion.
MCF	Message channel failure.
MKO	Message killed by operator.
MSO	Machine switched off.
NA	Correspondence with this subscriber is not permitted.
NAL	No address line is present.
NC	No circuits.
NCH	Subscriber's number has changed.
NDA	No delivery was attempted.
NFA	No final answer-back.
NIA	No initial answer-back.
NOB	Not obtainable.
NOC	No connection.
NP	No party. The called party is not, or is no longer, a subscriber.
NTC	Network congestion/
OAB	Operator aborted.
OCC	Subscriber is occupied.
OOO	Out of order.
PAD	Packet assembler/disassembler.
PRC	Premature clearing.
PRF	Protocol failure.
RCA	Reverse charging acceptance not subscribed.
REF	There was a failure in the remote equipment.
RLE	Resource limit exceeded.
RPE	Remote procedure error.
RPO	RPOA out of order.
SCC	Call completed successfully.
SHE	MES hardware error.
SNF	The satellite network has failed.
SPE	MES protocol error.
SUC	Test results being delivered.
TBY	Trunks busy.
TGR	TDM group reset.
TIM	Time-out.
TMD	Too many destinations.
UNK	Unknown. Is used when no other failure codes are suitable.
WFA	Wrong final answer-back.
WIA	Wrong initial answer-back.

Two-digit Code	Service	Remarks
00	Automatic	Use this code to make automatic telephone, facsimile and voice-band data calls using international direct dial (IDD) codes.
11	International operator	Use this code to obtain information from the international operator of the country where the LESO is located.
12	International information	Use this code to obtain information about subscribers in countries other than that where the LESO is located.
13	National operator	Use this code to obtain assistance to connect to subscribers in the country where the LESO is located. In countries which do not have an international operator, use this instead of Code 11.
14	National information	Use this code to obtain information about subscribers in the country where the LESO is located.
17	Telephone call booking	This code may be used via some LESOs to book telephone calls, although normally it is used via the telex service.
20	Access to a maritime PAD	This code is used when using a voice-band data modem to access a maritime packet assembly/disassembly (PAD) facility in a packet switched public data network (PSDN). The PAD is accessed via telephone circuits and two additional digits indicating the required data rate should follow the prefix 20.
23	Abbreviated dialling (short code selection)	This code is used by some LESOs to allow Inmarsat-A equipped subscribers to use abbreviated dialling codes for their regularly dialled numbers.
28	Internet access	This code is used by some LESOs to allow Inmarsat-A/B/M/mini-M to access the Internet. The terminals must generally first be registered with the LESO before this service can be used.
31	Maritime enquiries	This code may be used for special enquiries such as ship location, authorisation, etc.
32	Medical advice	Use this code to obtain medical advice. Some LESOs have direct connections with local hospitals for use with this code.

Table D-4 - *Two-digit access code for telephone services*

Two-digit Code	Service	Remarks
33	Technical assistance	Use this code if you are having technical problems with your Inmarsat terminal. Technical staff at the LESO should be able to assist you.
34	Person-to-person call	Use this code to contact the operator for a person-to-person call.
35	Collect call	Use this code to contact the operator for a collect call (charge payable by the recipient of the call).
36	Credit card call	Use this code to charge a telephone call to a credit or charge card.
37	Time and duration	This code should be dialled at the start of a call instead of Code 00 for an automatic call. With this service, the MES operator is advised of the time and duration of the call being set up, either by a telephone call back from the LESO or, more usually, by a short telex message giving the time and duration of the call. (Note that Code 37 cannot work with a second IMN on Inmarsat-A or an Inmarsat-M/mini-M MES, as there is no associated telex line).
38	Medical assistance	This code should be used if the condition of an ill or injured person on board the vessel requires urgent evacuation ashore or the services of a doctor aboard the vessel. This code will ensure that the call is routed to the appropriate agency or authority ashore to deal with the situation.
39	Maritime assistance	This code should be used to obtain maritime assistance if the vessel requires assistance or a tow or has encountered oil pollution, etc.
41	Meteorological reports	This code should be used by weather-observing vessels to send their observations. In most cases where this service is available the service is free of charge to the vessel, the National Weather Authority paying the relevant charges.
42	Navigational hazards and warnings	This code provides a connection to a navigational office for transmission of information from the vessel about any hazards which could endanger the safety of navigation (e.g. wrecks, derelicts, floating obstructions, defective radio beacons or light vessels, icebergs, floating mines etc.).
43	Ship position reports	This code provides a connection to an appropriate national or international centre collecting ship movement information for search and rescue (or other) purposes e.g. AMVER or AUSREP, etc.

Table D-4 *(contd.) - Two-digit code telephone services*

Two-digit code	Service	Remarks
6(x)	Administration specialised use	For use by administrations for specialised use. Often used for leased lines, etc. The 'x' digit following the 6 is allocated on a national basis and is usually not used for the same service/leased line for more than one LESO.
70	Databases	The LESO will normally use this code, if it is available, to allow automatic access to its information retrieval database.
91	Automatic line test	This code should be used to obtain test levels and tones when setting up a modem or voice-band data equipment.
92	Commissioning tests	This code should be used when a vessel is ready to commence its Inmarsat-A commissioning tests. The code should be used for this purpose only and then solely via the LESO through which the commissioning has been arranged.

Appendix J: Glossary

AA (accounting authority): The organisation named on a commissioning application form to administer the billing and settlement of the communication charges incurred by an MES.

AAIC (accounting authority identification code): An unique code assigned by the ITU to identify an accounting authority.

AMVER (Automated Mutual-assistance Vessel Rescue system): A vessel position-reporting system operated by the United States Coast Guard for any merchant vessel of 1000grt or more on a voyage lasting longer than 24 hours, to and from anywhere on the world.

Analogue: Any signal which represents a changing value over time.

Answerback: An identifier given to an Inmarsat MES and used in message transmissions. The format must be four letters (A-Z; no numbers) finishing with an x.

AOR-E: Atlantic Ocean Region (East).

AOR-W: Atlantic Ocean Region (West).

Applicant: The person who completes and signs a maritime commissioning application form when applying to have an Inmarsat MES commissioned. The applicant must submit the form to the national routing organisation for the country where the vessel is registered.

ARQ (automatic request repeat): The error correction process used in store-and-forward messaging by which a receiver checks for errors in received data packets and requests the sending end to re-transmit any packets which were received containing an error.

ASCII (American Standard Code for Information Interchange): A standard alphanumeric character set based on 7-bit codes.

AUSREP: A vessel position-reporting system similar to AMVER, but operated by the Australian Authorities.

BBER: Bulletin Board Error Rate.

Bit: The basic unit of digital communications; may be either 1 or 0.

Bit Error Rate (BER): used as a measure of the quality of reception by the MES of the Bulletin Board of a TDM Channel.

BPS (bits per second): A unit of measurement for speed of data transfer or throughput.

Bulletin Board (in a TDM channel): A data packet transmitted in each frame of a TDM channel which contains information about the status of the Inmarsat-B/M, mini-M and C network configurations and the current frame number, used by the MES as a timing reference.

Bulletin Board Service (BBS): A notice board on which information can be exchanged or posted for others to download.

Byte: One byte comprises eight bits and may represent either one alphanumeric character or numeric information.

CAG: Customer Activation Group.

Case-approval: The official approval given by Inmarsat to an MES model which is typically still undergoing development by a manufacturer so as to permit the model to access an Inmarsat communications system. See also type-approval.

CCITT (Comité Consultatif International Télégraphique et Téléphonique): An advisory committee to the International Telecommunication Union (ITU). The CCITT publishes standards and recommendations to enable telecommunications systems and equipment world-wide to communicate with each other. Examples of CCITT standards are the X.25 and X.400 protocols used on PSDN land-lines.

Channel number: The number representing the frequency of an Inmarsat communications channel.

Character: One element of an alphanumeric character set. One character is equivalent to one byte or 8 bits.

Class 1 Inmarsat-C MES: A Class 1 MES is capable of ship-to-shore and shore-to-ship message transfer and distress alerting, but is not capable of receiving EGC messages.

Class 2 Inmarsat-C MES: A Class 2 MES is capable of two modes of operation (selected by the operator):

- As Class 1, and also capable of receiving EGC messages when not engaged in Inmarsat-C traffic.
- Ready for EGC message reception exclusively (and not available in that mode for Inmarsat-C message transfer).

Class 3 Inmarsat-C MES: A Class 3 MES has two independent receivers, one for receiving two-way Inmarsat-C messages, the other for receiving EGC messages.

Closed network: A private network, with access limited to registered users. The Inmarsat-C system allows two types of closed networks: data reporting networks, identified by a Data Reporting Network Identification (DNID) code, and EGC FleetNET™ networks, identified by an EGC Network Identification (ENID) code.

Commissioning: The process by which an MES is registered for use via the Inmarsat network.

Companded: A method of transmission, meaning 'compressed/expanded', which is used to improve signal-to-noise ratio. At the sending end, a 'compressor' electronic circuit amplifies low-level signals and reduces high levels to a mean level according to an algorithm. At the receiving end, an 'expander' circuit uses similar methods to return the signal levels to their original values before passing them on to other circuits. See also *uncompanded*.

COSPAS-SARSAT: A satellite-based distress beacon locating system.

Coverage area: See footprint.

CSS: Co-ordinator Surface Search.

Data report (programmed unreserved, P): A short collection of data (up to 32 bytes in three packets) which is transmitted by an MES at random times in unreserved time slots of a signalling channel after receipt of a polling command from an operational centre.

Data report (reserved, R): A small amount of data (up to 32 bytes in three packets) which is transmitted by an MES in reserved times slots in a signalling channel, in response to an earlier polling command from an operational centre.

Data report (unreserved, U): A small amount of data (up to 32 bytes in three packets) which is transmitted in unreserved time slots of a signalling channel by an MES to an operational centre.

Data services: This is how a terminal may send and receive electronic messages such as e-mail.

DCE: Data circuit terminating equipment: a component part of an Inmarsat-C MES. An MES contains a DCE receiver and a DCE transmitter which are used for communication between the MES and an Inmarsat-C LES.

DECCA Navigator: A position-fixing system, based on chains of shore-based radio transmissions.

DHSD: Duplex high-speed data (see HSD).

Differential GPS: A global positioning system used with Inmarsat terminals and based on GPS satellites, with accuracy enhanced by the use of transmission of differential corrections from suitably located shore-based radio beacons.

Digital: A signal which represents values in the form of binary numbers.

Distress alerting: A facility available on all maritime MESs, enabling the MES to send distress priority messages through the Inmarsat system to a rescue co-ordination centre (RCC). This is not available on the Inmarsat-mini-M network.

Distress priority message: This is a message prepared and sent with distress priority using the Inmarsat system to a rescue co-ordination centre (RCC).

DMG: Distress Message Generator.

DNIC: Data Network Identification Code.

DNID: Data reporting Network Identification code. See data report (unreserved), data report (reserved) and data report (pre-assigned).

Downloading: The process by which an Inmarsat-C MES receives information from a service provider. For data reporting purposes, an operational centre downloads a DNID code and Member Number to the MES. In the EGC FleetNET™ service, an information provider downloads an EGC Network Identification (ENID) code to an MES.

DTE (data terminal equipment): a component part of an Inmarsat-C MES, used primarily for storage and interfacing external devices (such as a keyboard or monitor). For other Inmarsat systems, this can be a computer connected to the MES for use for data communications.

Duplex: The ability of a communications channel to transmit data simultaneously in both directions. Also known as Full Duplex.

EGC: The EGC (Enhanced Group Call) services provided in the Inmarsat-C system are EGC SafetyNET™, EGC FleetNET™ and Inmarsat system messages.

EIRP: Effective Isotropically Radiated Power, a measure of transmitted power.

E-mail: Electronic mail: a global message-handling system whereby subscribers to commercial e-mail services can exchange electronic messages and data files between computers. E-mail services are provided by some service providers and private organisations. Access to e-mail services may be via PSTN, PSDN networks or the Internet.

ENID: EGC network identification (ENID) code.

EPIRB: Emergency position-indicating radio beacon.

ESAS: Electronic Service Activation System.

Fax: Abbreviation for 'facsimile', a device used to transmit a copy of an original document. The Inmarsat-A, B/M and mini-M systems support two-way fax transmissions. The Inmarsat-C system is able to send only text messages (no graphics) to a fax terminal in the ship-to-shore direction. It is only possible to send text messages (no graphics) in the shore-to-ship direction by using a third party fax bureau.

Fax bureau service: A service offered by some private organisations and service providers to send and receive fax messages.

FleetNET™: A service provided by FleetNET™ information providers to distribute commercial information to MESs belonging to a FleetNET™ group, identified by an unique ENID code.

Footprint (of a satellite): The area on the Earth's surface (sea or land) covered by the satellite and where an antenna can obtain line-of-sight communications. In the Inmarsat systems, this area is also known as the ocean region or coverage area.

Gateway: An interface between communications systems such as the Inmarsat-C system and the national and international telecommunications networks.

Glonass: A global positioning system similar to GPS but using satellites of the former Soviet Union.

GMDSS: The Global Maritime Distress and Safety

System: the Inmarsat-A/B and C systems are the only Inmarsat networks included in the GMDSS by the IMO International Maritime Organisation.

Gold Franc (GF): A nominal currency used by LESs and accounting authorities to calculate communication charges incurred by an MES. A fixed rate of exchange exists between the GF and the nominal currency the SDR: 1 SDR = 3.061 GF.

GPS (Global Positioning System): System which provides the geographic location of a vessel. This service uses American military satellites which have been made available for civilian use.

Ground segment: The network of LESs which provide a link between the space segment and the terrestrial telecommunication networks.

HSD: High-speed data. This service allows for data to be transferred at data rates of up to 64kbit/s.

IA5: International Alphabet 5 - a standard alpha- numeric character set, also known as ASCII, based on 7-bit codes. Supports both upper and lower case characters.

IHO: International Hydrographic Organisation.

IMN (Inmarsat Mobile Number): The number assigned by the national routing organisation to an Inmarsat MES as its identity number. An Inmarsat-A maritime IMN has the format **1xxxxxx**; an Inmarsat-B maritime IMN has the format **3xxxxxxxxx**; an Inmarsat-C maritime IMN has the format **4xxxxxxxxx**; an Inmarsat-M maritime IMN has the format **6xxxxxxxxx**; and an Inmarsat-mini-M maritime IMN has the format **76xxxxxxxx**.

IMO: International Maritime Organisation.

Information provider: An organisation which provides MSI messages for broadcasting to MESs via the EGC SafetyNET™ service, which can be received by vessels fitted with an EGC receiver.

Inmarsat: The operator of global mobile satellite communications, part of the Inmarsat Ventures Ltd group of companies.

Inmarsat-A: The original Inmarsat system, which has been operating since 1982, based on analogue techniques and capable of global two-way telephony, facsimile, data and telex communications.

Inmarsat-B: An Inmarsat system based on digital technology, and capable of high quality telephony, facsimile, data and telex services.

Inmarsat-C: A digital system based on a low-cost MES with low power consumption. This system provides global two-way store-and-forward messaging, distress alerting, EGC SafetyNET™ and FleetNET™, data reporting and polling.

Inmarsat-E: A distress alerting system based on EPIRBs.

Inmarsat-M: Introduced in 1993, based on digital technology and capable of two-way voice telephony, distress alerting, fax and data services at lower data rates.

Inmarsat mini-M: Introduced in 1995, based on digital technology and capable of two-way voice telephony, alerting, fax and data services. Operates only in the reduced coverage offered by the spot beams

Inter-station Signalling Links (ISLs): These signalling channels are used between an NCS and the LESs in its ocean region to pass system information around the system.

Internet: An international network of computers linked to enable information to be exchanged.

IOR: Indian Ocean Region.

ISDN, Integrated Service Digital Network: A high capacity digital line which lets users send voice and data at 64kbit/s over one telephone line from a common network interface.

ISP (Inmarsat Service provider): An entity which establishes a contract with one or more of the SPs to bill, promote and retail the services of the contracted SPs to end users. It can be an alternative to an AA.

ITA2 (International Telegraph Alphabet 2): A standard alphanumeric character set, generally used for sending messages on the international telex networks. The character set is based on 5-bit codes, also known as telex format, or 5-bit packed.

ITU: The International Telecommunication Union, which publishes a list of approved accounting authorities. See also CCITT.

JASREP: A vessel position-reporting system similar to AMVER, but operated by the Japanese authorities.

Kbytes: 1024 bits or 128 characters.

LAN (Local Area Network): A network which allows computers and printers to communicate with each other, have access to and share expensive peripherals such as fax servers, modem servers and centralised databases.

Land earth station (LES): The name used in the Inmarsat network for a shore-based receiving and transmitting station which acts as an interface between MESs and the terrestrial communications networks. LESs are owned and operated by service providers.

LES TDM channel: A TDM channel used by an LES to transmit system information and data addressed to an MES.

Log in: The action performed on an Inmarsat-C MES to inform the NCS in an ocean region that the MES is available for communications.

Log out: The action performed on an Inmarsat-C MES to inform the NCS in an ocean region that the MES is not available for communication.

LORAN-C: A position-fixing system, based on chains of shore-based, low-frequency radio transmissions.

MEM: Macro-encoded message.

Member number: The number downloaded with a DNID to an MES, when the MES is registered to a data-reporting network.

MES (mobile earth station): The generic name used to describe an Inmarsat-approved terminal which is

allowed to access the network, and applicable to both maritime and land mobile communications.

Message channel: A channel assigned by the NCS for an MES to send a message through an LES to its required destination.

METAREA: Meteorological area corresponding to the NAVAREAs defined by the IMO.

MMSI (Maritime Mobile System Identity): A nine-digit format assigned by the maritime authority to identify a vessel. The first three digits are the code of the country where the vessel is registered as defined by the ITU.

Modem: MODulator/DEModulator, a device used to transmit digital data, by converting (modulating) a digital signal into an analogue form and re-converting (demodulating) the analogue signal into digital form at the receiving end.

MSI (Maritime Safety Information): Information supplied by shore-based information providers and forwarded to an Inmarsat-C LES for broadcasting over the Inmarsat-C system to MESs fitted with an EGC receive capability.

Multi-channel MES: An MES which is capable of making more than one call at a time. Most MESs are only single channel.

NAVAREA: One of 16 areas of sea as defined by the IMO, into which the world's oceans are divided for the dissemination of navigational and meteorological warnings. See also METAREA.

NAVTEX: The low-frequency system developed by the IMO for the broadcast and automatic reception of coastal MSI by means of direct-printing telegraphy.

NCS: An Inmarsat network co-ordination station; a specially equipped LES appointed as the NCS for each Inmarsat system and ocean region, which monitors and co-ordinates the operation of all of the MESs and SPs within that ocean region.

NCS Common Signalling Channel: Also known as the NCS Common Channel. A TDM channel used by the NCS to transmit system information and message announcements to MESs.

Network: A group of communication channels which enable the sharing of information and resources between several users.

NOC: Network Operations Centre, located at Inmarsat's headquarters in London, which monitors and controls the operation of the Inmarsat network.

NUA: Network user address.

Ocean region: The coverage area of an Inmarsat satellite within which an MES may send and receive messages.

Omega: A position-fixing system based on chains of shore-based, very-low frequency radio transmissions.

Omni-directional antenna: An antenna which is capable of line-of-sight communication with a satellite without requiring any pointing. Generally used on an Inmarsat-C MES.

Operational centre: A shore-based centre for controlling a data-reporting network. The operational centre initially downloads a DNID code and member number to an MES which joins the group. The centre subsequently sends polling commands to instruct selected MESs to return pre-assigned data reports or to perform a defined task such as SCADA. The centre also receives unreserved data reports from MESs belonging to the closed network.

Operator-assisted services: Communications services provided by some service providers, for example forwarding a text message from an MES as a voice message to a shore-based telephone.

Option 1 stand-alone EGC receiver: A type of stand-alone EGC receiver which can receive only EGC messages and cannot engage in non-EGC message transfer.

Option 2 stand-alone EGC receiver: This type of stand-alone EGC receiver may be added to the antenna of an Inmarsat-A or B MES so that the vessel may meet its GMDSS requirements.

Packet: An 'envelope' or block of data sent over a network; each packet contains addressing information as well as the data being sent.

Polling: The facility whereby an operational centre sends an instruction (a polling command) to selected MESs to perform a defined task, such as returning a pre-assigned data report or performing a SCADA operation.

POR: Pacific Ocean Region.

Presentation code: A code included in a transmission (ship-to-shore or shore-to-ship), indicating to the recipient the presentation or formatting of the data contained in the message.

Protocol: A defined set of communications standards which lay down the parameters to which all users must abide. Protocols in general use are X.25 and X.400.

PSA: Point of Service Activation.

PSDN: Packet Switched Data Network.

PSTN: Public Switched Telephone Network.

PVT: Performance Verification Test; used to test the performance of Inmarsat-C.

RCC: Rescue co-ordination centre.

SafetyNET™: This service is provided by SafetyNET™ information providers to distribute MSI to MESs fitted with an EGC receive capability.

SAR: Search-and-rescue.

SART: Search and Rescue Radar Transponder.

SCADA: Supervisory Control and Data Acquisition.

SCC: Satellite control centre.

SDR (Special Drawing Right): A nominal currency used by service providers and accounting authorities to calculate communication charges incurred by an MES.

A fixed rate of exchange exists between the SDR and the nominal currency of the GF: 1 SDR = 3.061 GF.

Service provider (SP): A company or organisation which operates an LES.

Signalling channel (MES - LES): A random access TDMA channel, used by an MES to transmit signalling information and data to an LES.

Signalling channels (MES - NCS): A random access TDMA channel, used by an MES to transmit signalling information and data to an NCS.

SIM (Subscriber Identity Module) card: Used with Inmarsat mini-M, SIM cards are easily installed and removed, allowing one terminal to be used by multiple users without having complex billing arrangements.

Simplex: The ability of a communication channel to carry communication traffic in one direction only.

SOLAS: Safety of Life at Sea.

Space segment: Consists of the communications satellites operated by Inmarsat.

Special access code: A destination address code used in a ship-to-shore or shore-to-ship message to access a special service provided by a service provider. The two-digit codes are examples of special access codes.

Spot beam: A concentrated area offering coverage within the global footprint for particular regions in the world.

Store-and-forward messaging: The protocol used by the Inmarsat-C system to transfer text or data messages in data packets to receiving equipment.

System message: A message originated by Inmarsat containing information relevant to the Inmarsat system, broadcast on the NCS Common Channel and received by all MESs.

TCP / IP (Transmission control protocol / Internet protocol): The set of protocols used to communicate via the Internet and between multiple networks.

TDM (Time division multiplex): The process by which multiple signals can share the same communication channel, each using a different time slot.

TDM channel: The Inmarsat system uses different TDM channels, each transmitted on an unique frequency. The TDM channels are used for system control and message transfer to MESs. See LES TDM Channel and NCS Common Channel.

TDMA (Time Division Multiple Access): The process by which MESs communicate with an LES or NCS.

TNID: Terrestrial Network Identity.

Terrestrial telecommunication networks: The national and international telephone, telex and data networks with which the service providers interface to route calls to and from MESs via the space segment.

Time slot: Basic unit into which one time frame of a TDM channel is divided.

Type-approval: The official approval given by Inmarsat to an MES model produced by an independent manufacturer when the MES meets the technical standards defined by Inmarsat. Only models which have been granted type-approval (or case-approval) are permitted to operate via the Inmarsat network.

Uncompanded: A method of transmission which does not use companding techniques and is used for data and fax transmission on the Inmarsat-A network. See *companded*.

UTC (Universal Co-ordinated Time): A term which, for practical purposes, has the same meaning as Greenwich Mean Time (GMT).

Value-added service (VAS) provider: A private organisation which provides services such as weather forecasting to vessels using Inmarsat and other networks.

Video conferencing: Video and audio communication between two or more people via a videocodec (coder/decoder) at either end and linked by digital circuits.

WAN (Wide Area Network): A network which connects users over large distances, often crossing geographical boundaries.

WMO: World Meteorological Organisation.

X.25: The communications protocol used on the national and international PSDN networks to exchange digital data between devices attached to the network.

X.400: A message-handling protocol used to exchange electronic mail (e-mail) messages around the world. Able to use the X.25 (PSDN) networks.

Two-digit codes: Special examples of Special Access Codes. See Tables D-1 and D-4, Appendix D.

5-bit packed (also known as telex format or ITA2): A format based on 5-bit codes used for sending alpha-numeric characters to and from telex terminals.

7-bit ASCII: A format based on 7-bit codes used for sending the alphanumeric characters of the ASCII character set.

8-bit data: A format based on 8-bit codes used for encoding information such as text, national character sets and numerical information.