Chapter 2

Inmarsat distress and safety services

Contents

Page

Figure

Table

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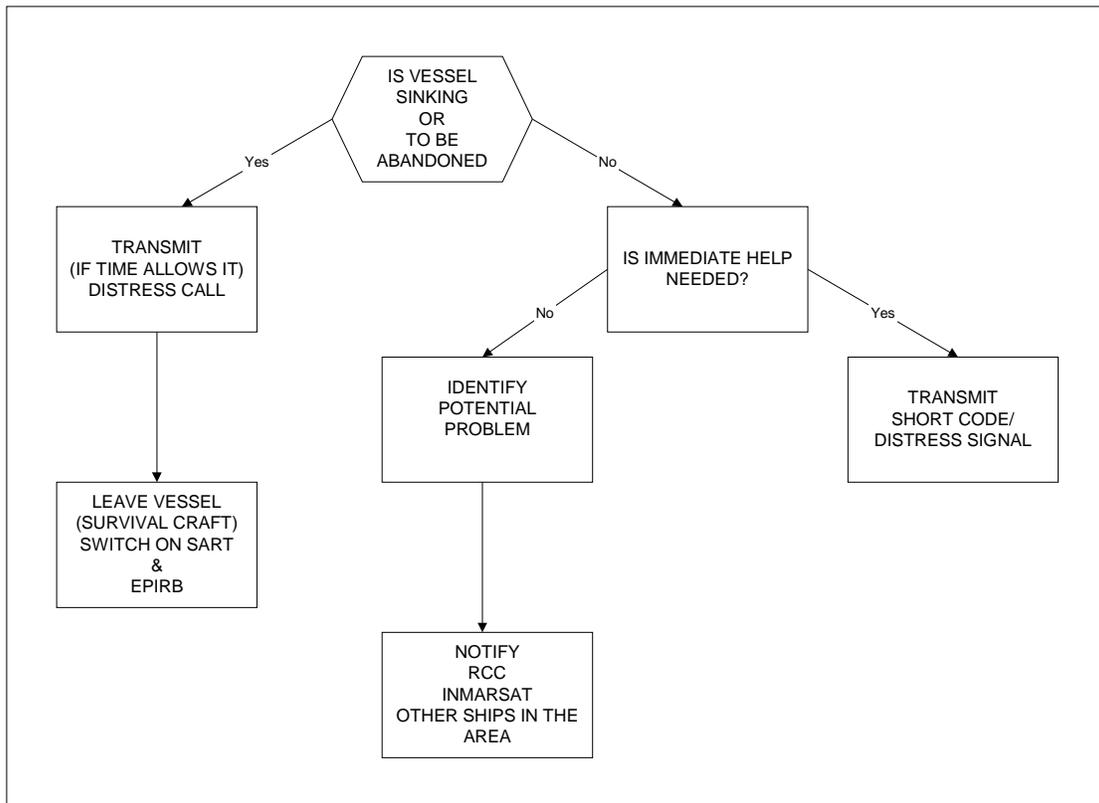
Figure 2-1   GMDSS operating guidance for masters of ships in distress situations

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^{TM} 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^{TM} 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^{TM}

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^TM 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^TM service. (See Paragraph 6.4 in Chapter 6 for more information on the SafetyNET^TM 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^TM 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.