

PROMULGATION OF NAVIGATIONAL WARNINGS UNDER THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM

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Abstract

The Global Maritime Distress and Safety System (GMDSS), adopted in 1988, was developed under the auspices of the International Maritime Organization (IMO). The GMDSS will improve the dissemination and receipt of Maritime Safety Information (MSI) by vessels at sea and appropriate shore facilities equipped to render search and rescue coordination to shipping. Operational service of GMDSS began on 1 February 1992, with full implementation scheduled for 1 February 1999. Although there are seven basic categories of MSI within the GMDSS, this paper will focus on the promulgation of long range and coastal navigational warnings, which are coordinated through the International Hydrographic Organization (IHO).

INTRODUCTION

Navigational warnings are broadcast to offshore waters through an internationally coordinated World Wide Navigational Warning Service (WWNWS). The world ocean, excluding the Polar Seas, is divided into sixteen "NAVAREAs," each of which is assigned to a Coordinator. See Figure 1. The IHO Commission on the Promulgation of Radio Navigational Warnings (CPRNW), in coordination with the IMO, monitors and provides guidance on all WWNWS activities concerning the full implementation of the GMDSS. The membership of this Commission includes the NAVAREA Coordinators, several National Coordinators and ex-officio representation by the IMO, World Meteorological Organization (WMO) and the International Mobile Satellite (Inmarsat) Organization. The essence of this international cooperation is the promotion of safety of life at sea and to prevent disasters in all oceans.

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BACKGROUND

Until the early 1970's, most national systems for the transmission of radio navigational warnings covered only their own coastal waters. Some countries broadcast in English and their own language, while others broadcast only in their national language. Broadcasts were generally unscheduled and reception was restricted to vessels near the coasts. There was limited interchange of information between some countries; however, no formalized system of cooperation and coordination existed.

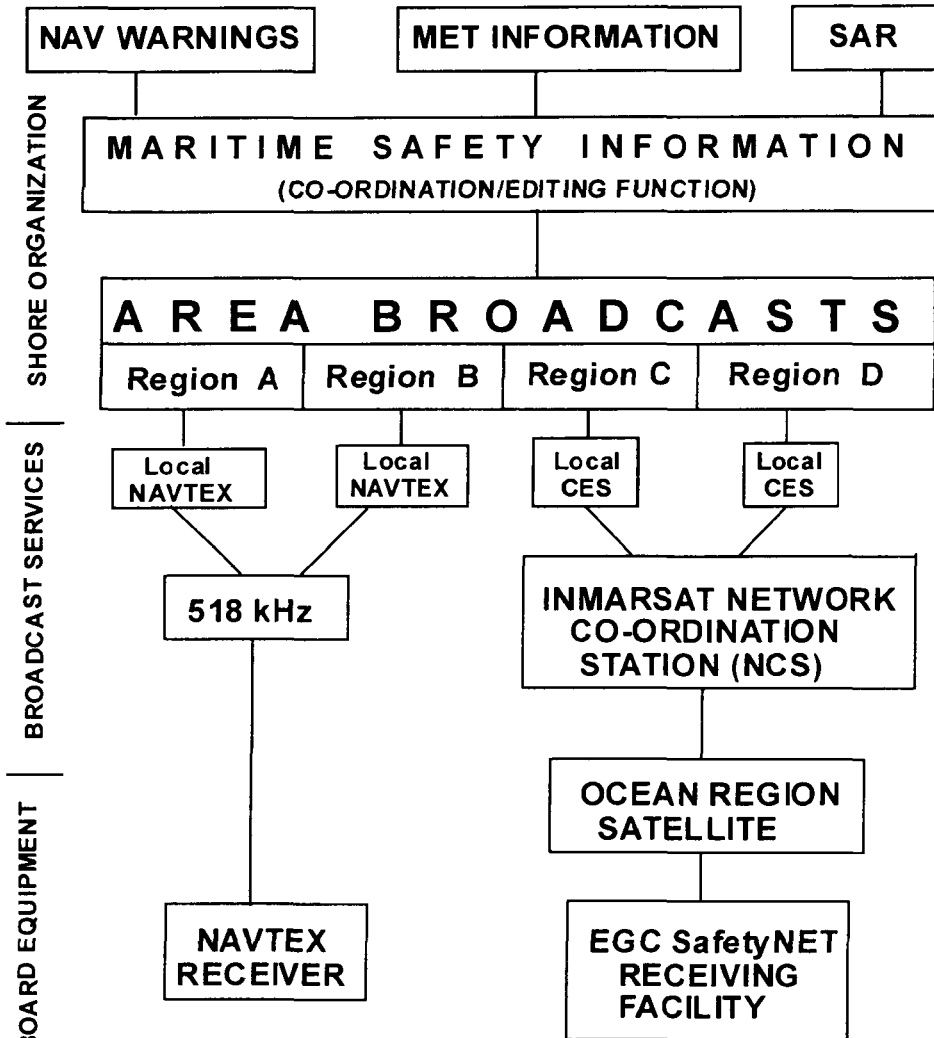
In addition to these coastal broadcasts, several national long range warning systems existed. These systems attempted to provide coverage over extensive ocean areas and to incorporate the more important coastal warnings issued by other countries in the area. Some examples are the Commonwealth's NAVSYS, now discontinued, and U.S. HYDROLANT/HYDROPAC navigational warnings' broadcasts. There remained, however, large areas of the world where little, or no, information was available.

The WWNWS was designed to minimize the redundancy of navigational warnings and standardize the formats and content of messages. It also sought efficiencies from new technology available at that time, such as Narrow Band Direct Printing (NBDP), although HF radiotelegraphy (Morse, hand copy) was the primary broadcast mode. HF NBDP or Radio Telex as it is more commonly known is a great improvement over Morse service, but it has inherent deficiencies such as propagation restrictions during solar activity. Clearly, the time had come for a new, modernized broadcast system.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM

The GMDSS was developed by the IMO to take advantage of modern communication technologies, especially satellite communications. It is an automated system designed to improve the dissemination and receipt of Maritime Safety Information, not only by ships at sea but also by pertinent shore based authorities equipped to render assistance to shipping. After many years of study and debate, the GMDSS was adopted in 1988 and IMO Member Governments began implementation on 1 February 1992. GMDSS is scheduled for full compliance by 1999.

The area in which the vessel operates dictates vessel carriage requirements under the GMDSS. Under the GMDSS, the world's oceans have been divided into four sea areas. Sea Area A1 is within range of at least one VHF coast station (out to about 30 miles); Sea Area A2 is within the coverage of MF/HF coast station (about 200 miles); Sea Area A3 is within the coverage of an Inmarsat geostationary satellite; and, Sea Area A4 is the area of the world not covered by A1, A2, and A3.



NOTE: HF NBDP systems may be used to provide an additional supplementary equivalent service to EGC SafetyNET until full implementation of the GMDSS on 1 February 1999.

FIG. 2.- International Maritime Safety Information Service (Source: IMO A.705 (17)).

MARITIME SAFETY INFORMATION UNDER THE GMDSS

The categories of Maritime Safety Information (MSI) under the GMDSS were expanded considerably, in keeping with the requirements of world shipping and the capabilities of new technology. It is these new developments that offer the greatest potential benefit and the greatest improvement in safety services for all ships at sea.

There are seven basic categories of MSI within the GMDSS. These are Navigational Warnings, Meteorological Warnings, Ice Reports, Search and Rescue Information, Meteorological Forecasts, Pilotage Service Messages (not in U.S.) and Electronic Navigation System Update Messages.

Under the current VWWWS, in order to receive all necessary messages in the above categories, an operator would have to be knowledgeable of the broadcast times and frequencies of the numerous radio stations and take the time to copy each broadcast affecting his vessel. Under GMDSS, a ship anywhere in the world will be able to receive all the above types of information by just flipping the switch of two small receivers.

DISSEMINATION OF MSI WITHIN THE GMDSS

The dissemination of MSI is an internationally coordinated network of broadcasts containing information necessary for safe navigation. It automatically monitors a preset frequency and prints out in English information relevant to that ship. This concept is depicted in Figure 2. Coastal warnings are generally sent via NAVTEX, or in some NAVAREAs by Inmarsat-C Enhanced Group Call (EGC) SafetyNET in lieu of NAVTEX; long range warnings are sent via Enhanced Group Call (EGC) SafetyNET service.

NAVTEX

Coastal MSI out to about 200 nautical miles will be available throughout most of the world on NAVTEX. This is a timeshared, universal broadcast on a frequency of 518 kHz. Broadcast schedules are coordinated internationally by the IMO to minimize interference and overlap. Routine messages are normally broadcast six times daily, and urgent messages are broadcast upon receipt, provided that an adjacent station is not transmitting. In most administrations, NAVTEX broadcasts are the responsibility of the National Coordinator, for example the Canadian Coast Guard. In addition to coastal warnings, NAVTEX broadcasts may contain the following information: specific Coast Guard District Broadcast Notice to Mariners that affect deep draft vessels in harbour areas and seaward to the line of demarcation between Inland and International Rules of the Road, severe weather warnings, offshore marine weather forecasts, International Ice Patrol reports, etc.

Implementation of NAVTEX services continues throughout the world, and most waters for which this service is suitable are either covered, or are planned to be covered, by NAVTEX. This is not to say that the necessary coverage is yet complete but it does indicate that administrations are aware of the requirement and are generally taking action to fulfill their obligations under the GMDSS. Latest details of planned and operational NAVTEX services are given in the IMO Master Plan of Shore-Based Facilities for the GMDSS.

It is important to remember, however, that many coastal waters will not generate enough information or have enough international shipping to warrant the establishment of a NAVTEX transmitter. These countries are encouraged to establish communication links with their NAVAREA Coordinators to arrange for the broadcast of coastal information through the International SafetyNET Service or by a neighbouring country's NAVTEX Service if the broadcast extends into (i.e., can be received in) their coastal waters. Where such countries do not yet have an organization for the collection and collation of coastal warning information, the IHO and IMO are available for advice and possible assistance.

SafetyNET EGC

Inmarsat SafetyNET is an international automatic direct printing satellite based service for the promulgation of MSI. It was developed as a safety service system to provide a simple and automated means of receiving MSI (at 600 bits per second) on board ships whether far at sea or in coastal waters. [NOTE: Australia has opted to utilize SafetyNET in lieu of NAVTEX for both long range and coastal warnings.] SafetyNET is designed with the capability to provide services within the footprint of geosynchronous maritime communications satellites (approximately 70 degrees North and 70 degrees South). Figure 3 shows the footprints of the satellites in relation to the NAVAREAs. Beyond these latitudes, there is little commercial shipping and if MSI coverage were required, either NAVTEX or a national high frequency service would be provided. With Inmarsat-C EGC, calls may be directed to a given geographical area such as a NAVAREA (fixed) or a region defined by the originator. The service is coordinated by a group of Coast Earth Stations, which work directly with each satellite region's Network Coordination Station.

The transition period for the implementation of SafetyNET began on 1 February 1992. To facilitate the registration of Administrations, IMO has approved two Circulars Letters. The first outlines the procedures for registering as an MSI Provider in the International SafetyNET Service and strongly encourages Administrations that have an obligation to provide MSI under the GMDSS to make interim arrangements with a CES in a neighbouring Administration. The second Circular Letter is a strong reminder that Administrations which are not or will not provide broadcasts of MSI in coastal areas via NAVTEX are required to issue these warnings via SafetyNET.

The IHO has also urged its Member Administrations to take prompt action and has, like the WMO, recommended that an interim service be established to provide navigational warnings in those NAVAREAs which are not yet able to fully participate in the SafetyNET service. Figure 4 is the current status of the provision of MSI via SafetyNET.

Once NAVTEX is fully implemented, a defined cut off between NAVTEX and NAVAREA messages will follow. NAVTEX coverage should be reasonably continuous to 200 nautical miles from the transmitting station. Since most NAVAREA warnings fall within the 200 nautical mile limit, it has been estimated that approximately 20% (600 messages per year) of the current NAVAREA traffic will be sent via EGC. This figure may increase once the gaps in NAVTEX coverage are known and to allow for overlapping duplication with messages that traverses the 200 nautical mile border.

However, as a general policy, the only NAVTEX messages that will be duplicated via EGC are those which might cause a vessel to reroute before entering the area of NAVTEX coverage, i.e. closure of a port/ harbour.

NAVAREA/ METAREA	NAV WARNINGS	MET FORECASTS & WARNINGS	OCEAN REGION FOR SCHEDULED BROADCASTS
I (UK)	X	X	AOR-E
II (France)	X	X	AOR-E
III (Spain/Greece)	X	X	AOR-E/IOR(MET)
IV (USA)	X	X	AOR-W
V (Brazil)	X	X	AOR-E
VI (Argentina)	X	X	AOR-W
VII (South Africa)	X	X	AOR-E + IOR
VIII (India/Mauritius/La Reunion)	X	X (Note 3)	IOR
IX (Pakistan)	X	X	IOR
X (Australia)	X	X	IOR + POR
XI (Japan/China)	X	X	IOR + POR
XII (USA)	X	X	POR + AOR-W
XIII (Russian Federation)	Note 4	X (Note 5)	POR
XIV (New Zealand)	X	X	POR
XV (Chile)	X	X	AOR-W
XVI (Peru/USA)	X	X	AOR-W
Notes:			
1.	X = Full Service now available.		
2.	IMO has decided that routine broadcasts of navigational warnings and meteorological forecasts will be made at scheduled times over a single nominated satellite. Unscheduled broadcasts of severe weather warnings will be made over all satellites, which serve the area concerned.		
3.	India provides meteorological warnings and forecasts for METAREA VIII north of the equator through LES Arvi (IOR). Mauritius/La Reunion provides meteorological warnings and forecasts for METAREA VIII south of the equator through LES Burum (IOR).		
4.	Full operational service expected in June 1998.		
5.	South of 60° North, full service provided by Japan.		

FIG. 4.- Status of MSI Broadcasts via the International SafetyNET Service (as of 30 April 1998).

Depending on the priority precedent imbedded in the message addressing "C" codes, the NAVAREA message is either sent immediately as an unscheduled broadcast or pooled with other traffic and sent on the next scheduled broadcast. NAVAREA broadcasts may remain in effect for a maximum of six weeks. At that time, information that is still valid would have been published as a correction in the Weekly Notice to Mariners or would be reissued as a new message. As proposed by the 37th Session of the IMO Sub-committee on Radiocommunications, only the primary Inmarsat satellite or satellites are to be used to fully cover a NAVAREA for scheduled broadcasts. For unscheduled broadcasts, all satellites with a footprint covering the

relevant area of the message are used. There are currently four Inmarsat satellites: one each for the Pacific Ocean Region (POR) and Indian Ocean Region (IOR), and two for the Atlantic Ocean Region (AOR (East) and (West)). A significant area of overlap is intentionally provided to give ships ample time to switch to the new satellite channel (when entering a new ocean satellite region).

In several NAVAREAs, a dual system whereby all navigational warnings are sent via both satellite and HF exists. Generally, these are only those navigational warnings that fall outside of the NAVTEX coverage. After HF is suspended on 1 February 1999, all MSI will be broadcast via satellite only.

NAVIGATIONAL WARNINGS IN THE WORLD-WIDE NAVIGATIONAL WARNING SERVICE

As previously mentioned, the WWNWS was also designed to standardize the format and content of navigational warnings. To this end, the CPRNW has nearly completed work on the IMO/IHO/WMO Joint Manual on Maritime Safety Information (MSI).

Radio Navigational Warnings are essentially HAZARD WARNINGS. In accordance with the WWNWS Guidance Document, section 4.2.1.3, the following subject areas are considered suitable for transmission as NAVAREA warnings. This list is not exhaustive and should be regarded only as a guideline. Furthermore, it presupposes that sufficiently precise information about the item has not previously been disseminated in Notice to Mariners:

1. casualties to lights, fog signals and buoys affecting main shipping lanes;
2. the presence of dangerous wrecks in or near main shipping lanes and, if relevant, their marking;
3. establishment of major new aids to navigation or significant changes to existing ones when such establishment or change might be misleading to shipping;
4. the presence of large unwieldy tows in congested waters;
5. drifting mines;
6. areas where search and rescue (SAR) and anti-pollution operations are being carried out (for avoidance of such areas);
7. the presence of newly discovered rocks, shoals, reefs and wrecks likely to constitute a danger to shipping, and, if relevant, their marking;
8. unexpected alternation or suspension of established routes;
9. cable or pipe-laying activities, the towing of large submerged objects for research or exploration purposes, the employment of manned or unmanned submersibles, or other underwater operations constituting potential dangers in or near shipping lanes;

10. establishment of offshore structures in or near shipping lanes;
11. significant malfunctioning of radio navigational service and shore-based maritime safety information radio or satellite services.
12. information concerning special operations which might affect the safety of shipping, sometimes over wide areas, e.g. naval exercises, missile firings, space missions, nuclear tests, etc. It is important that where the degree of hazard is known, this information is included in the relevant warning. Whenever possible, such warnings should be originated not less than five days in advance of the scheduled event. The warning should remain in force until the event is completed. NOTE: The IMO Maritime Safety Committee is authorized to review the provisions of this paragraph and, if appropriate, to provide for exemptions from this requirement, under special circumstances.
13. acts of piracy and armed robbery against ships.

Navigational warnings are issued in response to SOLAS V/2.b and carry information, which may have a direct bearing on the safety of life at sea. It is the fundamental nature of navigation warnings that they will often be based on incomplete or unconfirmed information and mariners will need to take this into account when deciding what reliance to place on the information contained therein.

IMO Resolution A.706 (17) requires the use of the English language for NAVAREA and Coastal Warnings of the WWNWS. It must always be remembered that the majority of mariners receiving radio navigational warnings are only professional users of English who do not speak or read it naturally. Warnings therefore must be written so as to be easily understood by all mariners.

In order to achieve maximum impact on the mariner, it is necessary to present information that it is CLEAR, UNAMBIGUOUS and BRIEF. This can be ensured by using structured messages, which present the text in a standard format with key words to emphasize the most important features of the message.

The Manual provides a practical guide for anyone who is concerned with drafting radio navigational warnings or with the issuance of meteorological forecasts and warnings for the high seas under the GMDSS. It is assumed throughout that the navigational warnings are being issued under the auspices of the IHO/IMO World-Wide Navigational Warning Service (WWNWS) and in accordance with the requirements of IMO Resolution A.706 (17). As cited earlier, the WWNWS includes two major international radio warning services as components; namely, NAVAREA warnings and Coastal warnings.

The structure of radio navigational warnings will provide the minimum information, which a mariner requires to avoid danger. This is:

HAZARD + POSITION

It is usual, however, to include sufficient extra detail to allow some freedom of action in the vicinity of the hazard. This means that the message will give enough extra data for the mariner to be able to RECOGNIZE the hazard and ASSESS its effect

upon his navigation. In some cases, it will be desirable to include an estimate of the DURATION of the event. e.g. special operations.

The text of any radio navigational warning will need to contain some or all of the STANDARD ELEMENTS defined in the Manual, however, it does not provide specimen texts for every type of event. The principles illustrated in the Manual may be applied in general to drafting messages for every kind of navigational warning and covering all types of hazards. Figure 5 is an illustration of specimen text with regards to New, Moved or Re-established Lights from the Manual.

LIGHTS - New, Moved or Re-established

B3

LIGHTHOUSES, BEACONS, LIGHT VESSELS		
Key Subject	Remarks	Comments
FLAMBOROUGH HEAD LIGHT, FLASH THREE 20 SECONDS 22 METRES 21 MILES	ESTABLISHED 21-14.6N 000-16.3W	New Light.
NARESBORO LIGHT VESSEL, FLASH RED 5 SECONDS 14 MILES	MOVED 0.3 MILES NORTH TO 63-14.8N 022-15.6E	Do not quote former geographical position. Indicate former position by approximate direction and distance.
	RE-ESTABLISHED	For CHARTED or LISTED as DESTROYED. See NOTE A.
NOTES: A. RE-ESTABLISHED is only appropriate for lights which have previously been CHARTED or LISTED AS DESTROYED. Navigational Warnings concerning such lights are merely canceled when the Light is re-established. A new Navigational Warning is only required if the Character or Position is changed. See table B2 or above. B. Quote accurate CHARTED position; in Degrees, Minutes and Decimal Minutes (maximum 2 decimal places). C. Distances should be quoted in nautical miles and decimals.		

FIG. 5.- Illustration for drafting Navigational Warnings for New, Moved or Re-established LIGHTS.

CONCLUSION

Technology improvements in the area of communications have pushed the IMO, IHO and WMO to provide improved services in the dissemination of MSI. The use of this new methodology and equipment has resulted in the receipt of more timely, comprehensive and vital maritime safety information. IMO COMSAR/Circ.15 of 9 March 1998, Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI) provides a practical guide for anyone who is concerned with drafting radio navigational warnings or with the issuance of meteorological forecasts and warnings for the high seas under the GMDSS. This Manual has also been published by the IHO as Appendix 1 to Special Publication S-53, IHO/IMO World-Wide Navigational Warning Service (WWNWS) Guidance Document. Additionally, the guidance/ formats specified in the Manual will help reduce the costs incurred by the Information Providers in the promulgation of MSI. It is anticipated that the Manual will be approved for publication as an official IMO document in due course.