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MARITIME SAFETY INFORMATION IN THE YEAR 2000: LISTEN UP, NAVY, THE TIMES THEY ARE A CHANGIN'!

BY

MR. STEVEN C. HALL

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Maritime safety information is that special category of navigational safety data that warns mariners at sea of hazards to navigation which might encountered while underway. It does the most good when received before the hazard is encountered. The U.S. Navy pioneered the use of radio to transmit maritime safety information to ships at sea beginning in 1908. Over the years, they have relinquished this position as a leader and become a follower. Beginning in 1992, the commercial maritime world will step out ahead of the

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U.S. Navy using modern commercial communications technology. Unless Navy reconsiders its position on receiving maritime safety information using NAVTEX and SafetyNET, it will remain a follower and be seriously disadvantaged. The risk here is not in losing a race, but in losing a ship.

Marine Navigation; Radio communications; Maritime safety; Warning Systems; (KT)

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MARITIME SAFETY INFORMATION IN THE YEAR 2000: LISTEN UP, NAVY, THE TIMES THEY ARE A CHANGIN'!

An Individual Study Project
Intended for Publication

by

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EXECUTIVE SUMMARY

INTRODUCTION

Radio broadcasts warning ships at sea of dangers to navigation have been made by the United States since 1908. This information was vital to the safe operation of merchant shipping and warships. Initially, the U.S. Navy (USN) broadcast these warnings. The Defense Mapping Agency (DMA) accepted responsibility for originating these warnings for the United States in 1972. These hydrographic warnings affecting the Atlantic and Pacific Oceans were called HYDROLANTS and HYDROPACS. USN and U.S. Coast Guard (USCG) communications stations transmitted the actual warnings on open, public broadcasts.

DIVERGENCE

Sometime after World War II, USN began servicing its ships with HYDROLANTS and HYDROPACS by using new, specially developed radio equipment. First radio teletype was used. This was followed by satellite systems. The merchant marine continued to receive warnings by Morse code until the late 1970's. DMA furnished the warning information to USN, both for its special use and for public broadcast.

WWNWS

A new radio broadcast warning system called the Worldwide Navigational Warning Service (WWNWS) began in 1977. The maritime world was divided into sixteen navigational warning areas called NAVAREAS. Single nations no longer had to furnish radio warnings for the world. International coordination ensured coverage in all oceans. Ships were now able to receive safety messages by radio for their area of interest only. Countries and ships were encouraged to use radio teletype but Morse code remained the primary means of sending messages. The United States became coordinator for two of the NAVAREAS.

FURTHER DIVERGENCE

USN requested that the HYDROLANT/HYDROPAC system be kept. As a result, all NAVAREA Coordinators were requested to send copies of their warnings to DMA. Despite some international objections, this was done. USN continued to receive worldwide warning messages from DMA. Upon receipt, they were sorted by area of operation and mission. Transmission to fleet units was by special USN communications equipment. USN was satisfied, although delivery of some warning information was long delayed in its receipt by ships listening to public NAVAREA broadcasts. Commercial shipping was having other serious problems, however. Merchant ships were disappearing without a trace. The civilian community had to look at modern communications systems. This was done through the International Maritime Organization which developed the Global Maritime Distress and Safety System.

GMDSS

The Global Maritime Distress and Safety System (GMDSS) assures effective distress and safety communications by a number of measures. Basic among these is the requirement by international convention for ships to carry a modern suite of communications equipment. Tailored radio frequencies are allocated to support the new equipment. GMDSS addresses the subject of maritime safety information (MSI). It stresses simplicity and dependability through automation. Radio navigational warnings make up a large portion of MSI. These warnings are divided into two categories, coastal and long range.

COASTAL WARNINGS AND NAVTEX

Over 80% of all navigation warnings are coastal warnings, that is, reports on hazards within 200 - 250 miles of the coast. Navigational telex or NAVTEX has been selected by the GMDSS and WWNWS as the primary means of promulgating these messages. It operates on 518 kHz in a cooperative, coordinated worldwide effort. NAVTEX is in operation now in many areas of the world. It is a passive, automated message receiving system. NAVTEX receivers are small, inexpensive, and simple to install and operate. The U.S. Navy has no plans to equip its ships to receive NAVTEX.

LONG RANGE WARNINGS AND SAFETYNET

The GMDSS and WWNWS will use the International Maritime Satellite Organization (INMARSAT) Enhanced Group Call SafetyNET system as the primary means for long range broadcasts (hazards beyond the limits of coastal warnings). This can be used as a passive, automated message receiving system. SafetyNET receivers are small, inexpensive, and simple to install and operate. Areas of the world that will not be covered by NAVTEX will be serviced by SafetyNET. The U.S. Navy has no plans to equip its ships with a SafetyNET capability.

THE PROBLEM

USN expects to continue to receive worldwide broadcast warnings from DMA. This may be possible for long range warnings and coastal warnings where a country uses SafetyNET. It will not be practical for coastal warnings in areas where a country uses NAVTEX. Ninety percent of all warnings are expected to be carried only by NAVTEX broadcast. Due to the limited range of the system, DMA would have to establish special agreements with dozens of countries to receive coastal warnings electronically. Considerable delay can be expected in getting the data to USN ships due to numerous processing delays. When time is lost, ship safety is placed at risk.

RECOMMENDATION

Equip all USN surface units with NAVTEX. Equip all surface units and communications stations with SafetyNET receivers. Existing radio broadcast systems should be held in reserve for use during exercises or conflicts. Action now can bring about a smooth transition by 1 February 1999, the date of full operation of GMDSS.

COST

NAVTEX receiving equipment costs less than $1,000 per unit today. SafetyNet equipment costs less than $10,000 per unit and is available with a dual function GPS/SafetyNET antenna.

INTRODUCTION

Ever since man has gone down to the sea in ships, it has been his desire to know what lay ahead before he stood into danger. This need to know applies equally to military combatant and military support ships. It also applies to merchant vessels and even to private boaters. Historically, governments have been relied upon to furnish timely navigational safety information to ships at sea to promote safety of life at sea.

Beating disaster to the punch has always been a problem of time verses available means of communications. The United States began winning this battle against the clock in 1908 when the U.S. Navy started radio transmissions of navigational warning information to ships at sea.[1] Since this was a humanitarian undertaking, such warning transmissions were provided on open public broadcasts for the benefit of mariners in general, regardless of nationality. Maritime safety information is every bit as necessary and as applicable to private vessels as it is to military ships. However, due to its military mission, U.S. Navy gradually moved away from relying on public broadcasts. Instead, it began using to its own independent U.S. Department of Defense supported communications systems. When this separation of systems was completed, however, the U.S. Navy ceased to be a leader in maritime safety information promulgation. Since it no longer used the service it originally provided mariners in general, U.S. Navy lost track of where maritime safety information services came from. Likewise, it failed to keep up with where these services were going.

Technology now has taken a giant step forward in the area of maritime safety information dissemination. Pending changes in this area are going to leave the Navy far behind the power curve. The U.S. Navy should reexamine its position and take advantage of the NAVTEX and SafetyNET* systems destined to serve the civil sector. Failure to do so may place its ships unnecessarily at risk around the world.

This paper will examine how the U.S. Navy arrived at this state of affairs. A recommended solution to this dilemma is proposed after the concluding remarks.

1908 - 1977 RADIO GOES TO SEA

The United States began transmitting navigation safety warning information to ships at sea in 1908. The U.S. Navy collected the data and composed the messages. It operated radio equipment to communicate with ships at sea by Morse code. These broadcasts were on an unscheduled basis at that time; that is, they were made as needed. Merchant ships and U.S. Navy ships

* SafetyNET is a registered trademark of the International Maritime Satellite Organization.

benefitted equally from this information.

The TITANIC disaster in 1912 resulted in emphasis being placed on the use of radio at sea in two major areas. First, it led to establishing an ice patrol by the U.S. Navy. Later the ice patrol was turned over to the U.S. Coast Guard. The ice patrol produced ice warnings which were broadcast by radio to ships at sea. Second, this disaster focused attention on safety equipment aboard ships. Several governments and the international shipping community met to address these matters. They agreed that certain types of ships must carry radio equipment so they could be warned of hazards to navigation while at sea.

Steady improvements to the broadcast system and equipment were made as time went on. By 1922, the volume of ice warning information and other necessary navigation safety warnings had grown large. This justified scheduled broadcasts by U.S Navy radio stations from both the East and West Coasts of the United States.[2] The contents of these broadcasts were now referred to collectively as maritime safety information. By this time, other maritime nations around the world had begun operating similar radio warning systems. The capability to warn ships at sea before they hit the iceberg, the uncharted reef, or the newly sunken wreck had finally arrived. Radio had gone to sea.

The responsibility for transmitting maritime safety information in the United States rested initially with the U.S. Navy Hydrographic Office. This organization became the U.S. Naval Oceanographic Office in 1962. In 1972, the U.S. Defense Mapping

Agency Hydrographic Center assumed operational control of this, by now, traditional U.S. Navy function.[3] Finally in 1978, the U.S. Defense Mapping Agency Hydrographic/Topographic Center was established with navigational warning dissemination as an important part of its mission statement. The function remains with the latter organization to this day.

The U.S. Coast Guard has been conspicuously absent from this brief chronology. The Coast Guard did, however, play key roles in these developments but mostly in an advisory capacity to the U.S. Department of Defense. The U.S. Coast Guard was responsible for radio warnings along the sea coasts of the United States, its territories, and possessions. It continually improved its radio communications and equipment. The U.S. Navy, and later the U.S. Defense Mapping Agency, was responsible for deep sea, or long range maritime safety information. Each was also responsible for foreign coastal warning information dissemination. These missions were complimentary and often used the same communications equipment and operators. The cooperation between the U.S. Coast Guard and the U.S. Department of Defense gave the United States a truly comprehensive, worldwide radio navigation warning system.

During this developmental period, U.S. Navy civilian personnel of the U.S. Naval Oceanographic Office processed incoming navigational safety information. A variety of domestic and foreign sources were used. Finalized messages were forwarded to U.S. Navy communications facilities. Upon receipt, these data were treated in two separate ways. First, it was transmitted by

Morse code to commercial shipping around the world on scheduled broadcasts. Second, the information was edited, culled, and reformatted. This allowed messages to be grouped according to the mission or area of operation of particular ships. These data were now transmitted on special Navy communications circuits to U.S. Navy ships. It was only natural that as sophisticated equipment came on line to satisfy military requirements, the Navy would use it to service its own ships with maritime safety information as part of its operational communications requirement. In doing this, the U.S. Navy took advantage of narrow band direct printing technology (radio teletype), and satellite communications, among other advances. These new methods of communication were beyond the economic reach of most of the commercial maritime community at that time. Therefore, the public broadcasts continued to be keyed separately in Morse code and contained the same basic information.

This gravitation by the U.S. Navy to the use of its own communications equipment, means, and methods marked the beginning of the end of the U.S. Navy's leadership role in maritime safety information dissemination. The end was complete when the U.S. Defense Mapping Agency Hydrographic Center assumed these broadcast functions in 1972.[4] The very same civilian personnel continued to process navigational warnings. However, they now worked for a Defense agency rather than the Department of the Navy. The Navy was relegated now to the position of a user. It no longer took part in policy formulation in this subject area, having relinquished that function to the U.S. Defense Mapping Agency.

The United States developed, refined, and improved its capability to provide maritime safety information on a worldwide basis. Several other major maritime nations did the same concurrently. The United Kingdom, France, and the Soviet Union established worldwide coverage. Japan, India, Germany, Spain and many others operated more localized, national systems. These systems were similar to our U.S. Coast Guard Local Broadcast Notice to Mariners service. These systems, although restricted to areas of national concern, nonetheless reached well offshore. In fact, it was these very foreign national systems that provided the source material for United States long range broadcast warnings. The source of the remainder of these data was the U.S. Coast Guard, the U.S. Department of State, and other government agencies. Direct reports from ships at sea of hazards to navigation also contributed.

Up until 1977 the United States radio broadcast warning system of maritime safety information for civilian and military ships contained three types of warnings. Coastal warnings were broadcast by the U.S. Coast Guard by voice and Morse code. They covered waters within about 250 miles of the coast. Long range maritime safety information was transmitted by U.S. Navy and U.S. Coast Guard radio stations by Morse code. Many coastal warnings were included in these broadcasts. Radio warnings for the Atlantic Ocean were called HYDROLANTs (Hydrographic Warnings -

Atlantic). Those for the Pacific and Indian Oceans were called HYDROPACs (Hydrographic Warnings-Pacific). These messages were originated by the U.S. Defense Mapping Agency. SPECIAL WARNINGS (originated by the U.S. Department of State) were transmitted over both the coastal and long range radio warning systems. All these warnings continued to be transmitted to the civilian mariner primarily by Morse code, just like they were in 1908. Technology had improved the quality of the equipment but not the method of operation for the civil mariner.

1977 - A TIME OF TRANSITION

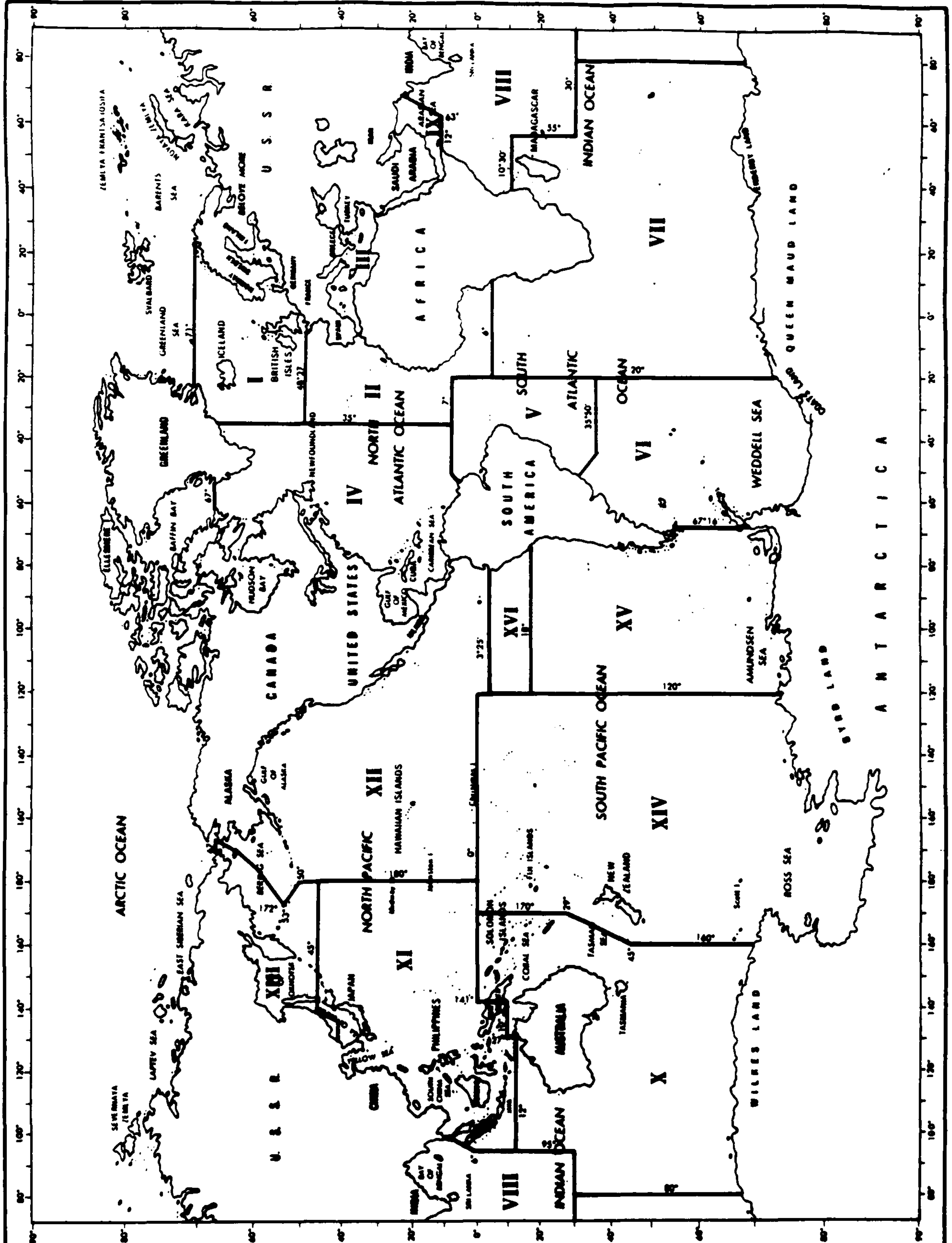
On 1 January 1977, the United States commenced conditional participation in the internationally supported Worldwide Navigational Warning Service.[5] The U.S. Defense Mapping Agency and the U.S. Coast Guard were principal architects in the design of this system. This warning system was created under the auspices of the International Maritime Organization and the International Hydrographic Organization[6] following ten years of discussion. It had three goals; namely, to eliminate redundant warnings worldwide, to standardize format and content of messages, and to improve broadcast warning efficiency by taking advantage of new technology. Encouraging countries to use narrow band direct printing was one such positive change brought about by the creation of the Worldwide Navigational Warning Service. This communication method is also called radio telex, radio teletype, simplex telegraph over radio (SITOR), automatic repeat request (ARQ), or forward error correcting (FEC).[7]

The Worldwide Navigational Warning Service divided the maritime world into sixteen navigational warning areas or NAVAREAS as shown by Figure 1. The intent was that each NAVAREA would have a coordinator responsible for obtaining broadcast warnings. National coordinators within the NAVAREA would provide the data. The coordinator would broadcast these data on scheduled transmissions as well as exchange information with adjacent NAVAREA coordinators. This arrangement was intended to reduce the size of areas of geographic responsibility to manageable levels. Even more important, it replaced multiple worldwide coverage systems by a single, cooperative, coordinated worldwide operation. By eliminating redundancy and the reprocessing of messages, it improved delivery time. Message comprehension was improved using coordinated schedules and standard message formats.

The International Maritime Organization and the International Hydrographic Organization monitor the Worldwide Navigational Warning Service. The Commission on Promulgation of Radio Navigational Warnings was established by the International Hydrographic Organization to assist with the coordination and operation of the new warning system. All NAVAREA coordinators and several interested governments and international organizations are represented on the Commission.

The U.S. Navy, not wishing to lose tailored, worldwide

FIGURE 1



ARCTIC OCEAN
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BRITISH ISLES
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AFRICA
CANADA
UNITED STATES
SOUTH AMERICA
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
NORTH PACIFIC
SOUTH PACIFIC OCEAN
WEDDELL SEA
ROSS SEA
AUSTRALIA
NEW ZEALAND
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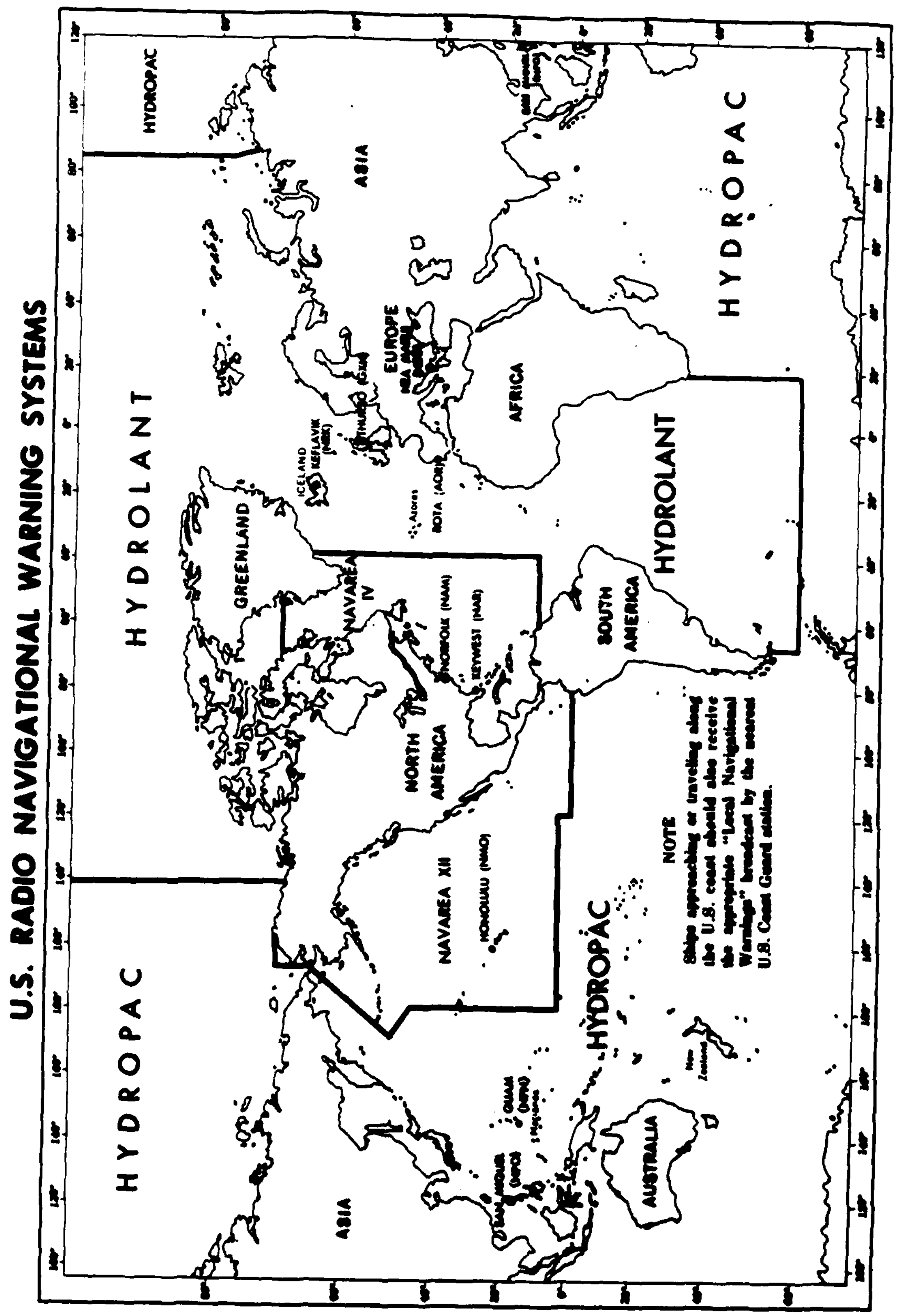
coverage, requested that the U.S. Government maintain the HYDROLANT/HYDROPAC system instead of the NAVAREA system. A compromise was reached. The U.S. Defense Mapping Agency Hydrographic/Topographic Center became coordinator for two of the sixteen NAVAREAS. NAVAREA IV covered the Western North Atlantic and Caribbean Sea and NAVAREA XII, the Eastern North Pacific Ocean. The limits of the existing HYDROLANT and HYDROPAC coverage areas were reduced and NAVAREAS IV and XII were created. HYDROLANTs and HYDROPACs covered the remaining fourteen foreign NAVAREAs. See Figure 2.

As part of these new arrangements, the U.S. Defense Mapping Agency added radio telex service to its schedules. U.S. Navy and U.S. Coast Guard communications facilities were responsible for the actual broadcasts. Despite this, the primary broadcast medium favored by the merchant marine remained radio telegraphy, that is, Morse code. The U.S. Navy continued to operate independent communications systems in support of its ships, primarily satellite based systems backed up by narrow band direct printing.

This compromise allowed the U.S. Navy to receive worldwide coverage of maritime safety information without using the NAVAREA system directly, especially concerning foreign waters. While NAVAREA IV messages, NAVAREA XII messages, HYDROLANTs, and HYDROPACs covered the world, the latter two categories were not nearly as timely as the originating foreign NAVAREA broadcasts.

FIGURE 2


U.S. RADIO NAVIGATIONAL WARNING SYSTEMS
HYDROPAC
HYDROLANT
HYDROLANT
HYDROPAC
HYDROPAC
HYDROPAC
ASIA
ASIA
GREENLAND
EUROPE
AFRICA
NORTH AMERICA
SOUTH AMERICA
AUSTRALIA
NAVAREA IV
NAVAREA XII
HONOLULU (NMO)
NORFOLK (NAM)
KEYWEST (NAR)
ICELAND
KEFLAVIK (NRK)
ROTA (AOK)
Azores
GUAM
New Zealand
NOTE
Ships approaching or traveling along the U.S. coast should also receive the appropriate "Local Navigational Warnings" broadcast by the nearest U.S. Coast Guard station.

PRESENT DAY CONCERNS

Despite the improvements in coordination of effort brought about by the inception of the Worldwide Navigational Warning Service, all problems were not solved. Technology continued to advance relatively unheeded in this area, and maritime disasters continued to occur. The U.S. Navy, to its credit, did take advantage of new communications technology. However, it ignored the source of maritime safety information when calculating its parochial navigation safety broadcast warning equation.

To continue the HYDROLANT/HYDROPAC system, the U.S. Defense Mapping Agency Hydrographic/Topographic Center made arrangements to receive all messages from the other fourteen NAVAREA coordinators. Most of these data are received electronically. Unfortunately, some of this source material is received by mail! In any case, it is delayed. These incoming messages are evaluated, reformatted as HYDROLANTs or HYDROPACs, and transmitted to U.S. Navy communications stations. Upon receipt, they are again reformatted and transmitted to commercial shipping and U.S. Navy ships by separate means. Each time a message is recomposed, time delays are incurred. Furthermore, the potential to introduce errors recurs and the veracity of the warning may be jeopardized.

Thus a duplicate, inferior, and less timely message system continues to serve the needs of the U.S. Navy. The open broadcasts of HYDROPACs and HYDROLANTs provides the maritime community an alternative to the Worldwide Navigational Warning Service. It serves well as a back up to the NAVAREA system, but only as a back up. It is not a timely, primary warning system now, and its timeliness and comprehensiveness will deteriorate further in the future. Unfortunately, maintaining this independent capability for HYDROLANTs/HYDROPACs lulled the U.S. Navy into a false sense of security that the broadcast warning system was working adequately. Meanwhile, very real problems in receiving maritime safety information were being faced by the commercial sector.

Radio broadcast warnings to ships at sea continue to be made in two ways. First is medium frequency or high frequency Morse code, and second is radio teletype. Although Morse code has functioned well for 80 years, it is labor intensive for the operators and must come to an end, yielding to modern technological replacements. The U.S. Navy realized this several years ago and ceased copying maritime safety information in that manner. In fact, the Navy for several years has not required knowledge of Morse code from its enlisted personnel (with a few exceptions).[9]

Radio teletype is a considerable improvement over Morse code service, but it has inherent deficiencies as well. Propagation restrictions during solar activity, frequency allocation requirements, broadcast scheduling, and the need for a skilled, dedicated radio operator are just a few. In addition, promulgation of warnings on medium and high frequencies contributes to circuit loads of already heavily burdened radio communications systems in a finite radio spectrum. The U.S. Navy continues to use radio teletype to receive broadcast warnings in certain instances, but primarily has moved further along to sophisticated satellite based communications systems.

The distress side of communications for the civil mariner remained a problem. Even with the improvements in broadcast warnings and new communications equipment, conventionally equipped ships continued to suffer sudden and unreported losses. Radio officers sometimes were unable to operate their complex equipment quickly enough in emergency situations. This was compounded by range limitations of 500 kHz distress transmissions, overcrowding of single side band communications frequencies, and error rates in transcribing Morse code broadcasts. Plainly, the time had come to modernize maritime safety broadcast systems and associated shipboard communications equipment. Satellite communications, as the U.S. Navy had already seen, was an obvious answer.

Initial attempts to bring the commercial shipping community into the world of satellite communications for maritime safety information purposes faced several problems. Foremost among these was cost. Next was the lack of emergency power systems on commercial ships to operate satellite terminals in emergencies. Third was the inability of satellite communications to contact ships in the immediate vicinity when in distress. Finally, the requirement for a satellite antenna to remain stable in emergency situations had to be met.[18]

Military satellite communications systems were not accessible to the civilian community to solve these problems. Finally, commercial maritime satellite communications became available to address the issue. Once more the maritime community, under the direction of the International Maritime Organization, set out to build a better mousetrap. The International Maritime Satellite Organization was there to help show the way.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM

The Global Maritime Distress and Safety System (GMDSS) was developed by the International Maritime Organization to take advantage of modern communications systems. Its goals are to improve the dissemination and receipt of several types of information. These data are indispensable not only to ships at sea, but also to pertinent shore based authorities. Shoreside organizations referred to are those equipped to render assistance to shipping, such as the Rescue Coordination Centers operated around the world. This represents a basic change for distress messages. They are changing from ship to ship with a 60% chance of being heard. Now they will be ship to shore where there is a 99.9% chance of being heard.[11] Satellite communications and automation were the tools of change.

Maritime safety information is very important to the everyday operation of U.S. Navy ships. In fact, the U.S. Navy often comes to the aid of ships in distress. Despite these facts, it took no part in developing the Global Maritime Distress and Safety System. Instead, the U.S. Navy continued to rely on its own dedicated systems. Thus the gap widened between new technologies developing in maritime communications and the U.S. Navy's influence over them.

The Global Maritime Distress and Safety System was adopted in November 1988. This process took many years of development, study, and debate in the International Maritime Organization.[12] The transition period to full operation is lengthy. It will begin being implemented in 1992 and will reach full operation 1999. Nearly all merchant ships over 300 gross tons must comply with specific radio equipment carriage requirements by that date. The functions of the Global Maritime Distress and Safety System will provide a new standard of safety for mariners worldwide.

MARITIME SAFETY INFORMATION DISSEMINATION AS PART OF THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM

The subject categories of maritime safety information within the Global Maritime Distress and Safety System have been expanded considerably in keeping with the requirements of world shipping. Not all the subject areas are of interest to naval combatants, but the new equipment and procedures often permit selective receipt of data. This allows control of not only the subjects received, but also the volume of information to be processed on board. It is these new developments that offer the greatest potential benefit to the U.S. Navy among the improvements in safety services for all ships at sea.

MARITIME SAFETY INFORMATION SUBJECT MATTER

There are seven basic categories of maritime safety information within the GMDSS:[13]

- Navigational Warnings
- Meteorological Warnings
- Ice Reports*
- Search and Rescue Information
- Meteorological Forecasts*
- Pilotage Service Messages*
- Electronic Navigation System Messages*

Navigational warnings include: casualties to lights, fog signals and buoys affecting main shipping lanes; dangerous wrecks; establishment of major new aids to navigation or significant changes to existing ones; the presence of large unwieldy tows; drifting mines; areas where search and rescue (SAR) and antipollution operations are being carried out; notification of ships and aircraft reported in distress, overdue or missing; newly discovered rocks, shoals, reefs and wrecks; unexpected alternation or suspension of established routes; cable or pipe-laying activities, the towing of large submerged objects for research or explorational purposes, the employment of manned or unmanned submersibles, or other underwater operations constitut-

* These categories marked with an asterisk can be blocked selectively at the receiver; that is, receipt of these types of data is at the user's option.

ing potential dangers; establishment of offshore structures; significant malfunctioning of radio navigation services; 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.[14]

Weather warnings are advanced notification of severe weather. This includes tropical storms, tsunami alerts, winds of force 10 and above on the Beaufort scale, sub-freezing air temperatures associated with gale force winds causing severe ice accretion on superstructures, etc.[15]

Search and rescue alerts are notification of vessels in distress and requiring assistance.[14]

Receiving all necessary messages in the above categories on a merchant ship is cumbersome. The radio operator must monitor practically the entire radio spectrum from medium frequency through ultra high frequency. Unquestionably, this is an unacceptable requirement for one person using, at best, semi-automated equipment. U.S. Navy ships have a marked advantage. These types of data are collected for them by U.S. Navy communications stations. They are then retransmitted to the appropriate fleet unit in a single broadcast. The U.S. Defense Mapping Agency is a primary source of these data, having previously received them from cooperative members of the Worldwide Navigational Warning Service.

Under the Global Maritime Distress and Safety System, a ship anywhere in the world will be able to receive all the above types of information. Significantly, this can be done by just flipping the "on" switch of two small receivers and making sure the paper is in the machine!

COASTAL WARNINGS - NAVTEX

NAVTEX is a contraction of the words navigation and telex. It has been chosen by the international maritime community as the primary method for disseminating coastal warnings for the twenty first century. NAVTEX is a receive only terrestrial based radio system that operates primarily on the medium frequency of 518 kHz.[17] It is an integral part of the Worldwide Navigational Warning Service under the Global Maritime Distress and Safety System.[18] Coastal maritime safety information, out to 200 miles or more, is already available in several high traffic areas of the world on NAVTEX. See Table 1 for a listing of active NAVTEX stations as of 7 February 1990 and Table 2 for a list of planned NAVTEX stations.[19]

NAVTEX uses a universal broadcast format on a single, time shared frequency. NAVTEX broadcast schedules are coordinated internationally. The International NAVTEX Panel of the International Maritime Organization performs this function to keep interference from signal overlap and schedule conflicts at a minimum. This passive system furnishes hard copy to the watch officer from all selected maritime safety information categories. English is the approved primary language for all messages.

TABLE 1

NAVTEX stations in full or trial operation as of 26 March 1990

United Kingdom
Cullercoats
Niton
Portpatrick

Netherlands
Ijmuiden

Iceland
Reykjavik

Norway
Bodo
Rogaland
Vardoe

Belgium
Oostende

France
Brest

Portugal
Lisbon
Azores (Horta)

USSR
Odessa
Zhdanov
Novorossisk
Murmansk
Arkhangelsk
Tallin

Turkey
Izmir
Samsun
Istanbul
Antalya

Greece
Limnos
Iraklion
Kerkyra

Yugoslavia
Split

Cyprus
Troodos

Egypt
Ismailia

Bulgaria
Varna

United States
Boston
New Orleans
Portsmouth
Miami
San Juan
Long Beach
Astoria
San Francisco
Honolulu
Guam

Sweden
Haernoesand
Stockholm

Canada
Sydney

Bermuda
St. Georges

Argentina
Bahia Blanca
Buenos Aires
Comodoro Rivadavia
Mar del Plata
Rio Gallegos
Rosario
Ushuaia

Hong Kong

China
Zhanjiang
Guangzhou
Fuzhou
Shanghai
Dalian
Tianjin

Chile
Valparaiso
Antofagasta
Talcahuano
Puerto Montt
Punta Arenas

TABLE 2

NAVTEX stations in planning stages as of 26 March 1990.

German Democratic Republic

France
Le Conquet
Toulon

Spain
Finisterre
Canary Islands
Tarifa
Cabo La Nao

Cameroon
Douala

Italy
Ancona
Augusta
Cagliari
Roma

Israel
Haifa

Egypt
Alexandria

Uruguay
Colombia
Laguna del Sauce
La Paloma
Montivideo
Punta del Este
Salto

India
Madras
Bombay

Bahrain
Hamala

Saudi Arabia
Damman
Jeddah

Singapore
Jurong

Japan
Otaru
Kushiro
Yokohama
Moji
Naha

Republic of Korea

United States
Kodiak
Adak

USSR
Vladivostok
Malokurilsk
Kholmsk
Nikolaevsk
Ust-Bolsherezk
Petropavlovsk
Magadan
Pakhacha
Providence

The frequency of 490 kHz has been approved for national, rather than the international system, for second language transmissions on NAVTEX. This frequency, however, is not available for use until 1 February 1999. Similarly, 4209.5 kHz has been reserved for national broadcasts in equatorial regions where medium frequencies experience propagation difficulties. It will be available after 1 July 1991. Its use also will be coordinated by the NAVTEX panel of the International Maritime Organization to facilitate time sharing.[20]

Countries that choose not to use NAVTEX for coastal warnings may use satellite SafetyNET broadcasts, described later, as an alternative. As of 7 February 1990, only Australia has indicated its intention to use SafetyNET instead of NAVTEX for coastal warnings.

NAVTEX shipboard equipment is extremely inexpensive and simple to operate. The receiver is small enough to be installed in the chart room or even on the bridge of a ship. In this way, the information it records is instantly available to the officer of the deck or watch officer. A typical receiver with an internal printer is 5 inches high, 11 inches wide, and 3 inches deep. It weighs about 3.5 pounds.[21] The antenna used can be as simple as a three foot whip antenna. NAVTEX receivers with printing capability are on the market now for less than $1,000. This author has seen advertisements for LCD readout NAVTEX receivers for as little as $315. The NAVTEX receiver's internal design is such that it rejects messages beyond a certain readable error threshold.

Since all incoming messages are numbered uniquely, the receiver will track messages previously received correctly and reject duplications. The single worldwide frequency and standard format alleviates the necessity for a skilled radio operator.

Further, the user can choose to receive only certain categories of maritime safety information. This keeps the amount of extraneous information received to a minimum.[22] The U.S. Navy should find this feature particularly attractive. Its ships can receive data concerning only specified subject categories and areas.

Should the U.S. Navy choose not to carry a simple, inexpensive NAVTEX receiver, it can still receive NAVTEX warnings. The ship's narrow band direct printing receiver can be tuned 518 kHz. The schedules for these broadcasts are published by the U.S. Defense Mapping Agency.[23] Of course to do that will tie up a radio operator and his equipment and delay getting the incoming information to the watch officer. Further, the advantage of rejecting duplicate messages as well as the ability to reject unwanted subject areas will be lost.

Accessing an automated system manually defeats the purpose of NAVTEX. Between 80% and 90% of all hazards which are the subject of maritime safety information broadcasts occur in areas within NAVTEX radio range.[24] Knowing this, it is difficult to imagine a prudent mariner putting to sea without a NAVTEX receiver.

NAVTEX broadcasts are scheduled so minimum interference is incurred despite common frequency usage. The information carried on these broadcasts will render current Broadcast Local Notice to Mariners made by the various U.S. Coast Guard districts superfluous and eventually obsolete. Thus, no longer will a radioman have to transcribe medium, very high, or ultra high frequency voice broadcasts in many areas when coasting or entering port in the United States. The watch officer can have a printed copy in hand from the NAVTEX receiver as soon as it is transmitted.

The East and Gulf Coasts of the United States are served by NAVTEX as are Hawaii and Guam. The Caribbean basin is partially covered. Other areas served by NAVTEX are Northern Europe and the Eastern Atlantic. Most of the Mediterranean Sea, the Black Sea, part of the Red Sea, and parts of South America are also covered. Many more stations are scheduled to begin offering NAVTEX service as the system continues to build to nearly full, worldwide coverage by 1 August 1993.[28]

Beyond NAVTEX range, or where NAVTEX is not available, most mariners rely on high frequency Morse code to receive maritime safety information by radio. A few ships use narrow band direct printing (radio teletype). As previously stated, the U.S. Defense Mapping Agency Hydrographic/Topographic Center provides worldwide information coverage using both of these long range transmission methods. This Agency is the most active component of the international broadcast warning network upon which the civil mariner relies. The U.S. Navy is almost totally dependent on the collection efforts of the U.S. Defense Mapping Agency to receive maritime safety information.

This emphasizes the most important reason for the U.S. Navy to adopt NAVTEX, that is, the future availability of maritime safety information. More than 80% of the present messages transmitted as HYDROLANTs and HYDROPACs are reformatted foreign coastal warnings.[26] Their timely availability is a direct result of their inclusion in the NAVAREA warning broadcasts and the close cooperation existing among NAVAREA coordinators. Once the Global Maritime Distress and Safety System is fully operational, the decentralization inherent in the NAVTEX broadcast service will reduce by an order of magnitude the messages available to NAVAREA coordinators.

The majority of radio warnings will be suitable for transmission by foreign maritime authorities using NAVTEX. Timely availability, or often any availability, of the warnings information will be denied to the U.S. Defense Mapping Agency. With a dependable range of only approximately 200 miles, the NAVTEX broadcast will be beyond the capability of the U.S. Defense Mapping Agency to copy. This circumstance would require either special bilateral arrangements with many, many countries or extensive monitoring facilities around the globe. Both of these options are costly and probably defy comprehensive collection of warnings. Furthermore, a major advantage of NAVTEX and Safety-

NET, namely, timeliness is defeated.

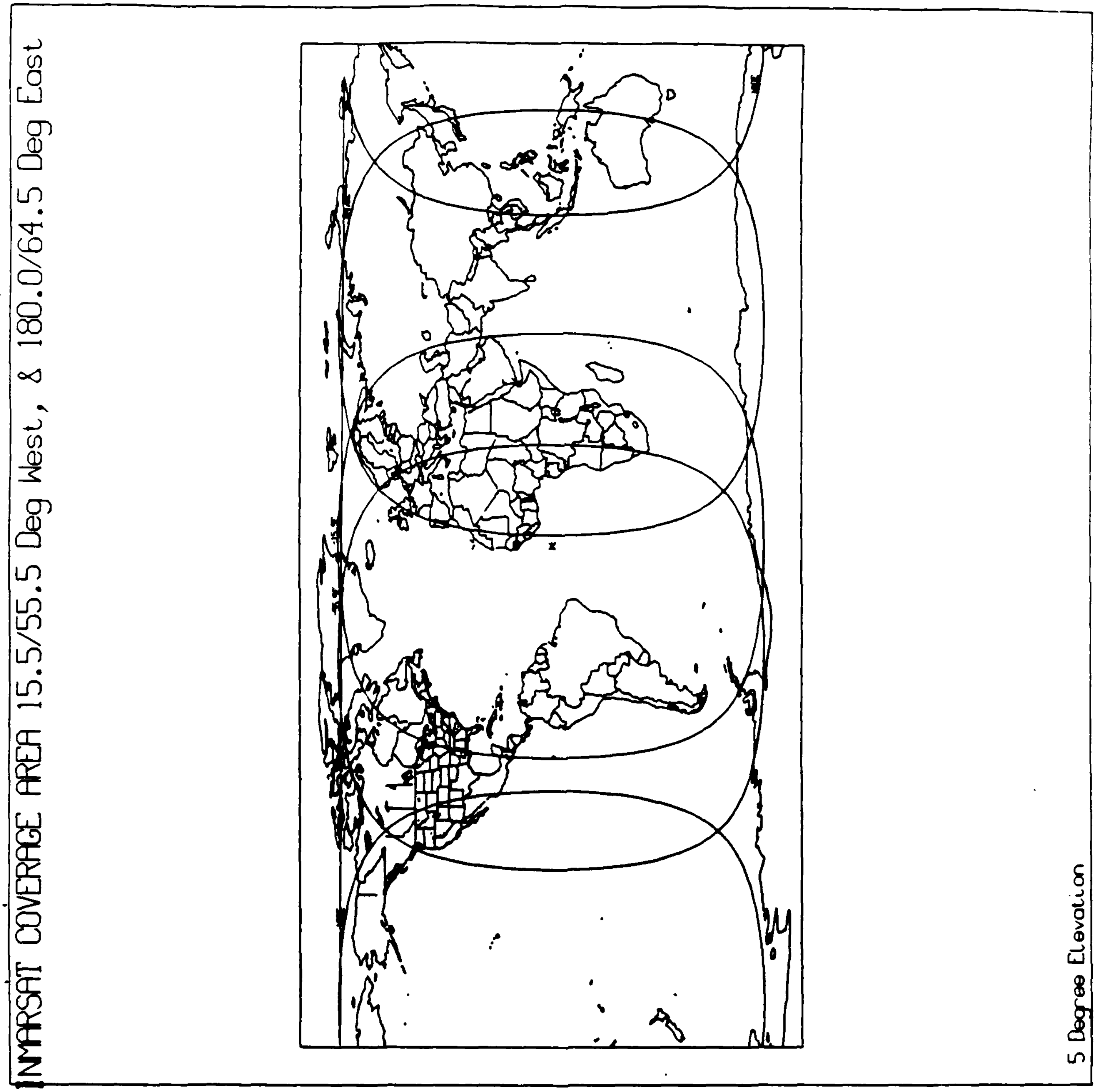
LONG RANGE WARNINGS - SAFETYNET

The International Maritime Satellite Organization (INMARSAT) defines SafetyNET as "an international automatic direct printing satellite based service for the promulgation of maritime safety information to ships."[27] SafetyNET uses commercial communications satellites operated by the International Maritime Satellite Organization. Its geostationary satellites provide communications footprints over the majority of the navigable portions of the globe. Commercial satellite communications coverage normally is not available in the polar areas beyond 70 degrees latitude. Figure 3 displays the four satellite configuration footprints that will service the SafetyNET system.

There is little commercial shipping in polar regions and even less warning information. If radio warning coverage is required in these areas, either NAVTEX or national high frequency service is capable of meeting that need. U.S. Navy ships which do operate in the ice laden high latitudes are currently served by their own special communications equipment. No changes in these procedures are suggested by the systems available in the Global Maritime Distress and Safety System.

The satellite Enhanced Group Call SafetyNET system has proven in tests to be extremely versatile and dependable.[28] It was adopted by the International Maritime Organization as the

FIGURE 3


INMARSAT COVERAGE AREA 15.5/55.5 Deg West, & 180.0/64.5 Deg East
5 Degree Elevation

primary long range maritime safety information broadcast system for the Global Maritime Distress and Safety System.[29] It also may be used instead of NAVTEX for coastal warnings if an administration so desires. However, after 1 August 1993, SafetyNET broadcasts normally will contain only warnings not carried by NAVTEX. The major exception will be if the coastal hazard is so major as to cause a ship to make a significant change in its intended track.

SafetyNET has been designed to operate with a newly created Standard-C satellite communications terminal. In the receive only version, the terminal operates like its coastal broadcast partner, the NAVTEX receiver. It is compact, simple to operate and inexpensive. It is capable of selecting which categories of messages to receive and of rejecting previously received messages. The unit is small enough to be installed in the chart room or on the bridge of a ship. This provides for ease of access by the commanding officer, officer of the deck, navigator, quartermaster, or watch officer. A typical unit is 3 inches high, 8 1/2 inches wide, 11 inches deep and weighs 4.4 pounds.[30] It can be connected to practically any standard computer printer of the user's choosing.

The receive only version of the Standard-C terminal is most appropriate for U.S. Navy units. It processes data at 600 bits per second using an omni-directional receiving antenna. The antenna is virtually identical in size and characteristics to that needed for Global Positioning System reception. A combined

Global Positioning System/SafetyNET antenna is now on the market. This unit is 10 inches high and 4 inches in diameter. It weighs only 1.1 pounds.[31]

Since SafetyNET, like NAVTEX, uses a passive receiver, it produces practically no electronic emissions.

The terminal's operation is quite simple. It requires only a few basic choices to be made by the operator. The user may select the satellite to be monitored and the types of message to be received. Certain classes of "ALL SHIP" messages, such as search and rescue alerts, cannot be deselected[32].

SafetyNET features a major enhancement that distinguishes it from NAVTEX. The latter system is geographically limited by the range of medium frequency transmissions. Since satellite communications cover extensive areas of the globe from a single satellite, artificial geographic limitations have been programmed into the SafetyNET system. The software within the SafetyNET receiver allows geographic addressing by shore authorities. This feature does not affect the passive nature of the receiver's operation. There is still no hand shake between the communication satellite and the receiving unit on board.

The software in the receiver does all the processing independently based on what it receives from the ground station over the satellite link. The receiver contains the ship's position. It is entered manually by the watch officer or automatically by the ship's electronic navigation equipment, such as LORAN-C or the Global Positioning System. This position is compared with the incoming signal. If it matches the geographic limit parameters, the message is recorded and printed. It will not be printed again even if the shore station repeats the message.

Using SafetyNET, a broadcast authority such as the U.S. Defense Mapping Agency Hydrographic/Topographic Center could address:

- Selected ships individually
- Fleet or group of ships
- All ships in a geographic area, either rectangular, circular, or irregularly shaped (such as a NAVAREA)
- All ships of a certain flag
- All ships

The limits of all sixteen NAVAREAS of the Worldwide Navigational Warning Service are programmed under option three. Even though a single satellite footprint may include multiple NAVAREAS, a ship need only copy the messages affecting its area of operation.

Improved timeliness is an important improvement that SafetyNET offers over existing systems. During the Enhanced Group Call Sea Trials of the SafetyNET system, a violent storm swept across southern England. A ship capsized at about 1000Z creating a potential hazard and Dover Harbor was closed until further notice. The Coordinator of NAVAREA I (Hydrographic Department, U.K. Ministry of Defence) transmitted a warning by SafetyNET. He informed the Coordinator of NAVAREA IV (U.S. Defense Mapping Agency) by traditional electronic means (AUTODIN). Ships equipped with a SafetyNET receiver had a hard copy of this information in less than two minutes.[33] The U.S. Defense Mapping Agency received the message one hour and twenty-five minutes later.[34] Ships equipped with NAVTEX receivers had the information in one hour and thirty minutes.[35]

Allowing time for reprocessing and transmitting the new message to U.S. Navy communications centers, the earliest a ship using only the HYDROLANT broadcast could learn of this event was 1600Z on the scheduled broadcasts from Norfolk, Virginia; Thurso, Scotland; and Rota, Spain which were made at that time.[36] That was nearly six hours after the event if everything worked right. Isn't it better to find out the harbor is closed before the ship arrives?

MANDATORY VERSES VOLUNTARY PARTICIPATION

The Global Maritime Distress and Safety System, which includes both NAVTEX and SafetyNET, is a cooperative, worldwide development. It is envisioned that all coastal states, either directly or through NAVAREA coordinators, will participate in its operation. Either SafetyNET alone or NAVTEX and SafetyNET combined can be used to promulgate maritime safety information. In this way, a ship equipped with a NAVTEX and a SafetyNET receiver is well protected. It can practically be guaranteed receipt of all coastal and long range warnings anywhere from the Worldwide Navigation Warning Service. Once again, this includes navigational warnings, weather warnings, and search and rescue information.

Conventional broadcast warning traffic accounts for a measurable portion of all maritime safety information to be transmitted by the Global Maritime Distress and Safety System. During peacetime, non-exercise periods, the combination of SafetyNET and NAVTEX offer the U.S. Navy a way to decrease this burden on its military communications system. This reduction can be measured by tangible savings both in circuit load time and manpower processing time. Both of these evolutions lead to delays in receiving warning messages by bridge personnel. The possibility exists that the International Maritime Satellite Organization satellites may be declared unusable during military exercises. This could also happen during periods of limited or even global conflict. The present medium and high frequency systems can be reactivated partially or fully in these circumstances.

Changes to the Safety of Life at Sea Convention of 1974 implement the Global Maritime Distress and Safety System. Mandatory major system upgrades for medium and high frequency radio teletype operations are part of these changes.[37] The Mobile World Administrative Radio Conference has specifically dedicated eight frequencies in the high frequency band for dissemination of maritime safety information. For those administrations that wish to maintain high frequency maritime safety information dissemination service, coordination with the

International Maritime Organization will be necessary to prevent signal interference. Administrations will have the option to continue to promulgate maritime safety information on internationally coordinated radio telex broadcasts in addition to satellite SafetyNET transmissions. Morse code will not be internationally endorsed as part of this system, although it may still be provided unilaterally.

Recently, a survey of U.S. Navy and U.S. Coast Guard personnel possessing extensive responsible ship operations experience was conducted on the subject of radio broadcast navigational warnings. The intent of the survey was to determine the feelings of voluntary users of broadcast warnings, as opposed to civilians who must comply with carriage requirements, as they relate to need, content availability, and system design. Although the sample size was very small (18 respondents from four separate U.S. government duty stations), the results are worth consideration.

Twelve of the eighteen respondents said rules or regulations always required them to review broadcast warnings. Furthermore, thirteen stated the captain's standing orders always or almost always required this review as well. When asked if the information contained in broadcast warnings contributes effectively to navigational safety, eight persons said that it always did. Nine said it almost always did.

For this small group, at least, broadcast warnings are necessary and useful in promoting safety of life at sea.

Regarding the specifics of receiving these messages, <u>all</u> preferred an automated system with sixteen of the eighteen preferring a scheduled broadcast over a random broadcast. One respondent pointed out that if this system is truly automated, a scheduled broadcast is unnecessary. In fact, that is one of the benefits of SafetyNET, although because of the possibility of antenna shadowing there is a chance a ship in port might unknowingly miss a random transmission.

In seventeen cases, one broadcast per day was thought to be sufficient if the data were guaranteed to be received 99.9% of the time within twelve hours. Eleven of eighteen indicated they were aware that over 61% of broadcast warnings affected the areas within 200 miles of the coast (NAVTEX coverage area). However, only seven were confident that these data were available from open public broadcasts in foreign waters. This short survey is produced in its entirety as Appendix 1.

As with every systemic improvement, resources must be considered. How much is it going to cost? Estimated cost for civil SafetyNET receivers today is between five and ten thousand dollars. This will no doubt be reduced markedly as mass production takes hold during the 1992-1999 transition period.[38] When the GMDSS is implemented fully, it is quite conceivable that a combined MILSPEC NAVTEX/SafetyNET receiver could be available for less than $5,000.

This does not represent a major per ship cost for the U.S. Navy, even in an era of declining budgets. These costs can be offset by the two major advantages. First is reduced conventional communications circuit time. Second is the 99%+ dependability of data receipt in any weather day or night. These factors help make the system is attractive. When absolutely minimal electronic emissions due to the passive nature of the system is considered, not only the cost of the system, but also the total system itself, become even more desireable.

The compact size of the receiver and its capability to select messages by category and area of operation, are a unique combination of benefits. Furthermore, the right messages can be received by the watch officer at the right time, and in the right place, whether he be a commanding officer or a quartermaster. Finally, there is no need for skilled radio officers or technicians to operate the equipment. Overburdened communications equipment will become available for other message traffic, both aboard ship and on shore at the communications station.

SUMMARY

The only possibility for timely receipt of navigational warnings by U.S. Navy ships worldwide is through the broadcast networks based on the Global Maritime Distress and Safety System, NAVTEX and SafetyNET.

It would be efficient, economical, and practical for U.S. Navy ships to carry NAVTEX receivers and SafetyNET receivers. Likewise, it is counterproductive to jury-rig around the Global

Maritime Distress and Safety System.

Arguments have been made that Navy ships have no yardarm space for new antennas. This is difficult to accept considering the small size of a NAVTEX antenna. The SafetyNET antenna is compatible with the Global Positioning System antenna. Since every Navy ship will eventually be fitted to use the Global Positioning System, these antennas could be combined with little or no space impact. At this writing, the U.S. Navy is considering equipping several of its ships with satellite equipment to receive broadcasts from the Armed Forces Radio and Television System.[39] The antenna for this equipment are 4 feet 6 inches high, 4 feet 3 inches in diameter, and weigh 209 pounds.[40] That is 100 times the weight and more than five times the size of a Global Positioning System/SafetyNET combined antenna.

Finally, U.S. Navy reluctance to be dependent on a civilian controlled satellite communications system will not stand on its merit. The U.S. Department of Defense already leases a large portion of spare commercial communication satellite capacity for its special uses. The present broadcast warning systems throughout the world are operated by civilians in various capacities. Although invariably employed by their governments, very few are in uniformed service.

CONCLUSION

The U.S. Defense Mapping Agency must participate in the

Global Maritime Distress and Safety System if it is to maintain timely access to even a portion of worldwide maritime safety warnings information. It is committed to providing maritime safety information using SafetyNET transmissions. This is one of its responsibilities as Coordinator for two of the sixteen NAVAREAs of the Worldwide Navigational Warning Service. It is time for the U.S. Navy to consider the advantages and disadvantages of maritime safety information receipt using NAVTEX and SafetyNET based on utility and merit.

Use of the equipment created for the Global Maritime Distress and Safety System will result in the receipt of more timely, more comprehensive, and more germane maritime safety information. It increases safety at sea. It need not be expensive. It need not compromise a ship's location. The system has been tested and it passed with flying colors. NAVTEX is here now. SafetyNET will be here in 1992. It is not too soon to act.

NAVTEX and SafetyNET are capable of providing nearly 100% of the maritime safety information needed by the U.S. Navy on a worldwide basis. No other system is, or can be, nearly that capable. Both NAVTEX and SafetyNET are automated systems. Both are based on scheduled transmissions with a random transmission capability for initial or emergency situations. SafetyNET is theoretically 99.9% reliable. NAVTEX schedules run every 12 hours at a minimum. The information provided by these systems is needed and even required on most ships. Why not get it the fast and easy way?

Legislation proposed by the Federal Communications Commission and the U.S. Coast Guard will state carriage requirements governing SafetyNET and NAVTEX equipment for United States' commercial shipping. Ships will have to comply with these carriage requirements. These rules will bring apply to all the commercial vessels under the purview of the Military Sealift Command. U.S. Navy combatants must come voluntarily. It would be far better done through directive than out of a ship's discretionary fund.

RECOMMENDATION

The U.S. Navy should equip its ships with NAVTEX and SafetyNET equipment. All surface units should be fitted with NAVTEX no later than 1 August 1993. All surface units that operate more than 200 miles from the coast should be fitted with SafetyNET satellite communications receivers no later than 1 February 1999. The cost of one major casualty related to the lack of warning information over the next decade will more than offset the minor equipment investment required to receive the information that can prevent that accident. The budget says there will be few new ships in the future which is all the more reason to protect the ships that are sailing now.

Mr. Steven Hall served from October 1984 to July 1987 as the Coordinator of NAVAREAS IV and XII of the Worldwide Navigational Warning Service and operated the HYDROLANT/HYDROPAC radio broadcast warning system for the U.S. Defense Mapping Agency. He was the Chairman of the International Hydrographic Organization's Commission on Promulgation of Radio Navigational Warnings from November 1986 to July 1988. During this time frame, he also served on the U.S. delegation to the International Maritime Organization Sub-Committee on Radiocommunications, represented the United States at the International Maritime Satellite Organization Meeting of Experts on Cost/Funding the Global Maritime Distress and Safety System, and participated actively in the conduct and analysis of the INMARSAT Standard-C Enhanced Group Call Sea Trials. The opinions expressed in this paper are those of the author alone and do not reflect the position of the International Hydrographic Organization, the U.S. Army War College or the U.S. Defense Mapping Agency.

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RADIO NAVIGATIONAL WARNINGS USAGE SURVEY

1. Are you serving in:
[*15*] U.S. Navy
[*1*] Coast Guard
[ ] Merchant Marine
[*2*] Other (specify) ____________________

2. On how many different active ships have you served?
[*73*] (Number)

3. What was your total length of service on these ships in these positions? (Months)(more than one may apply)
[*60*] Commanding Officer
[*344*] Navigator
[*851*] OOD
[*212*] Quartermaster

4. Did YOU use HYDROLANT or HYDROPAC long range radio broadcast navigation warning messages while on shipboard?
[*15*] Yes
[*1*] No
[*2*] Don't know

5. What positions did you hold when you used radio navigational warnings? (Check as many as apply)
[*1*] Commanding Officer
[*10*] Navigator
[*11*] Officer of the Deck
[*3*] Quartermaster
[*1*] Other (specify) *Communications Officer*

6. Did rules or regulations require you to review broadcast warning messages?
[*12*] Always
[ ] Almost always
[*3*] Almost never
[*3*] Never

7. Did Captain's standing orders require you to review broadcast warning messages?
[*11*] Always
[*2*] Almost always
[*3*] Almost never
[*4*] Never

8. Was a broadcast warning file readily at hand when you needed it?
[*11*] Always
[*1*] Almost always
[*3*] Almost never
[*2*] Never
[1] Can't remember

9. Was the broadcast warning file maintained in a usable form, that is, up to date?
[*9*] Always
[*5*] Almost always
[*2*] Almost never
[ ] Never
[2] No answer

10. How did you (your radio operator) receive HYDROLANTS/HYDROPACS?
[*1*] No, I never received them
[*2*] HF A1A (Morse Code)
[*6*] High Frequency Radio Teletype (F1B)
[*12*] FLTSATCOM
[*4*] AUTODIN
[*2*] Other (explain) *Submarine Broadcast system*
[2] Don't know

11. Did your radio operators routinely receive broadcast warnings by morse code to your knowledge?
[ ] Always
[ ] Almost always
[*6*] Almost never
[*8*] Never
[*4*] Don't Know

12. When there was a gap in a message series, from where did you (or your radio operator) get the missing information? (Check all that apply)
[*3*] Shoreside Communications Center
[*1*] DMA Hydrographic/Topographic Center
[*7*] Wait for Notice to Mariners
[*2*] U. S. Coast Guard
[*5*] Ask another ship
[*8*] Don't know
[*1*] Other *Ask squadron group operations*
[1] No answer

13. Did your ship routinely receive coastal radio broadcast navigation warnings?
[*6*] Always
[*3*] Almost always
[*4*] Almost never
[*3*] Never
[2] Don't know

14. How did you receive coastal warnings on your last ship?
[*4*] Did not receive coastal warnings
[*1*] A1A (Morse Code)
[*8*] Voice VHF
[*2*] Voice MF
[*1*] F1B (SITOR)
[*1*] NAVTEX
[ ] Other(explain)______________________________
[2] Don't know
[3] No answer

15. Have you served on a ship equipped with commercial INMARSAT communications equipment?
[*3*] Yes
[*13*] No
[*2*] Don't Know

16. Was the equipment?
[ ] Standard A
[ ] Standard B
[ ] Standard C
[15] Not applicable
[3] Don't know

17. Did the satellite equipment have Enhanced Group Call (EGC) capability?
[ ] Yes
[ ] No
[ ] Don't Know
[14] Not applicable
[4] Don't know

18. Would you prefer to receive radio warning messages on a scheduled or random basis?
[*16*] Scheduled
[*2*] Random
[ ] Don't want them at all

19. Would you prefer a manual or automated system for the receipt of radio broadcast warnings?
[ ] Manual
[*18*] Automated
[ ] Don't want them at all

20. The data contained in broadcast warning messages contributes effectively to navigational safety.

[*8*] Always
[*9*] Almost always
[*1*] Almost never
[ ] Never

21. How often do you consider the data in radio broadcast warnings as being worthwhile?

[*7*] Always
[*8*] Almost always
[1] Sometimes
[*2*] Almost never
[ ] Never

22. How frequently did you receive long range radio navigational warnings?

[*1*] Less than once a day
[*4*] Once daily
[*2*] Twice daily
[ ] More Than Twice daily
[*8*] Sporadically as issued
[3] No answer

23. Presently, messages are transmitted at least twice per day per frequency per station. Is this adequate?

[*3*] Always
[*11*] Almost always
[*2*] Almost never
[ ] Never
[2] Don't know

24. Would one transmission per day be sufficient if receipt was 99.9% guaranteed within twelve hours?

[*17*] Yes
[*1*] No

25. What percentage of the radio operators on the ships on which you served were proficient in sending and receiving morse code over continuous wave high frequency circuits (HF CW A1A)?

[*4*] Most
[*1*] Some
[*6*] Few
[*2*] None
[*4*] Don't Know

26. Have you ever received HYDROPAC messages from these stations?
[*6*] Honolulu, Hawaii
[*5*] Guam
[*6*] San Miguel, Philippines
[*1*] Other *Yokosuka, Japan*
[*7*] Don't know source
[2] No answer
[2] Atlantic Fleet area only

27. Have you ever received HYDROLANT messages from these stations?
[*4*] Boston, Massachusetts
[*8*] Norfolk, Virginia
[*3*] Key West, Florida
[*6*] Rota, Spain
[*3*] Thurso, Scotland
[*2*] Nea Makri, Greece
[*1*] Other *Annapolis, Md.*
[*7*] Don't know source
[4] Pacific Fleet area only

28. HYDROLANTS/HYDROPACS duplicate radio warnings broadcast by foreign hydrographic offices after processing by the Defense Mapping Agency (DMA).
[*4*] Always
[*3*] Almost always
[*3*] Almost never
[ ] Never
[8] Don't Know

29. Which of these areas are covered by NAVAREA broadcast warnings of the Worldwide Navigational Warning Service? (check as many as apply)
[*9*] North Atlantic
[*7*] Baltic Sea
[*8*] France, Spain, Portugal
[*8*] Mediterranean
[*7*] South America, East Coast
[*7*] South America, West Coast
[*9*] Caribbean Sea
[*8*] South Pacific
[*10*] North Pacific
[*8*] South Atlantic
[*8*] Australia/New Zealand
[*8*] Japan
[*8*] Indian Ocean
[*7*] Red Sea/Persian Gulf
[8] No answer

30. Long range radio warnings are available from open public broadcasts in foreign waters.
[*2*] Always
[*5*] Almost always
[*3*] Almost never
[*1*] Never
[7] Don't know

31. What percentage of broadcast warning information do you think affects the area within 200 miles of the coast?
[ ] Less than 20%
[ ] 21 to 40%
[*3*] 41 to 60%
[*5*] 61 to 80%
[*6*] More than 80%
[3] No answer

32. NAVTEX is a receive-only, direct printing coastal radio warning system covering many coastlines of the world.
[*8*] True
[ ] False
[*10*] Don't Know

33. NAVTEX operates on these frequencies. (Check all that apply)
[ ] 385 kHz
[ ] 490 kHz
[ ] 500 kHz
[*5*] 518 kHz
[ ] 655 kHz
[ ] 812 kHz
[ ] 1290 kHz
[*13*] Don't Know

NOTE: Totals are given in italics. Comments in italics reflect responses that did not fit the questionnaire. For instance, "Can't Remember, Don't Know, No Answer, Not Applicable, Sometimes, or specific fleet areas" were written in by the respondents or assumed by the author, as appropriate. They are listed here to help the totals to add up accurately. One response was severely mangled by the U.S. Mail so only part of its data are used. This questionnaire was distributed to a <u>very</u> <u>small</u> sample area but is considered representative of the trends a larger dissemination would produce.