



# INMARSAT MARITIME DESIGN & INSTALLATION GUIDELINES (DIGS)

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## 1. MARITIME DESIGN AND INSTALLATION GUIDELINES

### 1.1. Introduction

- 1.1.1. Mandatory and optional specifications for all Inmarsat equipment installed onboard SOLAS ships are defined in the appropriate System Definition Manuals (SDMs) or Technical Requirements Document (TRD) for the relevant Inmarsat system. The SDMs and TRDs are published by Inmarsat Ltd. to ensure that ship earth stations will perform adequately and not endanger the integrity of the Inmarsat system.
- 1.1.2. The “Design and Installation Guidelines” provide general information on the design and installation of Inmarsat equipment operating within the Global Maritime Distress and Safety System (GMDSS).

### 1.2. GMDSS Standards

- 1.2.1. The following International Electrotechnical Commission (IEC) standards and International Maritime Organization (IMO) documents are relevant to the operation of ship earth stations within the GMDSS:

Authority	Doc	Description	Date
IMO	A.694(17)	General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids	November 1991
IMO	A.701(17)	Carriage of Inmarsat enhanced group call SafetyNET receivers under the global maritime distress and safety system (GMDSS)	
IMO	A.807(19)	Performance standards for INMARSAT-C ship earth stations capable of transmitting and receiving direct-printing communications (Amended by MSC.68(68))	November 1995
IMO	A.808(19)	Performance standards for ship earth stations capable of two-way communications	November 1995
IMO	A.813(19)	General requirements for electromagnetic compatibility (EMC) for all electrical and electronic ship's equipment	November 1995
IMO	A.814(19)	Guidelines for the avoidance of false distress calls	November 1995
IMO	A.886(21)	Procedure for the adoption of, and amendments to, performance standards and technical specifications	November 1999
IMO	A.1001(25)	Criteria for the provision of mobile satellite communication systems in the global maritime distress and safety system (GMDSS) [Replaces A.888(21)]	November 2007
IMO	MSC Circ.862	Clarification of certain requirements in IMO performance standards for GMDSS equipment	May 1998
IMO	MSC.68(68)	Amendments to performance standards for shipborne radiocommunications equipment	June 1997
IMO	MSC.129(75)	Maritime Safety and Safety related radiocommunications	May 2002
IMO	MSC.130(75)	Performance standards for Inmarsat ship earth stations capable of two-way communications	May 2002
<b>IMO</b>	MSC.434(98)	PERFORMANCE STANDARDS FOR A SHIP EARTH STATION FOR USE IN THE GMDSS	
<b>IMO</b>	MSC.306(87)	Revised Performance Standards for Enhanced Group Call (EGC) Equipment	May 2010

Table 1 Relevant IEC and IMO Documents

### 1.3. GMDSS Requirements

- 1.3.1. The IMO documents listed in paragraph 1.2 form the basis for both International and national GMDSS requirements for Inmarsat equipment, which are required to comply with the carriage requirements of Chapter IV and V of the SOLAS Convention.
- 1.3.2. The IEC documents listed in the introduction of this document are used to perform national and international type-testing requirements and often form the basis for national type approval requirements.
- 1.3.3. IEC type approval ensures compliance with the requirements stated within the relevant IEC and IMO documents and Inmarsat type approval ensures that the equipment is safe to use over the space segment.
- 1.3.4. Inmarsat type approval and service activation are mandatory requirements before access to any part of the Inmarsat system is granted.
- 1.3.5. Environmental testing of the equipment is mandatory in the Inmarsat system definition manuals for each equipment and approval testing requires compliance with the specifications contained in the relevant IEC and IMO documents.
- 1.3.6. Requirements and specifications for the testing and operation of the GMDSS aspects of relevant Inmarsat equipment shall be in accordance with the relevant IMO and IEC documents.

### 1.4. Glossary of key terms

Abbreviation	Description
ADE	Above Decks Equipment
ALC	Automatic level control
BDE	Below Decks Equipment
CES	Coast Earth Station
DIGs	Design and Installation Guidelines
EGC	Enhanced Group Call (Inmarsat C)
ELT	Emergency Locator Transmitter
EPIRB	Emergency Position Indicating Radio Beacon
FB	FleetBroadband satellite equipment
Fleet Safety	GMDSS equipment formed of FleetBroadband and a Maritime Safety Terminal
GMDSS	Global Maritime Distress and Safety System
grp	Glass reinforced plastic
HF	High Frequency
IEC	International Electrotechnical Commission
IHO	International Hydrographic Office
IMO	International Maritime Organization
IMSO	International Mobile Satellite Organization
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication sector
ITU-T	ITU Telecommunication Standardisation Sector
LCD	Liquid Crystal Display

LES	Land Earth Station
MES	Mobile Earth Station
MF	Medium Frequency
MRCC	Maritime Rescue Co-ordination Centre
MSC	Maritime Safety Committee (IMO)
MSI	Maritime Safety Information
MST	Maritime Safety Terminal forming part of Fleet Safety
NCS	Network Co-ordination Station (Inmarsat)
NOC	Network Operations Centre (Inmarsat)
Radome	Protective housing for satellite terminal antenna, usually made from grp
RCC	Rescue Co-ordination Centre
RF	Radio Frequency
RR	Radio Regulations
SafetyNET	Service used to promulgate MSI using Inmarsat C
SAR	Search and Rescue
SART	Search and Rescue Transponder
SDM	System Definition Manual
SES	Ship Earth Station
SOLAS	International Convention for the Safety of Life at Sea, 1974, as amended
TRD	Technical Requirements Document
VDU	Visual Display Unit
VHF	Very High Frequency
W/m <sup>2</sup>	Watts per square metre (a measurement of radiated power)
WMO	World Meteorological Organization
WWNWS	World Wide Navigational Warning System

Table 2 Glossary of terms

## 2. TECHNICAL REQUIREMENTS

2.1. The Mobile Earth Station equipment shall be type-approved by Inmarsat Ltd. and should comply with the environmental conditions specified in the Inmarsat Technical Requirements and, where applicable, IEC 60945. Operational and performance requirements should be tested in accordance with the appropriate IEC standards.

2.2. Equipment, which:

.1 forms part of the global maritime distress and safety system; or

.2 is required by regulation V/12 of the 1974 SOLAS Convention as amended and other electronic navigational aids, where appropriate;

Should comply with **all** applicable requirements and performance standards adopted by the International Maritime Organization (IMO).

The ship earth station installation capable of two-way radiocommunications should comply with the general requirements set out in resolutions A.694(17), MSC.306(87), A.807(19), MSC434(98), A.813(19), MSC.191(79),

- 2.3. Where the equipment provides a facility additional to the requirements for compliance with the Global Maritime and Safety System (GMDSS) function for which the equipment is being used, the operation of such an additional facility shall not prevent the equipment from complying with the functional requirements of the GMDSS.

### 3. OPERATION

- 3.1. The number of operational controls, their design and manner of function, location, arrangement and size should provide for simple effective ergonomic operation. The controls should be arranged in a manner that minimises the risk of inadvertent operation.
- 3.2. All operational controls shall permit normal adjustments to be performed easily and should be easy to identify from the position from which the equipment is normally operated. Controls not required for normal operation should not be readily accessible.
- 3.3. The design of the equipment shall be such that any misuse of the controls shall not cause damage to the equipment or chance of injury to personnel.
- 3.4. No operator control on the equipment shall be able to alter the mobile earth station identity.
- 3.5. Where a digital input panel with the digits “0” to “9” is provided, the digits should be arranged to conform to ITU-T E.161 – Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network.  
However where an alphanumeric keyboard layout, as used on office equipment or data processing equipment, is provided the keyboard may be arranged in accordance with ISO Standard 3791 –1976.
- 3.6. It shall be possible to initiate and make distress alerts and/or distress calls from the position at which the vessel is normally navigated and from any other position designated for distress alerting. In addition, where a room or compartment is provided for radio communications, means to initiate distress alerts and calls should be fitted in that room.
- 3.7. A distress alert should be activated only by means of a dedicated button. This button should not be a key of an ITU-T digital input panel or an ISO keyboard provided on the equipment.

Clarification of certain requirements in IMO performance standards for GMDSS equipment is contained in IMO MSC/Circular.862 dated May 1998; see the following quoted extracts.

> *Dedicated Distress Button*

*“A dedicated distress button should not be a key of an ITU-T input panel or an ISO keyboard associated with the equipment and should be physically separated from functional buttons/keys used for normal operation. This button should be a single button for no other purpose than to initiate a distress alert.”*

> *Clearly identified*

*“The distress button should be red in colour and marked “DISTRESS”. Where a non-transparent protective lid or cover is used, it should also be marked “DISTRESS”.”*

> *Protected against inadvertent activation*

*“The required protection of the distress button should consist of a spring loaded lid or cover permanently attached to the equipment by e.g. hinges. It should not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button.*

*The operation of the distress button should generate a visible and audible indication. The distress button should be kept pressed for at least 3 seconds. A flashing light and an intermittent acoustic signal should start immediately. After 3 seconds the transmission of the distress alert is initiated and the indication should become steady.”*

> *At least two independent actions*

*“Lifting of the protective cover or lid is considered the first action. Pressing the distress button as specified above is considered as the second independent action.”*

> *Interrupting the distress alert at any time*

*“It should be possible to interrupt the repetitive transmissions of distress messages. Such operation should not interrupt the transmission of a distress alert or distress message in progress but should prevent repetitive transmissions of a distress message.”*

3.8. Adequate illumination should be provided within the equipment or in the area where the equipment is situated in order to enable the identification of controls and facilitate the reading of indicators at all times. Where appropriate, means should be provided for dimming the output of any equipment light source that is capable of interfering with navigation.

3.9. Where no other means of receiving distress urgency and safety broadcasts or an addressed distress alert relay are provided, and existing levels of aural signals from the equipment or its peripherals are considered inadequate, the equipment should be configured to actuate an aural/visual alarm of an appropriate level.

3.10. If a unit of equipment is connected to one or more other units of equipment, the performance of each should be maintained.

## 4. POWER SUPPLY

- 4.1. The ship earth station should normally be powered from the ship's main source of electrical energy. In addition, it should be possible to operate the ship earth station and all equipment necessary for its normal functioning, from an alternative source of electrical energy.
- 4.2. If provision is made for operating the equipment from more than one source of electrical energy, arrangements for rapidly changing from one source to the other should be provided, but not necessarily incorporated within the equipment.
- 4.3. Changing from one source of supply to another or any interruption of up to 60 seconds duration of the supply of electrical energy should not require the equipment to be manually re-initialized, should not result in loss of received communications stored in the memory and should not render the equipment inoperative when power is restored.
- 4.4. The equipment should continue to operate in accordance with these guidelines in the presence of variations of power supply normally to be expected in a vessel.
- 4.5. Means should be incorporated for the protection of the equipment from the effects of excessive current, voltage, transients and accidental reversal of power supply polarity.

## 5. INTERFERENCE AND COMPATIBILITY

- 5.1. All reasonable and practicable steps should be taken to ensure electromagnetic compatibility between the equipment concerned and other radio communication and navigational equipment carried on board in compliance with the relevant requirements of the 1974 SOLAS Convention (as amended). (Please refer to IEC standards 60533 and 60945).
- 5.2. Mechanical noise from equipment should be limited so as not to prejudice the hearing of any sounds on which the safe operation of the vessel may depend.
- 5.3. Each unit of equipment normally to be installed within the vicinity of a standard or steering magnetic compass should be clearly marked with the minimum safe distance at which it may be mounted from such compasses.

## 6. SAFETY PRECAUTIONS

- 6.1. All steps should be taken to ensure that electromagnetic radio frequency energy radiated from the equipment shall not be a hazard to personnel.
- 6.2. As far as is practicable, accidental access to dangerous voltages should be prevented. All parts and wiring in which the direct or alternating voltages or both (other than radio frequency voltages) combine to give a peak voltage greater than 55 volts should be protected against accidental access and should be isolated automatically from all sources of electrical energy when the protective covers are removed. Alternatively, the equipment should be so constructed that access to such voltages may only be gained after having used a tool for this purpose, such as a spanner or screwdriver, and warning labels should be prominently displayed both within the equipment and on protective covers.



- 6.3. Means should be provided for earthing exposed metallic parts of the equipment but this should not cause any terminal of the source of electrical energy to be earthed.
- 6.4. Radio frequency signals at high radiation levels may be hazardous to health. Since safety regulations may vary from country to country and the actual field distribution around the antenna may be different for the various antenna designs, a single value for the Safe distance to the antenna cannot be standardised.
- 6.5. Equipment containing elements which are likely to cause X-radiation should comply with the following requirements:
  - .1 external X-radiation from the equipment in its normal working condition should not exceed the limits laid down by the Administration concerned;
  - .2 when X-radiation can be generated inside the equipment above the levels laid down by the Administration, a prominent warning should be fixed inside the equipment. The precautions to be taken when working on the equipment should be included in the equipment manual; and
  - .3 if malfunction of any part of the equipment can cause an increase in X-radiation, adequate advice should be included in the information about the equipment. It should warn of the circumstances that could cause the increase and state the precautions that should be taken.
- 6.6. Provision should be made for protecting the equipment from excessive rise of temperature due to failure in any cooling system associated with the equipment. Means may be provided for reducing the level of acoustic alarms. It should not be possible to disable any acoustic alarm.

## 7. MAINTENANCE

- 7.1. The equipment should be so designed that the main units can be replaced readily, without elaborate recalibration or readjustment.
- 7.2. Equipment should be so constructed and installed that it is readily accessible for inspection and maintenance purposes.
- 7.3. Adequate information should be provided to enable the equipment to be properly operated and maintained:
  - .1 in the case of equipment so designed that fault diagnosis and repair is practicable down to component level, it should include full circuit diagrams, component layouts and a components parts list; and
  - .2 in the case of equipment containing complex modules in which fault diagnosis and repair down to component level is not practicable, it should contain sufficient information to enable a defective complex module to be located, identified and replaced.

The requirements of .1 above should be met in respect of other modules and those discrete components which do not form part of modules.

## 8. MARKING AND IDENTIFICATION

- 8.1. Each unit of the equipment should be externally marked with the following information, which should be clearly visible in the normal installed position:
- .1 identification of the manufacturer;
  - .2 equipment type/number or model identification under which it was type tested; and
  - .3 serial number of the unit
  - .4 optionally, software version
- 8.2. The power supply or supplies from which the equipment is intended to operate should be clearly indicated
- 8.3. A label displaying the distances from the antenna which result in radiation levels of 100 W/m<sup>2</sup>, 25 W/m<sup>2</sup>, 10 W/m<sup>2</sup> and preferably 5 W/m<sup>2</sup> should be attached to or nearby the antenna system and should be clearly visible in the normal operating position. Warning labels should be installed at appropriate locations so as to warn personnel against entering a hazardous area.

## 9. DURABILITY AND RESISTANCE TO ENVIRONMENTAL CONDITIONS

- 9.1. Equipment should be capable of continuous operation under the conditions of various sea states, ship's motion, vibration, humidity and temperature likely to be experienced in ships.
- 9.2. The ship earth station equipment and facilities should be capable of operating satisfactorily in a marine environment. All metal surfaces including cabinets, racks, panels or enclosures should be resistant to or suitably treated against corrosion.

## 10. INSTALLATION

Equipment should be installed in such a manner that it can operate in accordance with these Guidelines.

## 11. CONSTRUCTION

- 11.1. In all respects, the mechanical and electrical design, construction and the finish of the equipment should conform to good standards of engineering practice, particularly with regard to reliability and safety. The equipment should be suitable for use on board ships at sea (IEC Publication 60092-101 Electrical Installations in Ships: Definitions and general requirements)
- 11.2. In view of possible operation of Inmarsat ship earth stations in ports while loading and unloading hazardous fuels or gases, the use of components that may, under normal operating conditions, produce arcs or sparks (motors using brushes, encapsulated relays, switches) or produce excessive heat (electric heaters) should be avoided. Where such equipment is included in the Above Deck

Equipment, clear reference to this fact should be included in the manufacturer's description.

## 12. TESTING

- 12.1. The equipment should be designed with attention to equipment reliability, ease of testing and maintenance.
- 12.2. It would be advantageous if the design were to include self-diagnostic facilities with measuring points and indicators for efficient fault finding.
- 12.3. The equipment should be tested in accordance with the relevant International Electrotechnical Commission standards (see 1.2, page 4).

## 13. ANTENNA/ABOVE DECK EQUIPMENT (ADE)

- 13.1. For specific siting of different antennas/above deck equipment please refer to the relevant Annex.
- 13.2. Avoid siting the ADE at the following locations:
  - .1 At the same level as other antennas (e.g. radar, GPS, other MESs)
  - .2 Where ship's personnel may be exposed to hazardous radiation;
  - .3 close to the funnel or other locations which are subject to excessive pollution, since contamination of the ADE may result in signal degradation;
  - .4 where the antenna may be exposed to excessive temperatures;
  - .5 where the antenna may be subject to excessive vibration and shock. Avoid in particular locations affected by vibrations induced by the main engine/propeller whilst at sea.
- 13.3. The above-deck equipment should be separated, as far as is practicable, from the antennae of other communication and navigation equipment.
- 13.4. Particular directions, which result in obstruction of the main beam of the antenna, should be recorded and retained within the ship. This will enable a prediction of particular ship's locations and headings where degradation in performance may be expected.
- 13.5. The strength of the antenna mounting should be sufficient to withstand:
  - .1 the joint weight of the ADE and a covering of ice and snow; and
  - .2 the bending moment caused by the maximum values of pitch, roll and wind pressure that could be expected (taking a gust factor into account)
- 13.6. If a pedestal mount is used, it should be designed to minimise any vibration. Resonant frequencies near to those of the ADE should be avoided. Manufacturers are urged to provide such information to enable this requirement to be met.

High pedestals should be provided with platforms or steps for easy access and a guard rail for the safety of service personnel.

Pedestals should preferably leave a clearance of about 70 cm or more between the base of the ADE and the installation deck or platform for easy access. Where this is not the case, access should be possible through the platform or deck above which the ADE is mounted.

- 13.7. The ADE should be provided with a safe and easy means of access for maintenance. Where a pedestal mount is provided, it must provide for:
- .1 routing of cables; and
  - .2 safe access to the ADE for maintenance

If possible, access to the ADE should open inwards. This is to avoid accidents, e.g. falling tools. It is also recommended that provision be made for the connection of a working lamp to the main power supply in the ADE.

At sea, any unsecured door or hatch constitutes a hazard, since it will be subject to violent motions in rough weather. Access hatches should be capable of being secured both in the open and closed condition.

The atmosphere within the ADE may become contaminated by gases and fumes from funnel exhausts or cargo spaces. Care is necessary when entering and working within the ADE to avoid the risk of asphyxiation.

Care should be taken to avoid accidental activation of the transmitter or antenna steering system whilst personnel are within the hazardous zone of the ADE, if activation poses a threat to their safety.

- 13.8. Means should be provided to enable metal components and structures within the ADE to be earthed to the vessel's hull.

## 14. CONTACT INFORMATION

All queries about this document should be addressed to:

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## ANNEX A – SYSTEM GUIDELINES FOR INMARSAT SHIP EARTH STATIONS (SES)

### A.1 INTRODUCTION

- A.1.1. The ship earth station installation capable of two-way radiocommunications should comply with the general requirements set out in resolutions A.694(17), MSC.434(98) A.813(19), MSC.191(79), MSC.306(87)
- A.1.2. Where a unit of equipment provides a facility which is additional to the minimum requirements of this Recommendation, the operation and, as far as is reasonably practicable, the malfunction of such additional facility should not degrade the performance of the equipment's GMDSS functions.
- A.1.3. Mobile Earth Station equipment shall be of a type approved by Inmarsat Ltd. and should comply with the environmental conditions specified in the Inmarsat System Definition Manual (SDM) for Inmarsat C and Fleet Safety, where applicable, IEC 60945. Operational and performance requirements should be tested in accordance with IEC 61097-4.
- A.1.4. The EGC equipment should be capable of producing a printed copy of received information. Received EGC messages may be stored for later printing with an indication to the operator that the message has been received. Alternatively, the equipment need not provide means to produce a printed copy of received information if it is installed in combination with an interface connecting it to navigation equipment that is compliant with resolution MSC.252(83), as amended, on Revised Performance standards for integrated navigation systems. Provisions for interconnection to a shipborne integrated radiocommunication system (IRCS) when used in the GMDSS (resolution A.811(19)) should also be included." The EGC installation may be either separate or combined with other installations.

### A2 TECHNICAL REQUIREMENTS

- A2.1 The ship earth station should operate using a recognized mobile-satellite service and meet the functional requirements of resolution A.1001(25). The ship earth station should comply with the technical standard provided by the recognized mobile-satellite service provider and be certified by this provider for operation in the GMDSS, in order to ensure operational reliability.
- A2.2 The ship earth station should comply with ITU Radio Regulations.
- A2.3 The ship earth station should be capable of automatically recognizing the priority of ship-to-ship, ship-to-shore and shore-to-ship communications and should process them in accordance with the message priority defined by the ITU Radio Regulations. The order of processing these communications should be:
- distress;
  - urgency;
  - safety; and

- other communications.

A2.4 The ship earth station should provide a specific visual indication when unable to detect or otherwise make contact with the satellites of the mobile-satellite system for a period of one minute or more, as referred to in the appendix.

### A3 OPERATION

A3.1 The equipment should provide a visual indication that the ship's position has not been updated during the last 12 h. It should only be possible to reset this indication by revalidating the ship's position.

A3.2 Means should be provided to enter the ship's position and current and planned NAVAREA/METAREA codes manually so that area group calls can be received. Means should also be provided to enter current and planned coastal warning service coverage areas and different classes of messages. Optionally, the ship's position, as determined by the navigational equipment, may be entered automatically and the NAVAREA/METAREA code automatically derived therefrom.

A3.2.1 Facilities should be provided for the ship earth station to receive maritime safety information (MSI) for the NAVAREA/METAREA and the coastal warning areas and different classes of messages:

- where the ship is sailing and 300 NM beyond the limits of the NAVAREA/METAREA;
- for the planned voyage; and
- for a fixed position.

Additional means should be provided to filter received MSI based on NAVAREA/METAREA and the coastal warning area codes and different classes of messages.

A3.3 Provision should be made for a specific aural alarm and visual indication at the position from which the ship is normally navigated, to indicate receipt of a distress or urgency priority EGC message. It should not be possible to disable this alarm and it should only be possible to reset it manually and only from the position where the message is displayed or printed.

A3.4 The equipment should indicate when it is not correctly tuned or synchronized to the EGC carrier.

A3.5 Any message should be printed regardless of the character error rate of its reception. The equipment should print a low line mark if a character is received corrupted.

- A3.6 Acceptance or rejection of service codes should be under the operator's control except that equipment should always receive navigational warnings, meteorological warnings and forecasts, search and rescue information and shore-to-ship distress alerts, which are directed to a fixed or absolute geographical area within which the ship is operating.
- A3.6.1 The station should be able to receive and filter distress relay and urgency messages in accordance with area defined within the EGC message and the ship's position.
- A3.7 Means should be provided to prevent the re-printing of a message once it has been received without error.
- A3.8 The printing device should be capable of printing at least the standard International Alphabet Number 5 (IA5) character set or International Reference Alphabet (IRA). Other character sets are optionally used according to ISO 2022 standards or ITU-T Recommendations T.50.
- A3.9 The printing device should be able to print at least 40 characters per line.
- A3.10 The signal processor and printing device should ensure that if a word cannot be accommodated in full on one line, it should be transferred to the next line. The printing device should automatically feed five lines after completing the printed messages
- A3.10.1 Any messages should be displayed or printed regardless of the character error rate of its reception. The equipment should use an asterisk (the "\*" character) or a low line (the "\_" character) if a corrupted character is received
- A3.11 A local audible alarm should be sounded to give advanced warning of the printing device "paper low" condition. It should not be possible to confuse the sound of the "paper low" alarm with that of the distress or urgency alarm caused by the reception of a distress or urgency priority message.
- A3.12 Facilities should be provided to automatically update the ship's position and the time at which the position was determined from a suitable electronic position-fixing aid which may be an integral part of the equipment. For equipment which does not have an integral electronic position-fixing aid, such facilities should include a suitable interface conforming to the appropriate international standard.
- A3.12.1 If a dedicated display device or a connection to a navigation system is used, it should meet the general requirements of the Organization for such devices<sup>5</sup> and the following additional requirements:
- the capability of showing at least 16 lines by 40 characters, with a non-volatile memory of at least 255 messages of 1,023 characters;

- an indication of newly received unsuppressed messages should be immediately displayed until acknowledged, as referred to in the appendix; and
- the design and size of the display device should be such that displayed information is easily read under all conditions, by observers at normal working distances and viewing angles.

A3.13 The primary HMI should provide all functions necessary to carry out all communication procedures including those required by the GMDSS.

A3.14 No control external to the equipment should be available for alteration of the ship station identity.

A3.15 It should be possible to initiate transmission of distress alerts/calls at any time. It should be possible to initiate transmission of distress alert/calls whilst the ship earth station is transmitting lower priority communications, and whilst it is receiving communications of any priority, if necessary by pre-emption of those communications.

A3.16 It should be possible to initiate and make distress alerts/calls from the position at which the ship is normally navigated. The equipment should include an option making it possible to initiate transmission of distress alerts/calls at a position remote from the primary HMI of the equipment.

A3.17 The HMI should include a dedicated distress button that has no other function than activating distress transmissions.

A3.18 A distress alert/call should be activated only using a dedicated distress button (a physical button, not a touchscreen button). The dedicated distress button should not be any key of a digital input panel or a keyboard provided on the equipment. The distress button should be clearly identified and protected against inadvertent activation, requiring at least two independent actions. Lifting of the protective lid or cover is considered as the first action. Pressing the distress button as specified above is considered as the second independent action.

A3.19 The distress button should be red in colour and marked "DISTRESS". Where a non-transparent protective lid or cover is used, it should also be red in colour and marked "DISTRESS".

A3.20 The required protection of the distress button should consist of a spring-loaded lid or cover permanently attached to the equipment by, e.g. hinges. It should not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button.

A3.21 The equipment should indicate the status of the distress alert/call. The operation of the distress button should generate a visible and audible indication. The distress



button should be kept pressed for at least 3 seconds. A flashing light and an intermittent audible signal should start immediately. After the transmission of the distress alert/call is initiated, the visual indication should become steady and the audible signal should cease.

- A3.22 The equipment should automatically initiate repetitive initial distress alerts/calls, which are repeated until cancelled on the ship or until appropriately acknowledged. It should be possible to interrupt repetitive initial distress alerts/calls. Such operation should not interrupt the transmission of a distress alert/call in progress but should prevent repetitive transmissions of a distress alert/call.
- A3.23 The distress alert should contain identification of the station in distress, its position and the time of the position fix.
- A3.24 The equipment should be capable of transmitting and receiving subsequent distress communication.
- A3.25 After initiating a false distress alert/call, it should be possible to send a cancellation of the alert/call. This cancellation should not be initiated by cutting the power supply to the ship earth station nor by the operator switching the ship earth station off.
- A3.26 It should be possible to test the distress capability of the ship earth station without initiating a distress alert/call.
- A3.27 It should be possible for the ship earth station to receive distress, urgency and safety priority alerts/calls whilst it is being used for communications of a lower priority than that being received.
- A3.28 Provision should be made for an audible signal and visual indication at the position from which the ship is normally navigated, to indicate receipt of a distress or urgency enhanced group call message. It should not be possible to disable this indication and it should only be possible to reset it manually and only from the position where the message is displayed or printed. The audible signals for distress, urgency and their acknowledgements should be continuously repeated until manually terminated.
- A3.29 For the presentation of received distress and urgency alerts/calls and received EGC communications intended as text to be read, the equipment should include or interface to either:
- an integrated printing device; or
  - a dedicated display device, printer output port and a non-volatile message memory; or
  - a connection to a navigation system and a non-volatile message memory.

A3.30 The audible signals should be activated in relation to:

- distress alert/calls or distress relay alert/calls; and
- urgency calls and messages.

A3.31 To enable updating of the position:

- the status of the position update should be visible to the operator (e.g. offline, manual or automatic);
- if position data is being updated automatically, a caution should be raised if no update has been performed for a period of 10 minutes, as referred to in the appendix. The caution should be removed by receiving new position data;
- the equipment should have facilities for manually entering the ship's position and the time of the position fix;
- if the ship's manually-set position is older than 4 hours, a caution should be raised, as referred to in the appendix. The caution should be removed by inputting or receiving new position data; and
- if the ship's position is older than 24 hours, the position is clearly identified with the date and time of the fix in UTC for distress alerting purposes.

## A4 POWER SUPPLY

A4.1 The ship earth station including enhanced group call equipment should normally be powered from the ship's main source of supply of electrical energy. In addition, it should be possible to operate the ship earth station, the enhanced group call receiver and all equipment necessary for its normal functioning from an alternative source of energy.

A4.2 Changing from one source of supply to another or any interruption of up to 60 s duration of the supply of electrical energy should not require the equipment to be manually re-initialised and should not result in loss of received messages stored in the memory and should not render the equipment inoperative when power is restored.

## A5 ANTENNA SITING / RADIO FREQUENCY RADIATION HAZARDS

A5.1 An omni-directional antenna for ship earth stations should, if practicable, and for EGC receivers it is desirable that the antenna be sited in such a position that no obstacle likely to degrade significantly the performance of the equipment appears in the fore and aft directions down to  $-5$  degrees and in the port and starboard directions down to  $-15$  degrees, as shown in Figure 1.

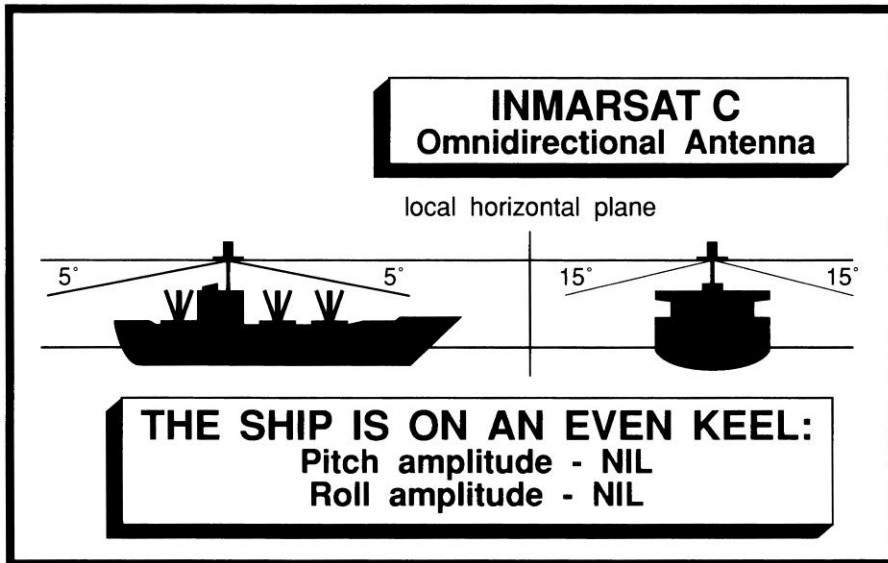


Figure 1 Above Deck equipment/Antenna Location Inmarsat C

- A5.2 For omni-directional antennas, objects, especially those within 1 metre of the antenna, which cause a shadow sector of greater than 2 degrees, are likely to degrade significantly the performance of the equipment.
- A5.3 For specific guidance on specific antennas including siting and separation, manufacturer's antenna installation manuals should be consulted along with this document.
- A5.4 Where a stabilized directive antenna is used, it is desirable that the antenna be sited in such a position that no obstacle likely to degrade significantly the performance of the equipment appears in any azimuth down to  $-5^{\circ}$
- A5.5 A warning of potential radiation hazards should be displayed in appropriate locations. A label should be attached external to a radome or antenna indicating the distances at which radiation levels of  $100 \text{ W/m}^2$ ,  $25 \text{ W/m}^2$  and  $10 \text{ W/m}^2$  exist. These distances should be noted in the user manual.
- A5.6 In case of multiple ship earth stations operating on adjacent frequency bands, the antenna should be installed such as to ensure electromagnetic compatibility.

## A6 INTERFACES

- A6.1 The equipment should include at least one interface for the transfer of received data to other navigation display or integrated communications equipment.
- A6.2 The equipment should include an interface for alert management in accordance with resolution MSC.302(87) on Performance standards for bridge alert management.

- A6.3 All interfaces provided for communication with other navigation or communication equipment should comply with the relevant international standards (Including IEC standards 61162)
- A6.4 The equipment should meet the requirements for Bridge Alert Management (BAM) system. Equipment interfaces should comply with recognized international standards. Where the ship earth station is part of an Integrated Communication System (ICS), Integrated Navigation System (INS), Integrated Bridge System (IBS) or connected to a navigation system, this should not impair any of the GMDSS functions of these systems or the ship earth station itself (Resolutions A.811(19), MSC.252(83) and MSC.302(87); guideline SN.1/Circ.288; international standards IEC 62940, IEC 61924-2 and IEC 62923).
- A6.5 The ship earth station should provide an interface from which data from Enhanced Group Call (EGC) communications, including Maritime Safety Information (MSI), can be provided to navigation display systems, in accordance with recognized international standards.
- A6.6 The ship earth station should provide either an integral electronic position fixing equipment or have an interface for position updating conforming to the recognized international standards.
- A6.7 The ship earth station should provide an interface in accordance with recognized international standards to report a ship's identifier and location data from a received distress alert relay to navigation display systems in order to enable graphical display and possible linking to available target information.

## A7 CROSS REFERENCES

- A7.1 IMO Resolution A.694(17) "General Requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids as applicable to Inmarsat C.

IMO A.694(17)	Inmarsat GMDSS Terminals	IMO A.694(17)	Inmarsat GMDSS Terminals
1.1	2.2	6.3	5.3
1.2	A1.2	7.1	6.2
2	10	7.2	6.3
3.1	3.1	7.3	6.1
3.2	3.2	7.4.1	6.5.1
3.3	3.8	7.4.2	6.5.2
3.4	3.3	7.4.3	6.5.3
3.5	3.10	8.1	7.1
3.6	3.5	8.2	7.2
4.1	4.4	8.3.1	7.3.1

4.2	4.5		8.3.2	7.3.2
4.3	4.2		9.1	8.1.1
5	9.1		9.2	8.1.2
6.1	5.1		9.3	8.1.3
6.2	5.2			

A7.2 IMO Resolution MSC.306(87) “REVISED PERFORMANCE STANDARDS FOR ENHANCED GROUP CALL (EGC) EQUIPMENT” as amended by MSC.431(98), applicable to EGC equipment installed on or after 1 July 2012

IMO MSC.306(87)	Inmarsat GMDSS Terminals
1.1	Annex A
1.2	A1.4
1.3	A1.4
1.4	A1.4
2	2.1
3.1	A3.1
3.2	A3.2
3.3	A3.3
3.4	A3.4
3.5	A3.5
3.6	A3.6
3.7	A3.7

IMO MSC.306(87)	Inmarsat GMDSS Terminals
3.8	A3.8
3.9	A3.9
3.10	A3.10
3.11	A3.11
4.1	A4.1
4.2	A4.2
5.1	A5.1
5.2	A5.4
5.3	A5.2
5.4	B2.1
6.1	A6.1
6.2	A6.2
6.3	A6.3

Note: For EGC equipment installed before 1 July 2012 refer to DIGs version 06

## ANNEX B – SYSTEM SPECIFIC GUIDELINES FOR INMARSAT FLEET SAFETY

### B1 SATELLITE COMMUNICATIONS ANTENNAS

B1.1 In general, satellite antennas should be located so that they have a 360° free view for the satellite at all times. In practice this can be difficult to achieve due to shadow sectors from nearby structures.

B1.2 For Fleet Safety (BGAN antenna) it is recommended that communication should be maintained with the satellite down to an elevation of minus 5° in the fore and aft direction and minus 15° in the port and starboard direction.

### B2 SATELLITE COMMUNICATION ANTENNA INSTALLATION

B2.1 The following guidelines should be observed in order to fulfil the above recommendations:

the antenna should be located at the top of the radar mast or on a pedestal, in the radar mast, or on the top deck so that:

- for directive antennas: shadows from constructions, especially within a distance of 10 metres, are maximum 6° and
- 
- for omnidirectional antennas: shadows from constructions, especially within a distance of 1 metre, are maximum 2°

B2.2 the antenna should be installed in a readily accessible location;

B2.3 the satellite antenna should not be located in an area where it can be damaged by heat and smoke;

B2.4 the satellite antenna should not be located on the same plane as the ship's radar antenna;

B2.5 the GNSS antenna should not be located close to or on the same plane as the Inmarsat antenna; and

B2.6 consideration should be given to installing the Inmarsat antenna on a suitable pedestal.

B2.7 the mast or pedestal should be constructed so that vibrations are reduced as much as possible.

### **B3 SAFE ANTENNA DISTANCES**

B3.1 The following "safe distance" from Inmarsat antennas to other antennas and to the compass are recommended:

- distance to the HF antenna should be more than 5 metres;
- distance to VHF antennas should be more than 4 metres; and
- distance to the magnetic compass should be more than 3 metres.

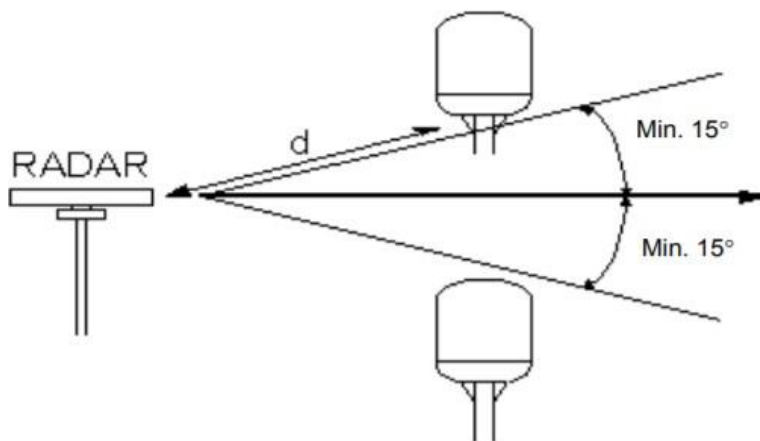
### **B4 FLEET SAFETY ANTENNA**

B4.1 Fleet Safety antennas are 2-axis stabilized BGAN antennas varying in size and throughput: FleetBroadband 150, FleetBroadband 250, FleetBroadband 500 and Fleet One.

B4.1.2 All FleetBroadband antennas rotate 360° and down to -25° in pitch and roll, to allow for continuous pointing even in heavy sea conditions. Any obstructions within this volume can cause signal degradation.

## B4.2 OBSTRUCTIONS

B4.2.1 The antenna should be mounted as far away as possible from the ship's radar and high-power radio transmitters (including other Inmarsat-based systems), because they may compromise the antenna performance. RF emission from radars might actually damage the antenna. Since a radar radiates a fan beam with a horizontal beam width of a few degrees and a vertical beam width of up to +/- 15°, the worst interference can be avoided by mounting the antenna at a different level, i.e. the antenna is installed minimum 15° above or below the radar antenna.



B4.2.2 The FleetBroadband antenna itself may also interfere with other radio systems. Other Inmarsat systems and GNSS receivers with poor frequency discrimination are especially vulnerable to the radiation generated by the FleetBroadband antennas.

## B4.3 ANTENNA CABLE

B4.3.1 A coaxial cable for connection between the antenna and terminal is delivered with the system. The manufacturer's specifications regarding total attenuation and maximum DC resistance (short-circuit in one end) should be complied with. The maximum allowed RF-loss in the antenna cable is 20 dB at 1660 MHz. This is to ensure the performance of the system.

## CROSS REFERENCES

IMO MSC.434(98)	Inmarsat Fleet Safety
1	2.2
2.1.1	A2.1
2.1.2	A2.2
2.2.1	A2.3
2.2.2	A2.4
2.3.1	A6.4
2.3.2	A6.5
2.3.3	A6.6
2.3.4	A6.7
3.1	A3.13
3.2	A3.14
3.3.1	A3.15
3.3.2	A3.16
3.3.3	A3.17
3.3.4	A3.18
3.3.5	A3.19
3.3.6	A3.20
3.3.7	A3.21
3.3.8	A3.22
3.3.9	A3.23
3.3.10	A3.24
3.3.11	A3.25
3.4	A3.26
3.5.1	A3.27
3.5.2	A3.28
3.5.3	A3.29

IMO MSC.434(98)	Inmarsat Fleet Safety
3.6.1	A3.30
3.6.2	2.2.
3.6.3	Appendix
3.7.1.1	A3.2.1
3.7.2	A3.6.1
3.7.3	A3.29
3.7.4	A3.12.1
3.7.5.1	A3.8
3.7.5.2	A3.9
3.7.5.3	A3.7
3.7.5.4	A3.10.1
3.7.5.5	A3.11
3.7.6	A6.4
3.8.1	A3.12
3.8.2	A3.31
4.1	4.1.
4.2	4.3
5.1	A5.1 / A5.3
5.2	A5.4 / A5.3
5.3	A5.4 / A5.3
5.4	A5.3
5.5	A5.3
5.6	A5.6
6	A5.5

## APPENDIX

BAM classification<sup>7</sup> of ship earth station warnings or cautions, as specified in these performance standards.

Cause	Alarm	Warning	Caution	Category A	Category B
No contact with satellites (referred to in paragraph 2.2.2)			X		X
Received distress communications (referred to in paragraph 3.6)		X		X	
Received urgency message (referred to in paragraph 3.6)		X		X	
Received safety message (referred to in paragraph 3.7.4.2)			X		X
Paper low (referred to in paragraph 3.7.5.5)			X		X
Loss of position (referred to in paragraph 3.8.2.2)			X		X
Manual position older than 4h (referred to in paragraph 3.8.2.4)			X		X