The complete GMDSS
The global maritime distress and safety system (GMDSS) entered fully into force on 1 February 1999. The new system is the culmination of nearly thirty years of work by IMO, other United Nations bodies, Member States and the shipping industry. A full report on the new system appears elsewhere in this issue. The photograph shows Inmarsat-C equipment in operation. (Inmarsat)
Eighteen West and Central African States have agreed a draft Memorandum of Understanding (MOU) on port State control (PSC), at a meeting in Conakry (Guinea) which ended on 22 January 1999. The meeting was jointly organized by the Guinean Government and IMO and was supported by the Ministerial Conference of West and Central African States on Maritime Transport (MINCONMAR).

The aim is to hold a further meeting to adopt the MOU in Nigeria during October 1999.

The countries participating in the meeting were Angola, Benin, Cape Verde, Congo, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Liberia, Mali, Mauritania, Namibia, Nigeria, Sao Tomé & Principe, Sénégal, South Africa and Togo.

The Conakry meeting was also attended by representatives of IMO, the United Nations Development Programme (UNDP), the Economic Commission for Africa (ECA), MINCONMAR, the Communauté économique et monétaire de l'Afrique centrale (CEMAC) and other regional organizations. Funding for the meeting was generously provided by the Guinean and Nigerian Governments.

The meeting at Conakry followed an initial preparatory meeting of the States in Accra, Ghana, in February 1998. Participants continued work on developing a set of training measures to improve the maritime Administration infrastructure and human resource capability of the participating States. The aim is to develop a regional training programme for flag State surveyors and PSC inspectors for the West and Central African region.

The meeting agreed, in principle, that the Regional Secretariat would be established in Nigeria while a regional Information Centre would be set up at MINCONMAR Headquarters in Côte d'Ivoire.

The draft MOU that was agreed in Conakry is similar to other regional PSC agreements already established around the world. All countries have the right to inspect ships visiting their ports to ensure they meet IMO requirements regarding safety and marine pollution-prevention standards, and experience has shown that PSC works best when it is organized on a regional basis.

However, the West and Central African MOU will also be expected to cover PSC inspections on smaller ships (below 500 gross tonnage) which are not generally covered by most IMO regulations. These ships tend to trade inter-regionally.

The first regional PSC agreement, covering Europe and the North Atlantic, was signed in 1982 and is known as the Paris Memorandum of Understanding (Paris MOU). The Latin-American Agreement (Acuerdo de Viña del Mar) was signed in 1992; the Tokyo Memorandum of Understanding (Tokyo MOU), covering Asia and the Pacific, in 1993; the Caribbean Memorandum of Understanding (Caribbean MOU) in 1996; the Mediterranean Memorandum of Understanding (Mediterranean MOU) in 1997; and the Indian Ocean Memorandum of Understanding (Indian Ocean MOU) in 1998.

Like the other agreements, the draft West and Central African MOU requires each maritime authority which is a signatory to the agreement to establish and maintain an effective system of PSC and sets for the region's maritime Administrations an annual required total of inspections of at least 15% of the estimated total number of foreign merchant ships entering the region's ports during the year, within a period of three years after the MOU becomes effective.

The MOU encourages exchange of information so that substandard ships can be identified and targeted. On the other hand, ships which have been inspected by one port State and found to be complying with all safety and marine pollution-prevention rules will not be subject to too frequent inspections.
When is radioactive material not radioactive?

The dumping of radioactive waste into the sea is prohibited under the International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (known as the London Convention or LC). However, virtually all materials are intrinsically “radioactive” since they contain radionuclides, and this has led to the problem of how to define when a material can be considered non-radioactive for the purpose of applying the regulations contained in the London Convention.

The 1993 amendments to the London Convention, which entered into force on 20 February 1994, prohibit the dumping of “radioactive waste and other radioactive matter” – but this “does not apply to wastes or other materials (e.g. sewage sludges and dredged material) containing de minimis (exempt) levels of radioactivity as defined by the IAEA [International Atomic Energy Agency]”.

The Twentieth Consultative Meeting reviewed a report by the IAEA on the application of the de minimis concept and agreed to establish an Ad Hoc Group of Experts on the Definition and Application of the de minimis Concept under the London Convention (London Convention de minimis Group). The Group is scheduled to meet in May 1999 and will consider the following issues in relation to the de minimis concept:

1. ensuring that the de minimis concept applies only to those wastes not otherwise prohibited from disposal under the Convention;
2. the protection of the marine environment, including human health, flora and fauna of the marine environment as well as legitimate uses of the sea; and
3. the need for practical and uniform guidance to national authorities responsible for authorizing sea disposal activities.

The de minimis concept

According to the IAEA report submitted to the LC Meeting, the term “de minimis”, in the context of the London Convention 1972, subsumes two distinct concepts:

1. Exclusion – equivalent to the expression de minimis non curat lex – covering a situation that is outside the regulation because it is unamenable to control by the regulation irrespective of the magnitude of the dose;
2. Exemption – equivalent to the expression de minimis non curat praetor – covering a situation of no concern to the regulator because of its triviality, even though it is of relevance to the regulation.

The IAEA report notes that “all materials, including natural and inert materials, contain natural radionuclides and are frequently contaminated with artificial radionuclides”. However, Contracting Parties to the London Convention do not intend to consider all such materials as radioactive in implementing the provisions of the Convention and therefore need to address the question of how to discriminate between “radioactive” and “non-radioactive” materials for the purposes of the Convention.

Materials defined as “non-radioactive” could then be considered for dumping at sea without any consideration of their radioactive constituents or the radiological consequences associated with their disposal.

The IAEA study concludes that, for the purposes of the London Convention, certain materials can be exempted from the prohibition on dumping. In general terms, this may be because the radiation is unamenable to control due to its being of natural origin or because the risk of harm to individuals is extremely low.

Radioactive waste sea dumping controls

The dumping into the sea of high-level radioactive waste was prohibited under the 1972 London Convention, and amendments adopted in 1993 (which
entered into force on 20 February 1994) extended the ban to low-level radioactive wastes. As a result of the 1993 amendments, the London Convention currently bans the dumping into the sea of "radioactive wastes or other radioactive matter" (Annex 1, paragraph 6). As part of the 1993 amendments, the Contracting Parties introduced the de minimis concept, adding a new paragraph stating that the ban on dumping into the sea of these materials "does not apply to wastes or other materials (e.g. sewage sludge and dredged material) containing de minimis (exempt) levels of radioactivity as defined by the IAEA and adopted by the Contracting Parties" (Annex 1, paragraph 9).

The current IAEA study stems from progress in the field of radiation protection and discussions between Contracting Parties to the London Convention. At the 19th Consultative Meeting of Contracting Parties to the London Convention 1972, in December 1997, it was agreed that the IAEA should be requested to provide guidance on whether materials planned to be dumped could be exempted or whether a specific assessment was needed.

The 1996 Protocol to the London Convention, which is not yet in force, also contains reference to "de minimis (exempt) concentrations as defined by IAEA and adopted by Contracting Parties."

### Status of the 1996 Protocol

Four countries have now ratified the 1996 Protocol to the London Convention (up to 31 December 1998), while seven Contracting Parties to the 1972 Convention informed the meeting they were expecting to complete ratification during 1999.

The 1996 Protocol, which was adopted in November 1996, will enter into force 30 days after ratification by 26 countries, 15 of whom must be Contracting Parties to the 1972 treaty. Whereas the current London Convention 1972 allows dumping of wastes at sea, providing certain conditions are met, the 1996 Protocol prohibits dumping of wastes or other matter with the exception of certain materials that are listed in an annex and adopts the "polluter pays" principle. It also applies the "precautionary approach", requiring preventative measures when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm, even when there is no conclusive evidence to prove a causal relation between inputs and their effects.

### Relationship between 1996 Protocol and 1972 Convention

The Meeting convened an ad hoc working group to discuss the relationship between the 1996 Protocol and the 1972 Convention, and agreed that the issue required further discussion at its next session, including the need to resolve administrative arrangements for future meetings once the 1996 Protocol has come into force.

Article 23 of the 1996 Protocol does not provide for the automatic withdrawal of States from the Convention on joining the Protocol, although the ad hoc working group considered that implementation of the provisions of the Protocol by a Party to the Convention would fulfill that Party's obligations under the Convention in full.

There will be five categories of relationships between States when the 1996 Protocol enters into force:

1. the Protocol will apply between two States which are party to both the Convention and the Protocol;
2. the Protocol will apply between a State which is party to both instruments and a State which is party to the Protocol only;
3. the Convention will apply between a State which is party to both instruments and a State which is party to the Convention only;
4. the Convention will apply between States which are parties to it and not to the Protocol;
5. there will be no treaty relations between a State which is party to the Protocol only and a State which is party to the Convention only.

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The Sub-Committee agreed that the use of asbestos on new ships should be prohibited and that new installations of materials containing asbestos in existing ships should also be prohibited. The aim is to develop regulations on asbestos aboard ships to be adopted in 2000.

The proposed ban on the use of asbestos aboard new ships was initially submitted by France to the Maritime Safety Committee (MSC) and referred to the Sub-Committees on Fire Protection and Ship Design and Equipment, with a view to eventually adopting appropriate amendments to SOLAS.

The Sub-Committee recommended that a draft requirement in SOLAS would prohibit, on all ships, new installation of materials which contain asbestos, except for:

1. friction products for compressors and vacuum vane pumps;
2. watertight joints and linings used for the circulation of fluids when, at high temperature or pressure, there is a risk of fire, corrosion or toxicity; and
3. supply and flexible thermal isolation assemblies used for temperatures above 1000° C.

The Sub-Committee discussed safety issues regarding the removal or replacement of asbestos on existing ships and agreed further consideration was needed, in order to develop measures relating to the evaluation of the condition of asbestos on ships as well as the safety issues relating to repairs, alterations and modifications to ships and spaces containing materials with asbestos. National and local regulations on shipyard safety already cover the treatment of asbestos under repair or alteration, according to non-governmental organizations representing the shipping industry.

Review of SOLAS chapter II-2 continues

The Sub-Committee continued its review of chapter II-2 (Construction – Fire protection, fire detection and fire extinction) of the International Convention for the Safety of Life at Sea (SOLAS), 1974. The comprehensive review is aimed at developing a clear, concise and user-friendly new chapter, to be in force by the year 2002, incorporating the substantial changes introduced in recent years following a number of serious fire casualties.

The Sub-Committee agreed to establish a correspondence group, coordinated by the United States, to look at a number of issues prior to the next session, including:

1. reviewing unified interpretations of regulations in chapter II-2 (currently contained in a 50-page MSC circular) and deciding whether they should be included in the new revised chapter, in the new draft Fire Safety Systems (FSS) Code, or in a separate set of unified interpretations, such as in a circular;
2. further developing the draft revised SOLAS chapter II-2;
3. further developing the draft FSS Code;
4. preparing draft guidelines for evaluating alternative designs.

The current chapter II-2 of SOLAS is divided into four parts: A – General; B – Fire safety measures for passenger ships; C – Fire safety measures for cargo ships; D – Fire safety measures for tankers. The proposed format for the revised chapter includes seven parts, each of which would include comprehensive requirements applicable to all or to specified ship types:

A – General: including application, general fire safety objectives
B – Prevention of fire and explosion: including preventive measures to be taken to avoid the risk of fire and explosion
C – Suppression of fire and explosion: including fire detection and alarm systems, fire-fighting equipment requirements
D – Escape: including requirements for provision of public address systems, escape routes, additional requirements for ro-ro passenger ships
E – Operational requirements: including maintenance, testing and inspections, training and drills
F – Alternative design and arrangements: aimed at providing verification methods for alternative designs and arrangements for fire safety
G – Special requirements: including helicopter facility, carriage of dangerous goods, protection of vehicle spaces and ro-ro cargo spaces.

In addition, there will be a mandatory Fire Safety Systems (FSS) Code.

Interim evacuation analysis guidelines agreed

The Sub-Committee agreed a draft MSC circular on interim guidelines for a simplified evacuation analysis of ro-ro passenger ships, for submission to the next MSC session in May 1999.

The draft interim guidelines are aimed at helping the implementation of SOLAS regulation II-2/28-1.3, which requires ro-ro passenger ships to undergo an evacuation analysis at an early stage of design.

The draft interim guidelines show how to execute a simplified evacuation analysis and use its results to:

1. identify and eliminate, as far as practicable, congestion which may develop during an abandonment due to normal movement of passengers and crew along escape routes, including the possibility that crew may need to move along these routes in a direction opposite to the movement of passengers; and
2. demonstrate that escape arrangements are sufficiently flexible to provide for the possibility that certain escape routes,
assembly stations, embarkation stations or survival craft may be unavailable as a result of a casualty.

The draft interim guidelines also call on Member Governments to collect any information and data resulting from research and development activities, full-scale tests, and findings on human behaviour which may be relevant for the necessary future upgrading of the guidelines.

Extension of evacuation analysis to other passenger ships

The Sub-Committee agreed to recommend to the MSC that the requirement for evacuation analysis at the design stage should also be applied to passenger ships other than ro–ro ferries.

This would include high-speed passenger craft as well as large passenger ships. IMO Secretary-General Mr. William A. O’Neil has questioned whether, in view of the increasing number of large passenger ships being put into service these days, it would be prudent to examine the adequacy of evacuation procedures.

SOLAS regulation II-2/28-1.3 covers escape routes on ro–ro passenger ships constructed after 1 July 1999. It requires escape routes to be evaluated by an evacuation analysis early in the design process, aimed at identifying and eliminating congestion which may develop if a ship has to be evacuated. The analysis should also demonstrate that escape arrangements are sufficiently flexible to allow for the possibility that certain escape routes may not be available due to a casualty.

The requirement was adopted by the November 1995 SOLAS Conference that was held in the wake of the Estonia ro–ro ferry disaster in which more than 850 people were killed.

The Sub-Committee anticipates that it would take three sessions to develop a single set of guidelines on evacuation analysis suitable for all types of passenger ships, and proposed that a correspondence group be set up to study the issue.

Fire safety aspects of high-speed craft

The Sub-Committee agreed draft amendments to the High-Speed Craft (HSC) Code related to special provisions for small high-speed craft. The HSC Code, originally adopted in 1994 along with a new chapter X of SOLAS (Safety Measures for High-Speed Craft), is undergoing complete revision, with a target completion date of 1999.

The Sub-Committee also approved:

- a draft MSC circular on interpretations of fire-protection-related aspects of the HSC Code; and
- a draft MSC circular on interpretations of resolution MSC.44(65) – Standards for fixed sprinkler systems for high-speed craft.

Fire-fighting systems in machinery and other spaces

The Sub-Committee agreed a draft new paragraph 7 to regulation 7 (Fire-extinguishing arrangements in machinery spaces) of SOLAS chapter II-2. The new draft paragraph, to be passed to MSC for approval, covers fixed local application fire-fighting systems. The Sub-Committee also agreed draft guidelines for the approval of fixed water-based local application fire-fighting systems and its appendix, “Test method for fixed water-based local application fire-fighting systems”.

Other issues for approval by MSC

The Sub-Committee also agreed to:

- draft amendments to resolution MSC.40(64), Standard for qualifying marine materials for high-speed craft as fire-restricting materials
- draft interpretation of the International Code for Application of Fire Test Procedures (FTP Code)
- draft interpretations of vague expressions and other vague wording in SOLAS chapter II-2 relating to regulation 23 – Structure – 23.2.1 Insulation of aluminium decks and interpretation of “load-bearing divisions”
- draft interpretations of the FTP Code and fire test procedures referred to in the Code relating to Part 2 – Smoke and Toxicity Test and Part 3 – Test for “A”, “B”, and “F” class divisions
- draft MSC circular on guidelines on fire safety constructions in accommodation areas.
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Ship distress and safety communications entered a new era on 1 February with the full implementation of the global maritime distress and safety system (GMDSS) – an integrated communications system using satellite and terrestrial radiocommunications to ensure that no matter where a ship is in distress, aid can be dispatched to it.

The GMDSS was developed by IMO in close co-operation with the International Mobile Satellite Organization (Inmarsat), the International Telecommunication Union (ITU) and other international organizations, notably the World Meteorological Organization (WMO), the International Hydrographic Organization (IHO) and the COSPAS–SARSAT* partners.

Under the GMDSS, all passenger ships and all cargo ships over 300 gross tonnage on international voyages have to carry specified satellite and radiocommunications equipment, for sending and receiving distress alerts and maritime safety information and for general communications. The regulations governing the GMDSS are contained in the International Convention for the Safety of Life at Sea (SOLAS), 1974, which has been ratified by 138 countries, covering 98.36% of the world merchant shipping fleet by tonnage.

The GMDSS requirements are contained in chapter IV of SOLAS on Radiocommunications and were adopted in 1988. The requirements entered into force on 1 February 1992 but provided for a phase-in period until 1 February 1999.

IMO Secretary-General Mr. William A. O’Neil said that the full implementation of the GMDSS is an important date in maritime history, coming as it does almost exactly 100 years after the first use of wireless technology to aid a ship in distress.

Italian engineer Guglielmo Marconi* invented radio in 1895, and the first use of wireless in communicating the need for assistance came on 3 March 1899 when a freighter rammed the East Goodwin Lightship, which was anchored ten miles offshore from Deal in the Strait of Dover off the south-east coast of England. A distress call was transmitted by wireless to a shore station at South Foreland and help was dispatched.

Mr. O’Neil said: “A century ago, Marconi was demonstrating his new wireless telegraphy system, and it was soon clear how valuable wireless would be in saving lives at sea. But wireless had its limitations, notably in terms of the distance that could be covered.

“In the 1960s, IMO recognized that satellites would play an important role in search and rescue operations at sea, and in 1976 the Organization established the International Maritime Satellite Organization, which later changed its name to the International

* COSPAS–SARSAT is an international satellite-based search and rescue system, established by Canada, France, the U.S.A. and Russia. These four countries jointly helped develop a 406 MHz satellite emergency position-indicating radio beacon (EPIRB), an element of the GMDSS designed to operate with the COSPAS-SARSAT system. These automatically activated EPIRBs are designed to transmit to a rescue co-ordination centre a vessel identification and an accurate location of the vessel from anywhere in the world.

* Marconi, Guglielmo (1874–1937), Italian electrical engineer, famous for inventions in radio-signalling. In 1895 he developed an apparatus that sent signals to a point a few kilometres away. In 1899 he established communication across the English Channel between England and France, and on the 11th of December 1901 he communicated signals across the Atlantic Ocean between England and Newfoundland. For his work in wireless telegraphy, Marconi shared the 1909 Nobel Prize in physics with German physicist Karl Ferdinand Braun.
Mobile Satellite Organization (Inmarsat), to provide emergency maritime communications. In 1988, IMO’s Member States adopted the basic requirements of the global maritime distress and safety system or GMDSS as part of SOLAS.

“Now, as we approach the 21st century, we have in place an integrated communications system which should ensure that no ship in distress can disappear without trace, and that more lives can be saved at sea.”

Under the GMDSS requirements, all ships were required to be equipped with NAVTEX* receivers, to automatically receive shipping safety information, and satellite emergency position-indicating radiobeacons (EPIRBs).

* NAVTEX is an international, automated system for instantly distributing maritime navigational warnings, weather forecasts and warnings, search and rescue notices and similar information to ships.
from 1 August 1993. Ships built on or after 1 February 1995 have been required to be fitted with all applicable GMDSS equipment. Ships built before that date were given until 1 February 1999 to comply fully with all GMDSS requirements.

The GMDSS communications system under SOLAS complements the International Convention on Maritime Search and Rescue (SAR), 1979, which was adopted to develop a global SAR plan, so that no matter where an incident occurs, the rescue of persons in distress will be co-ordinated by a SAR organization and, where necessary, by co-ordination between neighbouring SAR countries.

IMO’s senior technical body, the Maritime Safety Committee (MSC), has divided the world’s oceans into 13 search and rescue areas, in each of which the countries concerned have delimited search and rescue regions for which they are responsible. Provisional search and rescue plans for all of these areas have been completed, with those for the final area, the Indian Ocean, finalized at a conference held in Fremantle, Western Australia in September 1998.

Mr. O’Neil said that, with the completion of the SAR plans and the

*With GMDSS equipment, the occupant of this liferaft stands a good chance of being rescued soon. The search and rescue radar transponder (SART), on the right, can be identified on a ship’s radar while the floating satellite emergency position-indicating radiobeacon (EPIRB), bottom centre of picture, can transmit to a rescue co-ordination centre a vessel identification and an accurate location. (McMurdo Limited/Pains-Wessex Safety Systems)*

**INMARSAT satellites**

The International Mobile Satellite Organization is vital to the GMDSS. Four satellites in geostationary orbit of 36,000 km above the Equator cover four ocean regions and provide near-global coverage (geostationary satellites cannot reach above 70° N or below 70° S).
full implementation of the GMDSS, seafarers and ships’ passengers could feel safer and more secure at sea.

“In a sense, we have the hardware in place. From today all ships required to do so must comply with the GMDSS, and for that we can thank the pioneers who, three decades ago, first saw the possibilities offered by satellite communications to save lives at sea, and then had the vision and imagination to develop a cohesive and coherent global maritime distress and safety system.

“But we should also think about the software – the people who operate the ships, and the people onshore who will monitor and act on distress calls. We must ensure that the people who will be responsible for operating GMDSS equipment are adequately trained, to avoid false distress alerts. Having all the correct equipment on board ship in an emergency situation may be of little use if people on board the ship have not been through the required emergency drills.

“A little more than a century ago, before the advent of wireless communication, ships were cut off at sea, dependent on passing vessels for help in the event of an emergency. Now we can communicate with a ship anywhere in the world – but this does not mean we can be complacent. We should do our utmost to prevent emergencies from happening in the first place, by developing a safety culture and ensuring all maritime safety and pollution-prevention regulations are fully implemented. And we should be trained and prepared for dealing with any eventual emergency.”

The GMDSS on the Internet

There are a number of sites on the Internet which contain information about the GMDSS and communications at sea. A good starting point is IMO’s own web site at http://www.imo.org. The Focus on IMO section includes a detailed description of the new system entitled Shipping emergencies – Search and Rescue and the GMDSS. The IMO Library has also prepared a useful Bibliography on the GMDSS which gives guidance concerning further reading. Other sites include the following:

- USCG GMDSS overview http://www.navcen.uscg.mil/marcomms/gmdss/
- The GMDSS examination page http://members.aol.com/ab0di/
- GMDSS acronyms http://www.navcen.uscg.mil/marcomms/gmdss/gmdssacr.txt
- USCG GMDSS files http://206.65.196.30/marcomms/gmdss/document.htm
- USCG FAQs on GMDSS http://www.navcen.uscg.mil/marcomms/gmdss/gmdssfaq.htm
- USCG GMDSS regulations http://www.navcen.uscg.mil/marcomms/gmdss/gmdssreg.txt
- Maritime mobile Access & Retrieval System http://gold.itu.int/MARS/
- GPS information on the net http://www.apparent-wind.com/gps.html
- GPS World Online http://www.gpsworld.com
- Inmarsat http://www.inmarsat.org
- International Telecommunication Union (ITU) http://www.itu.ch
- Lifeboat services around the world http://members.xoom.com/irzetzsche/
- NAVSTAR Global Positioning System http://www.starlinkgps.com/start.htm
- Rescue Co-ordination Centre NETwork http://www.rcc-net.org/
- Marconi history http://ftp.bbc.co.uk/making_waves/history.htm
- Morse code in UK http://www.users.zetnet.co.uk/rdixon/crdf/500close.htm and http://www.users.zetnet.co.uk/rdixon/crs/specialevent/begin-end.htm
- First recorded use of wireless distress call http://www.king.igs.net/"karc/1stdistress.html
- SOS, CQD and the history of maritime distress calls http://metronet.com/"nmcewen/arc_current.htmlt
The Global Maritime Distress and Safety System

The Global Maritime Distress and Safety System (GMDSS) consists of many separate sub-systems being implemented in a co-ordinated and agreed-upon manner. Some are new, like digital selective calling (DSC), but many have been in operation for a number of years. The co-ordination enables a ship which is in distress to send a distress alert message in various ways and be virtually certain that it will be heard and acted upon. Search and rescue authorities ashore, as well as shipping in the immediate vicinity of the ship in distress, will be rapidly alerted so they can assist in a co-ordinated search and rescue operation with the minimum of delay.

The system also provides urgency (e.g. medical assistance) and safety communications and disseminates maritime safety information, including navigational and meteorological warnings.

Areas of operation for the GMDSS

As the various sub-systems which make up the GMDSS have different limitations with respect to ocean coverage, the equipment required to be carried by a ship is determined by the ship's area of operation. In all areas of operation a ship is required to have the continuous availability of alerting.

Area 1
Within range of VHF coast stations with continuous DSC alerting available. (about 20-30 miles)

Area 2
Beyond area 1, but within range of MF coastal stations with continuous DSC alerting available. (about 100 miles)

Area 3
Beyond the first two areas but within coverage of Inmarsat satellites. (roughly area between 70°N and 70°S)

Area 4
Remaining sea areas, the most important of which is the sea around the North Pole. (The area around the South Pole is mostly land.)

Ship in distress
A distress alert is normally initiated manually and all distress alerts are acknowledged manually.

General radiocommunications
- Medical advice
- Vessel Traffic Services
- Ship reporting
- Public correspondence

Maritime safety information (MSI)
- Navigational warnings
- Meteorological warnings
- SAR information

Graphic: Liz Gould
The delimitation of a Search and Rescue Region (SRR) is not related to and shall not prejudice the delimitation of any boundary between States. These areas are established to ensure that primary responsibility for co-ordinating Search and Rescue services for the geographical area is assumed by some State. In practice, SAR services may not necessarily be provided by the designated State. In such cases, SAR facilities are likely to be provided by the nearest country having the most appropriate SAR assets.
INSET MAP D: Northern Europe

INSET MAP E: Arctic

INSET MAP F: The Mediterranean

Agreed Maritime Search and Rescue Region boundary

Provisional unilaterally declared Maritime Search and Rescue Region boundary

The provisional SRR boundaries between Cyprus, Greece and Turkey have yet to be established.

Black Sea SRRs have yet to be established.
Implementing the SAR Convention

The International Convention on Maritime Search and Rescue (SAR) was adopted in 1979 and entered into force in 1985. To facilitate the preparation of a global search and rescue plan, which is the ultimate objective of the Convention, the Sub-Committee on Safety of Navigation established 13 maritime SAR areas and invited Member Governments to co-ordinate with other littoral States in the same maritime area for the purpose of accepting national areas of SAR responsibility and collecting pertinent information in accordance with the provisions of the Convention.

Since the Convention was adopted, IMO has been working with Member States and other organizations to help implement the Convention. It has organized a series of seminars and conferences in order to prepare and agree SAR plans for the oceans’ search and rescue areas, including the delimitation of individual countries’ search and rescue regions, for which they are responsible. This process – which began in 1981 – was concluded in September 1998 when an integrated SAR plan for the Indian Ocean was agreed at a conference held in Fremantle, Western Australia, based on regional plans adopted earlier at conferences in Tokyo and Cape Town.

The conferences and seminars have also provided the countries concerned with the opportunity to address training needs for SAR and the GMDSS and to consider the adequacy of shore-based GMDSS facilities in the particular region.

The table below shows the seminars and conferences that have been held.

<table>
<thead>
<tr>
<th>Venue and Year</th>
<th>SAR Area</th>
<th>Type of Meeting</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbados 1981</td>
<td>Caribbean Sea</td>
<td>Seminar</td>
<td>Preparation of provisional SAR plan</td>
</tr>
<tr>
<td>Caracas 1984</td>
<td>Caribbean Sea</td>
<td>Conference</td>
<td>Agreement on a provisional SAR plan</td>
</tr>
<tr>
<td>Jakarta 1984</td>
<td>Asia and Pacific</td>
<td>Seminar</td>
<td>Preparation of provisional SAR plan</td>
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<tr>
<td>Tokyo 1986</td>
<td>Asia and Pacific</td>
<td>Conference</td>
<td>Agreement on a provisional SAR plan</td>
</tr>
<tr>
<td>Lagos 1984</td>
<td>Eastern South Atlantic</td>
<td>Seminar</td>
<td>Preparation of provisional SAR plan</td>
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<td>Agreement on a provisional SAR plan</td>
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<td>South-West Indian Ocean</td>
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</tr>
<tr>
<td>Cape Town 1996</td>
<td>West Indian Ocean</td>
<td>Conference</td>
<td>Agreement on a provisional SAR plan</td>
</tr>
<tr>
<td>Lisbon 1994</td>
<td>Atlantic Ocean</td>
<td>Conference</td>
<td>Agreement on an integrated provisional SAR plan</td>
</tr>
<tr>
<td>Varna 1994</td>
<td>Black Sea</td>
<td>Seminar</td>
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<td>Istanbul 1996</td>
<td>Black Sea</td>
<td>Conference</td>
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<tr>
<td>Valencia 1997</td>
<td>Black Sea</td>
<td>Conference</td>
<td>General agreement on a provisional SAR plan</td>
</tr>
<tr>
<td>Ankara 1998</td>
<td>Black Sea</td>
<td>Conference</td>
<td>Signing of an Agreement on cooperation regarding maritime SAR services</td>
</tr>
<tr>
<td>Toulon 1995</td>
<td>Mediterranean Sea</td>
<td>Seminar</td>
<td>Preparation of provisional SAR plan</td>
</tr>
<tr>
<td>Valencia 1997</td>
<td>Mediterranean Sea</td>
<td>Conference</td>
<td>General agreement on a provisional SAR plan</td>
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<tr>
<td>Seoul 1997</td>
<td>Pacific Ocean</td>
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<td>Agreement on an integrated provisional SAR plan</td>
</tr>
<tr>
<td>Fremantle 1998</td>
<td>Indian Ocean</td>
<td>Conference</td>
<td>Agreement on an integrated provisional SAR plan</td>
</tr>
</tbody>
</table>

IMO adopted a revised annex to the SAR Convention in May 1998. The revised SAR Convention, which will enter into force on 1 January 2000, clarifies the responsibilities of Governments and puts greater emphasis on the regional approach and co-ordination between maritime and aeronautical SAR operations. It is hoped the revised Convention will be more acceptable to those States which have not yet ratified the 1979 SAR Convention – as of 1 February 1999, the SAR Convention had been ratified by only 60 countries, whose combined merchant fleets represent less than 50% of world tonnage.
What is the GMDSS?
The global maritime distress and safety system (GMDSS) is an international system which uses terrestrial and satellite technology and ship-board radio systems to ensure rapid, automated alerting of shore-based communication and rescue authorities, in addition to ships in the immediate vicinity, in the event of a marine distress.

Under the GMDSS, all ocean-going passenger ships and cargo ships of 300 gross tonnage and upwards engaged on international voyages must be equipped with radio equipment that conforms to international standards as set out in the system. The basic concept is that search and rescue authorities ashore, as well as shipping in the immediate vicinity of the ship in distress, will be rapidly alerted through satellite and terrestrial communication techniques so that they can assist in a co-ordinated search and rescue operation with the minimum of delay.

How does the GMDSS help in distress situations?
Ships fitted with GMDSS equipment are safer at sea – and more likely to receive assistance in the event of a distress – because the GMDSS provides for automatic distress alerting and locating when a radio operator does not have time to send out a distress call. The GMDSS also requires ships to receive broadcasts of maritime safety information which could prevent a distress from happening, and requires ships to carry satellite emergency position-indicating radio beacons (EPIRBs), which float free from a sinking ship and alert rescue authorities with the ship’s identity and location.

Who adopted the GMDSS?
The GMDSS was adopted by IMO. It was adopted by means of amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974. The amendments, which are contained in chapter IV of SOLAS, on Radiocommunications, were adopted in 1988 and entered into force on 1 February 1992 but provided for a phase-in period until 1 February 1999.

Who is implementing the GMDSS?
Implementation of the GMDSS requirements is the responsibility of Contracting Governments to SOLAS. This means the Administrations of individual countries that have ratified the GMDSS requirements into their national law.

In practice, it also means that individual shipowners are responsible for ensuring their ships meet GMDSS requirements, since they must obtain certificates from their flag State certifying conformity with all relevant international regulations.

When does the GMDSS take effect?
The global implementation of GMDSS services became fully effective on 1 February 1999. By that date, all applicable ships had to comply with the GMDSS requirements in SOLAS.

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<table>
<thead>
<tr>
<th>GMDSS Countdown</th>
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</thead>
<tbody>
<tr>
<td><strong>Between 1 February 1992 and 1 February 1999</strong></td>
</tr>
<tr>
<td>existing ships could comply with the version of chapter IV of SOLAS in force prior to 1 February 1992 or the GMDSS</td>
</tr>
<tr>
<td><strong>All ships have been required to carry a NAVTEX (transmission of maritime safety information) receiver and satellite EPIRBs (emergency position-indicating radio beacons) since 1 August 1993</strong></td>
</tr>
<tr>
<td><strong>Ships built on or after 1 February 1995 must comply with all applicable GMDSS requirements</strong></td>
</tr>
<tr>
<td><strong>From 1 February 1999 all passenger ships and all cargo ships of 300 gross tonnage and upwards on international voyages must comply with the GMDSS</strong></td>
</tr>
</tbody>
</table>

Who has to comply with the GMDSS?
All ships subject to SOLAS chapter IV have to fit GMDSS equipment; generally, this is all passenger vessels and all cargo ships over 300 gross tonnage on international voyages.*

What do ships have to do to comply with GMDSS?
Under SOLAS, every ship, while at sea, must have the facilities for essential communications, namely:

- transmitting ship-to-shore distress alerts by at least two separate and independent means;
- receiving shore-to-ship distress alerts;
- transmitting and receiving ship-to-ship distress alerts;
- transmitting and receiving search and rescue co-ordinating communications;
- transmitting and receiving on-scene communications;
- transmitting and (as required) receiving signals for locating;
- transmitting and receiving maritime safety information;
- transmitting and receiving general radiocommunications to and from shore-based radio systems or networks; and
- transmitting and receiving bridge-to-bridge communications.

* The GMDSS applies to all ships engaged on international voyages except:
  - cargo ships less than 300 gross tonnage,
  - ships of war and troopships,
  - ships not propelled by mechanical means,
  - wooden ships of primitive build,
  - pleasure yachts not engaged in trade,
  - fishing vessels, and
  - ships being navigated within the Great Lakes of North America.

Mobile Offshore Drilling Units (MODUs) have to fit GMDSS equipment if they are self-propelled, or if they are required to meet the International Maritime Organization’s MODU Code.
Specific equipment requirements for ships vary according to the sea area (or areas) in which the ship operates. The GMDSS combines various subsystems – which all have different limitations with respect to coverage – into one overall system, and the oceans are divided into four sea areas:

**Area A1** – Within range of VHF coast stations with continuous DSC alerting available (about 20–30 miles)

**Area A2** – Beyond area A1, but within range of MF coastal stations with continuous DSC alerting available (about 100 miles)

**Area A3** – Beyond the first two areas, but within coverage of geostationary maritime communication satellites (in practice this means Inmarsat). This covers the area between roughly 70° N and 70° S.

**Area A4** – The remaining sea areas. The most important of these is the sea around the North Pole (the area around the South Pole is mostly land). Geostationary satellites, which are positioned above the equator, cannot reach this far.

Coastal vessels, for example, only have to carry minimal equipment if they do not operate beyond the range of shore-based VHF radio stations, but they may carry satellite equipment. However, some coasts do not have shore-based facilities, so although the ship is close to shore, the area counts as area A2 or A3. Ships which do go beyond sea area A1 have to carry MF equipment as well as VHF – or Inmarsat satellite equipment. Ships which operate beyond the range of MF radio stations have to carry Inmarsat satellite equipment in addition to VHF and MF. Ships which operate in area A4 have to carry HF, MF and VHF equipment.

**What about Morse code?**

The invention of radio by Guglielmo Marconi and the use of Morse code was a significant development in saving lives at sea after an incident. However, Morse telegraphy required many years of training and practice. If something happened to the radio operator, it was unlikely that anyone else on board would be able to use the telegraphy equipment. GMDSS equipment still requires training – but systems can automatically send a ship’s position, speed and call sign when a distress button is pressed, and advances in technology mean that normal voice communication can be used, for example to speak to a rescue co-ordination centre.

Morse code is therefore not a mandatory requirement under the GMDSS and many Governments are phasing out Morse code listening services, if they have not already done so.

**Do all ships have to have satellite communications?**

No. If ships are travelling only in coastal areas served by VHF coast stations with continuous digital selective calling (DSC) available, they need only carry VHF equipment. However, they may use satellite communication in addition to or instead of terrestrial radio links.

**What about the problem of false alerts?**

One of the main reasons for false distress alerts is improper use of GMDSS equipment by untrained personnel. They are probably also caused by the lack of practical experience of GMDSS equipment on board ships by trained personnel. IMO has issued guidelines on avoidance of false alerts and has introduced a standard button design, which means that the distress button has to be protected and must be held down for 3 seconds to be activated. There are problems with equipment design and poor training. EPIRBs have to be sensitive, because they have to be able to float free, and this sensitivity can lead to false alerts.

But information from manufacturers and coastal States indicates that, on average, there is only one false alert every 50 years from each of the alarms now available.

At the same time, the GMDSS system makes it possible for the ship in distress to be contacted, to check whether the alert is real or false, before search and rescue operations begin.

**What proportion of ships will comply with GMDSS after the deadline of 1 February 1999?**

Flag States have been requested to provide IMO with information on compliance, but IMO has not received enough information to provide a detailed overview of compliance figures. Ships built since 1995 have been required to be equipped with GMDSS radio equipment. Older ships must comply by 1 February 1999, and it is likely that port State control inspectors will target these ships to make sure they are GMDSS-compliant. If not, they run the risk of being detained in foreign ports.

Ships that are not covered by SOLAS, such as smaller vessels or those not undertaking international voyages, will have to comply with requirements set out by their maritime Administration. Many Administrations encourage these non-SOLAS ships to fit relevant GMDSS equipment to help in an emergency situation.

**What do coastal States have to do to ensure the GMDSS will work?**

Under regulation 5 of chapter IV of SOLAS, “Each Contracting Government [to SOLAS] undertakes to make available, as it deems practical and necessary either individually or in co-operation with other Contracting Governments, appropriate shore-based facilities for space and terrestrial radiocommunication services ...”

**What is the difference between GMDSS and existing radiocommunications?**

The GMDSS includes the regulations for radiocommunications aboard merchant ships contained in SOLAS chapter IV. It includes some of the traditional maritime radio systems, but many have been upgraded to provide for automated listening and calling. The GMDSS utilises traditional radiocommunications, but integrates them into a co-ordinated system, adding satellite communications.

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* IMO resolution A.814(19) (adopted 23 November 1995) contains Guidelines for the avoidance of false distress alerts. IMO Circular MSC/Circ.861 (issued 22 May 1998) includes Measures to reduce the number of false distress alerts.*
What is DSC?
Digital selective calling (DSC) has been introduced on VHF, MF and HF maritime radios as part of the GMDSS. DSC is primarily intended to initiate ship/ship, ship/shore, and shore/ship radiotelephone and MF/HF radiotelex calls. DSC calls can also be made to individual ships or groups of ships. DSC distress alerts, which consist of a preformatted distress message, are used to initiate emergency communications with ships and rescue co-ordination centres.\(^4\)

Fully implemented, DSC eliminates the need for persons on a ship’s bridge or on shore to continuously guard radio receivers on voice radio channels used for distress, safety and calling, including VHF channel 16 (156.8 MHz) and 2182 kHz. A listening watch on 2182 kHz aboard GMDSS-equipped ships is scheduled to end on 1 February 1999, and on VHF channel 16 on 1 February 2005.

Can GMDSS equipment be used for routine radiocommunications?
Yes. GMDSS telecommunications equipment should not be reserved for emergency use only. IMO encourages mariners to use it for routine as well as for safety radiocommunications.\(^5\)

What is COSPAS–SARSAT?
COSPAS–SARSAT is an international satellite-based search and rescue system, established by Canada, France, the U.S.A. and Russia. These four countries jointly helped develop a 406 MHz satellite emergency position-indicating radiobeacon (EPIRB), an element of the GMDSS that is designed to operate with the COSPAS–SARSAT system. These automatically activated EPIRBs are designed to transmit a vessel’s identification and an accurate location of the vessel to a rescue co-ordination centre from anywhere in the world.

What is NAVTEX?
NAVTEX is an international, automated system for instantly distributing maritime navigational warnings, weather forecasts and warnings, search and rescue notices and similar information to ships. A small, low-cost and self-contained “smart” printing radio receiver installed in the pilot house of a ship or boat checks each incoming message to see if it has been received during an earlier transmission, or if it is of a category of no interest to the ship’s master. If it is a new and wanted message, it is printed on a roll of adding-machine-size paper; if not, the message is ignored. A new ship coming into the area will receive many previously broadcast messages for the first time; ships already in the area which had already received the message won’t receive it again. No person needs to be present during a broadcast to receive vital information.

What is Inmarsat?
The International Mobile Satellite Organization (Inmarsat), previously the International Maritime Satellite Organization, was established by IMO in 1976 to operate satellite maritime communication systems and is in the process of becoming a privately owned company, while retaining its public sector obligations to the maritime distress and safety system. Three types of Inmarsat ship earth station terminals are recognized by the GMDSS: the Inmarsat-A, -B and -C. The Inmarsat-A and -B (an updated version of Inmarsat-A) stations provide ship/shore, ship/ship and shore/ship telephone, telex and high-speed data services, including a distress priority telephone and telex service to and from rescue co-ordination centres. The Inmarsat-C station provides ship/shore, shore/ship and ship/ship store-and-forward data and telex messaging, the capability for sending preformatted distress messages to a rescue co-ordination centre, and the SafetyNET service. The Inmarsat-C SafetyNET service is a satellite-based worldwide maritime safety information broadcast service of high-seas weather warnings, navigational warnings, radionavigation warnings, ice reports and warnings generated by the International Ice Patrol, and other similar information not provided by NAVTEX. SafetyNET works similarly to NAVTEX in areas outside NAVTEX coverage.

What are Search and Rescue Radar Transponders (SARTs)?
The GMDSS installation on ships includes one or more search and rescue radar transponders, devices which are used to locate survival craft or distressed vessels by creating a series of dots on the display of a rescuing ship’s 3 cm radar. The detection range between these devices and ships, dependent upon the height of the ship’s radar mast and the height of the SART, is normally less than about ten miles.

What about fishing vessels and small recreational vessels, such as yachts?
At the moment, most fishing vessels and recreational boaters are not required to participate in the GMDSS. But they will find many of the services available useful and may want to acquire equipment such as EPIRBs, which must be registered with the appropriate authorities.

Small vessels are also recommended to fit DSC equipment since, once the GMDSS is fully implemented, vessels without DSC will have difficulty contacting ships which are monitoring the DSC calling channel only. However, in a vessel traffic service zone, ships will still be required to maintain a listening watch on the appropriate frequency.

Most fishers and recreational boaters are already carrying VHF marine radios; however, these are not generally DSC-compatible.

Can cellular telephones/mobile phones be used instead of VHF radio?
Larger vessels must have the radio equipment specified in the GMDSS regulations. For smaller vessels, not covered by the GMDSS, most coastal authorities do not recommend cellular telephones as a substitute for the marine radio distress and safety systems in the VHF maritime radio band.

A VHF radio is more advantageous in that it can also help ensure that storm warnings and other urgent marine information broadcasts are received. Furthermore, VHF radio can be used worldwide.
Background

Oil pollution of the sea, especially around ports and harbours, has been recognized since the 1900s, and the first attempts to minimize pollution by oil from ships came in the form of bans on illegal discharges of oil by the United Kingdom and the United States in the early 1920s. The United Kingdom was the first to adopt national rules on the prevention of marine pollution in 1922 (Oil in Navigable Waters Act) while the United States adopted its own regulations on oil pollution prevention in 1924 (Oil Pollution Act).

It was soon recognized that oil pollution was an international problem that could only be tackled effectively if the shipping nations and those countries most interested in importing and exporting oil agreed on the joint measures.

In 1926, the United States convened an international conference on oil pollution control, attended by 13 countries, but the draft convention that was prepared was never adopted. Another draft convention, prepared at the League of Nations in 1935, also failed to move beyond the draft format.

It was not until 1954, when the United Kingdom organized a conference on oil pollution, that the countries attending adopted the International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL).

The OILPOL Convention addressed not only pollution by oil, but also pollution by chemicals, sewage and garbage. Annexes were developed covering different categories of harmful substances and most recently, in 1997, a new Annex on air pollution was added.

The OILPOL Convention was taken over by IMO when the Organization came into being with the first session of its Assembly in 1959.

But it became clear that, despite being amended in 1962, the OILPOL Convention was inadequate. Following the Torrey Canyon disaster of 1967, the IMO Assembly convened an international conference to adopt a completely new convention addressing marine pollution.

The International Convention for the Prevention of Pollution from Ships (MARPOL) was created with the objective of preventing the pollution of the marine environment by the discharge of harmful substances, which were defined as:

Any substance which, if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by the present Convention.

MARPOL addressed not only pollution by oil, but also pollution by chemicals, sewage and garbage. Annexes were developed covering different categories of harmful substances and most recently, in 1997, a new Annex on air pollution was added.

MARPOL Annex I – Regulations for the Prevention of Pollution by Oil

Based on the OILPOL Convention, the concept behind Annex I to MARPOL 73/78 is to prohibit any discharge into the sea of oil or oily mixtures from ships. However, recognizing that this ideal presents considerable practical difficulties, certain exceptions are allowed.

These include allowing a small quantity (1/15,000 or 1/30,000 of the total quantity of the cargo for existing ships and for new ships, respectively) to be put into the sea provided that the tanker is not in a Special Area, the tanker is more than 50 nautical miles from the nearest land, the tanker is proceeding en route and the instantaneous discharge of oil does not exceed 30 litres per nautical mile.

Similar restrictions are imposed for the oil from machinery-space bilges of all ships of 400 tons gross tonnage.

Being the oldest part of MARPOL 73/78, with its roots stemming from

<table>
<thead>
<tr>
<th>Annex</th>
<th>Subject</th>
<th>Entry into force date</th>
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<tbody>
<tr>
<td>I</td>
<td>Oil</td>
<td>2 October 1983</td>
</tr>
<tr>
<td>II</td>
<td>Noxious liquid substances carried in bulk (chemicals)</td>
<td>6 April 1987</td>
</tr>
<tr>
<td>III</td>
<td>Harmful substances carried in packaged form</td>
<td>1 July 1992</td>
</tr>
<tr>
<td>IV</td>
<td>Sewage</td>
<td>Not yet in force</td>
</tr>
<tr>
<td>V</td>
<td>Garbage</td>
<td>31 December 1988</td>
</tr>
<tr>
<td>VI</td>
<td>Air pollution (added in 1997)</td>
<td>Not yet in force</td>
</tr>
</tbody>
</table>
OILPOL, Annex I has been the subject of many amendments which, when introduced, set standards for the new ships of the time whilst allowing some relaxation for the existing ships of the time.

**Changes to Annex I**

Because Annex I has become very difficult to follow due to the differing requirements for various generations of tankers, it was agreed in 1993 that a major review of this Annex should take place in order to simplify it. However, agreement has not yet been reached on the most appropriate way to make the revisions necessary to make it easier to follow in the future. The two options under consideration are:

1. To rewrite Annex I for new ships only and require existing ships to be subject to the existing Annex I. This would be much simpler for new ships initially but would gradually suffer the same fate as the existing Annex I as new amendments are introduced.
2. To structure Annex I so that there is a complete version for each generation of tanker. This would be much simpler for a ship operator, who would just take the version applicable to his ship, but more complicated for flag and port States, which would require several versions.

**MARPOL Annex II – Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk**

Under the definition of harmful substances, Annex I to MARPOL 73/78 treats all oils in the same way, whether they are heavy crude oils or refined, volatile distillation fractions.

However, when attention was focused on Annex II (Noxious Liquid Substances (NLS) or chemicals, transported in bulk), it was recognized that this approach was too simple for chemicals, due to their wide diversity in biological and physical properties that have an effect on their ability to be described as harmful.

As a result, when Annex II came into force in 1987 it included a differentiation mechanism based on the best scientific knowledge available at the time. This system divided products into five categories defining the amount of product allowed to be discharged into the sea from any one tank, as shown in Table 1.

Pollution category A products are deemed to be so harmful to the marine environment that their routine operational discharge has been stopped, whereas Appendix III products are considered to present no harm to the marine environment when discharged into the sea from tank cleaning or debollasting operations.

For the past twelve years,† products have been allocated to various pollution categories on the basis of the following biological properties which were considered to be relevant:

1. Bioaccumulation with associated hazards;
2. Tainting of fish;
3. Acute toxicity to marine organisms (fish and/or crustacea);
4. Acute and long-term toxicity to humans via all routes of exposure; and
5. Reduction of amenities.

The procedure that is used to allocate one of the five pollution categories to a product takes place in two stages:

1. The Joint Group of Experts on the Scientific Aspects of Environmental Protection (GESAMP)² set up a special Working Group on the Evaluation of Hazards of Harmful Substances (EHS) to evaluate each of the above properties and generate a GESAMP Hazard Profile (GHP) for each product.
2. The Evaluation of Safety and Pollution Hazards (ESPH) Working Group of IMO then uses this GHP to assign the appropriate pollution category and ship type for each product when they are transported under Annex II of MARPOL 73/78.

The Sub-Committee on Bulk Liquids and Gases (BLG) deals with the technical matters of safety and environmental protection and reports directly to the two policy-making Committees of IMO, the Marine Environment Protection Committee (MEPC) and the Maritime Safety Committee (MSC). Reporting to BLG is a semi-permanent Working Group on the Evaluation of Safety and Pollution Hazards (ESPH) which deals, primarily, with the assignment of pollution categories and carriage requirements for products in order to ensure their safe carriage and protection of the marine environment. The relationship between these bodies is shown in Figure 1.

**Table 1: Pollution categories and associated discharge volumes**

<table>
<thead>
<tr>
<th>Pollution category</th>
<th>Maximum discharge quantity</th>
<th>Are conditions of discharge regulated? (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing ships</td>
<td>New ships</td>
</tr>
<tr>
<td>A</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>B</td>
<td>300 litres</td>
<td>100 litres</td>
</tr>
<tr>
<td>C</td>
<td>900 litres</td>
<td>300 litres</td>
</tr>
<tr>
<td>D</td>
<td>Unrestricted</td>
<td>Unrestricted</td>
</tr>
<tr>
<td>Appendix III</td>
<td>Unrestricted</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

† When MARPOL Annex II was drawn up, experts from various IMO Member States agreed on the categories to which products should be allocated. In 1972, the Joint Group of Experts on the Scientific Aspects of Environmental Protection (GESAMP) set up a special Working Group on the Evaluation of Harmful Substances (EHS) to evaluate substances according to a range of properties.

² GESAMP includes experts from various United Nations agencies, including IMO, FAO, UNESCO-IOC, WMO, WHO, IAEA, UN and UNEP.

**Figure 1: Relationship between bodies associated with BLG Sub-Committee**
Recent developments affecting the pollution categorization of products under Annex II

Although the system described above has been employed effectively for twelve years, several recent developments have taken place which have made it necessary for IMO to reconsider the criteria used to assign both pollution category and ship type. The most important of these are:

1. Improvements in ship technology;
2. A greater appreciation of the relationship between the properties of chemicals and their impact on the marine environment;
3. The 1992 UN Conference on Environment and Development (UNCED) which took place in Rio de Janeiro;
4. The new GESAMP Hazard Evaluation Procedure for evaluating products; and
5. The review of Annexes I and II of MARPOL 73/78.

Improvements in ship technology

One of the most important features of Annex II to MARPOL 73/78 was the introduction of efficient stripping systems which ensured that only relatively small amounts (as shown in Table 1) of cargoes could be discharged into the sea with tank washings.

However, in the past ten years there have been advances in technology which allow efficient stripping levels as low as 10 to 20 litres (of product left in the cargo tank) to be achieved. Clearly, as the quantity of product that is expected to enter the marine environment is reduced, so the type of product deemed to be acceptable to be put into the environment may be reconsidered.

Factors affecting the marine environment

The MARPOL Convention was the first global legislation designed to protect the marine environment and, with hindsight, took a simplistic view on the definition of marine pollutants.

Annex I treats all oil products, from heavy crude oil to refined volatile solvents, in exactly the same way, even though their effects on the marine environment are completely different.

Annex II, however, introduced a degree of differentiation using a few simple biological properties, with the greatest influence being placed on acute aquatic toxicity, tainting of fish and bioaccumulation with associated harmful effects.

Since then there has been recognition of the fact that other properties, not previously considered, are equally important whilst the importance of some other properties may have been over-emphasized. This conclusion has been reached independently within IMO’s BLG Sub-Committee, GESAMP’s EHS Working Group and the OECD discussions on global harmonization resulting from the UNCED Rio Conference.

The 1992 UNCED Conference in Rio de Janeiro


This resulted in a considerable amount of activity, and the United Nations Committee of Experts on the Transport of Dangerous Goods and the Organization for Economic Co-operation and Development (OECD) have been acting as clearing houses for the development of harmonized hazard-classification systems covering physical and biological properties that affect safety and protection of the environment.

The importance of this work on harmonization for future legislation and regulation on the production, use and transportation of chemicals cannot be underestimated.

Currently, the classification and labelling of chemicals is not harmonized worldwide, and this has implications for shippers.

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1 When a cargo tank is “emptied” by pumping out the contents through pipes, it is inevitable that small amounts of the product will remain – which may be washed out afterwards. Efficient stripping systems use small deep-well pumps with a small-bore diameter pipe to get as much of the tank emptied as possible. Furthermore, the tank is designed to encourage the product to go into the deep well (where the pump sits) by having the bottom sloping in that direction and very smooth surfaces. In some cases, people may enter the tanks to sweep the product towards the pump to ensure that as much product is taken from the tank as possible.
For example, a product is defined as being toxic to mammals under the IMO International Maritime Dangerous Goods (IMDG) Code if the oral LD50 is less than or equal to 500 mg/kg; while EU Dangerous Substances legislation defines a product as being toxic if the oral LD50 is less than or equal to 2000 mg/kg.

Similarly, EU legislation defines a substance as flammable if it has a flashpoint of less than 55°C, whilst under the IMDG Code, a product is classified as flammable if the flashpoint is less than or equal to 61°C.

Hence there is a clear need for harmonization at a global level.

**Hazards to the aquatic environment**

Under the auspices of the OECD, there has been general agreement that the following properties represent a hazard to the aquatic environment:

1. **Acute toxicity** to fish, crustacea and algae; and
2. **Chronic toxicity** to fish, crustacea and algae.

In addition to these obvious hazards, there has also been agreement that the following properties may exacerbate or ameliorate these hazards:

1. Biodegradation; and
2. Bioaccumulation.

Agreement was reached on the definitions and cut-off points for these properties, which are recognized as being essential building blocks for all legislation designed to protect the aquatic environment. The definition of these building blocks is recognized as being an important level of harmonization.

At the same time, it was recognized that whilst all schemes should consider these building blocks, some legislation may need to take account of other factors not considered within the OECD scheme. This is particularly important for the discussions on the new criteria for the definition of pollution categories under Annex II to MARPOL 73/78.

The original philosophy behind the OECD scheme was based on the concept that chronic toxicity is the most important parameter for defining a product as hazardous to the aquatic environment. But, recognizing that chronic toxicity data are not widely available, it was agreed that biodegradability and bioaccumulation potential may be used as surrogate data for this parameter.

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1 Lethal Dose 50: the quantity that will kill 50% of a population.

2 Acute toxicity: the ability of a substance to cause poisonous effects resulting in severe biological harm or death soon after a single exposure or dose. Also, any severe poisonous effect resulting from a short-term exposure to a toxic substance.

3 Chronic toxicity: toxicity resulting from prolonged exposure.

4 Biodegradation: decomposition of a substance into more elementary compounds by the action of micro-organisms such as bacteria. Biodegradable: subject to degradation (breakdown) into simpler substances by biological action. The breakdown of detergents, sewage wastes, or other organic matter by bacteria are all examples of biodegradation.

5 Bioaccumulation: the retention and concentration of a substance by an organism. This is particularly important if the substance has other adverse effects and is passed through the food chain.

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**IAMSAR Manual**

(International Aeronautical and Maritime Search and Rescue Manual)

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However, it was finally agreed that both acute and chronic toxicity are important factors that may be employed in different ways according to the aspect of pollution prevention being addressed by a given piece of legislation. This is particularly important when considering Annex II of MARPOL 73/78, which addresses the operational discharge of small quantities of products as well as the potential sudden release of large quantities of product resulting from accidental damage to a chemical tanker.

The new GESAMP Hazard Evaluation Procedure

On request from the MEPC, the GESAMP Evaluation of the Hazards of Harmful Substances Carried in Ships Working Group developed a new procedure for evaluating the hazards of chemicals with regard to marine pollution, taking into account the OECD global harmonization exercise and improved awareness of the factors considered important in terms of marine pollution, including the following:

1. bioaccumulation (identified by Log $P_{ow}$ or BioConcentration Factor (BCF));
2. biodegradation;
3. acute aquatic toxicity (to fish, crustacea and algae);
4. chronic aquatic toxicity (to fish, crustacea and algae);
5. acute mammalian toxicity by swallowing;
6. acute mammalian toxicity by skin penetration;
7. acute mammalian toxicity by inhalation;
8. skin irritation/corrosivity;
9. eye irritation/corrosivity;
10. other specific health concerns;
11. tainting potential;
12. potential impact on beaches and amenities; and
13. effect on wildlife and the sea-bed (as measured by its physical properties causing it to sink or float persistently on the surface).

GESAMP selected these properties in line with the United Nations Convention on the Law of the Sea (UNCLOS) definition of harmful substance (marine pollutant) but, in recognition of the fact that their application would vary with the situation, made no attempt to combine them.

This is an important factor, as it is considered likely that differing emphasis will be placed on those properties used to define operational discharge categories from those used to define ship types.

Relevance of different properties

The significance of the properties identified by the EHS Working Group will vary according to the location, quantity and manner in which a product is released into the marine environment.

For example, an accidental spill or large discharge of a vegetable oil may score low in terms of acute or chronic toxicity. But it could have a high potential to damage beaches and amenities (such as tourism) if it is washed up on beaches, and its physical properties (floating on the surface) may adversely affect wildlife and the seabed.

Sulphuric acid may score highly in terms of toxicity and skin corrosion – but a spill on the high seas would be so rapidly diluted in seawater that its effects may be minor.

Review of Annexes I and II of MARPOL

In 1992, the Sub-Committee on Bulk Chemicals (BCH), now known as the Sub-Committee on Bulk Liquids and Gases (BLG), agreed that it was appropriate to review Annex II to MARPOL 73/78 because the regulations and requirements as well as the Procedures and Arrangements are too complex, and should be simplified in order to encourage their implementation.

Such simplification should include the categorization of noxious liquid substances whilst taking account of improvements in technology that now make ships capable of reducing their cargo residues to less than 100 litres compared with the 1000 litres or 3000 litres obtainable when Annex II was originally drafted in the early 1970s.

In July 1995 the ESPH Working Group indicated that the existing five-category system for defining pollution categories could be simplified into a three-category system whilst taking account of improvements in efficient stripping arrangements on chemical tankers and advancements in the understanding of those properties of a product that are likely to have an adverse effect on the marine environment.

The ESPH Working Group agreed that, in general, no product should be permitted to enter the sea in unlimited quantities, as is the case with the existing pollution category D and appendix III products.

As a result, the Group considered that the environment would be appropriately protected by combining these two categories into one, which would have limited restrictions associated with it.

In addition, the Group considered that it is no longer necessary to distinguish between pollution categories B and C (which permit residues of 100 litres and 300 litres, respectively, to be discharged into the sea). As a result of advances in technology, it is recognized that 100 litres, and as low as 10-20 litres of product left remaining in the tank after discharge), is easily achievable for the new ships being built today, which effectively removes the need for pollution category C.

While reducing the number of pollution categories, the ESPH Working Group recognized the advances in environmental sciences that have been made in the 25 years since the original criteria for defining hazardous substances had been developed. As a result, after considerable deliberation,
a preliminary set of criteria were developed to produce three pollution categories, based on an improved understanding of those properties that may have a significant impact on the marine environment.

These criteria, which will be based on the new GESAMP Hazard Profile Procedure, will be refined over the next two years but are expected to contain the following features that differ from the existing criteria:

1. the removal of Tainting (T) as a significant pollutant property for applying to operational discharges;
2. the consideration of physical properties used to define persistent sinkers and floaters as a harmful property that should be taken into account;
3. the consideration of (bio)degradation as a property that can ameliorate other harmful effects by removing the product from the environment; and
4. the reduction in the emphasis on acute aquatic toxicity as a property used to define pollution categories.

Rationale for a three-category system

While alternative categorization systems continue to be explored, support is growing for the three-category system that was originally proposed by the ESPH Working Group, based on submissions made by the Netherlands and the UK. The three categories proposed under this system are:

<table>
<thead>
<tr>
<th>Pollution category</th>
<th>Maximum discharge quantity proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>None</td>
</tr>
<tr>
<td>Y</td>
<td>100 litres</td>
</tr>
<tr>
<td>Z</td>
<td>900 litres</td>
</tr>
</tbody>
</table>

The following concepts were considered in developing this three-category system:

1. There are some products that should not be routinely disposed of at sea at all, and these should go in category X.
2. Products associated with category Y can be routinely discharged to the sea in 100 litre quantities under carefully controlled conditions without causing any environmental damage.
3. Under normal circumstances it is environmentally irresponsible to discharge unlimited quantities to the sea. Products falling outside the criteria of categories X or Y are assigned to category Z, and ships’ tanks containing these products should be emptied as much as their existing equipment will allow. A level of 900 litres of residue has been considered to be achievable by all ships today.
4 Products assigned to pollution categories X or Y are considered to have sufficient pollution potential to require them to be carried in chemical tankers whilst it is expected that only some products assigned to category Z will require this.

Summary of changes to Annex II

The development of a new pollution categorization system for Annex II to MARPOL 73/78 is benefiting from a series of positive factors:

1 improvements in ship technology, such as efficient stripping techniques, mean that lower levels for permitted discharge levels of certain products can be incorporated into Annex II;

2 scientific knowledge is at a stage where there is a greater appreciation of the relationship between the properties of chemicals and their impact on the marine environment;

3 the 1992 UN Conference on Environment and Development (UNCED) gave an impetus to the process of harmonization of the classification and labelling of chemicals, which will make it more likely that regulations in Annex II of MARPOL are compatible with those governing chemicals outside of the shipping industry; and

4 the new GESAMP Hazard Evaluation Procedure for evaluating products should make categorization more accurate and objective.

This has produced a unique opportunity to create a system that will afford a high degree of protection to the marine environment whilst being as simple as is practically possible to implement and based on meaningful transparent criteria that are easy to apply.

MARPOL Annex III – Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form

In order to identify packaged goods that are deemed to be marine pollutants, Annex III to MARPOL 73/78 uses criteria based on the GESAMP Hazard Profile of a product. Since these criteria were developed, other legislative systems, with differing sets of criteria, have also been developed to define products as hazardous to the aquatic environment.

Informal discussions with industry and Administrations indicate a desire to develop a harmonized classification and labelling system for products deemed to be hazardous to the aquatic environment (including marine pollutants) as a result of the 1992 UNCED Conference. It is anticipated that both the criteria and the labelling for such products will be harmonized within all modes of transport as well as various user classification systems.

Such measures may result in a complete change in the criteria used to define marine pollutants under Annex III to MARPOL 73/78. It may be argued that this will make such criteria more meaningful, as they are currently based on the operational discharge (pollution categories) of Annex II to MARPOL 73/78, which have little bearing on packaged products.

MARPOL Annex IV – Prevention of Pollution by Sewage from Ships

Though adopted in 1973, Annex IV to MARPOL 73/78 has not yet entered into force; a considerable number of Member Governments have indicated that they have no intention of ratifying it in its current form, mainly due to the difficulties in providing reception facilities for sewage from ships.

The MEPC is attempting to ascertain the necessary amendments that would enable Annex IV to become sufficiently acceptable to allow it to enter into force whilst remaining an effective mechanism for combating marine pollution from ship-based sewage.

MARPOL Annex V – Prevention of Pollution by Garbage from Ships, and Annex VI – Prevention of Air Pollution from Ships

As Annex V has only recently entered into force and Annex VI has only just been adopted, there have not been any suggestions that these annexes should be modified in any way yet.

Summary

Considerable experience has been gained since the adoption of MARPOL in 1973, enabling changes to be made to various Annexes in order to make them either easier to understand and to follow or more meaningful following a greater awareness of those aspects that are important.

Such changes should lead to legislation that will improve the environment whilst being easier to implement, and therefore making it more attractive to Governments to ratify the Convention. MARPOL 73/78 has been ratified by 106 countries (as of 31 December 1998), representing 93.88% of world merchant shipping tonnage.

This is based on a paper presented at the Twenty-Third Annual Conference on Current Maritime Issues and the Work of the International Maritime Organization, co-sponsored by Center for Oceans Law and Policy, University of Virginia School of Law, and IMO, held at IMO Headquarters in London, 6–8 January 1999.

The views represent those of the author.

Modern bulk chemical tankers transport bulk liquid chemicals, edible oils, acids, and other speciality liquids. (Courtesy Stolt-Nielsen S.A.)
Donations and pledges to the Seafarers Memorial Trust Fund reached the US$1 million mark in mid-January.

The Secretary-General of IMO, Mr. William A. O’Neil, said: “The purpose of the Trust Fund is to pay tribute to the seafarers on whom the shipping industry relies – and especially to recognize those seafarers who have lost their lives in what has always been one of the world’s most dangerous professions. The response of the shipping industry has been extremely generous and we are now well on the way towards achieving our target of US$10 million.”

The Trust Fund was established last year by the IMO Council to mark the 50th anniversary of the adoption of the international treaty which led to the establishment of IMO. The aim of the Fund is to provide for:

- the erection of an International Memorial to Seafarers, at IMO headquarters by the River Thames;
- the establishment of a Chair in maritime safety and pollution prevention at the World Maritime University in Malmö, Sweden;
- the provision of fellowships to students at certain maritime institutes around the world; and
- any other activity related to the training of seafarers, as might be determined by the administrators of the Fund.

The biggest donation to the Fund so far has come from the International Transport Workers Federation (ITF), which has contributed US$500,000. The Secretary-General said: “The fact that the ITF, which represents so many of the world’s seafarers, has made such a generous donation to the Fund is most encouraging. In the past the ITF has made generous contributions to the World Maritime University and various other IMO activities and we have worked closely together in many ways. This latest donation shows that we have the backing of the seafaring community and I would like to express my great appreciation to the ITF for its support.”

Since the Fund was announced on 24 September last year – World Maritime Day – progress has also been made in establishing a Board of Trustees from eminent members of the shipping community.