

THE GMDSS IMPLEMENTATION FOR NON-CONVENTION VESSELS

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Abstract

After full implementation of the GMDSS on February 1, 1999, non GMDSS equipped vessels may experience difficulty in establishing communications with vessels complying with the GMDSS. These difficulties are associated with the differences between the automated equipment required in the GMDSS and the non-automated equipment typically carried on small vessels. The purpose of this paper is to describe the IMO activities on the application of the GMDSS to non-SOLAS Convention ships both from a radiocommunication and a SAR point of view, and the national GMDSS implementation programme for non-SOLAS vessels. There are no differentiation between SOLAS ships and non-SOLAS vessels complying with the GMDSS, but they have to comply with the GMDSS according to the trading area A1, A2, A3 and A4. Canadian commercial vessels not subject to SOLAS, will be required to comply with the GMDSS. Carriage requirements are being developed in consultation with the marine industry. The vessels not subject to SOLAS will not be required to carry GMDSS equipment, however, it is recommended they fit for the GMDSS as applicable to their area of operation in many countries. Some recommendations are made to implement the GMDSS for non-SOLAS vessels in Korea

1 Introduction

What is GMDSS ?

The Global Maritime Distress and Safety System(GMDSS) is a new international system using improved terrestrial and satellite technology and ship-board radio systems. It ensures rapid alerting of shore based rescue and communications authorities in the event of an emergency. In addition, the systems alerts vessels in the immediate vicinity and provides improved means of locating survivors.

GMDSS was developed through the "International Maritime Organization" (IMO) and represents a significant change in the way maritime safety communications are conducted. It is mandatory for all ships subject to the "Safety of Life at Sea " (SOLAS) Convention (cargo ships >300 gross tons and passenger vessels, on international voyages), however, GMDSS will impact on all radio equipped vessels. The full international compliance date is February 1, 1999.

Why GMDSS ? - To save more Lives

The GMDSS was developed to modernize the current radiocommunications system and overcome many of its shortcomings. By utilizing improved satellite and digital selective calling (DSC) technology, it provides a more effective maritime communications system for distress and safety purposes. The GMDSS improves the current system by :

- o increasing the probability that an alert will be sent when a vessel is in distress
- o increasing the probability that the alert will be received
- o reducing the time spent searching in a distress
- o improving rescue communications and coordination
- o providing mariners with vital maritime safety information

GMDSS Equipment

DIGITAL SELECTIVE CALLING (DSC)

There is a change to the traditional marine radio (VHF/MF/HF) by the addition of a feature known as DSC. This enables vessels to maintain

the required listening watch, automatically, on distress and calling channels. A DSC receiver will only respond to the vessel's unique Maritime Mobile Service Identity (MMSI), similar to a telephone number, or an "All Ships" DSC call. Calls on DSC can be directed to individual radios using MMSI# or all DSC radios within range. Once contact has been made by DSC, follow-on communications take place by voice on another frequency.

SATELLITE COMMUNICATIONS

The INMARSAT satellite network provides global communications, except polar regions, for the GMDSS. In areas where no VHF or MF DSC shore facilities are provided, INMARSAT A, B or C terminals are used for ship-to-shore distress alerting and communications. INMARSAT provides an efficient means of routing distress alerts to Search and Rescue (SAR) authorities.

EMERGENCY POSITION INDICATING RADIO BEACONS (EPIRB)

GMDSS makes use of the 406 MHz COSPAS/SARSAT Satellite System which provides global detection of 406 MHz EPIRBs. These beacons are small, lightweight, portable, buoyant, and are an effective means of issuing a distress alert anywhere in the world.

SEARCH AND RESCUE TRANSPONDERS (SART)

SARTs are used to help locate survivors of distressed vessels, after the distress alert has been sent. They are meant to be detected by radar and operate in the same frequency range as radars carried onboard most vessels. When transmitting, they show up on the radar screen of a search craft as a series of dots, accurately indicating the position of the SART. Like EPIRBs, SARTs are portable and should be taken aboard the survival craft when abandoning.

NAVTEX

NAVTEX is an onboard receiver which automatically receives broadcasts of Maritime Safety Information (MSI) from shore authorities. It is a terrestrial radio system capable of receiving broadcasts up to about 400 nautical miles offshore.

Maritime Safety Information (MSI)

MSI comprises distress alerts, SAR information, navigational and weather warnings, and forecasts. For areas outside NAVTEX coverage, INMARSAT-C terminals receive Enhanced Group Call - SafetyNet broadcasts. Alternatively, HF Narrow Band Direct Printing (NBDP) receivers can be used where service is available.

2 IMO Activities for GMDSS Implementation

The Sub-Committee on Radiocommunications and Search and Rescue, at its first session (COMSAR 1), invited Member Governments to comment on the future application of the GMDSS to non-SOLAS Convention ships both from a radiocommunication and a SAR point of view (COMSAR 1/30, paragraph 6.3). IMO reminded Administrations of the necessity of prompt action to accelerate various actions necessary to achieve full implementation of the GMDSS by the scheduled 1 February 1999 date (COM/Circ. 121 of 14 February 1995).

According to the IMO's invitations and reminders, many member governments submitted papers on their activities.

United States of America has reported that they have decided to set up a National GMDSS Implementation Task Force composed of interested parties from both government and the private sector and drawn from various sectors of the maritime community.

The Task Force was formed in the summer of 1995 and these groups are as follows:

- GMDSS Training Task Group;
- Commercial Vessel Task Group;
- Recreational Vessel Task Group; and
- Service Agents and Manufacturers Task Group.

The Netherlands has submitted a paper to ask the attention of the Sub-Committee for the serious problems as experienced by the Netherlands Coast Guard Centre (RCC) from ships using cellular or other mobile telephones for maritime distress alerts. Since the number of distress alerts by cellular telephones is growing dramatically, the RCC

has experienced that realization of a special maritime emergency number to access the appropriate RCC is not sufficient to solve future problems. The growth of alerts by cellular telephones has already created a hardly to be managed additional workload during the yachting season and may frustrate the assistance in distress situations.

The Netherlands reconsidered the matter and after analyzing the current situation has come to the conclusion that further measures are necessary, in particular, in relation to the advent of future mobile satellite telephone systems with increased sea area coverage. The analysis and the involving measures which were taken, are as follows.

The Netherlands expects that after the full implementation date of the GMDSS pleasure craft will cease the use of appropriate maritime alerting systems in favour of cellular or other mobile telephone systems which do not appear to have any applications for SOLAS requirements.

The responsibility of the RCC's is not limited to SOLAS ships only, but extends to pleasure craft as well. The Netherlands had the intention to discontinue the listening watch on VHF Channel 16 after 1 February 1999 to encourage the participation of pleasure craft in the GMDSS. However, to modify the equipment or to purchase new appropriate maritime alerting systems will involve extra cost for pleasure craft owners. For this reason some categories of pleasure craft owners wish the continuation of the listening watch on VHF Channel 16. On the other hand one should bear in mind that any means of alerting can be used in distress situations such as the "old" VHF distress and calling frequency channel 16, and even the cellular or other mobile telephone systems.

Recognizing the number of disadvantages of the use of cellular or other mobile telephones for distress alerts, the Netherlands came to the conclusion that in this stage these telephone systems are no adequate means for co-ordination functions during SAR activities. Other measures has to be taken to discourage the use of these systems for distress alerts and to study the possible use of these systems in the future.

Besides the encouragement to install suitable marine radiocommunication equipment on non-Convention ships it is desirable that these ships do not

use cellular or mobile telephones for distress alerts. In contradiction to earlier decisions for this reason the Netherlands recently decided to choose for a less bad alternative and will continue the listening watch on VHF channel 16 for some years, to enable ships, already equipped with an "old" VHF installation, also to use the equipment after 1 February 1999.

Nevertheless the Netherlands will continue to stress via the media the disadvantages and dangers of using any other systems than those that from part of the GMDSS.

Australia has reported that the installation of EPIRBs on the non-Convention ships is one of the solution.

France and Norway have mentioned that ships less than 300 gross tons also participate to GMDSS according to their trading area.

The Netherlands and Germany mentioned that there is no discrepancy between the vessels subject to SOLAS and non-Convention ships.

The Sub-Committee (COMSAR 2) revised the draft MSC circular on Future implementation and the use of the GMDSS by non-Convention ships which the Committee is invited to approve for dissemination to Member Governments. The important points of the "GUIDELINES FOR THE PARTICIPATION OF NON-CONVENTION SHIPS IN THE GMDSS" are as follows.

(1) It should be noted that until the full implementation of the GMDSS on 1 February 1999, coast stations and Convention ships should maintain a continuous watch on the radiotelephone distress frequencies 2,182 kHz and 156.8 MHz, and maintain a capability to transmit the radiotelephone alarm signal on 2,182 kHz.

(2) The following functional requirements of the GMDSS are considered appropriate to allow effective participation of non-Convention ships in the GMDSS with respect to distress and safety communications :

- to provide safety for own ship ;
- performing ship-to-shore distress alerting ;

- transmitting ship-to-ship distress alerting ;
- transmitting and receiving on-scene communications including appropriate SAR co-ordinating communications ;
- transmitting locating signals.
- to assist other ships in distress :
- receiving shore-to-ship distress alerting; and
- receiving ship-to-ship distress alerting.

(3) If non-Convention ship carries voluntarily, for its own particular reasons, DSC equipment with a radiotelephone capability operating on GMDSS frequencies or an INMARSAT ship earth station (SES), such equipment can be utilized to perform most of the functions described above.

(4) The use of cellular telephone is not recommended as an alternative to marine radio telephones for distress and safety communications. Cellular telephones do not have an all stations capability to establish communications with nearby ships. Also, RCCs will be unable to call ships in the vicinity of a casualty. Furthermore, coverage limitations could well lead to a breakdown in communications in a distress situation.

(5) It is recommended that non-Convention ships operating in high sea areas should carry satellite EPIRB which could be free floating or manually activated.

(6) It is further recommended that non-Convention ships should carry equipment for general radiotelephone communications operating in radio systems appropriate to their areas of the ship is sailing.

(7) In performing the functional requirement of transmitting locating signals note should be taken that the 9 GHz SAR radar transponder will be the main means to fulfil this requirements in the GMDSS.

(8) Provision should be made for the reception of navigational warnings and meteorological forecasts and warnings and urgent safety information, depending on the area of operation and the services available in that area, e.g. NAVTEX, SafetyNet, radiotelephony, broadcasts.

(9) Ship Identities (MMSI, Call Sign, Serial Number, etc.) for non-Convention ships should be reported to the ITU and/or maintained in a registration database available on a 24-hour basis.

The Sub-Committee (COMSAR 2) also made "GUIDELINES ON THE DEVELOPMENT OF TRAINING MATERIALS FOR GMDSS OPERATORS ON NON-CONVENTION SHIPS". The main points of the Guidelines are as follows.

(1) The following guidance for the development of training materials for GMDSS operations is offered to :

- promote the development and availability of training materials for operators on ships not subject to SOLAS or other IMO Conventions using the GMDSS;
- encourage operators to use these materials to become familiar with GMDSS, proper operation of the relevant subsystems and means to avoid inadvertent activation of distress alerts; and
- encourage the use of existing materials developed for training operators aboard GMDSS ships as well as computer based training aids where available.

(2) In general, the manufacturer of radio equipment is best suited to develop effective general operating instructions for its own equipment. These are usually contained in an operating manual or technical manual packaged with the equipment.

(3) Manufacturer's representatives should, as necessary, help to provide the user with basic instruction (e.g. video showing, mock-up installation, etc.).

(4) Sailing clubs, coastguard auxiliary and other maritime volunteer organizations in co-operation with competent authorities should develop seminars on GMDSS subsystems as part of regularly scheduled events.

(5) Authorities responsible for maritime safety, search and rescue, and licensing of the GMDSS radio subsystems, should strongly advocate the following measures in order to preserve the integrity of the GMDSS and enhance its effectiveness in meeting the safety needs of non-Convention

ships :

(5.1) Promote the development of short, affordable, and easy to understand training materials, including videos, posters, short manuals and informations on detailed GMDSS training materials;

(5.2) Ensure, in-so-far-as-possible, that every operator of GMDSS subsystems has adequate training and skills for the proper use of the equipment by advocating suitable training, including competency testing, prior to use of the equipment.

(6) The equipments applicable to non-Convention commercial vessels and pleasure craft on domestic coastal voyages are Satellite EPIRBs, VHF-DSC and NAVTEX. And the equipments applicable to small commercial ships and pleasure craft operating on deep sea voyages are Inmarsat or other satellite SES, MF and HF DSC.

3 The Conference on the Safety of Fishing Vessels Operating in the East and South-East Asia Region

The Conference was held from 3 February to 6 February 1997 in Tokyo. Authorities of China, Hong Kong, Indonesia, Japan, Malaysia, the Philippine, the Republic of Korea and Thailand participated in the Conference and observer from IMO also attended.

The objective of the Conference was to establish the Guidelines for the Safety of Fishing Vessels of 24 metres and over but less than 45 metres in length Operating in the East and South-East Asia Region in compliance with the provisions of Article 3(5) of the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977.

As a result of its deliberation, the Conference :

- (1) established the **Guidelines for the Safety of Fishing Vessels of 24 Metres and over but less than 45 Metres in Length Operating in the East and South-East Asia Region; and**
- (2) adopted the **Declaration of the Conference on Safety of Fishing Vessels Operating in the East and South-East Asia Region.**

The Chapter 5 of the Guidelines is the Radiocommunications which apply to new and existing fishing vessels. The carriage requirements of radiocommunications on fishing vessels are summarized in the table.

SEA AREA		A1		A1+A2		A1+A2+A3				
Length of Vessel		24m ≤ L < 45m		24m ≤ L < 45m		L < 37m		37m ≤ L < 45m		
VHF Radio	DSC Alert (Ch.70)	X		X					X	X
	Telephone (Ch.6,13,16)	X		X					X	X
	DSC Watchkeeping (Ch.70)	X		X					X	X
MF Radio	DSC Alert (2187.5 kHz)			X					X	
	Telephone (2182 kHz, 1605-4000kHz)			X					X	
	DSC Watchkeeping (2187.5 kHz)			X					X	
MF/HF Radio	DSC Alert (1605-27500 kHz)							X		X
	Telephone (1605-27500 kHz)							X		X
	DSC Watchkeeping (2187.5-16804.5 kHz)							X		X
INMARSAT							X		X	
EPIRB	VHF (Ch.70)	X	X							
	Satellite (406 MHz)	X	X	X	X	X	X	X	X	X
MSI	NAVTEX or alternative	X	X	X	X	X	X	X	X	X
	EGC or HF-DP			X*	X*	X*	X*	X*	X	X
SART N=1		X	X	X	X	X	X	X	X	X
Domestic Radio			X		X	X				

X* : Required in the sea areas beyond NAVTEX (or alternative) coverage

3 Other Nation's Plan for GMDSS Implementation

3.1 Canadian Implementation Plan

SEA AREAS. In Canada, as a result of consultations with the Canadian marine industry, it has been decided to implement sea areas A1 on the east and west coasts. Outside of A1 will become A3 sea area. The Arctic will be A4 sea area. Canada will augment communications in the Arctic by HF DSC and NBDP services by February 1, 1999, at which time, sea area A4 will be declared. On the east and west coasts, VHF DSC implementation will begin in 1998 to cover the most trafficked areas. A1 sea areas will be declared as shore facilities are provided. Canada intends to have coverage on the two coasts, similar to today's coverage by 2002. At this time, sea areas are not being declared for the Great Lakes and St Lawrence River.

VESSEL COMPLIANCE. Carriage requirements for all SOLAS ships on international voyages have been determined by the IMO and must be complied with no later than February 1, 1999.

Canadian commercial vessels not subject to SOLAS, will be required to comply with the GMDSS. Carriage requirements are being developed in consultation with the marine industry through the Canadian Marine Advisory Council (CMAC).

Canadian pleasure craft will not be required to carry GMDSS equipment, however, it is recommended they fit for the GMDSS as applicable to their sea area of operation. For additional safety, vessels equipped with GPS or Loran-C are encouraged to connect this equipment to DSC and/or satellite communications equipment capable of transmitting a pre-formatted distress alert.

COMMUNICATIONS BETWEEN GMDSS AND NON-GMDSS VESSELS. After February 1, 1999, GMDSS ships will be maintaining an automated listening watch on VHF DSC ch 70 and MF DSC 2187.5 kHz. This creates the undesirable situation where vessels fitted with traditional radio equipment will be unable to alert or contact a GMDSS ch 16 by GMDSS ships is under review by the IMO, all vessels should fit VHF DSC as soon as practical to keep the transition period short.

**Proposed GMDSS Carriage Requirements for Domestic Voyages in
Sea Areas A1, A3 and A4**

Sea Areas	Cargo Ships ¹ ≥300t & Passenger Ships	Cargo Ships ¹ <300t - 24m (150t)	Cargo Ships ¹ 24 - 12m	Cargo Ships ¹ 12 - 8m
A1 or VHF	<ul style="list-style-type: none"> o VHF DSC o Class 1 EPIRB o 2-3 portable VHF² 	<ul style="list-style-type: none"> o VHF DSC o Class 1 EPIRB o 1 portable VHF⁶ 	<ul style="list-style-type: none"> o VHF DSC o Class 1 EPIRB⁸ 	<ul style="list-style-type: none"> o VHF DSC
A3	<ul style="list-style-type: none"> o A1 equipment o 1-2 SARTs³ o NAVTEX o either INMARSAT SES or regional sat service (INMARSAT EGC)⁵ 	<ul style="list-style-type: none"> o A1 equipment o SART o NAVTEX o either INMARSAT SES or regional sat service (INMARSAT EGC) 	<ul style="list-style-type: none"> o A1 equipment o NAVTEX o either INMARSAT SES or regional sat service (INMARSAT EGC) 	<ul style="list-style-type: none"> o A1 equipment+ Class1 EPIRB⁸ o NAVTEX o either INMARSAT SES or regional sat service (INMARSAT EGC)
A4	<ul style="list-style-type: none"> o A1 equipment o 1-2 SARTs o MF/HF DSC with NBDP 	<ul style="list-style-type: none"> o A1 equipment o SART o MF/HF DSC with NBDP 	<ul style="list-style-type: none"> o A1 equipment o MF/HF DSC with NBDP 	<ul style="list-style-type: none"> o A1 equipment o Class 1 EPIRB o MF/HF DSC with NBDP

1. A cargo ship is any ship which is not a passenger ship.
2. At least 3 portable VHF's on every passenger ship and every cargo ship ≥500t and at least 2 on every cargo ship <500t. The portable VHF requirements for ships operating solely on the Great Lakes has yet to be decided.
3. At least 2 SART's on every passenger ship and every cargo ship ≥500t and at least 1 on every cargo ship <500t.
4. Regional Satellite Service may be considered equivalent if voyage within footprint. Regional system may not have to meet all INMARSAT standards.
5. When voyage is outside NAVTEX coverage area.
6. Do not have to meet the IMO performance standards; however, they must be Industry Canada approved and stowed in a watertight container. Stowage yet to be addressed.
7. VHF Radiotelephone with minimal DSC capacity that meets adopted North American standards.
8. For ships < 20m, this requirements is dependent upon the successful resolution of the quality control issues.

MCTS CENTRES. In Canada, to help ease the transition to the GMDSS and bridge the communication gap between the two systems, the Canadian Coast Guard Marine Communications and Traffic Services Centres (MCTS) will continue to monitor VHF ch 16 and MF 2182 kHz, the distress and safety channels, past February 1, 1999. Once it is determined that these services are no longer required and low cost DSC is available, these listening watches will discontinue. VHF ch 16 and MF 2182 kHz will continue to be monitored at least until 2003 after Canada's sea areas have all been implemented and declared. To supplement the broadcasting of MSI within the GMDSS, MCTS Centres will continue safety broadcasts using the existing "continuous marine broadcast system".

RCC. Canadian RCCs and MRSCs will continue to receive distress alerts transmitted by vessels and relayed to the centre via MCTS or satellite.

The following table is the latest "Proposed Domestic GMDSS Carriage Requirements". This document is being updated and will be recirculated for discussion.

3.2 The United Kingdom Implementation Plan

INTRODUCTION. With the date for the final implementation of the GMDSS fast approaching for Convention ships, consideration has been given in the U.K. to the needs of non-Convention vessels and the ways in which they might join the GMDSS. The most populous class of non-Convention ships in the U.K. is leisure craft and so these were specifically targeted. Work began by publishing some articles in the yachting magazines which introduced many people to the GMDSS for the first time, and arranging demonstrations at the various Boat Shows in the U.K. which cater for leisure sailors.

VHF RADIO. Leisure sailors in Europe almost universally use VHF radio. There is also in Europe a growing amount of VHF DSC equipment being installed in coast stations to create A1 sea areas. The mainland European coast through Norway, Denmark, Germany, Netherlands, Belgium and France is now fitted and the U.K. will begin installing VHF DSC by fitting Channel 70 equipment in the Coastguard

stations this year for completion in 1999.

Enquiries made around the world indicated that the trend was towards the introduction of A1 sea areas and a gradual decline in the amount of manual channel 16 watchkeeping. The way to introduce GMDSS to the yachtman was therefore concluded to be through DSC and VHF radio.

MPT 1279. Starting from the basic outline a small group of interested parties including the Royal Yachting Association(RYA), the Royal Institute of Navigation(RIN), the Royal Lifeboat Institution(RLI), the Coastguard and manufacturers met with the Marine Safety Agency(MSA) and the Radiocommunications Agency to develop a new national standard for a voluntary fit VHF/DSC published as MPT 1279.

Recommended Radio Equipment

	Distance - Nautical Miles				
	Up to 5nm	Up to 30nm	Up to 60nm	Up to 150nm	Unrestricted Service
Hand held waterproofed VHF radio- also for use in liferaft	1	1	1	1	1
VHF fitted radio installation- fitted with DSC no later than 1 February 1999	None	1	1	1	1
406MHz float-free EPIRB with a121,5 MHz Homer	None	None	None	1	1
MF SSB radio telephone- fitted with DSC no later than 1 February 1999	None	None	None	1	1
INMARSAT	None	None	None	None	1
NAVTEX receiver	None	None	1	1	1
SART	None	None	None	1	1

4 Conclusions and Recommendation for GMDSS Implementation to non-Convention Vessels

PUBLISHING PAMPHLETS

The competent authorities, manufacturers and scholars try to publish bulletins and/or articles frequently in the relevant magazines which introduce the GMDSS, emphasize the necessity and benefits of the GMDSS and persuade them to participate with GMDSS system for their security.

Also the competent authority should publish some pamphlets to introduce the system and stress the necessity and benefits of the GMDSS system.

CONSTITUTION OF GMDSS IMPLEMENTATION WORKING GROUP

The competent authority should sponsor to establish a National GMDSS Implementation Working Group to facilitate the transition, to make guidelines for carriage requirements and recommend further actions. The Working Group should consist of all interested parties including the Maritime Safety Agency, the Radiocommunication Agency, the Coastguard, manufacturers, the relevant Associations and the representatives from the maritime communities.

The major tasks of the Working Group will be ;

- (1) Provide a forum for interested parties to consider all aspects of GMDSS implementation in the Nation and recommend action to appropriate authorities.
- (2) Institute a public relations program to inform all sectors of the maritime community on the impacts and benefits of GMDSS implementation and solicit feedback on GMDSS problems.
- (3) Maintain an overview of GMDSS training to encourage well trained GMDSS operators on compulsory vessels, indoctrinate operators of non-compulsory ships with an appropriate level of voluntary GMDSS information, and advocate programs to minimize false alerts in order to improve the effectiveness of SAR operations.
- (4) Establish liaison with equipment manufacturers and Government agencies to facilitate equipping of SOLAS vessels to meet GMDSS

standards and provide advice to non-SOLAS vessels desiring to use GMDSS systems on an even voluntary basis.

(5) Monitor implementation of GMDSS shore networks, vessel outfitting, and updating of official publications describing GMDSS facilities and procedures.

ESTABLISHMENT OF RECOMMENDED CARRIAGE REQUIREMENT

After February 1, 1999, GMDSS compliant ships will no longer be required to maintain a voice listening watch on channel 16 VHF or 2182 kHz MF. Considerable difficulty may be experienced in establishing communications between a GMDSS and non-GMDSS equipped vessel. Because no one on a GMDSS compliant vessel outside of certain area has to be specifically listening for voice calls, your call may go unanswered. This could lead to problems where contact is needed to avoid collision, or if help is needed from a ship in close proximity.

Therefore, the IMO and many Nations strongly encourage all vessels not required to participate in GMDSS to voluntarily carry selected GMDSS systems to enhance their safety. The primary systems would be a DSC-equipped marine radio suitable for the area of operations and the 406 MHz satellite EPIRB.

So, it is indispensable to make some guidelines of carriage requirement for non-Convention vessels. The guidelines could be made in the Working Group.

MANUFACTURING LOW-COST DSC EQUIPMENT

The low-cost versions of DSC equipment could expedite the participation of non-Convention ships with GMDSS systems. If marine radios have a DSC capability, then the problem of communications incompatibility between SOLAS and non-SOLAS vessels should mostly be resolved.

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