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THE ROLE OF COMMUNICATIONS IN SEARCH AND RESCUE

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ABSTRACT

The purpose of this paper is to examine more than mere rules and proceedings in order to show that is necessary to maintain strong interest for to increase activities for SAR. One of these are the communications process which it was considerated at International Convention on Maritime Search and Rescue, 1979. However, it is very important to take in account implications related to international and national development on this matter.
The communications in SAR which play an important role and technology available for such a system are examinated. This is followed by a critical analysis of the provisions of the Convention and a study of its main features.
The analysis and assessment made in this work assist in reaching certain conclusions to improve the Convention made to substantially reduce the loss of life at sea. Therefore, this work could be improving the VIII Congress on Naval Engineering, Sea Transport and Port Engineering made by IPIN.

THE ROLE OF COMMUNICATIONS IN SEARCH AND RESCUE

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Before dealing with the vital role of communications in Search and Rescue, it would be useful to say a brief word on the legal duty to render assistance.

The Legal Duty to Render Assistance

The duty to render assistance to persons in distress, which is one of the oldest traditions of the sea, derives from the rules of chivalry (I) and later received support from Christian teaching. It still appears is many recent international conventions.

Article II of the Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea 1910, states: (2)

> "Every master is bound, so far as he can do so without serious danger to his vessel, her crew and her passenger, to render assistance to everybody, even though an enemy, found at sea in danger of being lost."

The Genova Convention on the High Seas, 1958, in article 12, paragraph 2, provides: (3)

"Every coastal State shall promote the establishment and maintenance of an adequate and effective search and rescue service regarding safety on and over the sea and, where circumstances so require, by way of virtual regional arrangements, co-operate with neighbouring States for this purpose".

More recently, Regulation 15 of the Chapter V on Safety of Navigation, Safety at Sea (SOLAS) Convention, 1974, provides: (4)

"Each Contractiong Government undertakes to ensure that any necessary arrangements are made for coast watching and for the rescue of persons in distress at sea around its coasts. These arrangements should include the establishment, operation and maintenance of such maritime safety facilities as are deemed practicable and necessary having regard to the density of the seagoing traffic and the navigational danger and should, so far as possible, afford adequate means of locating and rescuing such persons."

"Each Contracting Government undertakes to make available information concerning its existing rescue facilities and the plans for changes therein, if any."

It is clear that the rules for the implementation of the principle of save and assistance, as stipulated in these conventions, are left to each State. Consequently, national law in some countries prescribes penal or disciplinary sanctions for failing to comply with such a duty.

In the United Kingdom (5) the duty to assist ships or aircra in distress is stipulated in:

(a) Section 6 (I) of the Maritime Convention Act, 1911, which provides that the master or person in charge of a vessel shall, so far as he can do so without serious danger to his own vessel, her crew and passengers (if any) render assistance to every person, even if such a person be a subject of a foreing State at war with Her Majesty, who is found at sea in danger of being lost. If he fails to do so, he is guilty of a misdemeanour.

(b) Section 22 of the Merchant Shipping (Safety Convention) Act, 1949, provides that the master of a British ship, on receiving a distress signal at sea or information from any source that a vessel or aircraft is in distress, must proceed with all speed to the assistance of the persons in distress (informing them if possible that he is doing so), unless he is unable, or in the special circumstances of the case considers it unreasonable or unnecessary to do so, or unless he is released from this obligation under certain conditions

(paragraph c refers). If the master of any ship in distress requisitions any ship that has answered his call, it is the duty of the master of the requisitioned ship to comply with the requisition by continuing to proceed with all speed to the assistance of the persons in distress. (6)

(c) A master is released from the obligation to render assistance as soon as he is informed of the requisition of one or more ships other than his own and that the requisition is being complied with by the ship or ships requisitioned, or if he is informed by the persons in distress or by the masters of any ship that has reached the persons in distress that assistance is no longer required

(d) Section 22 (5) of the 1949 Act provides that if a master of a British ship registered in the United Kingdom fails to act in accordance with these instructions he is guilty of a misdemeanour. (7)

In Chile the obligation to assist ships in distress is stipulated in the Navigation Law, "Decreto Ley N° 2222, 1978", replacing the Navigation Law of July 1878. Article 102 provides that all ships' masters have the duty to assist other ships in distress, so far as they can do so without serious danger to their own ship, her crew and her passengers. This duty ceases when the lives of crew and passengers of the ship in distress have been ensured. In case the master fails in complying with his duty in this respect, his certificate would be cancelled, without prejudice to any other penalties. (8)

Thus the legal duty to save life at sea (9) is established by international customary law, treaties and national law. It would be performed once a distress signal has been received. (10) Here lies the crucial issue of communication. (II) As the success of a rescue operation depends on:

(a) an effective system of communication; and
(b) the co-ordination of SAR services.

SECTION I

EFFECTIVE SYSTEM OF COMMUNICATION

"Seafaring in an adventurous calling. Seafarers are always in conflict with nature and have made epic voyages in danger of shipwreck from earliest times". (12) Ships in distress detected by other passing ships at short distance, some 5 miles or less by visual means, or if the ship in distress was near the shore, the help which could be provided depends upon the nearest available source of aid which exists.

Until 1900 visual lookout was the only means of communication for vessels in distress. At about this time an enormous improvement was made by Marconi's invention, whose introduction to shipping came from "the adoption of wireless telegraphy by the Admiralty." (13) By this means the message from a ship in distress could be received by more distant ships which could still give the assistance required in a timely manner.

Radio-Communication

The technical development of the radio system during this century has produced many remarkable improvements and MF,HF and WHF have been sufficient for communication needs at sea. However, as more nations enter into the shipping world (14) adding to the existing development, the increased number of ships involved could result in a shortage of radio-channels.

Radio is used not only for safety reasons, but also for the transmission of operational instructions and personal messages, so clearly serious delays are unavoidable. There is heavy congestion on a large range of frequencies which tend to get saturated by the sheer volume of traffic. Since there are similar problems with the frequency bands used by aeronautical and broadcasting services, it is not likely that additional space can be allocated to Search and Rescue co-ordination for use by a mobile maritime service.

The body responsible for such allocation is the International Telecomunication Union (ITU), which is an Inter-Governmental Orga-

nistation with 135 member countries. Its activities are governed by the Montreaux International Telecomunication Convention, 1965, (15) and the latest edition of the comprehensive radio regulations was published in 1968 (16)

Satellite Assistance

In recent years, poor quality in transmission and areas of black-out in the communications are increased principally by traffic congestion, bad weather and under certain ionospheric conditions. Nevertheless, it could be eliminated by the new space technology.

In fact, the main atractions of communications via satellite are to:

(a) relieve the pressure on the MF and HF bands;
(b) improve the quality of transmission;
(c) improve the geographical coverage; and
(d) improve distress communications.

For these reasons, the World Administrative Radio Conference for Space Telecommunications was held in June 1971, under the auspices of ITU. Although the Conference had the opportunity to specify the operational requirements for maritime satellite system, it unfortunately did not take these requirements into account when deciding on the frequencies to be allocated and other technical matters.

Notwithstanding, the Conference considered certain recommendations prepared by IMCO which state that space communication techniques could be used in exchange of information, in particular for alerting and locating ships in cases of distress and emergency..

Finally, at March 1982, a new global system of satellites began to revolutionise maritime communication. In fact, at the World Administrative Radio Conference for Mobile Telecommunications in Genova, it was designed the frequencies plan which need to be reserved for maritime subject to the provisions of the Radio Regulations of the ITU.

Marisat Programme

The Maritime Satellite System (MARISAT), developed by Comsat General Corporation of the United States, represents one of the most significant advances in maritime communications since the advent of wireless telegraphy at the turn of the century.

Marisat uses three satellites stationed over the Atlantic, Pacific and Indian Oceans, and they operate at different frequencies to serve distinctly different needs: UHF for Navy Service, L-band and C-band for commercial maritime users.

The shore stations are: at Southbury, Connecticut, for operation with the Atlantic Satellite; at Santa Paula, California, for operation with the Pacific Satellite; and a third shore station is in Yamaguchi, Japan, operating via the Indian Ocean. A general Control Centre in Washington, D.C. serves as the nerve centre for command and control of the three satellites in orbit.

The capacity for data communication is 1.200 and 2.400 bits per second. This service includes: a high quality two-way telephone link, interconnected with the world-wide telephone network; a telex system interconnected with the world-wide 50-band teleprinter network; and facsimile system having many uses such as manifests, drawings, daily reports, weather maps and other graphic materials, All of this information can be exchanged from ship-to-shore and vice versa.

Distress messages from vessels on the US Maritime Satcom System are routed directly to US Coast Guard co-ordination centres for appropriate action as part of the AMVER System. (17)

Marisat was planned to provide comprehensive coverage over the world's three major ocean areas between 70 degrees North and 70 degrees South, (IS) and the marine electronic industry has been developing associated equipment for use on board ships and ashore. (19)

Despite the advantages of Marisat, (20) certain shortcomings have resulted in many international objections based principally on the fact that it is not an international or global system and

because of its obvious political dependence on one nation. However, it will now be considered how it might be possible to obtain a solution to this problem.

MARECS Satellites

The European Space Agency (ESA) was formed by 10 countries: Belgium, Denmark, France, Germany, Holland, Italy, Spain, Sweden, Switzerland and the United Kingdom. The major financial contributors among them have assumed overall responsibility for a particular aspect of ESA's effort: France inagurated the spatial service when the "Ariane" vehicle was launched; Germany is the leader on the spacelab orbiting laboratory; and Britain is to team up with companies throughout Europe and act as guaranter for their technical ability (21)

The ESA programme consists of five European Communication Satellites (ECS). The first was the "Ariane" vehicle in orbit from 1981, the second was in orbit later and the others will be launched before 1990. ECS are designed to carry 12.500 telephone circuits and two television channels, and the satellites will relay the whole of European Broadcasting Union's Eurovision.

ECS will be preceded into orbit by MARECS (Maritime European Communication Satellite), a derivate of the ESA programme carrying a different payload but using many common components. The first MARECS was launched aboard the "Ariane" vehicle and it is hoped that four MARECS will form part of a worldwide marine network which will be discussed in the following paragraph.

MARECS will give a greater coverage, allows radio telephone and teleprinter transmissions to be automated and provides a link for a meteorological and hydrological bulletin. At the same time, MARECS will be capable of providing services such as data transmission which are not possible on the MF and HF bands, as well as an improved safety and distress service.

In practice the MARECS will have Coastguard connections with all the maritime countries, and distress messages will be initiated (via telex or telephone) by depressing a distress

buttom when the system is in operation. This buttom will immediately have access to terminals, with overriding priority assigned to the ships relaying the message to a rescue co-ordination centre.

In Britain the terminal will be at Falmouth MRSC, with the necessary line connections to the Post Office Satellite ground station at Goonhilly. The telex and telephone terminals are currently being planned. (22)

INMARSAT Organisation

In March 1972, the IMO (Ex-IMCO) Maritime Safety Committee decided to establish a panel of experts to study the above-mentioned problems in detail. The panel held six meetings and prepared a report which included the following sections: (I) reasons for establishing a maritime satellite system; (2) operational requirements; (3) basic technical parameters of a first-phase system; (4) channel assignment and terrestrial interface; (5) economic assessment; and (6) organisational and institutional arrangements.

The report was submitted to a conference convened by IMO. It held three sessions, the first in Apbril 1975, the second in February 1976 and the third in September 1976. It adopted two instruments: the Convention on the International Maritime Satellite Organisation (INMARSAT) and the Operationg Agreement on the International Maritime Satellite Organisation.

On July 16, 1979, the INMARSAT Convention came into force and it was accomplished with a reconcilitation of political and economic interests of diverse and even opposing character in an operational agency.(23)

The satellite system involved in INMARSAT has three main components as follows: (24)

a) Space segments will consist in principle of 3 Marisat and 3 Marecs, with 2 satellites placed in geostationary orbit over each of the three oceans. It is possible, at some future date, that 43 satellites could be providing a global distress system.

b) Shore stations performing the inter-connection between the network ashore and the satellite system by either partial or fully automatic means

c) Ships terminals carrying out the subscriber services of the system with tuning and other functions controlled by the shore stations to which they are connected.

This system will, of course, have to possess global capacity and basically the aim of this organisation is to make proper provision for the space segment necessary for improving communications at sea including those in connection with human life saving, management efficiency and other aspects (25).

There is no discrimination on grounds of nationality and it is likely that workers in danger on ODAS, (26) such as platform oil rigs at sea, could be rescued by means of this communications system. In this form INMARSAT has changed the telecommunication scene with most unusual possibilities where multinational accord is concerned.

Although INMARSAT was born from IMO's effort, the new organisation does not deem itself to be part of the UN family of organisations. It will certainly have to have an effective "modus vivendi" with several other organisations. In fact, there are those mentioned already (IMO, ITU), but in addition there are others of potential importance such as the UN Conference on Trade and Development (UNCTAD), which is active in the field of shipping; the International Labour Organisation (ILO), which deals with the welfare and safety of seafarers; and even the World Bank, which loans money to governments for projects of potential benefits, (27).

The INMARSAT internal structure consists of three elements; the Assembly of States which sign the convention and have one vote each; (28) the Council, where States are represented according to their investment in shares and have 'weghted voting' as in the International Monetary Fund (IMF); and finally the Directorate or Staff based in London.

The use of Satcoms (satellite communications) for distress traffic has its problems and complexities. For example, the cost

of 48 special low orbit satellites could be considerable bút a solution must be found; and it is necessary, if it is technically possible, for survival craft to carry a distress alerting system.

However, since the total INMARSAT elements are not yet implemented at all, other devices can assist in the interim, for example, the Emergency Position Indication Radio Beacon (EPIRB System) which is being developed to indicate position when the ship is interrogated by a satellite. Automatically a bearing on the ship in distress is obtained in an attempt to co-ordinate the rescue of survivors. (29)

The provisional draft system above is intended by IMO to be linked closely to the services provided by INMARSAT. The syste will provide for the integrated use of all frequency bands to ensure the reception of distress and safety messages at short, medium and long ranges. The wide use of satellites for reporting and locationg purposes as SAR operations will be a distinctive feature of the future system.

Other important work is in relation to the changes needed to the existing Radio Regulations to be made, and it was made by the Administrative Radio Conference for the Mobile Services at 1982. The necessary changes to the 1974 Safety at Sea Convention with provisions for the transitional plans was ready at 1981.(30)

The suggestions above are being considered by the authoritie concerned and it is planned that the entire programme will be operating in 1990. It is hoped there after that the messages of any ship in distress will be received in fact into a "Global Maritime Distress and Safety System", in order to co-ordinate appropriate Search and Rescue operations.

The Global Maritime Distress and Safety System.

The IMO Sub-Commitee on Radiocommunications firstly developed the requirements of the future Global Maritime Distress and Safety System. The objective of the system is, as was examined above, to provide for adequate radiocommunications in order to promote safety of life at sea. The system will support the International Convention on Maritime Search and Rescue 1979, and ensure the rapid transfer of distress messages from those in distress to the

units best suited for giving or coordinating assistance.

The Sub-Commitee on Radiocommunications, in order to promote safety, recognized that the future system is very dependent upon an efficient and well-developed international SAR organisation with functioning rescue co-ordination centres responsible for SAR operations and would like the Sub-Committee on Safety of Navigation to prepare, as a matter of urgency, a maritime SAR plan, taking into account the requirements of the future system.

A 1990 implementation date for the future system was planned by INMARSAT and IMO, However, it was recognized that a great number of administrative, technical and installation problems may arise which may affect the final date of implementation.

In view of the dependence of the future system on the provision of world-wide search and rescue co-ordination, this preferred implementation date for the system might not be achieved unless a co-ordination of SAR services in all areas is provided.

An important aspect of the future system is the provision of Short/Medium range (up to 100 miles) distress call and communication facilities which will provide SAR co-ordination and assistance in the immediate area of the distress. The other aspect is the provision of long range distress call and communication facilites which could provide for co-ordination by a remote station many thousand of miles from the area of distress if SAR co-ordination facilites were not locally available.

The present system is primarily based on aural watch being kept by ships and shore stations for distress calls and messages. Distress traffic is conducted by morse telegraphy or by radio-telephony. The normal range of communication is not required by Chapter IV of the 1974 SOLAS Convention to exceed 150 miles; it is therefore essentially a Short/Medium range system.

The future system will use automatic alerting (digital selective calling) by means of terrestrial and satellite communi-cation facilities. Distress traffic will be conducted by voice or by radio teleprinter (narrow band direct printing). The future system will, in addition to short/medium range alerting, also provide for long range alerting and communications.

The future system will be global and designed to ensure that:

(a) alerting, identification and positioning are quickly and reliably performed in all types of distress incidents;

(b) a telecommunications network exists to facilitate the rescue of survivors including their location and the co-ordination of rescue units;

(c) it is reliable and that equipment to be used by persons in distress will be simple to operate; and

(d) it is able to accomodate co-incident distress calls.

Distress alerting means the successful reporting of a distress situation to a unit which can provide or co-ordinate assistance.

The distress call which provides the alerting will be sent automatically and will provide for self-identification, particulars of the ship's position and time and nature of distress. Alerting may be achieved using the following methods: Ship-to-shore alerting; shore-to-ship alerting; or ship-to-ship alerting.

Short/medium range systems should always be used to alert ships except at long range and when within range of the shore. In this sense the future system includes associated coast stations and coast/earth stations belonging, for example, to H.M. Coastguard or SERBREM in Chile, which is defined as a unit responsible for promoting efficient organisation of SAR services and for co-ordinationg the conduct of Search and Rescue.

In addition, the future system will provide for long range distress alerting using terrestrial radiocommunications (HF) but will primarily be based on satellite techniques including satellite EPIRB's and other similar alerting devices. Such low-powered distress transmitters would also be used in certain instances when near to shore.

In "IMCO Notes",Seaways, November 1980, it was reported that "experience already gained shows that satellite communications are more efficient than existing methods; they also offer such advantages as rapid access, high reliability and long range",also the probability of receiving a distress alert is significantly

enhanced by a comprehensive system of mutually co-ordinated receiving stations. A similar network of transmitting stations will also improve the probability of alerting ships.

When the destress call is transmitted by the ship in distress using satellite links, on receipt of the distress call by the appropriate rescue co-ordination centre, this centre will initiate a distress call to be relayed to mobile units in the vicinity of the ship in distress, using the appropriate short, medium or long range facilities provided for the future system.

On receipt by a ship of a relayed distress call the ship will establish communication with the appropriate SAR centre. The ship will also attempt to establish communication with the ship in distress. To enable distress calls received at one rescue co-ordination centre to be rapidly transmitted to the rescue co-ordination centre responsible for the area in which the distress has occurred, there is a requirement that the rescue co-ordination centre should be permitted to use a maritime satellite link.

The operator on the ship in distress will enter in the equipment, the ship's position and time and nature of distress, if time permits and these are not automatically provided. He will then activate the distress call. The control of distress traffic will be the responsibility of the ship in distress when it has communicated with assisting SAR unite using the short and medium range communication facility. The control of distress traffic for long range purposes will be the responsibility of the appropriate rescue co-ordination centre. In both cases, the control of distress traffic may be delegated.

The considerations above indicate that the future Global Maritime Distress and Safety System will be a feasible reality in the near future, using the existing satellites until such time as world coverage is achieved.

SECTION 1.2

CO-ORDINATION OF SAR SERVICES

Despite the national effort applied to coast watching and search and rescue services, sometimes a marked lack of control and co-ordination, by individual countries in pursuit of their own requirements and resourses, has been observed around the world. As a result national organisational plans have developed along different lines.

The dissimilarity of such plans and the lack of agreement and standardised procedures on a world-wide basis, gives rise to certain difficulties although these are generally limited to the initial stages of an alert. In some cases, they can also result in an uneconomical use of SAR facilities, or in unnecessary duplication of effort. (31) Furthermore, differences in procedures and lack of lines of communication may result from the fact that personnel and equipment used for SAR are sometimes part of the military services of the country concerned, and their use has certain restrictions unless a solution should be found under common purposes. (32)

In certain regional areas, neighbouring countries have established regional arrangement which operate successfully and have agreed lines of communication, standard procedure and areas of responsibility for co-ordination and control of the distress at sea. (33).

The exchange of personnel, frequent contacts between the authorities involved, technical conferences or symposia and technical publications have helped to resolve operational difficulties and contribute to the system's effectiveness (34) Obviously, SAR operations could be extended and its practices or exercises agreed upon on a world-wide basis by means of the 1979 Convention.

However, the purpose of this Section is to illustrate the pre-convention position and this will be done by means of specific examples concerned.

The AMVER System

The international maritime programme designed to save life and property at sea, by providing informational aid in the development and co-ordination of SAR effects, has become the job of the "Automated Merchant Vessel Report System" (AMVER)

The AMVER System headquarters is operated by the US Coast Guard at a Centre in New York, Until 1958 it was a modest system restricted to the coastal waters, by which voluntary vessels were plotted manually by means of periodic reports and recorded in a voluminous data file.

Thereafter the use of a computer made data processing dramatically faster and more efficient, thus facilitating the development and co-ordination of SAR operations throughout the world. Vessels under international free service can transmit position reports on long voyages (35) to the New York Centre through specified stations. (36) Reports may be made at any time.

AMVER does not mount operations itself, but supplies 'surface pictures' (Surpics) to search and rescue agencies on demand. (37) The Surpics provide earch ships computer-dead-reckoning position, together with its SAR capabilities, for example, whether she equipped with surface search radar, if she is able to communicate with search aircraft by radio-telephone (2,182 KHz) or whether she has a doctor on board.

If a vessel in distress transmits an SOS message on 500 KHz, (38) the ANVER Centre will take the estimated position from the computer data and other information from previous vessel reports, and will relay the message to all vessels sailing into the area involved and at the same time to the co-ordination authority which is responsible for providing SAR service for vessels or persons in need of assistance in that area, (39)

If the geographical position of the vessel in distress is covered for example, by the United Kingdom, (40) AMVER will transmit a message with this information to the HM Coastguard by means of a link with the Marine Rescue Sub-Centre (MRSC) Laud's End, the only MRSC under this assigned function. Thereafter the air-

maritime SAR operation will be co-ordinated by HM Coastguard.

In these circumstances merchant ships proceeding into the emergency area will have a duty to render assistance, as was indicated above, in conjuction with specialised SAR units, as well as independently in some cases. (41)

AMVER has already become an impressive world-wide SAR service. Ways of making it more effective are continually being sought, and more and more shipping lines and ship owners are realising its benefits.

Certainly the AMVER experience will be important help to the future Global Maritime Distress and Safety System.

Air Search and Rescue on the Sea

The main purpose of the 1979 Convention is to facilitate co-operation between nations and those participating in air-maritime SAR operations at sea. (42) The SAR regulations of ICAO play an important role in co-ordination and its more important aspects of organisation are given below.

The Chicago Conference, 1944, established the basis for the ICAO Convention to be adopted. The Convention provides the Annex 12 (43) on the Search and Rescue Regulations. (44) Its Chapter titles are: 1. Definition; 2. General Co-operation; 3. Organisation; 4. Procedures Preparatory to SAR; 5. Procedures to be followed during SAR; and 6, Search and Rescue Signals.

The Standard and Recommended Practices adopted by the Council are a component part of the Annex. They are defined as follows:

Standard: "Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognised as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliances notification to the Council is compulsory under Article 38."

Recommended Practice:

"Any specification for phisical characteristics,

configuration, material, performance, personnel or procedure, the uniform application of which is recognised as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention."

The definition and general content of Annex 12 (45) above covers almost all the aspects which are taken into account under the International Convention on Maritime Search and Rescue 1979, except the mandatory and permissive functions of the Council referred to by the Article 38, (46)

Prior to the Convention

There were two publications produced by IMCO in 1977, and they provided the rules to be used in SAR operations as follows:

(a) The Merchant Ship Search and Rescue Manual (MERSAR) which is designed as a guide for those requiring assistance at sea or who are in a position to give it, in particular masters of ships who are called upon to conduct SAR operations (47); and

(b) The IMCO Search and Rescue Manual (IMCOSAR), which provides guidelines for a common SAR policy for governments wishing to establish or develop their Search and Rescue organisation and for personnel who may be involved in the provision of SAR services. (48)

In the United Kingdom, as in other countries, the Admiralty Notices to Mariners" (49) provide all the information concerned with Distress and Rescue at sea.

There are many publications which provide instruction on Safety at Sea and include articles on SAR organisation, (50) for example, there is a guide published by the International Chamber of Shipping (ICS) which is intended to enhance the safety of helicopter/ship operations and superseded the earlier ICS publication on "Guide to Helicopter/Tanker Operation". This guide has been prepared primarily for the use of masters, efficers and crews. The last edition was published in 1980.

It is interesting to observe how many International nongovernmental bodies, such as ICS, are to join forces with

the intention of improving procedures related to SAR. (51)

The authorities concerned are involved in the necessary publicity in order to achieve the most efficient and effective use of potential resources. For example, HM Coastguard is planning its future publicity on two considerations: (52)

(a) "That most of the material we produce relies assentially on the localised efforts by individual coastguards in distributing leaflets, arranging film shows, and so on";

(b) "that many coastguards already take public relations funcions very seriously, and arrange speaking engagements to schools, local groups, yachting and boating clubs,etc. and try to stimulate as much public interest as they can"

The publications and public relations above provide an effective means by which to prepare for the international SAR organisation, however, there must be some permanent way to ensure that each country has ain improved service when the 1979 Convention comes into force.

On this point, the words of C.P.S. Srivastava, Secretary General of IMO, could be applied to SAR Organisation, Refering to IMO activities he said, "Until a few years ago, IMO was involved almost wholly in standard formulation. The Organisation is now giving increasing attention to follow-up sections and universal implementation".

Co-ordination based ashore

Mention has been made several times already on the co-ordination of SAR services based ashore, as a main priority.The duty to deploy ships/aircraft to provide life saving assistance for crew and passangers of vessels assume increased importance nowadays

Reviewing the concept above it must be remembered that for a number of years efforts were made in many countries to establish Life-boat Institutions (53), or to cover life-saving services in specified harbour zones where bad weather endarngers the lives of seamen of anchored ships or craft. (54) Efforts have also been made "to maintain a fleet of offshore lifeboats around the coasts, except in certain remote locations where no operational requirement exists, which can reach a casualty up to 30 miles offshore within four

hours of launching". (55)

Much progress has been made in SAR activities in countries such as Britain where the following is offered:

(a) The Royal National Lifeboat Services covering far off territorial waters.
(b) The aircraft services of SAR on a world-wide basis.
(c) Planned international communication system capable of receiving any message from a ship in distress into the area assigned to its SAR services.

HM Coastguard was established under the authority of the Department of Trade with the object of organising Search and Rescue in the United Kingdom,It is responsible for the initiation and co-ordination of all civil maritime SAR measures for vessels or persons in need of assistance.

In Chile, the Search and Rescue service (SERBREM), which is a special branch of the Navy, has the mission of organising and establishing the SAR service for ships, boats and ODAS in distress at sea, as well as persons involved, within the SAR zone assigned (3.000 Square miles approximately). At the same time this service co-operates in Search and Rescue for persons and materials unrelated to the maritime activities on the sea, lakes and river areas.

Thus, in many countries there are organised authorities for SAR operations, and as a consequence it is necessary to maintain a close relationship between those authorities covering limited areas, such as the North Sea or South Pacific Ocean, in order to obtain better co-ordination within its operations.

However, the same consideration must be required of the authorities covering extended sea areas with small route densities, where the danger of casualties is only fortuitous and therefore worse, unless they organise SAR services under a planned system which in many cases will have to rely on its own resources. This, of course, would be extremely costly and may be difficult to justify. This is why the exchange of experiences between authorities concerned from each country is necessary to obtain world-wide standards under an International SAR Organisation.

Finally, the SAR co-ordination based ashore has the advantage of providing better links between IMO's Member States adding to many successful operations carried out nowadays.

CONCLUSIONS

The international regulations for safety at sea form a base for the formulation of national measures in the hope that it will be possible to overcome many of the hazards which threaten ships and their cargos. Saving lives and preventing injuries to crew and passangers is of prime importance.

Shipping has seen an extraordinary development in recent years, in the number of vessels registered and quantity of cargo carried. Technological improvements have brought new classes of special ships such as container and ro-ro. Another factor which must be underlined is the significant growth both in number of ships bearing flags of convenience and fleets of countries without a strong maritime tradition.

In this situation, the inexperience of the crew leads to a condition which could at any time cause numerous casualties.

IMO is taking steps to standardise training, certification and watchkeeping for seafarers, and to promote technical co-operation for those States which request such assistance. It would be encouraging to aim in the near future for the prevention of all accidents, but it is more realistic to accept that this ideal is never likely to be achieved. In fact, despite the advancements made in the adoption of safety measures, statistics reveal an extraordinary increase in the number of seamen killed and injured in recent years. Therefore, it must be taken into account that the sea will always be hazardous place and dangers will always exist.

There is certainly nothing new in saving life at sea by means of a ship-to-ship rescue. Serious problems may arise in those circumstances due to difficulties in communications between vessels, poor weather conditions or lack of experience in SAR operations. Vessels are well equipped for their own emergencies, but using this apparatus for assisting other vessels is not the same.

There are two considerations adding to the difficulties above, Firstly, the problem of not receiving a distress alert from a ship

in danger has been partly solved by the AMVER System which has been developed by the United States of America with undoubted success. In this system a ship voluntary supplies a sailing plan and periodic position reports, free of charge. A central computer collates the information to give a continuous surface picture. If an emergency arises, this information can be used to assist in co-ordinating the rescue operation. However, this system saffers from the drawback of poor short and middle transmission from/to the ship in distress. The international solution to these problems has been drafted by the SATNAV's system which is operated by the INMARSAT Organisation. This system provides a global communications network It is hoped that by the 1990's a "Global Maritime Distress and Safety System" will be fully operational, and there are already three satellites operating at present under a provisional plan.

Secondly, improving the effectiveness of SAR operations has been brought about by shore-based co-ordination for specialised aircraft and ships. The SAR area of responsibility for each country, in principle, has been assigned from the ICAO regulations on aircraft rescue at sea. At the same time the operative norms for air SAR operations have been adopted for maritime SAR from manuals already in use., so that optimum co-ordination of effort is achieved, as has been the experience even now in some countries.

The two points discussed above do not detract from the important value of the ship-to-ship rescue. In fact, they enhance it. The improvement in communications between ships has obvious value and the shore based rescue is aided by the presence of other ships in the vicinity of one in distress. The whole operation being under the co-ordination of one shore station endowed to this effect

The 1979 Convention offers the advantages indicated above and therefore it is hoped that it will come into force without any delay. Meanwhile the authorities concerned are taking steps to crystallize these proposals. For example, the industry is developing the devices required and the general consensus of opinion is that the new SAR organisation will become an international reality.

There is need to revise international laws to establish common regulations in the maritime field. The current laws applying to

the rescue of a ditched aircraft's crew and passenger are in conflict. Under maritime law there is a duty and no remuneration, while under air law it is rewarded. Therefore, about personal life salvage liability may be suggested that, subject to provisions of public and private bounty, it would be an undesirable, on the sea life assistances should be without rewards.

Finally, about the new Global SAR service, no distinction is made on grounde of nationality, ship's flag or membership of particular organisations such as INMARSAT.

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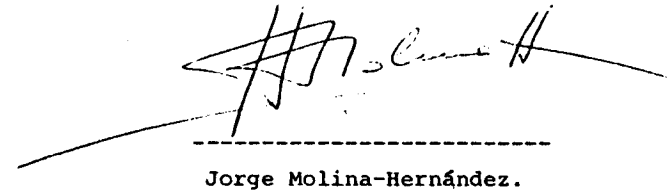

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1983.

NOTES

1. "Chivalry is only a name for that general spirit or state of mind which disposes men to heroic and generous actions". Murray J.A. "English Dictionary" Volume II. The Clarendon Press. Oxford. 1893.
2. See the text of the Convention on "International Conventions on Maritime Law". Comite Maritime International. 1976
3. See Gandhi D.S. "Shipowners, Marines and the new Law of Sea" Fairplay Publications. 1977.
4. In the same Chapter V there are other Regulations relating to Search and Rescue proceedings; for example: Regulation 9 on Misuse of Distress Signals; Regulation IO on Distress Messages, Obligations and Procedures; and Regulation I6 on Life-Saving Signals.
5. Sir Alexander Cockburn, C.J.; in Scaramanga v.Stamp (1880) 5 C.P.D. 295,304; expressed the traditional rule that a ship is to do everything in her power to save life, even if her own material interests are prejudiced, in words which will always remain effective: "to all who have to trust themselves to the sea it is of the utmost importance that the prompting of humanity in this respect should not be checked or interfered with by prudential considerations as to injurious consequences which may result to a ship or cargo from the rendering of the need aid."
6. See Watson v. R.C.A. Victor Coy, Inc (1934) 50 Ll L.R. 77.
7. Duties of masters for assistance in cases of collision are prescribed in Section 422 of the Merchant Shipping Act, 1894 Reports of shipping casualities are provided by Section 73 of the Merchant Shipping Act, 1970; and Merchant Shipping (Official Log Books) (Fishing Vessels) Regulations 1972 (as amended), stipulate the duty of masters to record casualties which have occurred in Official Log Books.
8. Article of the Chilean Law of Navigation, 1978, provides the duties between masters for assistance in case of collision; and Article 56 of the same law provides the master's duties on the Log Books control, particularly its notations on the ship

surroundings or elsewhere.

9. There are several international seminars or conferences about Salvage and Assistance Awards. For example, the Montreal Conference at 1981.
10. "For the saving of life, it is vital that each case of distress be communicated as quickly and accurately as possible to the rescue organisation ashore. The identity and location of the vessel in distress, as well as the kind of distress can usually only be transmitted by radio. Distress alerts from all parts of the world oceans must therefore be received without error by rescue organisation, even if low power distress beacons only are used."
    Hack S. "Maritime Mobile Satellite Service. HM Coastguard. Distress/ Urgency/Safety Facilities". Coastguard Magazine. October 1980, p. 102.
11. The composition of the existing satcom-equipped fleet of the world in 1980 was:

Tankers	96
LNG Tackers	20
Cargo/Container	55
Drill rigs and Platforms	27
Private yachts	10
Seismic vessels	35
Fishing vessels	11
Passenger vessels	17
Offshore construction	15
Others	12 +
Total	298

    + Additional vessels requesting confidentiality, not included. As we can see, this is an eloquent demostration of the communication requirements.

12. Bull J.W. "An Introduction to Safety at Sea". Brown, Son & Ferguson, Glasgow, 1966
13. Hope R. "The Merchant Navy". Stanford Maritime. London. 1980
14. The ratification of the liner code of conduct adopted by UNCTAD V 1979, would be likely to increase the number of ships at sea. See the Author "Planes de UNCTAD para la distribución de cargas bloqueados por paises desarrollados". Revista de Marina, Chile

N° 732, 1979, p. 560.

15. See Singh "International Convention Merchant Shipping". British Shipping Laws. Volumen 8, p. 378.
16. See also the text of the Convention and Protocols, ibid, p. 378-459
17. The AMVER System will be discussed in Section 1.2 infra.
18. Important experience was gained during a transatlantic yacht race in June 1980, when 89 competing craft were each fitted with an Argos transponder which, when interrogated by the satellite, gave latitude, longitude and meteorological informations. The race was from Plymouth to Newport, Rhode Island USA. The data was passed first from the satellite to Toulouse, where it was digested by a computer and then transmitted to the Royal Western Yacht Club (RWYC) and the HM Coastguard to plot the race and to assist in case of casualties, and hand earch craft over to the Coast Guard New York/RCC Halifax as it passed 30° W. The result were excellent, particularly with regard to the rescue of five casualties during the race. The experience above achieves the best solution to the communication problems by means of an automatic radio signal from the ship in distress to the satellite (EPIRB System), until the International Global Satellite System can be increased.
    See Roberts R. "Single-handed Transatlantic Race. "Coastguard Magazine October, 1980, p.95.
19. For instance, to prevent many avoidable emergencies, the Vessel Monitoring System (VMS), manufactured by Magnavox, enables their MX III Marisat Shipboard terminal to make automatic reports on ship emergencies at pre-selected intervals to any designated telex station. Ref. Safety at Sea. February 1980, p. 21.
20. It must be mentioned that there are other USA programmes for the same purpose. For example, the OMEGA System is to consider in future the use of one of its frequencies for distress messages. However the present state of this system is being modified, therefore there is no information on progress at present.

    Ref: Raab F.H. et al. "An Application of the Global Positioning System to SAR and Remote Tracking". Journal of the Institute of Navigation. Volume 24. N° 3, 1977, p. 216-227.
21. See Coastguard Magazine, April 1980, p. 48-49.
22. See Hewish M. "Satellites Loom Large for Europe" . New Scientist. November 15th, 1979.
23. Marisat System was transferred to INMARSAT to facilitate participation of satellite communications. The signatory of the agreement was Comsat (Communications Satellite) General Corpcration, a commercial affiliate to the US Communication interests.
    Ref: IMCO News. Number 2 : 1979, p. 9-10
24. See "Warning up for INMARSAT". Lloyd's List. June 4th, 1980 p.4
25. IMO identified sixteen operational requirements in its preparatory report, made by the Maritime Safety Commitee, to promote INMARSAT Organisation. Ref: IMCO News. Number 2: 1979, p. 9-II.
26. Safety Provisions of Ocean Data Acquisition Systems; Aids and Devices (ODAS) 1972, was a preparatory conference in order to formulate a draft convention in view of the increasing use of buoys and other scientific devices for the acquisition of ocean data or seabel exploitation; and the ship hazard arising from its indiscriminate deployment. ODAS means a structure, platform installation, buoy or other device not being a ship. However, the hazards to workers on ODAS was not considered, therefore as a comment on the International Coventon on Maritime Search and Rescue 1979, this aspect will be exposed at the next Section 1,2, note 34.
27. See Meradith B. "INMARSAT Satellite Communications". Marine Policy. October 1980, p. 329.
28. The INMARSAT Status of 32 countries includes States from East and West Blocs.
29. See Dennis B.C. Nautical Review, November 1979, p. 56; Seaways. November 1980, p. 24; "Co-ordination of EPIRB trials

sought". IMCO News, Number 2: 1980, p.8; and "Understanding EPIRB's several points to be clarified". Lloyd's Ship Manager. February 1981, p.42-43.

30. In general the IMO's working paper deals with such matters as operational requirements and characteristics, alerting methods, terrestrial and satellite communications,and the use of passive alerting. See IMCO News. Number I; 1980, p.3; also "Global System set for 1990 " Lloyd's Ship Manager, November 1980, p. 40. See also "INMARSAT : Space technology for maritime communications". INMARSATI, May 1981.

31. The duplication mentioned is based on the standard excercise of SAR operations by military forces of certain countries and at the same time by other institutions, both having similar purpose.

32. The provision of particular authorities as regards the organisation of SAR services by States, such as United Kingdom and Chile, will be discussed, showing that under common objectives each country can find its own solution to the individual problems concerned, therefore the consideration above on military restrictions should be inapplicable.

33. For instance, it is the agreement between France and the United Kingdom by which boundaries for SAR operations along the English Channel and mutual co-ordination according to existing circumstances were established.

34. There are important improvements in the co-ordination between North European countries in SAR opeations. For example, international maritime assistance was made when a distress occurred in March 1980 to the platform Alexander L.Kielland, a part of the Norwegian Ekofish field. On that occassions, without regulations to assist ODAS, 89 men were saved, however leaving 123 known dead or missing. The assistance was provided by helicopters from Britain and Norway, and trawlors which were fishing within a 60 miles radius of the rig.

The operation had many remarkable details, for example, eighteen trawlers, in the area involved, all hauled their

gear and answered the distress call. The trawler crews stood to their stations for the next 48 hours as a controlled search for survivors was carried out. During that time the trawlermen recovered 31 bodies. However, the helicopters rescue operation demostrated its effectiveness which could be increased at future operations if the distress alert from platforms is made directly to the SAR organisation.
See Hughes E. "Death in the North Sea". The Reader's Digest. Volume 117, November 1980, p. 55-59; See also The Telegraph, May 1980, p. 24.

35. There are four types of report as follows: type I are sailing plans; type 2 are position messages on long voyages to ensure computer accurancy; type D are deviation messages when actual position is more than 25 miles from dead reckoning position; and type 3 are arrival messages which assist in increasing the accurancy of the computer's shipping plot.

36. The complete list of participating stations is included in the "AMVER Bulletin" which is available free of chargo from the AMVER Centre, US Coast Guard, Governors Island, New York' NY 10004, USA.

37. AMVER System further provides advance notice of 24 hours prior to arrival as is required by the US Code of Federal Regulations, title 33, part 124-10

38. Three frequencies are nominated for international use by ships in distress: 500 kHz (H/T) and 2.182 kHz (R/T) in the medium frequency range, giving effective sea cover to distances of 300 and 150 miles respectively, and 156.8 MHs (Channel 16 VHF) with an effective line-of-sight range of up to 45 miles. There are other frequencies in addition for national service units.
Ref: Department of Trade "United Kingdom Maritime Search and Rescue Organisation 1979", p.18

39. The area's allocation to maritime SAR operations is extra-officially established, until the 1979 Convention comes into force, according to an air-plan of maritime SAR made by the

Convention of the International Civil Aviation Organisation (ICAO).

40. The assigned area to Britain covers up to 1.200 miles of the Atlantic Ocean.

41. The HM Coastguard organisation cover several MRSC along the coast, for example, HRSC Liverpool, at Formby, cover Liverpool access area.

42. Successful air SAR operations are normally not the subject of extensive press coverage. The rescue of the crew of three from the Norwegian fishing vessel "Fallback" was no exception. A distress call was intercepted by the crew of an RAF Hercules aircraft, and as a result the fishing vessel's crew was saved. It was probably the first occasion in the North Sea for the use of an emergency locator transmitter (ELT) in a successful rescue. The survivors were found whithin 48 minutes of their ELT signal being intercepted and rescued within only two hours 38 minutes.
Ref: Cowan T. "ELT alert saves three". Coastguard Magazine, October 1980, p. 121.

43. The Annex became effective on December 1st. 1950 and the 5th edition was made in 1970.

44. Other ICAO technical publications, including specialised manuals are: International Standards and recommended practices adopted by the Council in accordance with Art. 37, 54 and 90 of the Convention and are designed, for convenience, to other Annexes; Procedures for Air Navigation Services (PANS) for the safety of air navigation; ICAO field manuals prepared primarily for the use of personnel engaged in operations; Technical Manuals to provide guidance and information in amplification of the International Standards, Recommended Practices and PANS; finally ICAO Circulars make available specialised information of interest to Contracting States.

45. The Annex 12 is made up of the following component parts:
I. Material comprising the Annex proper.
   a) Standards and Recommended Practices;
   b) Appendices; and
   c) Definitions.

2. Material approved by the Council for publication in association with Standards and Recommended Practices.
   a) Forewords;
   b) Introduction;
   c) Notes; and
   d) Attachments

46. Mandatory functions of the Council are included in Article 54 (k) of the Convention as follows:

"Report to the Assembly any infraction of the Convention where a Contracting State has failed to take appropriate action within a reasonable time after notice of the infraction".

Permissive functions of the Council are included in Article 55 (e) of the Convention as follows:

"Investigate, at the request of any Contracting State, any situation, which may apperar to present avoidable obstacles to the development of international air navigation, and after such investigation,issue such report as may appear to it desirable."

47. MERSAR's Chapters are: I. Co-ordination of SAR operations; 2. Action by a ship in distress; 3. Action by assisting ships; 4. Assistance by SAR aircraft; 5 Planing and conducting the search; 6. Conclusion of Search; 7. Communications; and 8. Aircraft casualties at sea.

48. There is now the 1980 edition of IMCOSAR for public consultation, but it was before being available to national authorities, such as HM Coastguard services, in order that SAR organisation will be prepared to undertake their international responsibilities.

49. In order to provide the information for the mariners the Hydrographic Department publishes the "Annual Summary of Admiralty Notices to Mariners", which includes the Annual Notices: N° 4 on Distress and Rescue-Ships and Aircraft; N° 4B on the AMVER Organisation. Similar publications, called "Avisos a los Navegantes", are published by the Chilean "Institute Hidrografico de la Armada de Chile", Valparaíso.

50. Ie, "Code of Safe Working Practices for Merchant Seamen" (DoT); Wright C.H "Survival at Sea"; "Personal Safety on Ships" (DoT); Lee & Lee. "Safety and Survival at Sea", etc.

51 See basic Documents of IMCO, Vol II, N° 68.05 B, with Rules Governing Relationship with Non-Governamental International

Organisations.

52. Sutlisff B. "Coastguard Publicity for 1980/81 "Coastguard Magazine. April 1980, p. 56. Saying:... "many additional tools are produced eg films, slide sets, display panels, literature leaflets, booklets and posters, local activities programme such as open days, competitions, etc. All of them try to stimulate as much public interest about.

53. The Royal National Lifeboat Institution was founded in

54. The Chilean "Cuerpo de Voluntarios Bote Salvavidas" cover the principal areas at port.

55. See DoT "United Kingdom Maritime Search and Rescue Organisation 1979" Her Majesty's Stationary Office, p. II.