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**WORLD MARITIME UNIVERSITY**  
Malmö, Sweden

**DEVELOPMENT OF MARINE  
ENVIRONMENTAL PROTECTION CURRICULA  
FOR CADETS AT THE ARAB ACADEMY FOR  
SCIENCE AND TECHNOLOGY AND MARITIME  
TRANSPORT**

By  
**GAMAL AHMED MOHAMED GHALWASH**  
Egypt

A dissertation submitted to the World Maritime University in partial  
fulfilment of the requirements for the award of the degree of

**MASTER OF SCIENCE**

in

**GENERAL MARITIME ADMINISTRATION  
&  
ENVIRONMENT PROTECTION**

1997

## DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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**THIS DISSERTATION IS DEDICATED TO  
THE SPIRITS OF MY PARENTS**

## ABSTRACT

Title of Dissertation: **Development of Marine Environmental Protection Curricula for Cadets at the Arab Academy for Science and Technology and Maritime Transport.**

Degree: **Msc.**

Marine environmental protection is becoming, increasingly, a world-wide demand. Marine accidental and operational pollution due to shipping activities, though contributing by a relatively small percentage of the annual global inputs into the seas, is characterized by massive releases of oil or hazardous substances causing acute pollution, which enjoys media coverage and public concern. The human factor has always been behind most accidental and operational marine pollution from shipping activities

The IMO emphasised the role of the human factor in the effective and efficient implementation of international regulations, including marine pollution prevention, through the revised STCW 1978, as amended in 1995. Consequently, the Arab Academy for Science and Technology and Maritime Transport (AAST&MT) in Egypt, as a regional maritime institute, has taken a commitment to work on promoting competence standard requirements of international regulations including marine pollution prevention.

In order to achieve the objectives of the AAST&MT, conducting an assessment of the standards of maritime education and training concerning marine environmental protection was necessary. The Maritime Basic Studies Program (MBSP), a two-year academic common program for prospective officers in the AAST&MT, has been chosen in this dissertation to be reviewed, examined and evaluated. The methodology of standards assessment was followed at two levels:

1. Reviewing and analysing the curricular system of the MBSP evaluating adequacy and relevance of the subject areas concerning marine environmental protection.

2. Conducting a survey in the form of a questionnaire to evaluate the standards of environmental awareness of cadets in the AAST&MT.

Consequently, marine environmental protection curricula were prepared for the MBSP on basis of three major axis:

1. Deficiencies in the subject areas concerning marine environmental protection in the MBSP.
2. Standards of environmental awareness of cadets in the AAST&MT.
3. The competence and standard of knowledge requirements of the revised STCW 1978, as amended in 1995, concerning marine pollution prevention and anti-pollution procedures.

The syllabuses were prepared to promote environmental culture by providing baseline marine environmental information. They cover international preventive regulations (prevention, mitigation and control), curative regulations (response and clean-up), liability and compensation in cases of oil pollution damage. UNCLOS 1982, which provides the international legal framework of enforcement of environmental legislation, was also covered.

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## LIST OF ABBREVIATIONS

AAS&MT	Arab Academy for Science and Technology and Maritime Transport
ALOHA	Aerial Location of Hazardous Atmosphere
ALOHA	Aerial Location of Hazardous Atmosphere
AMTA	Arab Maritime Transport Academy
BCH Code	The Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
BOD	Biochemical Oxygen Demand
CAMEO	Computer Aided Management of Emergency Operations
CBT	Clean Ballast Tanks
CET	College of Engineering and Technology
CHS	Credit Hour System
CLC 1969	International Convention on Civil Liability for Oil Pollution Damage, 1969
CMT	College of Management and technology
CMTT	College of Maritime Transport and Technology
COLREG 1972	Convention on the International Regulations for Preventing Collision at Sea, 1972
COW	Crude Oil Washing
CRISTAL	Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution, 1971
DDT	DICHLORODIPHENYLTRICHLOROETHANE
EEZ	Exclusive Economic Zone

FUND 1971	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971
GESAMP	United Nations Group of Experts on the Scientific Aspects of Marine Pollution
GMDSS	Global Maritime Distress and Safety System
HSSC	Harmonized System of Survey and Certificates
IBC Code	The International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
ICS	International Chamber of Shipping
IMCO	Inter-governmental Maritime Consultative Organization
IMDG Code	International Maritime Dangerous Goods Code
IMF	International Monetary Fund
IMO	International Maritime Organization
INF Code	The Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-level Radioactive Wastes in Flasks on Board Ships
INTERVENTION	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969
IOPC	The International Oil Pollution Compensation Fund
ISC	Integrated Simulators Complex
ISF	International Shipping Federation
ISM Code	The International Management Code for the Safe Operation of Ships and for Pollution Prevention
LBMP	Land-based Marine Pollution
LDC 1972	Convention on the Prevention of Marine Pollution by Dumping of wastes and other matters, 1972
LL 1966	International Convention on Load Lines, 1966
LOT	Load On Top

MARPLLOT	Mapping Application of Response, Planning and Local Operational Tasks
MARPOL 73/78	The International Convention for the Prevention of Pollution from Ships
MBSP	Maritime Basic Studies Program
MEPC	Marine Environment Protection Committee
MRCC	Maritime Research and Consultation Centre
MSC	Maritime Safety Committee
MSPs	Maritime Studies Programs
NAS	The US National Academy of Science
ND 171	Marine Safety Course in the MBSP
ND 213	Watchkeeping and Ship Manoeuvring Course in the MBSP
ND 215	Watchkeeping 2 Course in the MBSP
ND 217	Cargo handling Course (Liquids) in the MBSP
ND 291	Maritime Law Course in the MBSP
ND 372	Maritime Survey Course in the MSPs
ND 392	Business and Law Course in the MSPs
ND 495	IMO Conventions Course in the MSPs
NRC	The US National Research Council
OILPOL 1954	International Convention for the Prevention of Pollution of the Sea by Oil, 1954
OPRC 1990	The International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990
OSCMS	Oil Spill Crisis Management Simulator
PCBs	<u>POLYCHLORINATED BIPHENYLS.</u>
SALVAGE	International Convention on Salvage, 1989
SBT	Segregated Ballast Tanks
SDRs	Special Drawing Rights
SMS	Safety Management System



✓ SOLAS 1974	International Convention for the Safety of Life At Sea, 1974
SOPEP	Shipboard Oil Pollution Emergency Plan
-STCW 1978	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978
STW	The Sub-committee on Standards of Training and Watchkeeping
TOVALOP	Tanker Owners' Voluntary Agreement Concerning Liability for Oil Pollution, 1969
ULCC	Ultra Large Crude Carriers
UN 501	Prevention and Combating of Marine Pollution Course in the MSPs
UN 511	Watchkeeping Duties Course in the MSPs
UNCED	United Nations Conference on Environment and Development
UNCLOS 1982	United Nations Convention on the Law of the Sea, 1982
UNEP	United Nations Environment Program

## ***CHAPTER I***

### ***Introduction***

Oceans are considered as the 'common heritage of mankind' and also as the prospective fundamental source of our life needs, and in fact they are the natural asset which we are relying upon in 'Our common future'. That is why the marine environment protection is a common and international demand for every country of the world.

Shipping activities are contributing to the marine environmental pollution by a percentage of about 12 % annually (GESAMP, 1990 and IMO, 1992). This percentage is relatively small compared with the percentage of contribution of other marine pollution sources. Nevertheless, marine pollution due to shipping activities is acute and characterized by massive spillage of pollutants to the sea whether it was accidental or operational pollution. These characteristics make marine pollution due to shipping activities enjoy wide media coverage and public concern. The other sources of marine pollution, especially land-based sources, are chronic, non-point, long-term and on the molecular level, which make the establishment of a cause-effect relationship between environmental damage and those sources of pollution absolutely difficult.

The International Maritime Organization (IMO) declared its objectives as safer shipping and cleaner oceans and has worked to achieve these purposes by issuing international regulations and calling for international technical co-operation. The IMO also initiated an endeavour to unify minimum global standards of safety of shipping and marine environment protection. Recently, the role of the human factor

in marine environmental protection and onboard safe operations has been emphasised by IMO. The revised STCW 1978, the ISM Code and the establishment of a special 'Human Element Section' in IMO indicates and addresses this approach.

The 1995 amendments of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW), following the functional approach, specified standards of competence of seafarers for 7 functions at three levels of responsibilities. One of these functions is "Controlling the operation of the ship and care of persons on board", under which come the tasks of marine pollution prevention, anti-pollution procedures and compliance with IMO regulations with respect to marine environmental protection. Consequently, in order to achieve the standards required by IMO regulations in the form of the revised STCW 1978, the Maritime Education and Training (MET) in the whole world should play a vital role in the whole comprehensive task.

All the curricular systems of the maritime institutes should be in compliance with these requirements. The Arab Academy for Science and Technology and Maritime Transport (AAST&MT), a regional maritime institute in Egypt, has taken the responsibility for awarding sea-going certificates of competence for thousands of marine officers from Arab and African countries. From this point of view, it is a commitment to work on promoting and developing competency and proficiency standard requirements of the international regulations for prospective officers in the field of marine pollution prevention and anti-pollution procedures.

That is why it was necessary to examine to what extent the curricular systems of the Maritime Studies Programs (MSPs) in the AAST&MT are in compliance with these international standards. Following the methodology of conducting a survey of the prospective officers and analysing the curricular systems relating to marine environmental protection of the MSPs in the AAST&MT, deficiencies of the subject areas, if there are any, could be specified. Subsequently, a new curricular system based on the extracted data can be constructed, developed and applied to the MSPs to be in compliance with the revised STCW 1978, as amended in 1995.

It was necessary to identify the baseline from which to start applying the developed and improved curricular system. The MSPs were examined and the Maritime Basic Studies Program (MBSP), a two-year academic studies common program of the MSPs, was found to be the best stage from which to start the application, i.e. to start applying the promotion and development of environmental awareness from the roots of the educational process. It was also necessary to study the criteria of dividing teaching hours of the proposed environmental curricula between the different subject areas according to their relevance and importance to seafarers and consequently to cadets.

### *1.1 AAST&MT as a Regional Maritime Institute*

The Arab Maritime Transport Academy (AMTA) was established in 1972 as a specialized agency of the Arab League engaged in educational, training and research activities related to the maritime transport industry.

Nowadays, the Academy is a multifaceted institution, enlarging its objectives to community services, projects, and a wide variety of functions. That is why the name was changed in 1994 to AAST&MT. The AAST&MT is serving thousands of students mainly from Arab and African countries.

The AAST&MT has been honoured with accredited recognition of the Supreme Council of Egyptian Universities in 1979, the Association of Arab Universities in 1992 and the International Association of Universities in 1992.

The accredited recognition granted to the AAST&MT by these associations is based on the excellent quality of educational programs, strong commitment to social responsibilities towards the local community and involvement in applied research. The IMO certified the AAST&MT as a regional centre for awarding sea-going certificates of competence, which was based on international standards of educational institutes generally and maritime education and training institutes particularly.

### ***1.2 AAST&MT Colleges and Departments***

The AAST&MT has four main core entities, each of which comprises several departments and programs. These four core entities are:

- 1- College of Maritime Transport and Technology (CMTT).
- 2- College of Engineering and Technology (CET).
- 3- College of Management and Technology (CMT).
- 4- Maritime Research and Consultation Centre (MRCC).

In addition to the four main core entities the AAST&MT has the following four specialized institutes:

- Productivity and Total Quality Institute.
- Sea Training Institute.
- Advanced management Institute.
- Port Training Institute.

The AAST&MT also operates and maintains the high technologically advanced training ship, AIDA IV, which was delivered in March 1992 as a 20-million US-dollar donation from Japan, for guided sea training of cadets.

In February 1996, the AAST&MT officially inaugurated the Integrated Simulators Complex (ISC) in the CMTT, which is ranked as one of the most recent and updated marine simulation sites world-wide.

### ***1.3 College of Maritime Transport and Technology (CMTT)***

The college includes four main departments and three specialized programs. The four departments are the Nautical Department, the Department of Management and Economics, the Department of Marine Safety and the Department of Graduates of Maritime Studies. The specialized programs are the Marine Environment Protection Program, the Fisheries Training Program, and the Diving Program.

The CMTT is responsible for operating the modern training ship AIDA IV, which can accommodate about 200 cadets for guided sea training. The CMTT comprises a number of simulators, laboratories, floating units, fire fighting and survival at sea centres, and marine pollution combating centre. The CMTT also includes one of the most advanced simulators complexes in the world, that is the ICS which comprises the Oil Spill Crisis Management Simulator (OSCMS).

#### ***1.4 Maritime Studies Programs (MSPs), (Nautical Branch)***

The CMTT, through its departments and educational and training programs, offers a considerable number of study curricula leading to the following degrees and certificates of competency.

-B.Tech. in Maritime Transport Technology, coupled with Second Mate Certificate of Competency.

-Third Mate /Second Mate Certificate of Competency.

-First Mate Certificate of Competency.

-Master Certificate of Competency.

There are also technical courses in compliance with mandatory standard requirements of the revised STCW 1978, as amended in 1995, for certification:

Fire fighting, navigational control, first aid, carriage of dangerous goods, medical studies, radiotelephony (RT), survival at sea, life boats, electronic navigation equipment, ULCC operation, marine pollution prevention and environment protection programs and courses.

The Maritime Studies Programs follow the Credit Hour System (CHS) which offers the student a higher degree of flexibility in deciding upon his/her academic or professional study program within a cumulative system that best matches the students' interests, capabilities and career advancement options. The details of the system are included in Appendix I of this document.

## **CHAPTER 2**

### ***Standards of the Environmental Education and Training in the Maritime Basic Studies of the AAST&MT***

According to international regulations, a major part of the preventive measures of the marine pollution caused by shipping activities is the responsibility of seafarers. The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (STCW Convention) determined the standard of competence required for tasks and responsibilities including marine pollution prevention and the minimum knowledge and proficiency required for achieving these responsibilities. In fact, the AAST&MT has contributed to the preparatory work of the revised STCW 1995 in a consultative status. Consequently, it is important to guarantee that the prospective deck officers in the MSPs acquire the international standards of competence and proficiency in marine pollution prevention requirements.

#### ***2.1 The Methodology of Standards Assessment***

In order to guarantee that the prospective deck officers in the AAST&MT acquire the standards of competence, knowledge and proficiency required to achieve their tasks, duties and responsibilities related to prevention of pollution of the marine environment and anti-pollution procedures, the curricular systems of the Maritime Studies Programs (MSPs) in the AAST&MT should cover all the items of the international regulations concerning marine pollution prevention. Subsequently, a proper examination, analysis, and evaluation are duly needed to determine

compliance with these international requirements in this field. But what is the best suitable methodology to be followed to achieve the evaluation satisfactorily?

The standards should be examined, on non-biased basis, at two levels as follows:

1-The first and essential part of evaluation is to review, examine and analyse the curricular systems of the MSPs in the AAST&MT to determine to what extent they are in compliance with the international regulation requirements of marine pollution prevention and anti pollution procedures.

2-The second level is to conduct a survey in a form of a questionnaire to evaluate the standards of the environmental awareness of the prospective deck officers in the AAST&MT, i.e. to evaluate the real results of the educational process.

It is obvious that one level of evaluation alone is not quite enough, since it is possible to prepare a perfect curriculum with ideal detailed teaching syllabus and learning objectives but still the standard of the graduates is not satisfactory. This may be due to some other reasons, which may not be on the same standard including the preparatory work of the course, the teaching staff, the teaching facilities, and other reasons. Nevertheless, without a satisfactory and well prepared curriculum the standards can never be satisfactory. The conclusion is that an ideal curriculum does not guarantee the required standards, while a curriculum deficiency is a guarantee for unsatisfactory standards.

## ***2.2 Review and Examination of the Courses of the AAST&MT Related to Marine Environmental Protection***

### ***2.2.1 Introduction***

As was illustrated in 1.4, and according to Appendix I, the MSPs include different optional educational programs to fulfil the requirements of the certificate of competency as a watch-keeping officer. All these educational programs include the common stage of the two-year academic Maritime Basic Studies Program (MBSP), except only one educational program of getting a certificate of Third Mate for



individuals who are not graduates from maritime institutes. For this exceptional case there will be a recommendation in Chapter 8.

This means that it is suitable to start review and analysis of the curricular system of the two-year academic MBSP. That is to determine and specify any shortage or deficiency of the subject areas covering marine environmental protection knowledge as required by international regulations. Then, by establishing and improving new developed courses to the two-year academic MBSP, these subject areas can be addressed, i.e. to start providing the suitable required awareness and knowledge related to marine environmental protection from the roots of the maritime educational process. That is also to guarantee a common applied knowledge which would reach every prospective officer.

The two-year academic MBSP is considered then as the baseline from which the review, analysis, and evaluation should start and take place. Subsequently, the preliminary step is to find the baseline data, which are the courses in this program related to marine pollution prevention and the objectives and scope of them. It is necessary to find to what extent they cover international regulations and their standard requirements. Nevertheless, an outline overview is required on the marine environmental related courses of the other programs of the MSPs.

### ***2.2.2 The two-year academic MBSP review and examination***

This program is composed of 4 semesters, two semesters each year. The semester is 16 weeks, each of which comprises about 30 hours of lectures, with two days a week as a holiday. Full details of this program are given in Appendix I, item I.2, including the credit hour system (CHS), the academic regulations of load and grading systems and the meaning of the codes of the courses.

***The First semester*** does not contain any course which may include any subject areas of marine pollution prevention. It contains only academic subjects like physics, chemistry, mathematics, English Language, and computer skills. It contains also the

basic principles of marine electronics, introduction to meteorology, seamanship and navigation.

*The Second Semester* includes one subject only, which was supposed to contain items or subject areas of marine pollution prevention. This is the course of Marine Safety (ND 171) since marine safety and marine environmental pollution prevention are two targets which in most cases can be achieved by common precautions and measures. By reviewing its scope and learning objectives, it was found that it covers the IMO Model Course 1.19 Personal Survival, Model Course 1.20 Basic Fire Fighting, and 1.14 Medical course: First Aid. This means that ND 171 does not cover any subject areas of marine pollution prevention.

*The Third Semester* includes only two courses which are supposed to cover the requirements of marine pollution prevention regulations. The first is Watchkeeping and Ship Manoeuvring (ND 213) because the competence of marine pollution prevention is one of the requirements of the revised STCW 1978 Convention as amended in 1995, for an officer in charge of a navigational watch. The second is Introduction to Maritime Law (ND 291) because the legal background of international regulations in the environmental field is essential for achieving environmental protection tasks and it is also a requirement of the STCW Convention.

By reviewing ND 213, it was found to cover three main subject areas which are watchkeeping arrangements and procedures including a safe navigational watch, keeping a watch in port and ships' manoeuvring and handling. Although the first two subject areas are closely related to marine pollution prevention requirements, no learning objectives related to the field were included.

A review and examination to ND 291 indicated that the course covers certain items of maritime law which are not related to marine pollution prevention. This course covers only ships registration, logbooks, responsibilities of ship owner and masters, principles of COLREG1972, and SALVAGE.

It does not contain learning objectives related to marine pollution prevention regulations.

*The Fourth Semester* is the one which contains two courses with subject areas and learning objectives covering an important part of the environmental protection requirements. The two courses are (ND 215) Watchkeeping (2) and (ND 217) Cargo Handling (Liquids). Each of them has a weight of two credit hours, 48 teaching hours and pass percentage of 60 %.

ND 215 covers the following subject areas: Anchors and their uses, management of ships in heavy weather, accidental damage including collisions and grounding, contingency planning for maritime emergencies and prevention of marine pollution. Under the subject area of prevention of marine pollution come sub-items of learning objectives like an overview of MARPOL 73/78, technical annexes, Annex I, control of oil from machinery spaces, oil record book and measures and procedures to be taken to prevent accidental pollution and in the case of accidental pollution including reporting and the immediate actions to stop or reduce oil spill.

The time devoted to this subject area is 7 hours, one hour of which is advising the use of the teaching aid of Video Films like Accidents at Sea, 25 minutes (Info film+Video Tel), and Fighting Pollution, 25 minutes (Video Tel), while 6 hours are taken as theoretical lectures.

It is clear that the time devoted to cover the learning objectives is comparatively short and not enough to cover all these essential items in the required depth. i.e. If comparing with the time devoted to cover the IMO model course 1.11 concerning the practical requirements of Annex I only of MARPOL 73/78 Convention, which is 27 hours.

ND 217 Cargo Handling (Liquids) is mainly to cover the subject areas of oil tankers, petroleum properties hazards, oil cargo containment and handling, oil tanker operations, marine pollution, safety and gas carriers. The subject area of marine pollution is covered by 4.5 hours, 2.5 of which are lectures and 2 hours laboratory work. The learning objectives of this subject area are divided as follows:

1. Causes of marine pollution (1H).
  - 1.1 Covering the marine pollution at sea as a result of accidents like grounding

and collision or as a result of tanker operations or discharge of oily wastes.

- 1.2 Covering the marine pollution in port due to mistakes in loading or discharging of tankers or due to discharge of oily wastes.
2. Prevention of marine pollution (1.5 H)
  - 2.1 Prevention at sea, mentioning that MARPOL 73/78 is preventing, restricting and controlling the oily waste discharge to the sea. Giving an idea about some technical operations like Load On Top (LOT) and Crude Oil Wash (COW).
  - 2.2 Prevention at port, by observing and controlling loading and discharging operations following an approved check list.
3. Giving general idea about air pollution caused by ships.

The two hours of the laboratory work are dedicated for illustrating the LOT and COW operations and watching Video Films of COW operations, 23 minutes (Video Tel) and COW system, 20 minutes (Video Tel).

It is obvious that the time devoted to the subject areas of marine pollution prevention in the time table is not enough at all to cover the mentioned items of the learning objectives with the required depth, since the IMO model course 1.02 Advanced Training Program on oil Tanker Operations has devoted 16.5 hours to IGS and COW modules.

### ***2.2.3 Other marine pollution prevention courses***

(ND 372) Marine Survey (1), of 2 credit hours, 48 Teaching hours, and 60 % pass percentage, comprises the subject area of anti-pollution standards and methods of enforcement. This course is in the sixth semester, third year of the B.Tech.+ Second Mate program, which is not a common path for all prospective officers (See Appendix I). The course is taken as a choice between three options, and as a personal observation between 15 to 30 % of the cadets in the AAST&MT who study this course.

(ND 392) Business and Law, of 2 credit hours, 48 teaching hours, and 50 % pass percentage. This course is in the sixth semester, third year which includes the subject area of MARPOL 73/78, LDC 1972, and CLC 1969 as an overview of the outline and emphasising on the regulations related to seafarers. This course is only studied by cadets who choose the educational program of B.Tech.+ Second Mate. They can be estimated as between 25 to 45 % of the total cadets (Personal estimation according to the number of students joining the program in 1994 and 1995). Subsequently this course is not a common one for all prospective officers.

(ND 495) IMO Conventions, of 2 credit hours, 48 teaching hours, 50 % pass percentage and prerequisite ND 392, is taken in the seventh semester, fourth year. It contains subject areas of MARPOL 73/78, LDC 1972, from the point of view of adoption ratification and national implementation. This course is not a common course having exactly the same conditions like ND 392.

(UN 501) Prevention and Combating of Marine Pollution. This is a short mandatory course, which is one of the requirements of the certification of an officer in charge of a navigational watch. It covers at the mean time the practical requirements of Annex I and II of MARPOL 73/78 according to IMO model courses 1.11 and 1.12. Although it is a common mandatory course for all prospective officers, it is not comprehensive and the period of time available is too short to cover the competence of marine pollution prevention theoretically and practically. A proposal for a short course which is more comprehensive and covers most of the items required was introduced by M.A.K.Farag, (1996). This short course was devoted to Egyptian marine officers, but could be beneficial to other nationalities.

(UN 511) Watchkeeping Duties, is a common course which has to be studied by all prospective officers, either in the two-month preparation course for the B.Tech + Second Mate Program or in the theoretical study in an upgrading session of 22 weeks for Second Mate and Third Mate programs. It covers subject areas of an outline of MARPOL 73/78 and precautions of preventing accidental and operational pollution.

Once again, although it is a common course for all prospective officers, it does not cover all subject areas of marine pollution-prevention standards.

#### ***2.2.4 Observations***

Two courses only in the two-year academic MBSP contain subject areas concerning marine pollution prevention standard requirements. The total time devoted to these subject areas is 12.5 hours, covering causes of accidental and operational marine pollution, procedures of prevention or mitigation of marine pollution at sea and in ports, an overview of the outline of MARPOL 73/78 and general ideas about air pollution from ships.

This indicates, on the one hand, that the time devoted to the learning objectives of the required subject areas is not enough to cover these items in the required details and depth. This is based on personal experience in teaching, and compared with the IMO Model Course 1.11 covering only the requirements of Annex I of the MARPOL Convention 73/78, which needs 27 hours and Model Course 1.12 covering requirements of Annex II, which needs 16.5 hours to be covered properly and deeply as indicated by IMO.

On the other hand, the subject areas are not covering all the standard requirements of international regulations. A lack of important subject areas is obvious in the curricular systems of the MBSP. This deficiency is substantially clear in the subject areas of impacts of marine environmental pollution, practical operational requirements of MARPOL Convention 73/78, international regulations concerning marine environmental protection, an overview of the major maritime accidents involving oil pollution, liability and compensation in cases of marine oil pollution damage.

Nevertheless, it needs to be determined to what extent the time devoted to the learning objectives of the specified subject areas is not enough to cover them thoroughly and deeply. It is also important to show to what extent there is a lack of important environmental protection items. That is why the methodology of the

standard assessment was decided to be on two levels. The second level of the standard assessment, which was decided to follow the approach of conducting a survey, in the form of a questionnaire, of the prospective deck officers in the AAST&MT, may be able to answer these questions.

Courses other than those included in the two-year academic MBSP like ND 372, ND 392, and ND 495 are covering an essential part of the technical marine pollution prevention standards and legal background, but they are not common courses for all prospective officers.

UN 501 and UN 511 are common courses for all prospective officers but do not cover all the competence standard requirements of the international regulations. The time devoted to the subject areas belonging to the field is also comparatively short and not enough to achieve the comprehensive items of the subject areas and mentioned learning objectives. This is measured on basis of the IMO model courses program and the practical personal teaching experience. It is also clear that both of the two courses are applied at a final stage of the second and third mate programs which is very late and does not give the chance to the cadets to apply their information during the sea training period.

### ***2.3 A Survey to Evaluate the Standards of Marine Environmental Protection Awareness of the Prospective Officers in the AAST&MT***

#### ***2.3.1 Preparation of the survey in a form of a questionnaire***

It was necessary to clarify several issues before starting preparatory procedures of the survey. This was through answering three questions.

*-Why should the survey be conducted?*

*-To whom should the survey be directed?*

*-How should the survey be conducted ?*

### ***2.3.1.1 Why applying the methodology of conducting a survey in a form of a questionnaire?***

As was mentioned in 2.1, the second level of the standard assessment is to evaluate the real results of the educational process, i.e. the standard of awareness and knowledge for the candidates themselves. Conducting the survey in a form of questionnaire would give indications, impressions and reveal several unknown required facts, which can be summarised as follows:

- 1- It indicates the standard of the preparatory work for producing the curricular system, the level of adequacy and relevance of the syllabuses and to what extent they are in compliance with the standard requirements of international regulations.
- 2- It reflects to what extent the learning objectives could be achieved.
- 3- It gives impression to what extent the teaching staff could convey the depth of knowledge required and could overcome the prime communication difficulty presented by the syllabus.

### ***2.3.1.2 To whom should the survey be directed?***

On a non-biased basis, the survey was conducted of the graduates of the two-year academic MBSP, Nautical Branch, which are the first two years of theoretical study in the MSPs. The MBSP is the only common route among the different programs of the MSPs as indicated in Appendix I of this document.

It is obvious that conducting a survey of the graduated officers would be misleading. That is because the educational programs and the curricular systems and courses delivered by these officers after the two-year MBSP are completely different, making the survey an unsuitable means of evaluating the curricular system of the MSPs. It is also clear that starting a general curricular system for improving and developing all prospective officers' environmental protection awareness should begin from the baseline, which is the common stage for all officers, i.e. the MBSP, whatever the educational program they follow later.



A survey was conducted in a previous dissertation in January 1996 by M.A.K.Farag (1996) for Egyptian merchant marine officers on responsibilities for the marine environment. The objectives were stated as 'to highlight the role played by Egyptian marine officers in contributing to the pollution of the marine environment', consequently, to construct guidelines for a short course on Egyptian marine officers' responsibilities for the marine environment. This reflects why it was the best methodology for that dissertation, to direct the survey to the already graduated Egyptian marine officers. This was to identify the area of lack of information and then construct a short course as a way of remedy to the existing situation.

The objectives of the survey conducted in this dissertation are to determine the roots of the problem, if there is any, and start to demonstrate the remedy which can also be applied to the two-year MBSP which is the common program for the prospective officers. It is not devoted to any specific nationality, but to all the graduates of the two-year MBSP of the AAST&MT.

### ***2.3.1.3 How was the questionnaire prepared, distributed and how was the response?***

Since it was decided that the questionnaire should be devoted and directed to the graduates of the MBSP, the educational standard of those graduates should be taken into consideration during the questionnaire preparation. In order to rationalise the questions they had to be more general and away from any technical experiences. It was prepared to request short answers, yes or no and true or false question types to encourage the students to participate and respond to the survey. A note was added on top of every questionnaire paper indicating that "mentioning the name is optional" to encourage the students to participate and contribute in the questionnaire freely and honestly.

The questionnaire comprised ten questions which were prepared to cover the subject areas of interest in marine environmental protection. These subject areas are as follows:

- 1- Awareness of the marine environmental pollution problems.
- 2- Sources and impacts of marine environmental pollution.
- 3- Awareness of international conventions concerning marine environmental protection.
- 4- Maritime accidents and incidents involving marine oil pollution and their main causes.
- 5- Damage, liability and compensation related to maritime accidents and incidents involving marine oil pollution.

The questionnaire was prepared, distributed and the answers were collected in December 1996 and January 1997. The total number of papers distributed was one hundred (100), the number of papers returned by respondents were fifty-five (55), representing 55 %, which is a satisfactory percentage of response. Twenty-nine (29) mentioned their names, representing 52.73 % of the respondents.

### ***2.3.2 Details of statistical analysis to the survey conducted to evaluate the standards of marine environmental protection awareness for prospective deck officers in the AAST&MT.***

This part is devoted to seek the subject areas of lack of necessary environmental information for the graduates of the two-year MESP, nautical branch, of the AAST&MT. This objective will be achieved by analysing the answers of the respondents statistically and extract the required information in a percentage form to simplify the standard assessment procedure.

**2.3.2.1 Questions Number One (1) and Two (2)** covered the first subject area which is awareness of the marine environmental pollution problem.

**2.3.2.1.1 Question One (1):** Put a letter (T) if the statement is true, a letter (F) if it is false.

*The world oceans and seas are extensive and deep enough to withstand and absorb all the daily disposals of oil residuals, wastes, sewage and garbage. ( )*

Question one (1) is very simple, testing the student's basic awareness of environmental principles. It is to examine their feelings about the marine environment and to discover their attitude about the comparative relationship between the extensive and deep oceans and seas on the one hand and the amount of oil, wastes, and garbage generated by mankind and discharged into the marine environment on the other hand.

The results of the respondents were fifty-two (52) correct answers representing 94.55 % correct. Only one student gave the wrong answer and two students gave no answer representing 5.45 %. This suggests that at least 5 % of the graduates of the MBSP do not recognise marine environmental pollution problems.

**2.3.2.1.2 Question Two (2):** Put a letter (T) if the statement is true, a letter (F) if it is false.

*The best means of ships' oil residuals, wastes, sewage and garbage clean-up is by disposal into the sea.( )*

Question two (2) carries nearly the same objectives of question number one beside trying to discover the student's information and knowledge about the probable existence of alternative solutions to the disposal of all wastes in the oceans and seas. It is also to discover if they know that disposal of wastes into the seas and oceans is considered as violation of international regulations. All the answers were significantly correct, Fifty-five (55) answers representing 100 % were correct. This indicates that all the respondents refuse the perspective considering the seas and oceans as the appropriate disposal site of wastes.

**2.3.2.2 Questions Three (3) and Four (4)** covered the subject area of the sources and impacts of marine environmental pollution.

**2.3.2.2.1 Question Three (3):** *Mention some of the sources and causes of marine environmental pollution, ranking them according to their importance.*

This question was necessary to discover the students' awareness about these serious causes and sources of marine pollution, since the first step of the marine pollution prevention procedures was to identify its causes and sources. The request

of ranking the causes and sources of marine pollution according to their importance was made to evaluate the students' awareness of maritime transport and shipping activities as sources of marine pollution and to find out how they would rank them.

Thirteen (13) papers contained no answer to this question, while forty two (42) answers were given. The answers were evaluated and given grades, according to the following rationale; and the results are indicated in Table 2.1.

According to (GESAMP, 1990), the main sources of marine environmental pollution are land-based discharges (44 %), atmosphere (33 %), maritime transport (12 %), dumping (10 %) and offshore oil operations (1 %). Subsequently, the grades were assigned to the answers of the respondents as follows:

- Grade **A**: Mentioning 4 sources, or 3 sources and putting the maritime transport in the correct rank, Grade **B**: Mentioning 3 sources, Grade **C**: Mentioning 2 sources, Grade **D**: Mentioning 1 source, Grade **F**: Nothing relevant.

Evaluation of Standards of Awareness of the Causes and Sources of Marine Environmental Pollution for Graduates of the MBSP in the AAST&MT								
Ans.	No.	%	Gr.	No.	%	Stand.	No	%
Gave Ans.	42	76.36	A	-	-	* Inf. Res.	41	74.55
			B	4	7.27			
			C	19	34.55			
			D	18	32.72			
No Ans.	13	23.64	F	13	23.64	Non- Inf. Res.	13	25.45
			F	13	23.64			
Total	55	100.00		55	100.00		55	100.00

**Table 2.1**

Key words: (Ans.) Answers, (No.) Number, (Gr.) Grade, (Stand.) Standard, (Inf.) Informed, (Res.) Respondents. A: Excellent, B: V.Good, C: Good, D: Satisfactory, F: Failed.

The final results of the evaluated answers of question three (3) indicated that about 74.55 % of the students have satisfactory, good or very good information about the sources and causes of marine environmental pollution, while only about 25.45 % do not have the required information.

**2.3.2.2.2 Question Four (4):** *Have you studied, read or gained any background about the impacts of oils, wastes, garbage, or sewage disposal into the sea ?*

*If yes, mention these impacts:*

Question Four is examining the students' awareness of the impacts of the disposal of oils, wastes, garbage or sewage into the oceans and seas. The objective of this question was to extract the required evaluation of the students' information about damage and depletion caused by waste disposal to the marine environment. It was necessary to extract this evaluation because the pollution prevention procedures are more prompted by recognising the impacts of waste disposal rather than enforcement of preventive legal regulations.

The results of the fourth question are indicated in Table 2.2. The rationale of assigning the grades to the comments of the respondents is based on considering seven main items as impacts of waste disposal into marine environment as follows: Toxicity to human health and marine life, gross fouling of beaches, plants and animals, effect on the food chain, economic impacts, oxygen depletion, persistence, bioaccumulation and biomagnification, destruction of the whole ecosystem. Consequently, the grades were assigned as follows: Grade A: If the comment includes 4 items, Grade B: 3 items, Grade C: 2 items, Grade D: 1 item, Grade F: nothing relevant.

By reviewing and evaluating the answers, 23 students gave comments which were evaluated as indicated in Table 2.2. It is difficult to evaluate the answers of 30 students, who answered (Yes I know) but did not give any comment on the impacts. However, they either do not really know at all or may have some information. That is why a questionnaire conducted to students must not rely upon the "Yes" or "No" question types only.

Evaluation of Awareness Standards of the Impacts of Waste Disposal into the Sea for Graduates of the MBSP in the AAST&MT						
First Part of Que. 4, Yes or No			Second Part of Que. 4, Comment.			
Answers	Number	%	Comment	Number	%	Total %
			Evaluation			
YES I know	53	96.36	A	-	-	41.81
			B	12	21.81	
			C	7	12.73	
			D	4	7.27	
NO I do not know	2	3.64	F	-	-	58.21
			No Com. (F)	30	54.55	
			F	2	3.64	
Total	55	100.00	-	55	100.00	100.00

**Table 2.2**

Key Words: (Que.) Question, (Com.) Comment, (A) Excellent,

(B) V.Good, (C) Good, (D) Satisfactory, (F) Fail.

The final result of question number four (4) was that only about 42 % of the graduates are informed about impacts of the waste disposal into the sea while 58 % are not.

**2.3.2.3 Question Number Five (5) and Six(6)** covered the subject area of the legal background and international conventions concerning marine environmental protection.

**2.3.2.3.1 Question Number Five (5):** *Have you studied, read or gained any background about international regulations which forbid, restrict and control discharge operations of wastes into the sea ?*

Question Five (5) is a “Yes” or “No” question type, trying to ask the students if they know or not. This question is not enough to judge and evaluate the legal background of the students, since many of them may say that they really know while they do not. That is why it was supplemented by question number 6 which is a complementary part of it. Forty-six (46) students representing 83.64 % answered that they have the background, while only nine (9) representing 16.35 % said clearly that they do not know. Nevertheless, to what extent is this result true? That is what the analysis of answers of question number six was expected to clarify.

**2.3.2.3.2 Question Number Six (6):** *Determine and mark any of the following international regulations which you have studied, read or even have a good background about:*

*1- MARPOL Convention 73/78 .*

*2- London Dumping Convention 1972 (LDC 1972).*

*3- International Safety Management Code (ISM Code).*

*4- The International Convention on Oil Pollution Preparedness , Response and Co-operation , 1990 (OPRC 1990).*

*5- Revised STCW 1978, as Amended in 1995. (STCW Convention).*

Question number six (6) intended to assess and evaluate legal background and the standards of awareness of international regulations concerning marine pollution prevention, which is one of the basic requirements of the revised STCW 1978, as amended in 1995.

In fact this was one of the most important questions, which was expected to highlight an important area of lack of information and give significant impression about the real marine environmental protection awareness standards. It should have considerable weight in the assessment process. Consequently the analysis of the evaluated results of this question will be presented in more than one method of presentation. They will be presented by a table, a figure and a pie chart to illustrate standards of awareness of international environmental regulations generally and of each individual instrument individually. The evaluation results of the answers of the

students are indicated in Table 2.3. The grades were assigned according to the following rationale:

Grade A: Awareness of four (4) of the international instruments, Grade B: three (3) of the intentional instruments, Grade C: two (2) instruments, Grade D: one (1) instrument, Grade F: the student is not aware of any of the international instruments.

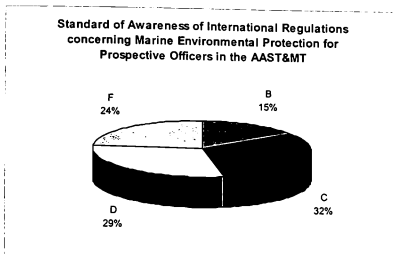
<b>Standards of Legal Background and Knowledge of International Regulations concerning Marine Environmental Protection for Graduates of the MBSP in the AAST&amp;MT.</b>			
<b>Standards of Knowledge</b>	<b>Number</b>	<b>Percentage</b>	<b>Evaluation</b>
Know Nothing,	13	23.64	F
MARPOL Only	16	29.09	D
MARPOL+STCW	12	21.82	C
MARPOL+LDC	6	10.91	C
MARPOL+STCW+LDC	6	10.91	B
MARPOL+STCW+ISM	2	3.63	B
<b>TOTAL</b>	<b>55</b>	<b>100.00</b>	

**Table 2.3**

Key words: (A) Excellent, (B) V.Good, (C) Good, (D) Satisfactory, (F) failed.

The results indicated in Table 2.3 are represented in Figure 2.1 to clarify the resultant assessment of the legal background and awareness of international regulations concerning marine pollution prevention for cadets at the AAST&MT.



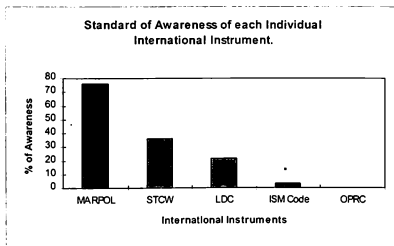


**Figure 2.1**

Key words: (B) V.Good, (C) Good, (D) Satisfactory, (F) Failed.

The evaluation of the responses to question six (6) also indicated the number and percentage of the students who have knowledge and awareness of each international legal instrument individually as indicated in Figure 2.2.

#### As a Result of the Survey of the Prospective Officers in the AAST&MT



**Figure 2.2**

**2.3.2.4 Questions Seven (7) and Eight (8)** covered the subject area of major maritime accidents and incidents which involved marine oil pollution. In fact studying these accidents and incidents, taking into consideration the prevailing circumstances, the causes and mistakes, the response actions taken by masters and crew and the response procedures of the authorities, is of great significant for every seafarer. Studying the mistakes and analysing the investigation results also play a vital role in issuing new or amending existing international regulations. It is well known that issuing most of the main international conventions and other legal instruments concerning safety of shipping and marine environmental protection were results of major maritime accidents.

**2.3.2.4.1 Question Number Seven (7):** *Have you studied, read or gained a background about major maritime accidents involving marine oil pollution ?*

Question seven (7) tried to find out the standards of awareness of the students of these maritime accidents and incidents involving marine oil pollution.

The evaluation of the results of question seven (7) indicated that forty-five (45), representing about 82 %, indicated that they had read or studied some of the major maritime accidents, while only ten (10) students, representing about 18 %, declared that they had no information about major accidents.

**2.3.2.4.2 Question Number Eight (8):** *Mention the basic causes or factors which were behind most maritime accidents.*

Question number eight (8) covered the essential factors or causes of maritime accidents since most of them involve marine oil pollution. It was important to analyse and evaluate the results of this question to indicate to what extent the students recognise that the human factor was behind the majority of these accidents; 77 % of the accidents were caused mainly by the human factor (DAMA, Databank to Safeguard Maritime Operations, 1997). Consequently, the construction of the intended courses intended courses syllabuses should cover this subject area. The responses to question number eight (8) were evaluated as indicated in Table 2.4.

According to Databank to Safeguard Maritime operations, 1997, the main reasons for maritime accidents are as follows:

- Substandard conditions (technical factors), 23 % .

- Human factor 77 % , under which many items can be categorized as follows:

- 1- Lack of knowledge. 2- Lack of skills. 3- Lack of inspections. 4- Work conditions.
- 5- Lack of procedures and training. 6- Attitude.

The grades were assigned to the answers of the respondents as follows:

Grade A: Mentioning the human factor and at least three items which can be classified under it, and the technical factor; Grade B: Human factor with two items under it and the technical factor; Grade C: Human factor with one item under it and the technical factor; Grade D: Human factor or technical factor; Grade F: Nothing.

Standard of Awareness of the Essential Cause of the Maritime Accidents Involving Marine Oil Pollution for the Graduates of MBSF in the AAST&MT.							
Answers	No.	%	Evaluation of Answer	No	%	Total No.	Total %
I Know	46	83.6	A	3	5.45	22	40.00
			B	8	14.55		
			C	9	16.35		
			D	2	3.62		
			F	24	43.60		
I Do Not Know	6	10.9	F	6	10.90	33	60.00
No Answer	3	5.5	F	3	5.50		
<b>Total.</b>	<b>55</b>	<b>100.0</b>		<b>55</b>	<b>100.0</b>		<b>100.00</b>

Table 2.4

Key words: (A) Excellent, (B) V.Good, (C) Good, (D) Satisfactory, (F) Failed

The conclusion is that only 40 % of the students recognise the contribution of the human factor in maritime accidents involving marine oil pollution.

**2.3.2.5 Questions Number Nine (9) and Ten (10)** covered the subject area of liability and compensation related to major maritime accidents and incidents involving marine oil pollution damage. They also examine conventions and voluntary industry schemes concerning liability and compensation in such cases. This subject area is very important to cover in order to examine the background of the students about the tremendous and huge losses and expenditures involved in such accidents. It is also important to take this subject area into consideration when constructing the required curricula.

**2.3.2.5.1 Question Number Nine (9):** *Have you studied or read about the damages, costs of combating and value of liability and compensation related to major maritime accidents involving marine oil pollution ? Give examples.*

Question number nine (9) is prepared to reveal the background of the students of the serious damages and losses when such kind of accidents happen. It also concerned the costs of oil pollution combating and the value of liability and compensations in such cases, i.e. to highlight the value of losses which may occur due to the human factor through negligence, ignorance or the two together.

The results of question nine (9) were evaluated as follows:

Thirteen (13) students, representing 23.64 %, did not study or read about the values of damages, costs of combating or liability and compensation. Forty-two (42) students had between good and satisfactory knowledge representing 76.36 %.

**2.3.2.5.2 Question Number Ten (10):** *Do you have any information about international conventions and voluntary industry schemes of liability and compensation related to maritime accidents involving marine oil pollution damage ?*

Question number ten (10) mainly took the subject area of conventions and voluntary industry schemes related to liability and compensation of oil pollution damage. It is important to have an overview knowledge of these conventions and schemes to know how the damages, costs of combating and compensations are

covered in the case of major maritime accidents involving marine oil pollution damage.

The evaluation of the results of question number ten (10), indicated that thirty-nine (39) students, representing 70.91 %, did not have any information about the systems of liability and compensation, while only sixteen (16) students had some information concerning these systems, representing 29.09 %.

### ***2.3.3 Observations on the Standards of Marine Environmental Protection Awareness of the Graduates of the MBSP in the AAST&MT***

The survey was divided into five (5) subject areas and the summary of the evaluation and assessment of the standards of awareness of each subject area of marine environmental protection for graduates of the MBSP at the AAST&MT was indicated in Table 2.5.

Cadets showed low standards of awareness in the following subject areas:

1. Impacts of marine pollution problems (42 %).
2. The Standard of awareness of international regulations concerning marine pollution prevention (47 %).
3. Awareness of the essential causes or factors behind accidents and incidents involving marine oil pollution (40 %).
4. Conventions and industry voluntary schemes of liability and compensation in cases of oil pollution damage (29 %).

<i>Observations on the Standards of Marine Environmental Protection Awareness as a result of the conducted Survey of the Graduates of the MBSP in the AAST&amp;MT</i>	
<i>Subject area I: Marine Environmental Pollution Problems</i>	
ITEM A	ITEM B
Recognising marine environmental pollution problems	Recognising that disposal of or any wastes into the sea is not the appropriate option.
95 %	100 %
<i>Subject area II: Sources and Impacts of Marine Pollution</i>	
ITEM A	ITEM B
Sources of marine pollution	Impacts of marine pollution
74 %	42 %
<i>Subject area III: International instruments concerning marine pollution prevention.</i>	
ITEM A	ITEM B
Recognising the existence of legal and technical regulations concerning MPP.	The Standard of knowledge of the international regulations of MPP.
84 %	47 %
<i>Subject area IV: Maritime accidents involving marine oil pollution.</i>	
ITEM A	ITEM B
Knowledge of the maritime accident and incidents involving oil pollution.	Awareness of the essential causes or factors behind these accidents
82 %	40 %
<i>Subject area V: Damages, costs of combating, liability and compensation regarding accidents involving marine oil pollution.</i>	
ITEM A	ITEM B
Awareness of the value of damages, liability and compensation in cases of accidents and incidents involving marine oil pollution.	Awareness of the liability and compensation conventions and industry voluntary schemes.
76 %	29 %

**Table 2.5**

#### ***2.4 Resultant statement***

The resultant statement is a summary and conclusion to clarify to what extent the standard requirements of international regulations concerning marine environmental protection have been fulfilled by the curricular system of the MBSP. It is also to identify the subject areas of shortage or deficiency of the curricular system, which was achieved through the combined analysis and observations of the questionnaire results and the examination and review of the curricular system.

Cadets are well aware of environmental pollution problems, and they are covered by the curricular system of the MBSP. However, they do not recognise the real impacts of these problems and there is really a lack of this subject area in the curricular system. While the curricular system covers MARPOL 73/78 as an overview of the outline, no specifications of the practical operational requirements are included. An obvious lack of awareness and curricular deficiency in the subject area of international regulations dealing with marine environmental protection appear in the combined analysis and observations. There is a shortage of the awareness of causes of major maritime accidents and incidents involving marine oil pollution. The analysis also revealed shortage of the subject areas of conventions of liability and compensation for oil pollution damage and industry voluntary schemes.

## **CHAPTER 3**

### ***Baseline Marine Environmental Awareness***

#### ***3.1 Marine Environment and Marine Pollution***

The earth's oceans cover over 70 % of the earth's surface. They play an essential and vital role in the world's climate, in supporting the earth's life systems, and in sustaining oxygen-producing phytoplankton. In fact they are the lungs of the earth. There are many other varieties of benefits and resources of the oceans. They provide the best types of animal protein; they are a world-wide common means of transportation, a source of energy and mineral resources, an extensive field for employment, recreation, and many other activities closely related to the nations' economy, culture, and traditions.

Notwithstanding, the recognized great value of the oceans, they still receive wastes from cities, farms, and industries. That is beside the wastes dumped from barges and ships, coastal run-off, river discharges and natural atmospheric precipitation. That is why it is important for seafarers to study the nature of the marine environment and its components to realize its real great value, which has to be protected for the world benefit, so that they may contribute to the protection and preservation of it.

It is also important to study the main pollutants to the marine environment, their sources, and their impacts to be able to see the complete picture and how serious it is. This is the effective way to develop and promote the feelings of the seafarers of the importance of marine environmental protection rather than giving them concrete pieces of regulations to be followed irrespective of the reasons and the results.



Cadets of today are the prospective officers of tomorrow. So they should be targeted by environmental awareness programs. Consequently, the MBSP at the AAST&MT needs to be supported with baseline marine environmental information course which can promote and develop marine environmental protection awareness and consciousness for cadets. It is a call for marine environmental protection culture.

### **3.1.1 Marine Environment and Ecosystems**

#### **3.1.1.1 Marine Ecosystem**

The marine ecosystem is the highest unit of ecological integration of the marine environment which encompasses a diversity of living species with their populations, communities and their common non-living environment. In the Convention on Biological Diversity (Biodiversity), which was concluded at the UNCED in Rio de Janeiro, Brazil, in 1992, an ecosystem is defined as '*A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit*'. Estuarine and coral reef areas are examples of well known forms of ecosystems. The marine environmental systems are either *pelagic*, which is that of the water column from the sea surface to the waters immediately above the bottom or *benthic*, which is the seafloor and also species attached to the sea bottom or living on or within it. Marine biodiversity is higher in benthic rather than pelagic systems and in coasts rather than the open ocean since there is a greater range of habitats near the coasts. Losses of marine diversity are highest in coastal areas largely as a result of conflicting uses of coastal habitats (Gray,1996).

The pelagic environment is divided into distinctive zones at different depths in the water column due to the vertical gradients of temperature, light, plant photosynthesis (primary production), pressure and salinity. These vertical zones are epi-, meso-, bathy-, and abysspelagic. The life style and behaviour of organisms living deeper in the water column differ from those exhibited by epipelagic species, and biomass of zooplankton decreases exponentially with depth. The benthic environment is divided into a number of distinctive ecological zones based on depth, seafloor topography,

and vertical gradients of physical parameters. They are supralittoral, littoral, sublittoral, bathyal, abyssal, and hadal zones. The intertidal areas have the greatest fluctuations in environmental conditions. Littoral plants and animals are especially adapted to cope with variable temperature and salinity and to withstand periodic exposure to air (Berner, 1996).

These functional units known as ecosystems are absolutely insensible and unknown for seafarers since they can not see them by the naked eyes. Consequently, impacts, damage and destruction caused to those ecosystems by discharge of oil and wastes to the marine environment are not recognized at all by seafarers.

### ***3.1.1.2 Non-living Marine Environmental Characteristics***

In fact the marine environmental characteristics change significantly with depth forming different depth ranges due to vertical gradients in environmental parameters like light, temperature, pressure and salinity. According to the penetration of sunlight in sea water, the ecological zones can be categorized into three zones. The euphotic zone which is the region where light is sufficient for the growth of plants, the disphotic zone which contains sufficient light for vision but too little for plant reproduction, and the deepest and largest zone is the aphotic zone where darkness is extending to the seafloor and the only light emanates from the bioluminescence of certain animals.

The thermal stratification of the ocean consists of the uppermost mixed and homogeneous temperature layer of water, a region of rapid temperature decrease known as thermocline and underlying layer of cold water formed originally in polar regions. Hydrostatic pressure effectively increase linearly with depth, at a rate of 0.1 atmospheric pressure/meter. In the deepest areas organisms live at pressure exceeding 1000 atmospheric pressure. The average salinity of the ocean is about 35 parts per thousand (PPT) by weight. Variations in salinity, in the range of 5 PPT in the open seas and 25 PPT in shallow and closed waters, are primarily caused by high rates of evaporation and precipitation (Encyclopedia of Earth System Science, 1992).

### ***3.1.1.3 Marine Biodiversity***

Biodiversity is a word composed of two combined parts, biological and diversity. The word biodiversity was used in the Convention on Biological Diversity, concluded in Rio de Janeiro, Brazil, 1992 during the UNCED under the auspices of UNEP, to protect the different living species and their environments.

Plankton and nekton inhabit the pelagic environment. The nekton is distinguished from plankton by the ability to swim independently of current direction. Phytoplankton, which is composed of several diverse groups of algae, carry out photosynthesis (primary production). Photosynthesis results in the production of high-energy organic materials and oxygen from carbon dioxide, water and inorganic nutrients. It is the beginning of the pelagic marine food chain, which provides the required oxygen for respiration of living organisms. Zooplankton community includes different species of animals, ranging in size from microscopic protozoans to larger animals, they feed on phytoplankton and eaten by larger organisms forming the base of food chain. Nekton comprises the larger pelagic marine animals including fish, squid, shellfish, turtles, marine mammals and whales.

The benthic living species are called benthos. The benthic plants include mangrove trees, march grasses, seagrasses, sea weeds, and algae. The number of species of benthic animals exceeds those of pelagic species because of the greater physical variety of benthic habitats. They include variety of coral reefs, microscopic organisms, clams, mussels, benthic carnivores like cod and many other benthic animals (Gray, 1996).

Generally speaking, it is difficult for non-specialist individuals, including seafarers, to appreciate the value, benefits and importance of the marine biodiversity without being informed about them. It is not also difficult to tell that if seafarers, who used to discharge oil and wastes into the sea, were well informed about biodiversity and the damage and depletion caused to them by oil discharge and waste disposal, they would think twice before conducting this environmental damage.

#### **3.1.1.4 The Unity of the Oceans**

The oceans are characterized by a fundamental unity because cycles of energy, climate, marine living resources and human activities move through coastal waters, regional seas and all the oceans. Fish species, marine resources, water masses and currents, pollution and other impacts of economic development do not respect the legal boundaries. This means that the effect of urban, industrial and agricultural growth can never be contained in one country's Exclusive Economic Zone (EEZ). It is also documented that the marine environmental pollution due to shipping activities is extending its impacts to the coasts of the flag states, port states and coastal states irrespective of the place of discharge of marine pollutants (GESAMP, 1990).

#### **3.1.2 Marine Pollution**

Severe marine pollution is destructive not only to the communities of the marine species but also to the whole supporting habitats and ecosystems which include their common environment. In order to simplify the word pollution for the public it has been described as 'The wrong amount of the wrong thing in the wrong place at the wrong time'. Although the definition is fundamentally correct, it is not useful for legislative and scientific purposes. The widely used and commonly accepted definition of marine pollution is the one made by the United Nations Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP):

*Marine pollution* is the introduction by human activity, directly or indirectly, of wastes or other substances or energy into the marine environment (including estuaries) which results or is likely to result in such deleterious effects as harm to living resources and marine ecosystems, hazards to human health, hindrance to marine activities including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

It is obvious that there is a distinction between *contamination*, in which concentrations of a certain substance is at a certain level which is higher than natural levels but with no obvious effect detectable, while pollution exists when the concentrations are at high enough levels that harmful effects become obvious.

These definitions make it necessary to face an essential question:

- *What is the level of the ability of the oceans to withstand, tolerate and absorb wastes without sensible or detectable damage ?*

The answer of course depends on the toxicity and quantity of the waste discharged and the nature of the receiving environment. However, it has been accepted for a long time that the oceans have infinite capacities for assimilation and can be used as a kind of huge receptacle for virtually all wastes. When practice proved that the theory was wrong, some nations derived some estimates of environmental capacity and allowed the discharge of wastes if they were below these estimates. This means that the marine environment had been for a long time one of the options in the waste disposal management policy.

GESAMP issued a report in 1984 stating that environmental capacity "the potential of the environment to receive and accommodate contaminants", can be determined, utilized and appointed. Application of the concept requires considerable data and understanding of the ecosystem to which protection and utilization is applied. It will necessarily involve formulation of environmental quality objectives and criteria. Such environmental capacity concept involves the risk that the idea of environmental pollution becomes an acceptable feature of ocean management.

Table 3.1 indicates the major marine pollutants and a comment for illustrating each group of those marine pollutants according to a study conducted by the US National Research Council in 1985.

Major Marine Pollutants	
Pollutants	Comment
Petroleum Hydrocarbons	Crude oil and some of its refined products .
Sewage	The effects of the sewage pollution are generally local but sewage may contain some of the other chemicals listed in this table.
Halogenated hydrocarbons	Hydrocarbons containing Chlorine, Fluorine, Bromine or Iodine (the halogens) such as: <u>D</u> ICHLOR <u>O</u> D <u>I</u> PHENYL <u>T</u> RICH <u>L</u> OETHANE (DDT) and <u>P</u> OLY <u>C</u> H <u>L</u> ORINATED <u>B</u> IPHENYLS (PCBs).
Heavy Metals	Particularly mercury, cadmium, and lead.
Radionuclides	Particularly Cesium-137, Strontium-90 and Plutonium isotopes.
Litter	Particularly persistent plastics and including lost fishing nets, packing bands and straps, synthetic ropes, bags, bottles, small pellets and sheeting.

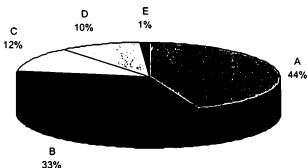
**Table 3.1**

Source: National Research Council (1985).

### 3.1.2.1 Marine Pollution Sources

In general terms, land-based run-off or discharges are the main relative contributors of contaminants to the marine environment, as indicated in Figure 3.1. They represent 44 % of the global sources of marine pollution. The atmosphere represents 33 %, which is mainly land-based generated waste gases, vapours and exhausts of land-based combustions and other operations. Maritime transport activities represent 12 %. Dumping wastes represents 10 %, which are mainly land-based generated wastes and offshore production only 1 % (GESAMP, 1990).

**Relative Contributions of Marine Pollution  
Sources To the Global Annual Inputs**



**Figure 3.1**

Source: GESAMP (1990)

**Key Words:** (A) Land-based Sources, (B) Atmosphere, (C) Maritime Transport, (D) Dumping, (E) Offshore.

From these statistics it can be said that land-based marine pollution represents approximately 87 % of the global marine pollution sources. However, maritime transport activities, which represent 12 % only, are in the focus of the media considering them as the main marine pollution source. This is normal because of the differences in nature between marine pollution caused by land-based sources and that caused by maritime activities.

Land-based marine pollution (LBMP) is characterized by low-level but ongoing sources, mainly industrial, agricultural and municipal activities. They are daily operational activities and the discharge of wastes therefrom usually occurs in the operational processes rather than as a result of accidents. Low-level discharges from a non-point land-based source make these discharges undetectable, making it very

difficult to establish a cause-effect relationship between such non-point sources and actual visible damage to the marine environment. LBMP is a chronic problem which is mostly a result of long-term accumulation of both pollutants on the molecular level and the expressed stress in the marine biotic community.

Marine pollution due to maritime activities has a special significance because of the completely different nature. Maritime activities contributions are most often in massive releases due to maritime accidents causing severe noticeable effects and enjoying wide public coverage. Even the operational pollution due to maritime activities is considered as acute detectable pollution.

#### ***3.1.2.1.1 Sources of Oil***

Oil represents the petroleum hydrocarbons which is a complex mixture of chemicals, it is either crude oil consisting of thousands of complex chemical components or one of its refined products which is simpler in composition. The amount of petroleum hydrocarbons annually entering the ocean from all sources was estimated in 1973 as 6.1 million tonnes, including 2.13 million tons due to maritime transport activities, representing 34.92 % (National Research Council, NRC, 1975). In 1981 the amount was estimated to be 3.25 million tonnes, including 1.47 million tons due to maritime transport activities, representing 45.23 % (NRC, 1985).

A study was conducted in 1990 by the US National Academy of Sciences (NAS), at the request of the International Maritime Organization (IMO), updating the 1981 estimates of inputs of petroleum hydrocarbons into the ocean due to maritime transport activities. The conclusion of the study was that the estimate of oil entering the oceans from maritime transport activities has been reduced from 1.47 million tonnes in 1981 to 0.57 million tonnes in 1989 (IMO, 1990).

Table 3.2 indicates the estimated inputs of petroleum hydrocarbons into the oceans due to maritime transport activities and the relative contribution of the input of each of these activities to the global annual inputs in 1981 and 1989. Table 3.2 determines the largest single source of oil from maritime transport activities in 1981 and in 1989.



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Estimated inputs of Petroleum Hydrocarbons into the ocean due to Maritime Transport Activities and their relative contributions to the global annual inputs (Quantity of Inputs are in million tonnes)						
Maritime Transport Activity	Quantity of inputs 1981	% to MTA 1981	% to G.inputs 1981	Quantity of inputs 1989	% to MTA 1989	% to G.inputs 1989
Tanker Operations	0.700	47.62	21.54	0.159	27.89	6.77
Tanker Accidents	0.400	27.21	12.31	0.114	20.00	4.85
Bilge and Fuel Oil Discharge	0.300	20.41	9.23	0.253	44.39	10.77
Dry docking	0.030	2.04	0.92	0.004	0.70	0.17
Marine Terminals	0.022	1.50	0.68	0.030	5.26	1.28
Non Tanker Accidents	0.020	1.36	0.62	.007	1.23	0.30
Scrapping of ships	0.000	00.00	00.00	0.003	0.53	0.13
<b>Total</b>	1.47	100	45.30 %	0.57	100	24.27 %

**Table 3.2**

Source: NCR (1985), Pettersson and Broman (1990), IMO (1990).

Key Words: (MTA) Maritime Transport Activities, (G.inputs) Global inputs.

The best known cause of oil pollution is that arising from tanker accidents. Although these accidents contributed by a comparatively small percentage, 4.85 % of global inputs in 1989 as indicated in Table 3.2, the consequences of an accident can be disastrous to the immediate vicinity. The table also provides a comparison between the largest single source of oil from maritime transport activities in 1981 and 1989, indicating that in 1981, it was the tanker operations, while in 1989 it was

from machinery-space bilges and fuel oil sludge discharges. This result can be attributed to the promotion of the compliance of tankers with the international regulations, the introduction of effective techniques and on the other hand the lack of reception facilities especially for ships other than tankers. It is also important to notice that the estimated annual oil input into the oceans due to maritime transport activities had been reduced from 45.3 % to 24.27 % between 1981 and 1989.

Although tanker accidents and other accidental as well as intentional discharges of oil at sea are highly visible and therefore in the focus of the public attention, the municipal and industrial waste waters are globally more important and in some places the predominant local sources of hydrocarbons but at the molecular level. Table 3.3 indicates the relative contributions of petroleum hydrocarbon inputs into the world oceans due to different sources in 1985 and 1990.

<b>The Estimated Relative Annual Contributions of Petroleum Hydrocarbon Inputs Sources into the World Oceans in 1985 and 1990</b>		
<b>Input Source</b>	<b>% in 1985</b>	<b>% in 1990</b>
<b>Land-based Discharges</b>	34 %	50 %
<b>Marine Transportation</b>	45 %	24 %
<b>Atmosphere</b>	10 %	13 %
<b>Natural sources</b>	8 %	11 %
<b>Offshore Production</b>	2 %	2 %
<b>Dumping at Sea</b>	1 %	0 %
<b>Total Inputs</b>	100 %	100 %

**Table 3.3**

Source: NRC (1985), IMO (1990).

Table 3.3 indicates that the estimated relative contribution of the annual petroleum hydrocarbons inputs into the world oceans due to maritime transport activities have been reduced significantly from 45 % to 24 % of the global annual inputs between

1985 and 1990. This reduction is due to measures taken in accordance with control requirements of national and international regulations and the estimating methods have also been improved.

#### ***3.1.2.1.2 Sources of Sewage***

Sewage is mainly a land based source, sometimes its disposal has been on land but frequently discharges have been made into rivers, into estuaries, or directly into the seas. The comparatively small percentage of the amount of sewage disposal from merchant ships into the seas with respect to the land-based source is a subject of considerable debate and part of the reason why Annex IV of MARPOL 73/78 concerning sewage has not yet entered into force. However, the quantities of sewage generated by huge passenger ships and animal carrying ships in enclosed and semi-enclosed areas, are of considerable impacts on the functions of the coastal ecosystems.

#### ***3.1.2.1.3 Sources of Halogenated Hydrocarbons***

They are hydrocarbons containing fluorine, chlorine, bromine or iodine (the halogens). They include pesticides like DDT, PCBs and other persistent organic chemicals. They are introduced to the marine environment as land-based discharges and run-off sources. No estimates about Halogenated hydrocarbons inputs to the marine environment due to maritime transport activities have been published. Nevertheless, the ocean incineration of the Halogenated hydrocarbon substances has been a common and accepted means of treating these substances which are not a result of maritime activities but mainly land-based generated substances carried to the ocean to be incinerated. These operations are regulated under London Dumping Convention 1972 (LDC 1972), and its 1996 Protocol.

It is worth mentioning that DDT and PCBs have been used for a long time extensively in antifouling paints to prevent algae and certain marine organisms from

fouling the hull. These toxic paints add to coastal areas higher concentrations of these toxic substances (Clark,1992).

#### ***3.1.2.1.4 Sources of Heavy Metals***

Heavy metals include Mercury, Cadmium, Lead and Tin, the sources of which are mainly land-based industrial sources of pollution. Shipping activities add to the heavy metal pollution of some coastal areas which are used as harbours and for yacht clubs, that is because of the antifouling paint that the ship's bottom has to be painted with to prevent fouling with algae and marine organisms. Mercury is one of the heavy metals which was used extensively in antifouling paint.

Tin and copper have been also used as toxicants in manufacturing antifouling paints. Some other heavy metals like Lead, Chromium and Zinc have been used as constituents of ships bottom primers, from which they find their ways to the sea water. Zinc is used in sacrificial anodes to prevent steel hulls from corrosion. Cadmium is also used in some maritime paints.

Most of these heavy metals representing constituents of marine paints find their way to the marine environment. They are representing significant contribution of marine pollution in shallow water areas with restricted water exchange and high concentration of recreational boats and repair yards. That is beside the contribution of big shipyards as source of heavy metal marine pollutants which can not be neglected (Qing-Nan,1987).

Due to the detectable damage of the antifouling paints and their toxic constituents to the marine ecosystems, the subject is in the agenda of the 40th session meeting of the Marine Environment Protection Committee (MEPC) in the IMO in September 1997.

#### ***3.1.2.1.5 Sources of Radionuclides***

Radionuclides and radio activities are added to the oceans from natural sources in the atmosphere and the earth and also there is a mixture of artificial radioactive substances derived from atomic weapons testing, other military activities, and

peaceful uses of nuclear energy. The wastes discharges from nuclear fuel reprocessing plants are very important sources. The nuclear power generating reactors, low-level radioactive waste dumped at sea, and accidental discharges resulting from the unplanned return to earth of nuclear-powered satellites and the loss of nuclear powered submarines are also very important sources of radioactive substances contained in the oceans.

Nuclear-powered ships are also considered as one of the sources of radionuclides. They release, during operational processes, some radioactivities but the amounts are trivial compared with the discharges from nuclear power stations and fuel reprocessing plants. The nature of the discharges from nuclear-powered ships make them widely distributed in the oceans, not confined to one area as in the case with discharges from land-based installations (GESAMP, 1990). A large concern over threat from maritime transport of nuclear fuel for reprocessing made the subject a material of considerable debate.

The IMO, considering the significance of such a threat caused by transport of nuclear fuel, adopted in 1993 the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-level Radioactive Wastes in Flasks on Board Ships (The INF Code). In 1995 the IMO adopted resolution number A. 790 (19), calling for the INF Code review to cover liability and compensation regime and many other issues concerning ships structural design, route planning, monitoring the ships by shore-based facilities and adequacy of emergency response arrangements.

#### ***3.1.2.1.6 Sources of Plastic Litter***

Plastic litter is mainly introduced to the marine environment in the form of land-based garbage disposal and also as ships garbage disposal into the sea and as lost fishing nets. There is growing concern among fishermen, scientists, seafarers, conservationists and tourists about the increasing amounts of plastic material found at sea and on beaches. Plastic debris can be loosely classified in three groups:

- 1- Fishing gear and equipment, such as nets and lines;

2- Packing bands, straps and synthetic ropes; and

3- Plastic litter, including bags, bottles, sheeting, packaging material and pellets.

On basis of the present information, it is not easy to compare the amount of debris originating from land-based sources with that arising from fishing and shipping (GESAMP, 1990). Irrespective of the quantities of plastic debris inputs, almost all inputs into the oceans of group (1) and (2) and some inputs of group (3) are mainly due to fishing and shipping activities.

### ***3.1.2.2 Marine Pollution Impacts***

The results analysis of the questionnaire conducted of the prospective officers in the AAST&MT revealed a low standard of awareness of fundamental marine environmental issues, like the impacts of marine pollution. The percentage of awareness was only 42 %, indicating a lack of marine pollution baseline information and awareness. This necessary information can always be helpful in promoting the role of the human factor in marine pollution prevention, mitigation, control and response.

#### ***3.1.2.2.1 Impacts of Oil***

With such a complex mixture of a great many individual chemicals, many of the environmentally significant properties such as toxicity, solubility, and viscosity vary considerably from oil to oil, making the task of predicting effects very difficult. The most serious effects of oil pollution are also the most obvious. Gross fouling of beaches, plants, and animals can have devastating effects and in serious cases the whole ecosystem could be destroyed.

In fact spilled oil is generally highly toxic and affects even the phytoplankton and zooplankton which are the first level of food chain in the ecosystem. Consequently, the whole food chain could be badly affected on different levels. Fish are normally capable of avoiding contamination, but tainting of fish by small quantities of oil make them unpalatable and therefore unsalable. Fouling of fish spawning areas or

blockage of migration routes could have also serious consequences for breeding patterns, which generally occurs in shallow waters with poor circulations. Oil is also destructive to commercial shellfish source areas, affecting the breeding success and spoiling the smell and taste of shellfish. Seabirds and marine mammals are very vulnerable to spilled oil. An incident which results in fouling of breeding beaches could have very serious effects on breeding success.

That is beside the toxic effect of oil on the human health due to contaminated seafood consumption or direct skin contact with oil, the destructive effects on the economic resources, the severe impacts on the tourism and the enormous efforts and resources required for clean-up and response procedures. Generally speaking, impacts of oil spill are greater and of much more significance in shallow waters, enclosed and semi-enclosed areas and areas with very weak or no tides and waves. That is because these areas are characterized with very low rate of water exchange (GESAMP, 1990).

The serious toxic effect of light or refined oils should be taken into consideration, since they could be much less persistent but far more toxic to marine biota. More strict preventive measures of spill of such oils should be taken. Anyway, such oils are generally volatile and evaporate quickly after the spill, without causing significant damage if spilled in open seas, leaving slicks of heavy oils floating on the sea surface.

#### ***3.1.2.2.2 Impacts of Sewage***

Sewage has an important and primary feature from an environmental point of view which is its Biochemical Oxygen Demand (BOD). This is the amount of Oxygen that would be consumed by bacteria as they feed on and degrade the waste. The problem will clearly appear in the ecosystem if the BOD is greater than or equal to the amount of oxygen available creating anoxic conditions which are extremely toxic to aquatic animals. This situation appears clearly in shallow waters and areas of poor water exchange. The consumption of contaminated seafood is an environmental problem



which is closely related to sewage disposal. Fish and shellfish are capable of accumulating a variety of organisms from sewage contaminated water causing certain dangerous diseases if eaten by humans.

One of the common problems of sewage discharge is Eutrophication, which is over-fertilization of the sea having the undesirable effects of altering the structure of communities in the ecosystems. A common sign of sewage pollution on a beach is the growth of the green algae which is a severely damaging phenomenon in the shallow waters and areas of restricted water exchange due to Oxygen depletion (Clark, 1992).

#### ***3.1.2.2.3 Impacts of Halogenated Hydrocarbons***

They are generally toxic, persistent in environment, and bioaccumulated. Plankton, which forms the first stage of the food chain in the oceans, is adversely affected by the toxic effect of the Halogenated hydrocarbons. Because of the toxic and persistent characteristics, very low concentrations in seawater can lead to much higher concentrations in fish, marine mammals, marine turtles and fish-eating birds because of biomagnification in higher levels of food chain. Consequently, human health can be severely affected due to the use of sea water or seafood consumption.

#### ***3.1.2.2.4 Impacts of Heavy Metals***

They are called metalloids which are generally not required for metabolic activity and are harmful to the cell at quite low concentrations. They are all toxic if present in excess, and persistent and tend to accumulate in fish and shellfish and cause very dangerous diseases for humans. Itai-itai disease from Cadmium, and Minamata disease from Mercury in Japan are examples of the dangerous diseases caused by heavy metals. They are characterized by bioaccumulation and biomagnification.

High Mercury concentrations are encountered in fish-feeding sea birds and in seals because these animals reach great ages. They take up more mercury with their food than they are able to eliminate, and therefore accumulate more Mercury in their

tissues from year to year. Impacts of heavy metals on the marine environment are significant in coastal, shallow, and enclosed or semi-enclosed waters.

Nevertheless, it is worth mentioning that high Mercury concentrations have been found also in animals which live far away from any sources of pollution on the high seas (GESAMP, 1990).

#### ***3.1.2.2.5 Impacts of Radionuclides and Radioactivities***

The concern about radioactive substances in the oceans stems from the potential harmful effects of the emitted radiation on organisms, particularly man. This depends on the doses received by the targets, which is the energy absorbed by living tissues from sources outside them (external irradiation) or emitted by radionuclides deposited in the tissues (internal irradiation) after ingestion or inhalation (GESAMP, 1990).

Doses to, and effects on, marine organisms or marine populations are much less well known. As in man, effects may be somatic (in the individual exposed) or genetic (in the germ cells of the irradiated individuals and therefore transmissible to their descendants).

Radionuclide substances are bioaccumulated and transfer with food chain. Most inshore fish and marine animals are benthic feeders and in an area with a localized input of radioactive material sedimentation processes ensure that there is an accumulation of radionuclides on the seabed with corresponding contamination of the infauna. Consequently, man could be affected through seafood consumption.

Radioactivities are considered in the oceans, at the levels at which the populations of marine organisms are currently exposed as a result of man-made inputs, not to be a threat to the health of the marine organisms or the marine environment in general. A great concern with respect to the marine environment is the significance of any routes by which artificial radioactivity discharged to the ocean can find its way back to the land and result in excessive exposure to individual humans. It is also the risk of

maritime accidents of vessels carrying nuclear fuel in flasks, which has to be taken into consideration.

#### ***3.1.2.2.6 Impacts of Plastic Litter***

There is little argument that discarded plastics are harmful in the ocean environment, but agreement about the degree of harm is not easy to achieve because quantitative estimates of loss of marine life due to plastic pollution are difficult to obtain. Plastic litters include persistent materials which are harmful to the ecosystem generally and to the living organisms specifically. Lost fishing nets are causing severe losses of the marine living organisms, they are catching fish all the time of their persistence which may extend to a 100 years. They can also seriously affect shipping by fouling propellers, damaging drive shafts and clogging sea intakes and evaporators.

Plastic strapping and packing bands are used to hold palletted materials, to secure cargo, to strap boxes and crates and to reinforce packing cases. When simply pulled off rather than cut, the bands float free in the sea and can encircle marine mammals and large fish. The third group of plastic debris includes bags, containers, sheeting, packing material and raw plastic pellets. In 1985 at least 450,000 plastic containers were dumped from the world's shipping fleet (GESAMP, 1990). These materials cause great harm to fish, turtles, squids, marine mammals and sea birds which are killed by ingesting such materials.

The increasing quantities and wider distribution of small plastic particles in the ocean are of considerable concern, since their negative impacts extended to hamper many uses of the sea and coastal areas affecting the quality of sea water and the marine resources and fisheries. They are ingested by marine animals generally reducing the nutritional value of their food intake.

Plastic litter disposal has its considerable negative impacts on tourism by fouling beaches and spoiling quality of sea water. The effect of passenger ships disposal of plastic debris in small ports is another acute problem of plastic litter. The problem

needs strict implementation, enforcement and monitoring of requirements of Annex V of MARPOL Convention 73/78.

### ***3.2 Observations***

Clearly, marine pollution is serious and dangerous enough to be taken into consideration, and to conduct research and issue regulations and audit the implementation to prevent, mitigate and control marine pollution from all sources on global, regional and local basis. It is also clear that giving an overview knowledge of the marine environment and marine environmental pollution issues to the prospective marine officers is a necessary prerequisite to motivate marine officers and crew to implement the international standards and regulations through the human factor. In the case of the AAST&MT, the MBSP is the best stage to start providing this basic information to guarantee common and early delivery of such necessary information to cadets.

## **CHAPTER 4**

### ***Knowledge and Competence Standard Requirements of International Regulations for Prospective Officers with Respect to Marine Pollution Prevention***

#### ***4.1 Objectives of the International Maritime Organization (IMO)***

Since the IMO, represented by the MEPC, is the organization concerned with facilitation of the adoption of international standards of marine pollution prevention from ships, it is important for cadets to be familiar with the general objectives of the Organization. It is necessary for cadets to be aware of the system, organizational structure and responsibilities of the IMO. That is to have a general idea about the organization responsible for adoption and amendment of conventions and other instruments and regulations and measures of enforcement concerning marine pollution prevention, mitigation and control. This enables cadets to realize the efforts behind those regulations and standards which they have to follow and apply carefully.

IMO is a technical organization which was established by the United Nations by a convention adopted on 6 March 1948. The Convention entered into force on 17 March 1958. The Organization was inaugurated on 6 January 1959. The Organization has 153 Member States and two Associate members, as at 30 November 1995 (Focus on IMO, January, 1996). The objectives of the IMO as indicated by Article 1(a) of the convention are:

'to provide machinery for co-operation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships'

In fact the Organization has also the authority to deal with administrative and legal matters related to its objectives. Formal arrangements for co-operation and

consultative status have been established with a large number of international organizations to achieve the objectives. The governing body of the IMO is the Assembly which comprises all the Member States. The Assembly meets every two years. In between Assembly sessions the Council, which consists of 32 member States that proposed to be 40 members from the next meeting, elected by the Assembly acts as a governing body.

The technical work of the IMO is carried out by five main committees and a series of sub-committees. The Marine Environment Protection Committee (MEPC) is the one empowered to consider matters related to prevention and control of pollution from ships. This includes adoption and amendment of conventions and other regulations and measures to ensure their enforcement. The fact that the most important IMO conventions are now accepted by countries whose combined merchant fleets represent at least 92.74 % (IMO, 1995), which indicates virtually universal coverage, shows how successful the IMO policy has been.

#### ***4.1.1 Observations***

Issuing conventions of universal coverage and world-wide acceptance is not enough to achieve the mentioned objectives. Accidents are still happening and will continue to happen, intentional wastes discharges to the sea are still going on and marine pollution is still above an acceptable limit. The key word is implementation through human factor, which can never be achieved without competent and efficient education and training. It is the ideal way to achieve understanding, awareness and belief of seafarers of the value of marine environment as our common asset. Then the willingness of seafarers to protect this asset will be emerging from and more prompted by their environmental awareness and consciousness rather than just applying stiff pieces of regulations and legislation.

In the last few years the international maritime community has placed increasing emphasis on the role of the human factor in safe operations and marine environmental protection. The heavy concentrations on technical solutions to safety and environmental related problems is increasingly recognized as misguided. Most would now agree that attempts to respond to every casualty by demanding a redesign of ships sometimes obscures the need to focus on people rather than on hardware alone.

STCW 95, the ISM Code and the establishment of a special 'Human Element Section' at IMO are all indications of a major change in approach (ISF, 1997).

#### ***4.2 The Revised STCW Convention 1978, as amended in 1995, and knowledge and competence standard requirements for prospective officers with respect to marine pollution prevention***

##### ***4.2.1 Introduction***

With the reference to the results analysis of question number six (6) of the survey conducted in a form of a questionnaire of cadets of the AAST&MT, the answers indicated that only 36.36 % of the graduates of the MBSP are aware of the STCW Convention, indicating a low standard of awareness. STCW Convention represents special and vital importance for cadets, specifying the competence and knowledge standard requirements for prospective officers including requirements of marine pollution prevention and anti-pollution procedures. The Convention should be one of the main items to be included in the proposed environmental protection curricula for MBSP at the AAST&MT.

##### ***4.2.2 Background***

The STCW 1978 is the first Convention to establish minimum global standards for maritime training and certification for seafarers. It was the first time to unify these technical standards for seafarers as distinct from ships. That is because the IMO in its beginning concentrated on provisions concerning standards of design, construction and equipment of ships and marine pollution prevention rather than education and training standards of seafarers.

The beginning of the STCW was when the IMO's MSC decided to establish the sub-committee on Standards of Training and Watchkeeping (STW Sub-Committee) in 1971 to adopt a convention on the subject. The Convention was adopted by the International Conference on Training and Certification for Seafarers which was held in London from 14 June to 7 July 1978. The condition of entry into force, which was the acceptance by not less than 25 States having merchant fleets aggregating not less 50 % of World tonnage, was fulfilled on 27 April 1983 and the Convention entered

into force twelve month later on 28 April 1984. The status of the Convention, as of 1 January 1997, was: 120 States with an aggregate of 95.50 % of World tonnage.

#### ***4.2.3 Amendments of the STCW Convention***

Since the Convention entered into force it has been amended 3 times:

- First Amendment adopted on 22 May 1991, in respect of its radio communication provisions (Requirements of GMDSS), entered into force with tacit acceptance on 1 December 1992.
- Second Amendment adopted on 25 May 1994, in respect of replacement of the existing chapter V, which contains special training for crews on tankers, with a new text, came into force, by tacit acceptance, on 1 January 1996.
- Third Amendment adopted in June-July 1995, a comprehensive review of the Convention, came into force by tacit acceptance, on 1 February 1997.

##### ***4.2.3.1 The 1995 amendments to the STCW Convention***

The 1995 amendments did not amend the articles of the Convention, but by using the tacit acceptance provisions the adopted new technical Annex and the mandatory part of the STCW Code could enter into force on 1 February 1997. However until 1 February 2002 parties may continue to issue, recognize and endorse certificates which applied before that date in respect of seafarers who began training or seagoing service before 1 August 1998.

The revised STCW 1978 as amended in 1995 is composed of:

- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. Which comprises 17 Articles providing the legal framework of application of the Convention which were not changed.
- Amendments to the technical Annex to the STCW 1978. Which comprises 8 chapters providing legal and technical framework of applying the mandatory technical standards in Part A of the STCW Code.
- The STCW Code. Which comprises mandatory technical standards contained in Part A. Part B provides guidance to assist those involved in educating, training or assessing the competence of seafarers or who are otherwise involved in applying STCW Convention. Part B of the STCW Code is not mandatory.



#### *4.2.4 Requirements and obligations of the revised STCW Convention 1978*

The revised STCW 1978 has created impacts and initiated new responsibilities for maritime training institutions. The most obvious features of these impacts, are the additional emphasis on methods for demonstrating competence and the criteria for evaluating this competence. The Convention also requires internal quality assurance reviews, external independent evaluation and reports on maritime education and training institutions to IMO's Maritime Safety Committee (MSC) by parties. There will be also increased requirements for revalidation, refresher and updating training.

The Convention is following a functional approach in specifying the standards of knowledge and competency. This means that a function is taken into consideration and not a rank or position. The Convention defines standards of competence for seven functions at three levels of responsibility. The seven functions are navigation, cargo handling, controlling the operation of the ship and care of persons on board, marine and control engineering, electrical and electronic engineering and machinery, maintenance of ship and communications. The three levels of responsibility are management level, operational level and support level.

Under Chapter II of the amended Annex to STCW 1978 Convention, which is covering 'Master and deck department', Regulation II/1 indicates the mandatory minimum requirements for certification of officers in charge of a navigational watch on ships of 500 gross tonnage or more. The Regulation is referring to Section A-II/1 of the STCW Code which includes the standard of competence, and demonstrate in Table A-II/1 the specification of minimum standard of competence for officers in charge of a navigational watch on ships of 500 gross tonnage or more.

As indicated in Table 4.1, which provides extract of the Table A-II/1 of the STCW Code, the competence is identified as to ensure compliance with pollution prevention requirements, but no specifications were given about these requirements, except in the criteria for evaluating competence where compliance with MARPOL requirements were mentioned. In front of the competence of monitoring compliance with legislative requirements, the knowledge requirements are the basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment.

Extract from the revised STCW 1978, as amended 1995 Table A-II/1

Function: Controlling the operation of the ship and care for persons on board at the operational level.

Competence	Knowledge, understanding and proficiency	Methods of demonstrating competence	Criteria for evaluating competence
Ensure compliance with pollution-prevention requirements	<i>Prevention of pollution of the marine environment and anti-pollution procedures.</i> Knowledge of the precautions to be taken to prevent pollution of the marine environment Anti-pollution procedures and all associated equipment.	Examination and assessment of evidence obtained from one or more of the following: .1 approved in-service experience .2 approved training ship experience	Procedures for monitoring shipboard operations and ensuring compliance with MARPOL requirements are fully observed.
Monitor compliance with legislative requirements	Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment.	Assessment of evidence obtained from examination or approved training.	Legislative requirements relating to safety of life at sea and protection of the marine environment are correctly identified.

Table 4.1

Source: Revised STCW Convention 1978, as amended 1995

It is also clear that these conventions were not specified and there are many conventions which can be classified as concerning protection of marine environment. The level of knowledge of the subjects listed in column 2 of the Table A-II/1 are the sufficient knowledge for officers of the watch to carry out their watchkeeping duties. The IMO Model course 7.03 'officer in charge of a navigational watch' is supposed to provide assistance in the preparation of courses which cover these requirements, but to what extent does this model course cover the marine pollution prevention requirements ? That is to be examined in the next two items.

Regulation I/6 of the amended Annex to 1978 STCW Convention, Section A-I/6 and B-I/6 of the Code provide the requirements of the training and assessment of the prospective officers including qualifications of the instructors, supervisors and assessors. This Regulation has to be taken into consideration when developing the proposed curricula in this Dissertation, since one of the main items of the framework of each curricula is to pay attention to the staff requirements because a satisfactory curriculum alone can not achieve the objectives.

STCW 95 also emphasised the role of companies in achieving a planned and structured programme of training designed to assist a prospective officer to achieve the standard of competence including protection of the marine environment in accordance with the Convention.

It is also mandatory minimum requirement for all seafarers to acquire the competence of taking precautions to prevent pollution of the marine environment as a social responsibility (A-VI/1-4).

The STCW Code Page 141 Section A-VIII/2 Part 3-11, indicates that one of the main watchkeeping requirements at sea is the protection of the marine environment, and identifying that awareness of serious effects of operational and accidental pollution is essential for master, officers and ratings. It is also indicating that all possible precautions should be taken to prevent or mitigate such pollution within the framework of relevant international and port regulations. Under article X of the 1978 STCW Convention and Regulation I/4 of the amended Annex to 1978 Convention and A-I/4 of the STCW Code, the Convention gives the right to the port states control, subject to certain conditions, to assess competence of seafarers.

#### ***4.2.5 Observations and analysis***

Regarding the low standard of awareness of the STCW Convention for cadets in the AAST&MT, it should be one of the main items to be included in the proposed environmental protection curricula for MBSP.

The STCW Convention represents special importance for cadets, specifying the competency and knowledge standards requirements for prospective officers including requirements of marine pollution prevention and anti-pollution procedures.

From the review of the new revised STCW 1978 as amended in 1995, it is clear that with respect to marine environment, the Convention does not provide technical or legal regulations for marine environmental pollution prevention. The Convention provides and determines the competence standards, knowledge, understanding, and proficiency requirements of the marine environmental pollution prevention and anti-pollution procedures for seafarers, which can be contained in other legal and technical international rules and regulations.

The new provisions of 'Control Procedures' which empowered port states to assess the competence of seafarers, according to certain conditions and circumstances, have initiated new commitment for port states, flag states, shipping companies, and particularly education and training institutes. Marine environmental protection competence standards are of the main targeted items in the port state control procedures. This is another secondary reason for the necessity of developing and promoting the competence standards of marine environmental protection for prospective officers in the AAST&MT.

### ***4.3 The IMO Model Courses Program***

#### ***4.3.1 Background***

Since the adoption of the STCW 78 Convention, which created new obligations to the party states, particularly with respect to education and training for seafarers, it was necessary to have suitable guidance for the development of courses and curricular systems to achieve the purpose of being in compliance with the required standards of the Convention. The IMO recognized the necessity of developing such guidance and started to study suggestions from a number of its member governments.

The Government of Norway and Finland provided great assistance in this field which led at the end to the design of the series of model courses to enable the maritime institutes to play their roles in the implementation of the Convention.

The IMO model courses provided great help to facilitate familiarization with the increasingly sophisticated maritime technology. They are applicable to all systems of maritime education and training with flexible outline and framework which can be modified by the teaching staff of maritime institutes to be suitable for application according to the dominating circumstances in their country and their structure of the education and training curricula. They can be only as guidance for providing and introducing new courses or even developing and enhancing already existing courses.

#### ***4.3.2 Implementing global standards of maritime education and training***

It is obvious that the IMO model courses were mainly designed to achieve global common standards in maritime safety and pollution prevention as determined by the STCW Convention requirements. That is to prevent interpretations by party states on individual basis. The IMO provided the 'Guidance on the Implementation of IMO Model Courses', which gives useful notes on the preparation, teaching techniques, and curriculum development of the provided model courses.

The guidance emphasised the role of preparation in the success of implementing the model courses program. It gives general considerations of preparation like course package studding, following check-list of preparation and constructing the detailed teaching syllabus in learning objectives format. It also gives specific considerations of preparation which are indicated as scope, objectives, entry standards, certification, intake limitation, staff requirements, teaching facilities and equipment, IMO references, textbooks, bibliography, and timetables. The Guidance also provides notes on teaching techniques, which are really useful for any teaching staff of maritime institutes.

The curriculum development is also one of the important specifications of the Guidance. Each course of the model courses program includes four main items: the course framework, course outline and timetable, detailed teaching syllabus and the instructor manual. A section on evaluation is provided when appropriate.

There are three groups of model courses which are seagoing staff (shorter specialized courses), seagoing staff (advanced courses), and maritime safety/pollution-prevention (administration).

The IMO model courses and the Guidance on the Implementation will be used as a reference in the procedures of constructing syllabuses for marine environmental protection curricula for cadets of the MBSP at the AAST&MT, which is the purpose of this document. The same approach will be followed, constructing summarized, instead of detailed, teaching syllabuses in learning objectives format.

#### ***4.3.3 Updating the IMO Model Courses***

The Sub-committee on Standards of Training and Watchkeeping (STW) declared a report, in the 28th session on 20 November 1995, including that there is a number of matters require urgent attention with respect to revising and updating IMO model courses, shortly before the entry into force of the 1995 STCW amendments. The 1995 STCW Conference adopted resolution 13 "Revision of model courses published by the IMO". That is to take steps to revise and update the IMO model courses. The IMO prepared a list of the courses which require revision to make them suitable for use under the provisions of the revised STCW Convention. Model course 7.03, officer in charge of a navigational watch and training record book is listed as one of the model courses requiring revision to be in compliance with the new provisions of the revised STCW Convention.

#### ***4.3.4 Model Course 7.03 'Officer in Charge of a Navigational Watch' and Training Record Book for Seagoing Phase***

The course was first published in 1991, and reprinted in 1997 but it is not updated to the comprehensive 1995 amendments to the STCW 1978 Convention.

##### ***4.3.4.1 Scope***

The course covers the mandatory minimum requirements of regulation II/4, paragraph 2(d) of the technical Annex of the 1978 Convention on standard of Training, Certification and Watchkeeping for Seafarers (STCW 1978).

It is based on the minimum knowledge required for certification of officers in charge of a navigational watch on ships of 200 gross register tons or more, as set out in the appendix to regulation II/4 of the Convention.

#### ***4.3.4.2 Objectives and Subject Modules***

The objectives of the course are to provide sufficient knowledge to carry out safely the watchkeeping duties of an officer in charge of a navigational watch, both at sea and in port.

The model course 7.03 includes 17 subject modules covering all the requirements specified by the Convention, as indicated in the scope. Module 2 'Watchkeeping' is the only module comprising marine environmental pollution prevention objectives.

#### ***4.3.4.3 Module 2 'Watchkeeping'***

This module includes 3 subject areas, suggested to be covered in 117 hours.

- 1- Watchkeeping arrangements and procedures, 106 hours.
- 2- Keeping a watch in port, 4 hours.
- 3- Prevention of pollution, 7 hours.

Under the subject area of prevention of pollution, there are 6 items suggested to be covered in 7 hours as follows:

- 1- The International Convention for the Prevention of pollution from Ships, as amended by the Protocol of 1978 related thereto, MARPOL 73/78, 2 hours.
- 2- Technical annexes, 1 hour.
- 3-Annex I, 1 hour.
- 4- Control of oil from machinery spaces, 1 hour.
- 5- Oil record book (Part I, machinery space operations), 1 hour.
- 6- Precautions which should be taken to prevent accidental pollution by oil, 1 hour.

#### ***4.3.4.4 Module 17, Training Record Book for the Seagoing Phase***

The module forms part of the IMO model course 7.03, which serves both as a guide to the practical training which should be undertaken during the mandatory period of seagoing service and as a record of the satisfactory completion of that training.

It includes 13 items under the subject outline, non of which is especially dedicated to marine pollution prevention. However, under the Seagoing Phase Training Manual, it is stated clearly that 'In all work aboard ship, two main considerations are safety and prevention of pollution should be taken into account'.

#### ***4.3.4.5 Observations***

It is obvious that assessment of the model course 7.03, on the same basis of assessment of the marine environmental pollution prevention courses of the MBSP at the AAST&MT, would indicate that the time devoted to the subject areas concerning marine pollution prevention is not quite enough. On the other hand the subject areas are not comprehensive and many essential items necessary for the competence standards of marine pollution prevention and anti-pollution procedures are not covered as required by the new revised STCW 1978, as amended in 1995.

Model course 7.03 is one of the courses mentioned in the IMO list for the courses which need updating to be in compliance with the new revised STCW according to resolution 13 of the 1995 STCW Conference "Revision of model courses published by the IMO".

#### ***4.4 A Call for Promoting Marine Environmental Protection Culture***

The proposed marine environmental protection curricula for cadets of the MBSP at the AAST&MT should comprise preliminary course of marine environmental awareness to work on developing and promoting marine environmental protection culture. The course should provide baseline marine environmental information about the components, value, importance and functions of the marine environment, which are included in item 3.1.1 of this document. That is in order to enable cadets to recognize the benefits and functional values of the marine environment which can not be seen by naked eyes of seafarers or cadets.

The course must involve the main pollutants, their sources, impacts and measures of control, which are included in item 3.1.2 of this document. This helps cadets to realize the nature and characteristics of those pollutants, the damage and depletion caused to the marine environment by those pollutants and consequently the impacts on human health.



Recognizing the efforts behind issuing the main international instruments of marine environmental protection requires studying the objectives of the IMO, which should be included in the preliminary course.

The revised STCW Convention 1978 as amended in 1995, should carry considerable weight in the course since it is the convention which specifies the minimum knowledge and competence standard requirements for prospective officers. The course should address the marine pollution prevention requirements of the revised STCW Convention 1978.

An overview of the principles of ISM Code should be also included. It is the second international instrument, after the STCW, intended mainly for dealing with the role of the human factor in safety operations and marine pollution prevention on board ships. It enables cadets to be aware of the meaning of the environmental protection policy as a functional requirement of the Safety Management System (SMS) and the Safety Management Certificate. It is important for cadets to be aware of the system of documenting all operations and procedures on board including dealing with emergencies and oil spills.

#### ***4.5 International regulations dealing with marine pollution***

In Chapter 3, baseline marine environmental information was reviewed and the basic knowledge and competence standards requirements for prospective deck officers with respect to marine pollution prevention were also reviewed in this Chapter. The review emphasised the role of the human factor in contributing to marine environmental protection and in implementing international regulations concerning marine pollution prevention. The human factor role can be achieved through promoting and developing marine environmental awareness and consciousness.

The following chapters review, summarise and analyse the international instruments involving legal and technical regulations relevant to marine pollution prevention and environmental protection. They also specify the important items and subject areas which could be helpful when included in the proposed marine environmental protection curricula to be prepared for cadets in the MBSP at the AAST&MT. They provide rationale of the importance and relevance of each included

international convention or agreement for the proposed curricula and for MBSP cadets.

The international conventions dealing with technical and legal aspects of marine pollution operate essentially on three major axis:

- 1- Prevention, mitigation and control (preventive regulations): LL 66 - COLREG 72 - LDC 72 - SOLAS 74 - MARPOL 73/78 - STCW 1978 - SALVAGE 1989.
- 2- Response and clean up (curative regulations): INTERVENTION 1969 - OPRC 1990
- 3- Liability and compensation: CLC 1969 - FUND 1971- TOVALOP - CRISTAL

The international preventive rules and regulations of marine pollution are the main interest of seafarers, and consequently of cadets the prospective officers of the near future. These rules are deeply related to seafarers' work and many tasks and responsibilities are mandated to them to implement the essential principles of such preventive rules and regulations.

Nevertheless, international rules and regulations of curative measures can give cadets clear idea about the international efforts and resources involved in marine oil pollution accidents and the extent of international co-operation, collaboration and co-ordination needed in such crisis situations.

Studying the international legal instruments concerning liability and compensation is necessary to complete the picture for cadets to recognize the extent of the value of damage to the marine environment and coastal installations caused by oil spill incidents which exerts huge amounts of money for recovery, clean up and compensation for damage. It is also important to realize the extent to which the shipowners can limit their liability and how compensations are recovered.

The United Nations Convention on the Law of the Sea (UNCLOS 1982) is a comprehensive instrument which comprises provisions including all sources of marine pollution and all measures, and procedures for enforcing those measures, for marine pollution prevention. The Convention determines the limits of the sovereign rights of the states and their jurisdictions and obligations in enforcing the foregoing international instruments beside the national legislation. It is essential and vital instrument to be included in the basic maritime education and training curricula to

provide information about the legal framework of enforcement of international environmental law.

It is clear from the foregoing that the proposed curriculum involving international legal and technical regulations, concerning marine environmental protection, should carry different weight for different subject areas. It should emphasise the importance of prevention, mitigation and control (preventive regulations) of marine pollution for cadets, giving this subject area the biggest relative weight. This should cover OILPOL 54, MARPOL 73/78, SALVAGE 89, and overview of LDC 72. STCW 78 has already been covered in the preliminary course, while SOLAS 74, LL 66, and COLREG 72 are well covered in the MBSP safety courses.

The international curative regulations should be included as an overview of OPRC 1990 and INTERVENTION 1969. International regulations of liability and compensation should be covered, giving the main principles of application of CLC 1969 and FUND 71. That is in addition to a historical background about TOVALOP and CRISTAL voluntary agreements. An overview of UNCLOS 1982 should be covered emphasising the marine environment and marine pollution provisions.

## **CHAPTER 5**

### ***International Regulations of Prevention, Mitigation and Control of Marine Pollution (Preventive Regulations)***

Generally, marine pollution caused by shipping activities could be accidental, operational or even by dumping, which is mainly land-based generated wastes dumped into the marine environment using ships, which can not be classified under the other two categories. MARPOL Convention 73/78, STCW Convention 1978 and ISM Code deal with prevention, mitigation and control of both accidental and operational pollution.

MARPOL 73/78, which replaced OILPOL 54, provides legal and technical regulations of marine pollution prevention, mitigation and control. STCW 1978 and ISM Code handle the subject from the point of view of the importance of the role of the human factor. LL 66, COLREG 72, SOLAS 74, and SALVAGE 1989 deal with prevention of accidental marine pollution. LDC 72 deals with the prevention, mitigation and control of marine pollution by dumping of land-based generated wastes.

#### ***5.1 International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as amended in 1962, 69 and 71 (OILPOL 1954)***

The Convention was adopted on 12 May 1954, and entered into force on 26 July 1958. It was superseded by MARPOL 73/78, but it has historical importance which indicates the evolution of the global marine environmental pollution prevention rules and standards, which started even before the IMO was established. The Convention contained prohibition of the intentional discharge of oil or oily mixtures from all

vessels, except tankers of less than 150 tons gross and other ships of less than 500 tons gross, in specific areas called 'Prohibited Zones'. The prohibition extends at least 50 miles from all land areas, and 100 miles from some exceptional areas.

The Convention was promoting establishing reception facilities for oil residues by the contracting parties. The oil record book concept was first initiated by the Convention, which gave any contracting party the right to inspect it. The Convention carried proceedings of dealing with violation, giving the sequence of actions to be taken when a contracting party discovers a violation from another contracting party's ships. These measures, which were incorporated in MARPOL 73 later on, include notification of the flag state, investigation conducted by the flag state, notification of the IMO and reporting coastal state by the results in cases of oil spill accidents.

The 1962 amendments, which were adopted in April by a Conference convened by IMO, extended the application of the OILPOL 1954 Convention to ships of lesser gross tonnage, and enlarged the prohibited zones. They entered into force on 18 May/28 June 1967.

The 1969 amendments, adopted on 21 October 1969, gave recognition to the 'Load On Top' (LOT) system, and put restrictions on oil discharge, including the limitation of the total quantity of oil to be discharged and the rate at which oil may be discharged which is 1/ 15,000 of the ship's total cargo-carrying capacity and 60 litres per mile respectively. It also included complete prohibition of discharge of oil from cargo spaces of a tanker within 50 miles of the nearest land. They entered into force on 20 January 1978.

The 1971 amendments, adopted on 12/15 October, set out the limits of a protected zone in the Great Barrier Reef in North Australia as an area of great and unique scientific importance. They provide a limitation on the size of individual cargo tanks in VLCCs to limit the outflow of oil in cases of accidents. Although the 1971 amendments never entered into force, their subjects have been incorporated into MARPOL 73/78.

### ***5.1.1 Observations***

The Convention was an important step on the way to marine pollution prevention. It was really innovative at that time, specifying technical and legal regulations for preventing marine pollution by oil, which was one of the earliest indications of marine pollution as a problem requiring international control. The Convention has set the most important principles of preventing marine pollution by oil, which were incorporated into MARPOL 73/78.

However, it did not deal with the other serious and major marine pollutants, which were covered later by MARPOL 73/78, the Convention which replaced OILPOL 1954, and which followed a wider perspective approach to marine pollution prevention.

OILPOL 1954 is an important Convention to include its overview in the proposed curricula for cadets of the MBSP at the AAST&MT. It gives cadets a good idea about the evolution of marine oil pollution prevention regulations and the historical development and promotion of such legal and technical regulations. It is the way to illustrate for cadets the step-by-step progress of international environmental awareness and consciousness.

### ***5.2 The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)***

MARPOL 73/78 is the essential Convention dealing with prevention, mitigation and control of marine pollution from ships. The Convention is relying upon the human factor, represented by seafarers, in applying a number of principal regulations of marine pollution prevention. With respect to seafarers the Convention is always considered as the backbone of the legal and technical regulations concerning prevention, mitigation and control of operational and accidental pollution. Subsequently, the Convention represents special vital importance for cadets in that

field. Therefore, MARPOL 73/78 should be included in the proposed curricula of marine environmental protection for MBSP at the AAST&MT, addressing the role of human factor in implementing the Convention and emphasising the tasks and responsibilities mandated to seafarers to ensure effective application.

Subsequently, MARPOL 73/78 will be included in two separate courses of the curricula. The first one includes the legal framework of application of the Convention, illustrations of the outline and main definitions and concepts. While the second course is devoted to the practical operational requirements of the Convention that concern seafarers.

The steps of evolution of this instrument, which should be considered as one document, are described in its two headings, since it is a combination of the convention and the protocol adopted in 1973 and 1978 respectively. As a result of the environmental disaster of the Torrey Canyon accident in 1967, the maritime community realised that there is a necessity for a new and more strict convention to prevent environmental pollution by shipping activities and that the OILPOL 1954 is not enough anymore due to the far-reaching developments in modern industrial practices. The IMO Assembly decided in 1969 to convene an international conference for the preparation of an international agreement to control the environmental pollution caused by ships. The agreement was adopted in November 1973 to deal with several types of marine pollution caused by ships.

### ***5.2.1 International Convention for the Prevention of Pollution from Ships, 1973***

#### ***5.2.1.1 An Overview of the Convention***

The Convention was adopted on 2 November 1973, to cover all the technical aspects of pollution from ships excluding disposal of waste into the sea by dumping, and applies to ships of all types, but it does not apply to the offshore exploration and exploitation of sea-bed mineral resources activities. The Convention did not enter into force, but the modifying Protocol of 1978 did, with the legal principle that ratifying the Protocol gives effect to the 1973 Convention.

The convention comprises 20 articles concerning the legal framework of application, two protocols concerning Reports on Incidents Involving Harmful Substances and Arbitration respectively; and five technical Annexes each of which contains regulations for the prevention of a certain form of pollution. States ratifying the Convention must accept Annex I and II but can choose not to accept the other three. That is why the optional Annexes have taken much longer to meet the requirements for entry into force.

#### ***5.2.1.2 Technical Annexes***

**Annex I:** Prevention of Pollution by Oil, is an obligatory annex for the contracting parties to MARPOL 73/78, which entered into force on 2 October 1983.

**Annex II:** Control of Pollution by Noxious Liquid Substances, is also an obligatory annex, which entered into force on 6 April 1987.

**Annex III:** Prevention of Pollution by Harmful Substances carried by sea in Packaged form. It is the first of the convention's optional annexes, which entered into force on 1 July 1992.

**Annex IV:** Prevention of Pollution by Sewage, is the second optional annex, which has not yet entered into force. The conditions for entry into force is the ratification of 15 states whose combined fleets of merchant shipping constitute at least 50 % of the world fleet. It will enter into force 12 months after these conditions are fulfilled. The status of Annex IV is that 64 contracting parties representing 41.11% of the world fleet tonnage have ratified it (Focus on IMO, January 1997).

**Annex V:** Prevention of Pollution by Garbage, is the third optional annex and entered into force on 31 December 1988.

#### ***5.2.2 The Protocol of 1978 Relating to the International Convention for Prevention of Pollution from Ships 1973***

The Protocol was adopted by the International Conference on Tanker Safety and Pollution Prevention which was held in February 1978, and entered into force on 2



October 1983. The early ratification of the MARPOL Convention was not possible at that time because of problems associated with Annex II. The Conference contained changes involving mainly Annex I, and it was decided to defer implementation of Annex II for three years after the date of entry into force of the Protocol. In fact the Protocol incorporated and absorbed the contents of the parent Convention. It is a legal principle of the ratification of the 1978 protocol, that ratifying the Protocol gives effect to the 1973 Convention as well.

### ***5.2.3 Amendments to MARPOL 73/78***

**The 1984 amendments** were adopted on 7 September 1984 and entered into force on 7 January 1986. They were concerned with Annex I, to facilitate implementation and add provisions concerning the oily water discharge.

**The 1985 (Annex II) amendments** were adopted on 5 December 1985 and entered into force 6 April 1987. They were concerned with Annex II to simplify its implementation. They also make the International Bulk Chemical Code IBC Code mandatory, which was revised to take into account anti-pollution requirements to make the amended Annex more effective in reducing accidental pollution.

**The 1985 (Protocol) amendments** were adopted on 5 December 1985 and entered into force on 6 April 1987, under which the reporting of incidents involving discharge into the sea of harmful substances in packaged form became an explicit requirement.

**The 1987 amendments** were adopted in December 1987 and entered into force on 1 April 1989. They extended Annex I Special Area status to the Gulf of Aden.

**The 1989 (March) amendments** were adopted in March 1989 and entered into force on 13 October 1990. They affect the IBC Code, the BCH Code and replace the lists of chemicals in appendices II and III of Annex II of MARPOL.

**The 1989 (October) amendments** were adopted on 17 October 1989 and entered into force on 18 February 1991, making the North Sea a “Special Area” under Annex V of MARPOL.

**The 1990 (March) amendments** were adopted in March 1990 and will enter into force six months after the entry into force of the 1988 SOLAS and Load Lines Protocols. The amendments are designed to introduce the Harmonised System of Survey and Certificates (HSSC) into MARPOL 73/78, IBC Code and BCH Code.

**The 1990 (November) amendments** were adopted in November 1990 and entered into force on 17 March 1992. They extend the Special Area Status under Annex I and V to the Antarctic.

**The 1991 amendments** were adopted on 4 July 1991 and entered into force on 4 April 1993. The amendments make the wider Caribbean a Special Area under Annex V. Other important amendments add a new chapter IV to Annex I requiring ships to carry an oil pollution emergency plan. For existing ships, the requirements can be deferred for two years.

**The 1992 amendments** were adopted on 6 March 1992 and entered into force on 6 July 1993. They affect Annex I, concerning the design standards of new and existing ships, and change provisions of discharge of oil and oily mixtures to more strict ones.

**The 1994 amendments** were adopted on 13 November 1994 and entered into force on 3 March 1996 under tacit acceptance. They affect Annexes I, II, III, and V, extending Port State Control to the operational requirements of these Annexes.

**The 1995 amendments** were adopted on 14 September 1995 and entered into force on 1 July 1997. They affect Annex V, clarifying regulation 2 and adding regulation 9 which deals with placards, garbage management plans and garbage record keeping.

**The 1996 amendments** were adopted on 10 July 1996 and expected to enter into force on 1 January 1998 under tacit acceptance. They affect protocol I to the Convention requiring more precise requirements of the sending of reports of incidents involving harmful substances. They also affect the IBC and BCH Codes.

#### ***5.2.4 Observations and Analysis***

MARPOL 73/78 follows a legal and technical approach to provide regulations of marine environmental pollution prevention, the implementation of which concerns

flag states, coastal states, port states and particularly seafarers. Consequently, the human factor role in implementing MARPOL 73/78 is quite essential and vital, especially the role of seafarers in applying the regulations of prevention and control of discharge of marine pollutants to the sea.

The standard of awareness of MARPOL 73/78 for cadets in the AAST&MT was found to be 76.36 %, as indicated by the results of the analysis of question number 6 of the questionnaire conducted to them, the details of which are given in Chapter 2. This indicates, relatively, satisfactory standard of awareness. Due to the importance of MARPOL 73/78 to seafarers, the legal and technical regulations that concern marine officers will be summarized and reviewed in Appendix II. These regulations should be included in the proposed curricula for the MBSP.

The original text of MARPOL 73/78 is very sophisticated, using complex language and almost every regulation refers to many other preceding and following regulations, causing a lot of confusion and making the meaning difficult to understand. That is why it is very difficult for seafarers, without deep and thorough study, to recognize all its practical operational requirements. Subsequently, the IMO published in 1993 'MARPOL How To Do It', Manual on the practical implications of ratifying and implementing MARPOL 73/78. The Manual provides simplified practical operational requirements in an understandable straightforward form. This Manual tells the concerned parties what needs to be done. However, the Manual needs to be updated to be in compliance with the latest amendments, which were included in the 1997 consolidated edition of MARPOL 73/78.

Due to the continuous progress in shipping technology and the increasing international concern about marine environmental protection, MARPOL 73/78 has been amended several times during the last five years. The 1992 consolidated edition of MARPOL 73/78 is out of date and needs to be used with the aid of four or five pamphlets containing the latest amendments. IMO, recognizing this problem, published the 1997 consolidated edition of MARPOL 73/78. Nevertheless, a draft of a new Annex VI of the Convention, concerning air pollution, has been prepared and

is being discussed in the fortieth session of the Marine Environment Protection Committee (MEPC) for adoption. A new annex to MARPOL 73/78 has also been prepared by MEPC on the introduction of unwanted aquatic organisms in ballast water and sediment discharges.

The details of the study carried out by the National Research Council (NRC) of Marine Board of the United States and the US National Academy of Science (NAS) to determine the change of the oil pollution inputs into the ocean in 1990, are given in this dissertation in item 3.1.2.1.1. The study provides that the estimated inputs of oil into the ocean due to shipping activities had been reduced from 1.47 million tons annually, (representing 45.3 % of the annual global inputs of oil), to 0.57 million tonnes annually, (representing 24.27 % of the annual global inputs of oil), between 1981 and 1989. The study credited MARPOL 73/78 with making 'A substantial positive impact in decreasing the amount of oil that enters the sea' (IMO, 1990).

Besides this report, the study provides a comparison between the largest single source of oil pollution input from shipping activities in 1981 and 1989. It was estimated that in 1981, the tanker operations were the largest single source of annual oil inputs, (0.700 million tons annually, representing 47.66 % of the inputs of the annual shipping activities, and 21.54 % of the annual global oil inputs). In 1989, the machinery-space bilges and fuel oil sludge discharges were the largest source, (0.253 million tons annually representing 44.39 % of the inputs of the annual shipping activities, and 10.77 % of the annual global oil inputs).

The analysis of these results is not an easy task, since there are contributions of a lot of influencing factors and circumstances. This change of the largest single source of oil pollution inputs into the ocean can be attributed to the introduction of new effective techniques of tanker operations. Some examples of these techniques are Load On Top (LOT), Crude Oil Wash (COW), Clean Ballast Tanks (CBT) and Segregated Ballast Tanks (SBT). On the other hand neglecting the human factor and the environmental awareness and consciousness for seafarers have led to illegal intentional discharges of machinery-space bilges and fuel oil sludge from ships.

Due to economic factors, port states failed to provide adequate reception facilities as required by MARPOL 73/78; consequently, ships try to find any other means of disposal of the wastes, usually by illegal discharges into the sea during night in the open sea, where there is no means of violation detection.

This indicates that even if seafarers are well aware of marine pollution prevention regulations and have environmental consciousness, they can not find an available legal means for waste disposal. It was also observed, surprisingly, that even when reception facilities are available free of charge in certain ports, ships do not use them for delivery of their wastes. According to the owners' instructions no additional time should be spent in ports after loading or discharging, following the principle of 'Time is Money'. This problem has not yet been solved.

The problem can be treated through stricter port state control, to inspect ships and ensure that ship-generated wastes are not disposed at the sea. This can be achieved with the aid of the simple formula which estimates the quantities of sludge wastes generated by machinery during a certain period of time when sailing and when at port, and supporting this estimate by the information of the oil record book.

It is worth mentioning that IMO, recognizing the importance of the human factor in the marine pollution prevention and environmental protection, held a MARPOL Conference in 1994 in conjunction with MEPC 36th session. This session of the MEPC and the 1994 MARPOL Conference adopted a number of amendments to the Convention and approved some new unified interpretations to the regulations of the Convention. The most important aspect related to the human factor was the Resolution 1 of the 1994 MARPOL Conference, providing amendments to Annexes I, II and III on port state control on operational requirements.

The amendments added a new regulation 8A after the existing regulation 8 of Annex I, a new regulation 15 to Annex II and a new regulation 8 of Annex III. These amendments give the right to the port state to inspect the ship concerning the operational requirements under Annex I, II and III where there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures

relating to the prevention of marine pollution by oil, noxious liquid substances and hazardous materials in packaged form. The ship will not be able to sail until the situation has been brought to order in accordance with the requirements of Annexes I, II and III. These amendments entered into force on 3 March 1996.

These amendments illustrate the emphasis on the human factor and address the critical importance of education and training in the marine pollution prevention field. They will also be taken into account by the shipowners, who will be more interested in the standards of education and training of their crews, since they do not want any delay of their ships by port state control procedures.

Finally, MARPOL 73/78 succeeded to promote and develop regulations concerning the safe construction and equipment of tankers and other ships, but no matter how good the ships are, the human factor should always be emphasised on achieving the objectives of marine pollution prevention and environmental protection regulations established by MARPOL 73/78 and other international instruments.

### ***5.3 Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matters, 1972 (LDC 1972)***

LDC 1972 is aimed at prevention, mitigation and control of dumping and incineration at sea of land-based generated wastes rather than ship-generated wastes. Nevertheless, it is necessary to include an overview of the Convention in the proposed curricula for cadets of the MBSP at the AAST&MT to provide them with information about the global perspective of marine environmental protection by preventing waste disposal into the sea. It is also important to make them aware of the principles of the Convention in order to be able to avoid participation in dumping or incinerating operations involving violation of the Convention.

### ***5.3.1 Adoption and Objectives***

As a result of the United Nations Conference on the Human Environment, Stockholm 1972, an Inter-governmental Conference on the Convention on the Dumping of Wastes at Sea was held in London in November 1972. The Conference adopted the Convention on 13 November 1972, known as the London Dumping Convention (LDC 1972). The Convention was a new step on the way of marine pollution-prevention by prohibiting and controlling dumping of land-based generated wastes at sea which came into force on 30 August 1975. The objectives of the Convention were to take effective measures, according to scientific, technical and economic capabilities to achieve its targets, which are the prevention of marine pollution by dumping and the promotion of effective control of all sources of marine pollution.

### ***5.3.2 An Overview of LDC 1972***

The Convention provided a definition for *Dumping* as follows:

*Dumping is the deliberate disposal at sea of wastes or other matters from vessels, aircrafts, platforms or other man-made structures, as well as the deliberate disposal of these vessels or platforms themselves.*

The Convention prohibits dumping of certain hazardous materials included in Annex I, known as the ***black list***, while a number of other identified materials included in Annex II, known as the ***grey list***, need special permit for dumping at sea. A general permit for other matters is required before dumping for which the Convention stated the characteristics, composition, dumping site, method of deposit and other general considerations and conditions in Annex III. The Convention also emphasised the necessity of notification of dumped wastes and monitoring.

The Convention requires the contracting parties to design an authority to deal with permits, keep records, and monitor the condition of the sea.

### *5.3.3 Amendments to LDC 1972*

The 1978 amendments (incineration), were adopted 12 October 1978, and entered into force 11 March 1979. They affect Annex I of the Convention and are concerned with the incineration of wastes and other matter at sea.

The 1978 amendments (dispute), were adopted on 12 October 1978, they will enter into force one year after being positively accepted by two thirds of contracting parties, because these amendments affect the articles of the Convention, so explicit acceptance must be applied, while tacit acceptance can not be applied in this case. Until January 1997 the status was that only 20 contracting parties have been accepted. These amendments introduce new procedures for the settlement of disputes.

The 1980 amendments (List of substances) were adopted on 24 September 1980, and entered into force on 11 March 1981. They concern incineration and provide a list of substances which require special care when being incinerated.

The 1989 amendments (Impact assessment) specify the procedures to be followed when issuing permits for dumping under Annex III, after assessing the impact of dumping.

The 1993 amendments were adopted on 12 November 1993, and entered into force on 20 February 1994. The amendments were the first step with the approach to the 1996 Protocol, by initiating new concepts, which made the regulations of dumping at sea stricter and reflected the change of the old perspective, considering the sea as the best site for disposal of all kinds of wastes. They included the following three key changes:

- the amendments ban the dumping of low-level radioactive wastes into the sea,
- phase out the dumping of industrial wastes by 31 December 1995 and
- ban the incineration at sea of industrial wastes.

These important changes were adopted by consensus due to the change of the attitudes towards the use of the sea.



#### **5.3.4 The 1996 Protocol to London Dumping Convention 1972**

At a special meeting of the contracting parties to LDC, which was held in November 1996, the 1996 Protocol was adopted. The Protocol followed a new approach, which is the inclusion of *Reverse or Positive* lists. As opposed to the current prohibition list in conjunction with Article IV (1) (a) which states that 'The dumping of wastes or other matter listed in Annex I is prohibited', the *Reverse or Positive* list on sea disposal states that 'Contracting parties shall prohibit the dumping of any wastes or other matter with the exception of some specified items of wastes which are included in Annex I of the Protocol'.

Annex II of the protocol contains a *Reverse or Positive* list of the substances and wastes which can be dealt with by incineration at sea. Annex III is concerned with studying the available alternatives of dumping at sea. It is also concerned with the rules and regulations of conducting environmental impact assessment of waste disposal to the wastes permitted to be dumped, and the conditions of issuing the permits. It also takes into consideration the waste disposal prevention audit, considerations of waste management options, the chemical, physical and biological properties of wastes, the action list, dumping site selection and monitoring.

One of the most important regulations of the Protocol is to prohibit the export of wastes or other substances to other countries for the purpose of dumping or incineration at sea.

#### **5.3.5 Observations**

LDC 1972 and its Protocol of 1996 are international legal and technical instruments involving marine pollution prevention regulations, related to land-based generated wastes when dumped into the sea. Nevertheless, the operations of dumping involve ships and shipping activities, which means that seafarers could be involved in such operations. However, the Convention and the 1996 Protocol indicate the new concepts of the environmental consciousness and reflect the change of the old perspective considering the sea as the appropriate disposal site of wastes.

#### ***5.4 The International Convention On Salvage, 1989 (SALVAGE 1989)***

The Convention was adopted and approved by the Plenary of the Conference convened by IMO in London on April 28, 1989.

##### ***5.4.1 Background***

The efficient and timely salvage operations can make major contributions to the safety of vessels and other property in danger and to the protection of the marine environment. It was clear that the substantial development in maritime transport, and particularly the increased concern for the protection of the marine environment was in need of encouraging the efficient and timely professional salvage operations. That is by changing the reward fixing criteria to enable professional salvors to acquire the high technologically advanced equipment and skilled and well trained crew to be capable of achieving these unique risky missions.

The salvage operations during the Amoco Cadiz accident in 1978 were a bad example of the salvage contracting arrangements, whose investigations had proved that it was one of the factors which resulted in famous environmental disaster, and which could be avoided with better salvage arrangements and salvage operations.

Salvage operations in the past were mainly regulated by the Convention for the Unification of Certain Rules of Law Respecting Assistance and Salvage at Sea, signed at Brussels on 23 September 1910. This Convention incorporated the principle known as “No Cure No Pay”. It did not take into account the compensation of the salvor when the salvage operations are not completely successful, when the operations result in protecting the marine environment from severe oil pollution damage. That is simply because this system did not take pollution into account.

According to the Lloyd’s Open Form, at that time, the salvor would only receive payment based on the value of the ship and cargo, if the operation was successful. It was a commonly applied rule to protect the shipowners from awarding remuneration

if their ships were not completely saved. Nevertheless, this principle worked as a disincentive factor for salvors, especially the professional salvage companies which were diminishing due to the fact that their operational costs could not be covered when the operations were not achieved successfully. These circumstances had their impacts on the marine environment, since a lack of the competent professional salvors at times of distress could result in environmental disasters like the Amoco Cadiz incident.

#### **5.4.2 SALVAGE Convention 1989**

Due to the general feeling that the traditional system of salvage remuneration awarding did not prove suitable for salvage operations involving possible oil pollution, IMO adopted the SALVAGE 1989 Convention by the Conference held in London on 28 April 1989. The Convention entered into force on 14 July 1996, to replace the Brussels 1910 Convention. The SALVAGE 1989 Convention defined "Damage to the Environment" in Chapter I, Article 1 (d), as:

*Substantial physical damage to human health or to marine life or resources in coastal or inland waters or areas adjacent thereto, caused by pollution, contamination, fire, explosion or similar major incidents.*

Although, again under Chapter III, Article 12, the Convention approved the "No Cure No Pay" principle, the skills and efforts of the salvors in preventing or minimizing damage to the environment were mentioned under Article 13 (b) as one of the criteria for fixing the salvage reward.

Recognizing the importance of salvage operations in the marine environmental protection, the SALVAGE 1989 Convention was really an initiative in making provisions for "Special Compensation" to be paid to salvors when a threat to the environment could be minimized or prevented, which was concluded under Chapter III, Article 14. The special compensation covers the salvor's expenses plus 30 % if environmental damage is minimized or prevented, which can be increased to 100 % of the expenses in certain circumstances. The Lloyd's Open Form 1995, which is a

standard form of salvage agreement approved and published by the Council of Lloyd's, contained the provisions of the SALVAGE 1989 Convention, for information only, even before the Convention entered into force.

#### ***5.4.3 Observations and Analysis***

Eventually, the SALVAGE Convention followed an environmentally conscious approach. The marine environmental pollution prevention and environmental protection principles are practically taken into account by the "special compensation" provisions and the new criteria of remuneration awarding. The new concepts of SALVAGE 1989 can work as incentive factors for professional salvage companies, the efforts of which can contribute a lot to protecting the marine environment and preventing or mitigating environmental disasters.

SALVAGE Convention 1989 is closely related to seafarers, and consequently to cadets who are the prospective officers of the future. Providing an overview of the Convention for cadets gives them clear idea about the co-operation relationship between salvors, master and crew of a vessel in distress during salvage operations to save the vessel and properties and protect the marine environment. It also clarifies for the cadets the new environmental protection perspective dominating almost all international maritime rules and regulations, which appear clearly in the environmental criteria for fixing a salvage reward and the special compensation provisions. It also illustrates for cadets that requesting salvage, by the master of a vessel in real distress, as early and safely as possible is not a shame for him. That is in the cases where a vessel is in severe danger and arranging salvage operations by its company or agent is not possible.

#### ***5.5 ISM Code and the Marine Environmental Protection Requirements***

The whole world maritime community is in continuous debate about the ISM Code, the extent of its effectiveness in safety and marine pollution prevention, and the capability of the shipping companies to be in compliance with its requirements

during the remaining short period to come into force. The standard of awareness of the ISM Code for cadets in the MBSP at the AAST&MT, as indicated by the results analysis of the questionnaire included in Chapter 2, is only 3.63 %, indicating a very low standard of awareness which needs immediate and effective corrective action.

The action to be taken is including an overview of the Code as a part of the curricula which are being prepared to cover the lack of marine environmental awareness. This is because of the importance of the code, the application of which involves mainly seafarers. Consequently, cadets should be provided with the principal requirements of implementing the code, which deals mainly with the documented role of the human factor in safety operations and marine pollution prevention on board.

The International Management Code for the Safe Operation of Ships and for Pollution Prevention, known as International Safety Management (ISM) Code, was adopted in November 1993 by resolution A.741 (18) and is expected to enter into force on 1 July 1998, under SOLAS Convention Chapter IX by tacit acceptance.

One of the objectives of the Code is stated as avoidance of damage to the marine environment, specifying responsibilities of the companies including preparation for emergencies involving threat or likely to involve threat to the marine environment. The requirements of the ISM Code may be applied to all ships. It is also important to indicate that one of the functional requirements for a Safety Management System (SMS), as an obligation of the ISM Code for every shipping company and on board ships, is a safety and environmental protection policy.

The Code requires shipping companies to construct instructions and procedures to insure protection of the environment in compliance with relevant international and flag state legislation. Companies should also define and document the master's responsibilities with regard to implementing the safety and environmental-protection policy of the company.

Shipping companies should also ensure that the SMS operating on board the ship contains a clear statement that the master has the overriding authority and responsibility to make decisions with respect to safety and pollution prevention.

One of the important obligations of the Code determines that the company should establish procedures for the preparation of plans and instructions for key shipboard operations concerning the safety of the ship and the prevention of marine pollution. A certificate, called a Safety Management Certificate, has to be issued to every ship by the administration which should verify that the company and its shipboard management operate in accordance with the approved SMS.

#### ***5.5.1 Observations***

The ISM Code was reviewed and taken into account because it is emphasising the principles, ideas and objectives of this dissertation. The ISM Code is one of the international instruments concerning, among many other objectives, prevention, mitigation and control of marine pollution by dealing with the role of the human element through an organized and documented approach. It is one of the initiatives of IMO that deals with the main and critical cause of marine casualties and marine pollution, which is the human element. Consequently, the ISM Code and the revised STCW 1978, as amended in 1995, which are the main international instruments emphasising the human element issues, will be included in the first proposed marine environmental protection curriculum.

**CHAPTER 6**  
***Marine Pollution and International Curative Regulations***  
**&**  
***Liability and Compensation***

***6.1 International Regulations of Response and Clean up of Marine Pollution (Curative Regulations)***

These are the international regulations involving provisions dealing with marine pollution in cases of maritime accidents and incidents. They deal with international co-operation and co-ordination in cases of maritime incidents involving marine pollution.

***6.1.1 The International Convention on Oil Pollution Preparedness , Response and Co-operation , 1990 (OPRC 1990)***

The standard of awareness of OPRC Convention 1990 for cadets in the MBSP at the AAST&MT was 0 %, as indicated by the results analysis of question number 6 of the survey conducted of them, the results of which are concluded in Chapter 2 of this document.

The Convention was adopted in November 1990 , and came into force in May 1995. The Convention was one of the most important global instruments concerned with the integrated international preparedness and response to major oil spills from a global perspective. The Convention encouraged prompt and effective action, which is essential in cases of major oil spills. This action requires mainly the establishment of oil pollution contingency plans on ships and off-shore installations, and at ports

and oil handling facilities, together with national and regional contingency plans. From this point of view the Convention intended to establish a framework for international co-operation in responding to pollution emergencies. This co-operation will enable and facilitate the required mobilization of resources as quickly as possible when an incident involving a major oil spill occurs.

The Convention created and emphasised essential concepts related to the marine environmental pollution response as follows:

1-The port authorities, masters of ships and others will be required to report pollution incidents without delay, and if the incident is serious, other states likely to be affected must be informed and all details of the incident should be sent to IMO.

2-The OPRC promotes and encourages the establishment of national and regional systems for responding to pollution incidents. These systems should include features, such as a national contingency plan, the pre-positioning of the oil spill combating equipment, and exercises in dealing with spills.

3-The cornerstone of the Convention is the International co-operation. Parties to the convention agree to co-operate and provide advisory services, technical support and equipment at request of the other Parties.

4-The financing of the costs involved in the operations of combating are also dealt with in an Annex to the Convention.

5-Research and development is also involved in the Convention, as for the development of the standards for oil combating techniques and equipment.

6-Technical co-operation in training and advisory services are prompted by the Convention.

7-The Convention encourages the establishment of a comprehensive training programme by IMO in co-operation with governments and oil and shipping industries, to draw up a plan for the development of oil spill combating equipment stockpiles.



### ***6.1.1.1 Observations and analysis***

The OPRC 1990 Convention was a reaction of the maritime community to major maritime incidents involving marine oil pollution, trying to set out the main principles of integrating international efforts and resources to combat pollution in cases of these incidents. Although the major maritime incidents are responsible for only a small percentage of the oil that is spilled, pumped or leaked into the world's oceans annually, about 5 % (IMO 1990), major tanker incidents are dramatic, high profile and newsworthy events. These maritime incidents involving oil spills cause great impacts on the marine environment.

The intensive media coverage of maritime disasters has an impact on the public opinion and thereby the politicians. They react by creating new national legislation and by co-operating in establishing international regulations. The international maritime community realised that it is impossible for any country alone to be able to respond effectively to these major marine oil spills. From this point of view, the international maritime conventions introduced the framework for co-operation in combating major oil pollution incidents by national and regional contingency plans.

OPRC 1990 is an important Convention for seafarers, and consequently for cadets. The Convention provides requirements for reporting pollution incidents without delay by ship masters. It encourages also the establishment of oil pollution contingency plans on ships and off-shore installations and oil handling facilities. Since all these tasks and responsibilities of reporting procedures in cases of oil spills and the principles of implementing and applying shipboard oil spill contingency plans are mainly mandated to seafarers, they should be aware of the principles of the convention, which comprises such requirements. These are the main reasons for including the OPRC 1990 Convention in the proposed curricula of marine environmental protection for MBSP at the AAST&MT. The Convention also enables cadets to realize how tragic and dramatic major incidents involving oil spills are, involving tremendous international efforts, resources and co-operation for response and combating.

### ***6.1.2 The International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 (INTERVENTION 1969)***

The Convention belongs to the “curative regulations”, which are the regulations dealing with a situation of an oil or hazardous substance spill accident. It is one of the conventions which should be included in the proposed curricula for cadets to realize the international efforts, resources, co-operation and co-ordination needed in such incidents to imagine how disastrous and tragic such incidents are.

The Convention was adopted, by a Conference held in Brussels on 29 November 1969, as a result of the doubts revealed by the Torrey Canyon disaster in 1967, concerning the powers of the coastal states under international law in respect of incidents on the high seas, and entered into force on 6 May 1975. The Convention affirms the right of a coastal state to take measures on the high seas to protect its territory from pollution where a casualty threatened that state with oil pollution. The coastal state is empowered to take only such action as is necessary, and after due consultation with appropriate interests, particularly the flag states.

The coastal state which takes measures beyond those permitted under the Convention is liable to pay compensation for the damage caused by such measures. There is a provision for the settlement of the disputes arising with the application of the Convention. The protocol, which was adopted on 2 November 1973 and entered into force on 30 March 1980, extends the application of the Convention to substances other than oil. The amendments adopted on 4 July 1991, revised the list of substances drawn up in 1974, to assist the application of the 1973 Protocol.

#### ***6.1.2.1 Observations***

The Convention mainly deals with powers of the coastal states to intervene on the high seas in cases of oil pollution and hazardous substances casualties, which is not closely related to the responsibilities of seafarers. Nevertheless, it was reviewed to show the complete picture of the marine pollution problem, including the maritime incidents involving marine oil pollution, and to what extent they are tragic and

require involvement of international co-ordination in response and combating operations, especially when they happen on the high seas but still threat or are likely to threat coastal states.

## ***6.2 International Regulations of Liability and Compensation in Cases of Oil Pollution Damage***

### ***6.2.1 Torrey Canyon Disaster and its Consequences***

In March 1967 the oil tanker Torrey Canyon went aground off the southwest coast of England, spilling some 80,000 tonnes of crude oil, which spread along British and French coasts. The subsequent investigation found that the grounding was caused solely by human error of the master. The oil was released subsequent to the initial grounding and after the vessel had been bombed to sink.

The total clean-up costs amounted to US\$ 75 million, and the damage claims in Great Britain amounted to GBP 6 million and to FRF 40 million in France. The accident enjoyed wide media coverage and influenced public policy. It resulted in relatively rapid action by various governments as well as by several international organizations. This action was in the form of issuing several conventions, following the subsequent debates at IMO, which was at that time the Intergovernmental Maritime Consultative Organization (IMCO), like the INTERVENTION 1969, the International Convention on Civil Liability for Oil Pollution Damage (CLC 1969), and the International Convention on the Establishment of an International Fund for Oil Pollution Damage (FUND 1971).

At the same time, debates within the shipping and oil industry resulted in the Tanker Owners' Voluntary Agreement Concerning Liability for Oil Pollution in 1969 (TOVALOP), and the Contract Regarding an Interim Supplement to Tanker liability for Oil Pollution in 1971 (CRISTAL).

### ***6.2.2 The International Convention on Civil Liability for Oil Pollution Damage (CLC 1969)***

The Convention was adopted with the main objectives of facilitating the recovery of compensation for oil pollution damage against the polluting vessel. The Convention most significantly changed the traditional damage liability base from one of proven fault or negligence to one of strict liability, which means the shipowner is strictly liable up to a limit ceiling irrespective of whether the fault or negligence was proven or not.

The Convention introduced a system of certification, making pollution damage insurance basically compulsory and giving a right of direct action against the insurer if the shipowner did not pay. The CLC 1969 Convention entered into force on 19 June 1975. It covers seagoing vessels of any type carrying oil in bulk as cargo, while vessels in ballast were not covered until the changes applied by the 1992 Protocol. CLC also covered the persistent oil only and not the dirty ballast and other polluting substances.

The damages covered by CLC are those resulting from the escape or discharge of oil as well as the costs of preventive measures to mitigate damage. The important point to notice is that the CLC covers pollution damage occurring in the territory or territorial sea of a contracting state. It does not cover pollution from a vessel flying a flag of a contracting state or oil cargo belonging to a contracting state.

Claims are to be put forward in the courts of contracting states where damage has occurred. Liability can be limited to approximately US\$160 per ton of the ship's tonnage up to a ceiling of USD16.8 million, which was increased by the amending protocols, as shown in 4.8.6. The coverage is provided by the vessel's P&I club. If a claimant can prove that the accident occurred as a result of personal fault i.e. the "actual fault or privity" of the owner, the latter will be deprived of the right to limit his liability.

### ***6.2.3 The Tanker Owner's Voluntary Agreement Concerning Liability for Oil Pollution (TOVALOP)***

The tanker shipping industry responded to the demands for a better compensation regime for marine pollution damage by developing the voluntary industry scheme TOVALOP in 1969. The scheme was set up at the same time as the CLC to provide benefits comparable to those available under the CLC in states which had not ratified it, and due to the feeling that the CLC would take considerable time to enter into force. It is a privately administered scheme which provides its members with limited coverage for oil pollution claims. The compensation provisions cover not only actual damage, but also costs incurred in mitigation and removal which are not covered by CLC, and the basis of liability is strict.

The right of limitation of liability of the shipowner is absolute under TOVALOP irrespective of the fact that the shipowner's fault and privity contributed to the incident. The amount of liability is the same as CLC. Tankers whether loaded or in ballast are included, but only persistent oils are included. The shipowner's liability under TOVALOP is often, but not necessarily, covered by his P&I insurance like the CLC. Claims against the scheme must be brought directly against the vessel owner. Disputes are handled by the International Chamber of Commerce by arbitration procedure. TOVALOP was intended to be an interim solution and to remain in operation only until the CLC had world-wide application. In 1987 a supplement was added to the agreement which applies only to incidents where the tanker is carrying a cargo owned by a party to CRISTAL.

### ***6.2.4 The International Convention on the Establishment of an International Fund for Oil Pollution Damage (FUND Convention 1971)***

At the Inter-governmental Maritime Consultative Organization (IMCO) it was decided that a supplementary convention to the CLC was needed. Even before the CLC entered into force in 1975, marine insurers and underwriters realized that for very large-scale pollution incidents the CLC limits might be inadequate. As a result,

in 1971, a supplementary convention, FUND 1971, was concluded. The FUND Convention extended considerably the CLC limits, particularly for significant shipping disasters. The FUND Convention established a regime for compensating victims when the compensation under the CLC Convention is inadequate, or when the case falls within one of the exceptions of defences under the CLC, such as incidents due to natural disasters, sabotage by a third party and negligence by public authorities.

The International Oil Pollution Compensation Fund (IOPC Fund) was set up under the FUND Convention when it entered into force in 1978. The IOPC Fund is financed from levies on the import of oil in contracting states. Only oil carried in bulk by vessels is covered. Parties to the FUND Convention must also be parties to the CLC, and the flag state of the vessel which caused the damage, must also be a party to the FUND. Amount of liability is maximum of US\$54 million, aggregated with CLC compensation (if any). The FUND Assembly can decide to increase this limit to US\$72 million. These values have been increased by the amending protocols, as shown in 6.2.6.

#### ***6.2.5 The Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL 1971)***

Once again, the oil industry realized that the FUND Convention would take a long time to enter into force, so it was decided to provide an additional voluntary interim agreement. This time the major international oil companies introduced a new scheme entitled CRISTAL, which commenced in 1971. Like the FUND Convention, it extended the oil pollution liability ceiling considerably. Coverage under CRISTAL is applied to members who own the oil cargo, provided it is carried on vessels covered by TOVALOP. Actual pollution damage, as well as the removal of a “threat” is covered. The amount of liability up to US\$36 million aggregated with all other sources of compensation can be increased to US\$72 million, which was increased when the voluntary schemes were revised.

Due to inflationary pressure which made the TOVALOP and CLC limits too low, CRISTAL has become a supplementary scheme to the other international pollution compensation schemes, which have caused friction between the oil and vessel sectors of the shipping industry. CRISTAL does not apply to incidents which are covered under the FUND. It is specifically a supplementary scheme which begins operation when other regimes, such as the CLC and TOVALOP are inadequate. If the limits of the TOVALOP supplement are exceeded, a claim against CRISTAL may be made.

#### ***6.2.6 Revision of the CLC and FUND Conventions***

Each of the two conventions has been revised by 3 protocols, 1976, 1984, and 1992 protocols as follows:

-The 1976 Protocols, which established that the Poincare Francs values set out in the conventions should be replaced by the Special Drawing Rights (SDRs) of the International Monetary Fund (IMF). The protocol entered into force in 1981.

-The 1984 Protocols, which provided higher limits of compensation and a wider scope of application than the conventions in their original version. The two protocols did not enter into force.

-The 1992 Protocols, which insures the viability of the future of the system of compensation established by these conventions has provided the following key changes:

-**Special liability limit** for owners of small vessels and substantial increase in the **limitation amounts**. The revised limits changed as follows:

(a) for a ship not exceeding 5,000 units of gross tonnage, US\$4.7 million; (b) for a ship with a tonnage between 5,000 and 140, 000 units of gross tonnage, US\$4.7 million plus US\$655 for each additional unit of tonnage; and (c) for a ship of 14,000 units of gross tonnage or over, US\$93 million.

-**Increase in the limit of compensation payable by the IOPC Fund** to US\$210 million including the compensation payable by the shipowner under the 1992

Protocol to CLC. This limitation would be increased automatically, under certain conditions, to US\$312 million.

-A simplified procedure for increasing the limitation amounts in the two conventions.

-**Extended geographical scope** of application of the conventions to include the EEZ.

-Pollution damage caused by spills of persistent oil from **unladen tankers** will be covered.

-Expenses incurred for preventive measures recoverable even when **no spill** occurs, provided that there was a **grave and imminent danger** of pollution damage.

-New definition of pollution damage retaining the basic wording of the present definition with the addition of phrases to clarify that, for environmental damage, only costs incurred for reasonable measures to reinstate the contaminated environment are included in the concept of pollution damage.

The 1992 Protocol to the CLC and the FUND Convention entered into force on 30 May 1996 in respect of the following states: Denmark, France, Germany, Japan, Mexico, Norway, Oman, Sweden, and the United Kingdom. The Protocol to the CLC only entered into force on that day in respect of Egypt.

#### ***6.2.7 Revision of the Industry Voluntary Schemes***

The Industry Voluntary Schemes have been revised several times. The limits of the compensation under the TOVALOP Supplement are the same as those in the 1992 protocol of CLC. The maximum compensation payable under revised CRISTAL reached US\$187 million.

In November 1995 the Boards of Directors of the International Tanker Owners Pollution Federation Limited (ITOPF-the company which administers TOVALOP) and of CRISTAL Limited (The company which administers CRISTAL) decided that the voluntary agreements would not be renewed when their terms ended on 20 February 1997. The directors considered that the continued existence of the voluntary agreements could slow progress by acting as a disincentive to states which had not yet ratified the 1992 protocols.



### **6.2.8 Observations**

The standard of awareness of the liability and compensation conventions and voluntary industry schemes for cadets in the MBSP at the AAST&MT was only 29 % as indicated by the results analysis of question number 10 of the questionnaire, the results of which are included in Chapter 2 of this dissertation. The conventions and voluntary industry schemes related to liability and compensation of oil pollution damage are important for seafarers to have an overview of their outline. This is to recognize the amounts of money involved in such oil spills and how disastrous and tragic these incidents would be. It is also to be aware of how the damages are compensated, how the costs of combating are recovered, and how the claims are paid in cases of major maritime incidents involving oil spill.

If cadets realize these facts, it is an essential incentive factor for them to promote and develop their information and skills in marine pollution prevention to avoid both operational and accidental marine oil pollution. An overview and general information of the regulations concerning liability and compensation for oil pollution damage should be included in the proposed curricula of marine environmental protection to achieve these purposes.

It is worth mentioning that, based on the successful model of the oil pollution regime established under the CLC and FUND Conventions, the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea 1996 (HNS Convention) was concluded in May 1996 following a three-week conference held under the auspices of IMO in London. HNS Convention provides for a two-tier liability and compensation regime entailing strict but limited liability for the shipowner "the first tier" and a fund financed by cargo interests for claims which exceed the shipowner's liability "the second tier or HNS Fund".

## **CHAPTER 7**

### ***Marine Pollution and the Law of the Sea - Comprehensive Perspective***

#### ***The United Nations Convention on the Law of the Sea, 1982 (UNCLOS 1982) and Marine Environmental Protection Regulations***

UNCLOS 1982 is a very important and fundamental instrument to be included in the maritime education and training curricula. It is the convention which determines the limits of the sovereign rights of the flag states, coastal states and port states and the concept of the jurisdiction and obligation of each of them in enforcing national and international environmental legislation. Therefore, it is a comprehensive convention providing the legal framework for enforcing international and national environmental law, among many other issues not necessarily related to the environment.

#### ***7.1 Background***

In April, 1958 the United Nations adopted four conventions to deal with the law of the sea, through a conference convened under the name of the United Nations Conference on the Law of the Sea (UNCLOS I). The four conventions are Convention on the Territorial Sea and Contiguous Zone, Convention on the Continental Shelf, Convention on the High Seas and Convention on the Fishing and Conservation of the Living resources of the High Seas.

Although it was an important step to start to put traditional maritime law in a codified form of legal instruments, the four conventions could not deal with certain essential issues, particularly, the breadth of the territorial sea or the limits of the

continental shelf. They were ratified by a small number of maritime states without the participation of many of the newly emerging developing maritime countries. In 1960 the United Nations convened the second Conference on the Law of the Sea (UNCLOS II) to deal with the problems left by UNCLOS I, but it could not cover all the existing problems or the emerging changes of the maritime world. Consequently, there was a need for UNCLOS III, due to the new redistribution of the main maritime nations, and emerging new technologies to introduce solutions of many problems associated with a number of new uses of the sea.

The UNCLOS III was convened in April 1982 and resulted in the United Nations Convention on the Law of the Sea (UNCLOS 1982), which entered into force on 16 November 1994. The Convention was exposed to contradictory opinions from some developed countries related to Part XI, concerning the “Area”, which is defined as the seabed and subsoil of the sea floor.

## ***7.2 UNCLOS 1982 and Marine Pollution***

UNCLOS has established many innovative components, embodying new concepts, creating new laws and establishing new institutions. The innovative components are constitutive building blocks of the Convention. The Convention includes 17 Parts comprising 320 Articles.

### ***7.2.1 Protection and Preservation of the Marine Environment***

Part XII contains the existing, binding, enforceable, global and comprehensive environmental law, which comes under the title of ‘Protection and Preservation of the Marine Environment’. In this part the Convention covers all sources of pollution, oceanic, land-based and atmospheric and provides the legal framework and enforcement mechanisms for the global environmental laws. It is mainly dependant, in this part, on IMO and UNEP initiated conventions.

### ***7.2.2 Pollution from Vessels***

Part XIII contains 11 Sections, and under Section 5, Article 211 'pollution from vessels', the Convention emphasises the role of IMO, which is mentioned as the Competent International Organization, in establishing global rules and standards. It also indicates that states should adopt and issue their national legislation in compliance with the global standards to prevent, reduce, and control pollution of the marine environment from vessels flying their flags. It also gives the coastal states sovereign rights within the territorial sea to adopt laws and regulations concerning the same goals but with respect to foreign ships. Coastal states, in respect of their EEZ, can adopt, for the purpose of enforcement, laws and regulations for the prevention, reduction and control of marine pollution from foreign vessels. The Article emphasised the notification of coastal states, whose coastline may be affected by incidents.

### ***7.2.3 Enforcement by Flag States***

Under Part XIII, Section 6, Article 217, 'Enforcement by Flag States', the Convention indicates that flag states ensure compliance of the vessels flying their flag with international rules and standards of IMO, and national laws and regulations adopted in accordance with UNCLOS for the prevention, reduction and control of pollution of the marine environment from vessels. Flag states shall provide for the effective enforcement of such rules, standards, laws and regulations, irrespective of where a violation occurs.

Flag states can prohibit vessels flying their flag from sailing until they are in compliance with the requirements of international rules and standards. Flag states ensure that vessels flying their flags are carrying on board certificates required by and issued pursuant to international rules and standards. Flag states conduct investigations when violation is committed by a vessel flying its flag. Flag states have to conduct an investigation, on a request of any state, of any violation committed by vessels flying their flag.

#### ***7.2.4 Enforcement by Port States***

Article 218, 'Enforcement by Port States', determines that the port state has the right to carry out investigations, when a vessel is "voluntary" within a port of the state, and institute proceedings, if there is clear evidence, in respect of any discharge from that vessel inside the internal waters, territorial sea or EEZ of that state in violation of applicable international rules.

#### ***7.2.5 Enforcement by Coastal States***

Article 220, 'Enforcement by Coastal States', determines the right of the coastal state to conduct physical inspections of a vessel, where there are clear grounds for believing that this vessel violated laws and regulations of that state adopted in accordance with UNCLOS or applicable international rules and standards for the prevention, reduction and control of pollution from vessels, when navigating in the territorial sea of that state.

If a vessel has committed a violation of international or national pollution prevention regulations in the EEZ of a coastal state, that state has the right to ask the vessel for information regarding its identity and port of registry, its last and next port of call and relevant information required to establish whether a violation has occurred. If the vessel refuses to give the required information, this gives that coastal state the right to carry out physical inspection of the vessel for matters relating to the violation.

If the violation resulted in a discharge causing major damage or threat of major damage to the coastline or related interests of the coastal state, or to any resources of its territorial sea or EEZ, that state has the right, provided that the evidence so warrants, to institute proceedings, including detention of the vessel, in accordance with its laws.

### ***7.2.6 Measures Relating to Seaworthiness of Vessels to Avoid Pollution***

Article 219 gives the right to the port state to take administrative measures to prevent a vessel from sailing, if ascertained that the vessel within one of its ports is in violation of applicable international rules and standards relating to seaworthiness of vessels and thereby threatens damage to the marine environment.

### ***7.2.7 Measures to Avoid Pollution Arising from Maritime Casualties***

Article 221, 'Measures to avoid pollution arising from maritime casualties', gives the right to the coastal state to enforce measures beyond the territorial sea proportionate to the actual or threatened damage to protect its coastline or related interests from pollution or threat of pollution following a maritime casualty.

### ***7.3 Observations and analysis***

The above review of the regulations and provisions of UNCLOS 1982, relevant to marine pollution, shows the importance and relevance of the application of the Convention to seafarers and consequently to cadets. The review shows that it is the only comprehensive convention which has paid close attention to marine pollution among many other problems and conflicts facing the marine environment uses and utilization.

From the international legal point of view, UNCLOS 1982 covers all sources of pollution, all enforceable global environmental legislation and measures and proceedings to be taken by all parties involved to implement enforcement. Determining the sovereign rights and the concept of jurisdiction and obligation in enforcing national and international environmental laws are the main features of the Convention with respect to marine pollution prevention.

It is important to notice that when MARPOL 73/78 provides the requirements for control of operational pollution, it gives the restrictions for control of discharge of oil where the distances mentioned are related to the nearest land. The definition of the nearest land in MARPOL 73/78 is: the term "from nearest land" which means from

the baseline from which the territorial sea of the territory in question is established in accordance with international law. The international law in this definition is a general term, but it is accepted to mean UNCLOS 1982, which gave a precise definition and description of the baseline.

This indicates the importance of UNCLOS 1982 for seafarers and consequently cadets in applying the marine pollution prevention rules and regulations standards. Nevertheless, the baseline does not appear on the navigational charts, which means that seafarers would apply the rules of MARPOL 73/78 concerning control of discharge of oil with respect to distances only approximately or they may even measure the distances from the coastline, which is a common error.

When the main provisions of marine environmental protection of UNCLOS 1982 are included in the proposed curricula for MBSP at the AAST&MT, cadets will be able to recognize the legal framework of application of environmental law and the limits of sovereign rights of states and the concept of jurisdiction and obligation in enforcing such law.

## **CHAPTER 8**

### ***Constructing Syllabuses of Marine Environmental Protection Curricula for MBSP, Nautical Branch, at the AAST&MT.***

#### ***8.1 Preparation Considerations***

During the preparation procedures for constructing syllabuses of marine environmental protection curricula for the MBSP, nautical branch, at the AAST&MT, the following main considerations were taken into account:

1- The syllabuses were prepared focusing on the deficiencies in the subject areas of marine environmental protection in the courses of the MBSP, nautical branch, at the AAST&MT. These deficiencies were identified as a result of curricular system examination and review in Chapter 2, in 2.2.4. These deficiencies include impacts of marine pollution problems, practical operational requirements of MARPOL 73/78, international regulations concerning marine environmental protection, liability and compensation for oil pollution damage.

2- During the preparation procedures, the observations on the levels of marine environmental protection awareness of the graduates of the MBSP, nautical branch, at the AAST&MT, were always taken into account. The details of these observations are given in Chapter 2, in 2.2.5. These observations indicate a low standards of awareness in the subject areas of impacts of marine pollution, background of the international regulations concerning marine pollution prevention, essential causes or factors behind maritime casualties, liability and compensation conventions and industry voluntary schemes in cases of oil pollution damage.



3- Recalling the rules and regulations of the revised STCW 1978, as amended in 1995, was essential during the preparation procedures, focusing on the knowledge and competence standard requirements for prospective officers with respect to marine pollution prevention. These standard requirements are indicated in this document in Chapter 3, in 3.3.

4- The syllabuses were prepared bearing in mind that following the same approach of the IMO model courses and the Guidance on the Implementation of IMO Model Courses would facilitate the beneficial use of the curricula. This approach is indicated in Chapter 4, in 4.3. The IMO model courses were consulted in constructing the syllabuses on basis of learning objectives. Consequently, the marine pollution prevention syllabuses, for the MBSP, nautical branch, at the AAST&MT, have been constructed in a learning objective format to facilitate the development of the curricula in a standard and easy form, which can be beneficial for the teaching staff.

5- Emphasising the role of the human factor in marine environmental protection was taken into consideration through developing a high level of marine environmental awareness and consciousness for seafarers starting with the baseline stage of the maritime education and training process (promoting a marine environmental protection culture).

6- It was taken into consideration that, with respect to marine pollution, the preventive and mitigating regulations are more related to seafarers than the curative and response regulations or even liability and compensation principles. The criteria of relevance and importance of the different subject areas of marine pollution prevention to seafarers was taken into account in dividing the teaching hours dedicated to marine environmental protection courses as indicated in this Chapter in 8.6 and Table 8.5.

7- Addressing the role of practical training on the operational requirements of international regulations concerning marine pollution prevention and marine environmental protection has been emphasised. Consequently, illustrating, practically, the restrictions of MARPOL 73/78 on the discharge of oil, noxious liquid substances and wastes into the sea were taken into account.

8- Following the same academic regulations of the AAST&MT in applying the Credit Hour System when constructing the syllabuses of the marine environmental protection courses was necessary. Courses are also given codes on the same principles followed in the AAST&MT to be included in the Annual Educational Catalogue. The Credit Hour System, academic regulations and the principles of giving codes to the courses are illustrated in Appendix I of this document.

***8.2 Preliminary Course of Marine Environmental Protection Awareness  
(Code ND 101, 16 teaching hours, 0.5 credit hours)***

***8.2.1 Course Framework***

***8.2.1.1 Subject Area:*** Introduction to marine environmental protection.

***8.2.1.2 Scope:*** The course is intended for the students of the MBSP, nautical branch, in the first semester.

The course covers the introductory information to the marine environment and ecosystems. It provides baseline information about marine pollution sources and impacts. The course covers also the competence standard requirements of international regulations for prospective officers with respect to marine pollution prevention as part of the comprehensive policy of IMO for marine environmental protection.

***8.2.1.3 Objectives:*** To provide and develop basic marine environmental awareness and consciousness for cadets of the MBSP. To determine and illustrate clearly and

precisely the basic competence standard requirements of international regulations for prospective officers concerning marine environmental protection.

**8.2.1.4 Prerequisite:** None.

**8.2.1.5 Staff Requirements:** The teaching staff responsible for the course should acquire the ability, experience and qualifications concerning marine environment and marine pollution. It is also important to acquire full knowledge and experience about the STCW Convention requirements and marine environmental protection requirements of the ISM Code.

### **8.2.2 Summarised Teaching Syllabus.**

All objectives are understood to be prefixed by the words “ The expected learning outcome is that the trainee is able to -----.”

**8.2.2.1 Training Area 1:** Marine environment and marine pollution.

**8.2.2.1.1. Area General Objectives:** Acquire baseline information related to the basic constituents and benefits of the marine environment, ecosystems, and sources and impacts of marine environmental pollution.

**8.2.2.1.2 Learning Objectives:**

- 1- Recognise the meaning, components and functions of the marine ecosystems.
- 2- Explain the non-living characteristics of the marine environment.
- 3- Illustrate the meaning, benefits and functions of the marine biodiversity.
- 4- Explain the meaning of the unity of the oceans, and that resources and pollution do not recognise boundaries.
- 5- Define marine pollution in comparison with marine contamination.
- 6- State the main marine pollutants and their percentage of the annual contribution to the total global marine pollution.
- 7- Illustrate the main marine pollutant sources.
- 8- Illustrate the main marine pollutant impacts.

### **8.2.2.2 Training Area 2: The Objectives of IMO**

**8.2.2.2.1 Area General Objectives:** Recognise that marine pollution prevention is a world-wide common interest expressed in one of the main objectives of IMO which is one of the specialised agencies of the United Nations concerning maritime affairs, safety of ships and marine environmental protection.

#### **8.2.2.2.2 Learning Objectives:**

- 1- Explains the outline of the main objectives of IMO.
- 2- Illustrate that adoption of the highest practicable standards in prevention and control of marine pollution from ships is one of the main objectives of IMO.
- 3- Recognise that the MEPC is the committee empowered to deal with matters related to prevention and control of pollution from ships.
- 4- Recognise that IMO objectives can not be achieved by issuing international regulations only, but by implementing these regulations through the human factor.
- 5- Mention international regulations issued by IMO concerning marine pollution prevention.

### **8.2.2.3 Training Area 3: The revised STCW Convention 1978, as amended 1995 and requirements of marine pollution prevention.**

**8.2.2.3.1 Area General Objectives:** Recognise and understand the knowledge and competence standard requirements of international regulations for prospective officers with respect to marine pollution prevention.

#### **8.2.2.3.2 Learning Objectives:**

- 1- Illustrate the framework of the revised STCW Convention 1978, as amended in 1995.
- 2- Explain the minimum competence standard requirements for officers in charge of a navigational watch focusing on marine pollution prevention responsibilities.
- 3- Illustrate and explain requirements of Regulation II/1 of the STCW Convention,

Section A-II/1 and Table A-II/1 of the STCW Code concerning marine pollution prevention.

- 4- Illustrate the role of the shipping companies in implementing the STCW Convention requirements.
- 5- Illustrate that protection of the marine environment is one of the main watchkeeping requirements(Section A-VIII/2 Part 3-11).
- 6- Identify that awareness of the serious effects of operational and accidental pollution is essential for masters, officers and ratings.(Section A-VIII/2 Part 3-11 of the STCW Code.)
- 7- State that the Convention gives the right to port states to control and assess the competence of seafarers with respect to safety and marine pollution prevention.

**8.2.2.4 Training Area 4:** ISM Code and the marine environmental protection requirements.

**8.2.2.4.1 Area General Objective:** Recognise that avoidance of damage to the marine environment is one of the main objectives of the ISM Code and one of the functional requirements for a Safety Management System (SMS).

**8.2.2.4.2 Learning Objectives:**

- 1- State the main principles of the objectives of the ISM Code.
- 2- Illustrate that one of the main objectives of the ISM Code is marine environmental protection.
- 3- Specify the responsibilities of the shipping companies including preparation for emergencies involving threats to the marine environment.
- 4- State that an SMS is an obligation of the ISM Code for every shipping company and on board ships.
- 5- State that one of the functional requirements of the SMS is a safety and environmental protection policy.
- 6- Illustrate the requirement to develop instructions and procedures by shipping

companies to insure protection of the marine environment in compliance with relevant international and flag state legislation.

- 7- State that a Safety Management Certificate should be issued by the administration to every ship.

### **8.2.3 Course of Preliminary Marine Environmental Protection Awareness**

#### **Syllabus Outline and Timetable**

<b>Course (Code ND 101, 16 teaching hours, 0.5 credit hours)</b>					
<b>Syllabus Outline and Timetable (Time indicated in hours)</b>					
<b>Training Area</b>	<b>Th.L</b>	<b>Dis.</b>	<b>A/V</b>	<b>P.T.</b>	<b>T.T.D</b>
<b>1- Marine environment and marine pollution.</b>	<b>7.0</b>	<b>1.0</b>	<b>1.0</b>	<b>-</b>	<b>9.0</b>
<b>2- Objectives of IMO.</b>	<b>1.5</b>	<b>0.5</b>	<b>-</b>	<b>-</b>	<b>2.0</b>
<b>3- The Revised STCW 1978, as amended in 1995 and competence standard requirements of marine pollution prevention.</b>	<b>2.0</b>	<b>1.0</b>	<b>-</b>	<b>-</b>	<b>3.0</b>
<b>4- ISM Code and marine environmental protection requirements.</b>	<b>1.5</b>	<b>0.5</b>	<b>-</b>	<b>-</b>	<b>2</b>
<b>Total Time</b>	<b>12</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>16</b>

**Table 8.1**

**Key Words:** (Th.L) Theoretical Lectures, (Dis) Discussion, (A/V) Audio Visual, (P.T) Practical Training, (T.T.D) Total Time Dedicated.

The course ND 101 comprises 16 teaching hours, constituting 0.5 credit hours to be taken in the 16 weeks of the first semester, on a basis of one hour per week.

**8.3 An Overview of International Legal and Technical Regulations of Marine  
Pollution Prevention, Mitigation, Control and Combating  
Course (Code ND 102, 16 teaching hours, 0.5 credit hours)**

**8.3.1 Course Framework**

**8.3.1.1 Subject Area:** Marine pollution and international regulations.

**8.3.1.2 Scope:** The course is intended for the students of the MBSP, nautical branch, at the AAST&MT in the second semester. The course comprises the principal conventions covering the legal and technical regulations of prevention, mitigation and combating of marine pollution.

**8.3.1.3 Objectives:** To establish a summarised comprehensive legal and technical background of international regulations controlling marine pollution prevention, mitigation and combating for cadets of the MBSP.

**8.3.1.4 Prerequisite:** Course (ND 101).

**8.3.1.5 Staff Requirements:** The teaching staff responsible for the course should be properly qualified and acquire experience in teaching the international regulations especially those concerning marine pollution prevention, mitigation and combating.

**8.3.2 Summarised Teaching Syllabus.**

All objectives are understood to be prefixed by the words: “ The expected learning outcome is that the trainee is able to -----”.

**8.3.2.1 Training Area 1:** Introduction and background of international marine environmental protection regulations.

**8.3.2.1.1 Area General Objectives:** Recognize the main principles of adoption, issuing and entering into force of international instruments. Realize the main principles of ratification and implementation of these instruments. Recognize the

the main international instruments concerning marine pollution.

**8.3.2.1.2 Learning Objectives:**

- 1- Explain the difference between conventions, resolutions, codes and recommendations.
- 2- Explain the procedures and meaning of adoption, issuing and entry into force of a convention.
- 3- Mention the steps and procedures of ratification of a convention.
- 4- Illustrate the measures of implementation of a convention.
- 5- State the names of the conventions concerning marine pollution prevention, mitigation and combating.

**8.3.2.2 Training Area 2: UNCLOS 1982 and marine pollution.**

**8.3.2.2.1 Area General Objectives:** Recognize the role of the UNCLOS 1982 in specifying the jurisdictions and obligations of flag states, port states and coastal states concerning protection and preservation of the marine environment.

**8.3.2.2.2 Learning Objectives:**

- 1- State briefly the steps of issuing UNCLOS 1982, and state the importance of UNCLOS 1982 to marine environmental protection.
- 2- Describe the outline of UNCLOS 1982, specifying the main items concerning marine pollution.
- 3- Explain the contents and concepts of Part XII 'Protection and Preservation of the Marine Environment'.
- 4- Explain the contents and concepts of Part XIII, Section 5. Article 211 'Pollution From Vessels'.
- 5- Explain the contents and concepts of Part XIII, Section 6, Article 217 'Enforcement by Flag States'.
- 6- Explain the contents and concepts of Part XIII, Section 6, Article 218 'Enforcement by Port States'.



- 7- Explain the contents and concepts of Part XIII, Section 6, Article 219 'Measures relating to seaworthiness of vessels to avoid pollution'
- 8- Explain the contents and concepts of Part XIII, Section 6, Article 20 'Enforcement by Coastal States'.
- 9- Illustrate the 'Measures to Avoid Pollution from Maritime Casualties' as indicated in Part XIII, Section 6, Article 221.

#### **8.3.2.3 Training Area 3: OILPOL 1954**

**8.3.2.3.1 Area General Objectives:** Recognise the evolution of the global maritime environmental pollution prevention rules, regulations and standards.

##### **8.3.2.3.2 Learning Objectives:**

- 1- Describe the outline and main concepts of the OILPOL 1954.
- 2- State the rules of prohibiting oil discharge from vessels.
- 3- State the concept of 'Prohibited Zone'.
- 4- Illustrate the concept of the Oil Record Book.
- 5- Illustrate measures to be taken when discovering violations.
- 6- State the OILPOL amendments.
- 7- State the rules and regulations which were incorporated in MARPOL 73.

#### **8.3.2.4 Training Area 4: INTERVENTION 1969.**

**8.3.2.4.1 Area General Objectives:** Recognise that oil pollution casualties can be serious and disastrous and require involvement of international co-ordination and co-operation in response and combating.

##### **8.3.2.4.2 Learning Objectives:**

- 1- Illustrate the reasons for adopting the Convention, relating to the Torrey Canyon disaster.
- 2- Explain that the Convention affirms the right of a coastal state to take measures on

the high seas to protect its territory from pollution where a casualty threatens that state with oil pollution.

- 3- State that the measures taken beyond those permitted by the convention will make the coastal state liable to pay compensation.
- 4- State the principles of the 1973 Protocol and the 1991 amendments to the convention.

#### **8.3.2.5 Training Area 5: LDC 1972 and the new Protocol of 1996.**

**8.3.2.5.1 Area General Objectives:** Recognise the new concepts of the environmental consciousness, and understand the change of the old perspective considering the sea as the appropriate disposal site of wastes.

##### **8.3.2.5.2 Learning Objectives:**

- 1- State the objectives and causes of adoption of the LDC 1972.
- 2- Describe an overview of the LDC 1972.
- 3- State the concepts of LDC 1972 amendments.
- 4- Explain the new concepts of the 1996 Protocol of LDC 1972.

#### **8.3.2.6 Training Area 6: MARPOL 73/78**

**8.3.2.6.1 Area General Objectives:** Recognise the importance, objectives and requirements of MARPOL 73/78. Understand the outline and main components of the Convention. Realise the main principles of the legal and technical operational requirements of the Convention.

##### **8.3.2.6.2 Learning Objectives:**

- 1- State the causes and steps of issuing and evolution of the Convention.
- 2- Describe the outline of the MARPOL Convention 1973 and its two protocols.
- 3- Explain the legal principles of MARPOL 73 Convention and its two protocols.
- 4- Illustrate the objectives of the Protocol of 1978 related to the Convention and its

main legal principles.

- 5- Explain the objectives and main legal principles of the five Annexes.
- 6- State the main definitions of the five Annexes.
- 7- Mention the main amendments to MARPOL 73/78.

#### **8.3.2.7 Training Area 7: OPRC 1990.**

**8.3.2.7.1 Area General Objectives:** Recognise the impacts of maritime casualties involving oil pollution, and realise the objectives of the Convention in promoting technical co-operation and advisory services in oil pollution combating. Understands the role of the Convention in encouraging the establishment of national, regional and onboard ships contingency plans for oil pollution combating.

#### **8.3.2.7.2 Learning Objectives:**

- 1- Illustrate that the Convention requires establishment of oil pollution contingency plans on ships and off-shore installations, at ports and oil handling facilities together with national and regional contingency plans.
- 2- State that quick and proper reporting of oil pollution incidents is required by the Convention.
- 3- State that the financing of the costs involved in the operations of combating are dealt with in an Annex to the Convention.
- 4- Illustrate that technical co-operation between party states in oil pollution combating is the corner stone of the Convention.
- 5- State that the Convention encourages establishment of training programmes by IMO in co-operation with party states and oil and shipping industries.

#### **8.3.2.8 Training Area 8: Oil Pollution Liability and Compensation.**

**8.3.2.8.1 Area General Objectives:** Recognise how disastrous and serious major maritime casualties involving oil spills can be, and realise the huge amounts of

money involved in such casualties. Understand how the damages are compensated, how the costs of combating are recovered, how the limits of liability are set and how the claims are paid in cases of maritime casualties involving oil spills.

**8.3.2.8.2 Learning Objectives:**

- 1- State the causes and purposes of establishment of the liability and compensation conventions and industry voluntary schemes.
- 2- Explain the main principles of CLC 1969 Convention, including conditions of application and liability limits according to the last amendments.
- 3- Explain the main principles of FUND Convention 1971, including conditions of application and liability limits according to the last amendments.
- 4- State the basic principles of the amendments and protocols of CLC 1969 and FUND 1971.
- 5- Illustrate the main basic principles of TOVALOP, including conditions of application and liability limits.
- 6- Illustrate the main basic principles of CRISTAL, including conditions of application and liability limits.
- 7- State the principles of TOVALOP and CRISTAL revisions.
- 8- State the cause of not renewing TOVALOP and CRISTAL voluntary agreements.

**8.3.2.9 Training Area 9: SALVAGE 1989 and the Marine Environmental Protection.**

**8.3.2.9.1 Area General Objectives:** Recognise the necessity of efficient and timely salvage operations. Realise the importance of a timely request for salvage by masters in distress situations and the role of efficient co-operation with salvors in protecting the marine environment. Understand the new concepts of SALVAGE 1989 and its positive impacts on the marine environment.

**8.3.2.9.2 Learning Objectives:**

- 1- Illustrate the need for efficient and timely salvage operations to help protecting the

marine environment.

- 2- Explain the importance of a timely request for salvage by master in distress situations and the role of co-operation with salvors in protecting the marine environment.
- 3- State the steps of evolution of salvage regulations.
- 4- State the old principles of awarding remuneration for a salvor.
- 5- Define '*Damage to the environment*' as stated in the SALVAGE 1989 Convention.
- 6- Explain the new criteria for fixing the salvage reward, set by the SALVAGE 1989 Convention.
- 7- Explain the new concept of '*Special Compensation*', set by the SALVAGE 1989 Convention.

#### **8.3.2.10 Training Area 10: Casualty Investigation.**

**8.3.2.10.1 Area General Objectives:** Recognise the importance of understanding the causes and circumstances of maritime casualties involving oil pollution and addressing the involvement of the human factor in such casualties. Realise the importance of experiences which can be gained through analysing casualty investigations.

#### **8.3.2.10.2 Learning Objectives:**

- 1- Understand the causes and circumstances of two of the major maritime casualties involving an oil spill. (Torrey Canyon, Amoco Cadiz, Exxon Valdez, Braer, Sea Princess or Sea Empress).
- 2- Explain the role of the human factor in these casualties.
- 3- Explain the precautions and measures to avoid repetition of such casualties.
- 4- Explain the importance of SOPEP, and the documented instructions of the SMS in emergency situations as indicated by the ISM Code.

**8.3.2.11 Training Area 11: National maritime legislation and marine pollution prevention.**

**8.3.2.11.1 Area General Objectives:** Recognise the importance of understanding national maritime legislation which governs maritime transport in the student's country. Realize the necessity of awareness of overview of the organisational structure of the maritime administration in the student's country.

**8.3.2.11.2 Learning Objectives:**

- 1- Explain the importance of understanding the national maritime legislation.
- 2- State the importance of having an overview of the organisational structure of the maritime administration, including the maritime safety administration, and specify the department responsible for marine pollution prevention.
- 3- State the importance of understanding the maritime education and training system in the student's country and to what extent the system emphasises marine environmental protection.
- 4- State the importance of understanding the system of inspections, surveys and issuing certificates related to MARPOL 73/78 in the student's country.
- 5- State the importance of realising the department responsible for implementing the international maritime regulations generally and marine pollution prevention regulations particularly.

**8.3.3 An overview of international legal and technical regulations of marine pollution prevention, mitigation, control and combating (ND 102)**

**Syllabus Outline and Timetable**

<b>Course (Code ND 102, 16 teaching hours, 0.5 credit hours)</b>					
<b>Syllabus Outline and Timetable ( Time indicated in hours)</b>					
<b>Training Area</b>	<b>Th.L.</b>	<b>Dis.</b>	<b>A/V</b>	<b>P.T.</b>	<b>T.T.D</b>
<b>1- Introduction and background.</b>	0.5	-	-	-	0.5
<b>2- UNCLOS 82 and the marine environmental protection.</b>	1.5	0.5	-	-	2.0
<b>3- OILPOL 1954.</b>	0.5	-	-	-	0.5
<b>4- INTERVENTION 1969.</b>	0.5	-	-	-	0.5
<b>5- LDC 1972.</b>	1.0	-	-	-	1.0
<b>6- MARPOL 73/78.</b>	2.0	1.0	0.5	-	3.5
<b>7- OPRC 1990.</b>	0.5	-	-	-	0.5
<b>8- Casualty investigation.</b>	2.0	0.5	0.5	-	3.0
<b>9- Oil pollution liability and compensation.</b>	1.5	0.5	-	-	2.0
<b>10- SALVAGE.</b>	1.0	0.5	-	-	1.5
<b>11- National maritime legislation and marine pollution prevention.</b>	1.0	-	-	-	1.0
<b>Total Time</b>	12.0	3.0	1.0	-	16.0

**Table 8.2**

**Key words:** (Th.L) Theoretical Lecture, (Dis.) Discussion, (A/V) Audio/Visual, (P.T.) Practical Training, (T.T.D) Total Time Dedicated.

The course ND 102 comprises 16 teaching hours constituting 0.5 credit hours to be taken in the 16 weeks of the second semester on a basis of one hour per week.

**8.4 Technical and Legal Operational Requirements of MARPOL 73/78**  
**Course (Code ND 203, 24 teaching hours, 1.0 credit hours).**

**8.4.1 Course Framework**

**8.4.1.1 Subject Area:** Operational Requirements of MARPOL 73/78.

**8.4.1.2 Scope:** The course is intended for students of the MBSP, nautical branch, at the AAST&MT in the third semester. The course covers the technical and legal operational requirements of MARPOL 73/78 that concerns seafarers. It covers also documents and certificate requirements of MARPOL 73/78.

**8.4.1.3 Objectives:** To provide and develop the principal legal and technical information required for prospective officers for achieving the operational requirements of MARPOL 73/78.

**8.4.1.4 Prerequisite:** Course (ND 102).

**8.4.1.5 Staff Requirements:** The teaching staff responsible for the course should acquire the ability, experience and qualifications concerning legal and technical operational requirements of MARPOL 73/78.

**8.4.2 Summarised Teaching Syllabus**

All objectives are understood to be prefixed by the words “ The expected learning outcome is that the trainee is able to-----”.

**8.4.2.1 Training Area 1:** An Overview of MARPOL 73/78.

**8.4.2.1.1 Area General Objective:** Recognise and understand the outline, objectives and importance of MARPOL 73/78 for seafarers. It is considered as a refreshing revision of Training Area 6 of Course ND 102.

**8.4.2.1.2 Learning Objectives:**

1- Illustrate that MARPOL 73 Convention comprises the legal framework of



application.

- 2- Explain the objectives and main requirements of the two Protocols of MARPOL .
- 3- Illustrate the concepts and legal principles of the Protocol of 78 related to MARPOL 73.
- 4- Explain the general objectives and outline of the five technical Annexes.
- 5- State the Guidelines, Codes, and other IMO publications relevant to MARPOL 73/78.

#### **8.4.2.2 Training Area 2:** Legal and technical operational requirements of Annex I.

**8.4.2.2.1 Area General Objectives:** Recognise and understand the purpose, importance and details of the legal and technical operational requirements of Annex I of MARPOL 73/78 that concern seafarers. Realize the importance of implementing the regulations of Annex I for protection of the marine environment.

#### **8.4.2.2.2 Learning Objectives:**

- 1- State the main definitions, rules of application, rules of surveys and inspections, rules of issuing certificates and form and duration of certificates under Annex I.
- 2- Explain requirements for control of operational pollution.
  - 2.1 Control of discharge of oil from oil tankers.
  - 2.2 Control of discharge of oil from machinery spaces bilges outside “Special Areas”.
  - 2.3 Control of discharge of oil within “Special Areas”.
- 3- Explain requirements for ship survey, certification, control of discharge, equipment and construction.
  - 3.1 For ships other than oil tankers of 400 gross tonnage and above.
  - 3.2 For oil tankers of 150 gross tonnage and above.
- 4- Explain the positive impacts of implementing regulations of Annex I of MARPOL 73/78 indicated by IMO and GESAMP statistics of the annual oil inputs to the marine environment.

#### **8.4.2.3 Training Area 3:** Legal and technical operational requirements of Annex II

**8.4.2.3.1 Area General Objectives:** Recognise and understand the purpose, importance and details of legal and technical operational requirements of Annex II of MARPOL 73/78 that concern seafarers. Realize the importance of implementing the regulations of Annex II for marine environmental protection.

##### **8.4.2.3.2 Learning Objectives:**

- 1- State the main definitions, rules of application, rules of categorisation of noxious liquid substances and rules of exceptions.
- 2- Explain rules of discharge of noxious liquid substances.
  - 2.1 Category A, B and C substances outside special areas and category D substances in all areas.
  - 2.2 Category A, B and C substances within special areas.
- 3- State ship design, construction and equipment requirements of Annex II.
- 4- Explain survey and certification requirements of Annex II.
- 5- State the records and documents requirements of Annex II.

#### **8.4.2.4 Training Area 4:** Legal and technical operational requirements of Annex III

**8.4.2.4.1 Area General Objectives:** Recognise and understand the purpose, importance and details of legal and technical operational requirements of Annex III of MARPOL 73/78 that concern seafarers. Realise the importance of implementing the regulations of Annex III for marine environmental protection.

##### **8.4.2.4.2 Learning Objectives:**

- 1- Illustrate the main legal and technical principles of Annex III regarding application, packing, marking, labelling, documentation, stowage, quantity limitations and exceptions.
- 2- Explain implementation of Annex III by means of the IMDG Code.
- 3- Extract, practically, requirements of packing, marking and labelling, stowage and

quantity limitation of certain harmful substances carried by sea in packaged forms, using the IMDG Code.

#### **8.4.2.5 Training Area 5: Legal and technical operational requirements of Annexes IV&V**

**8.4.2.5.1 Area General Objectives:** Recognize and understand the purpose importance and details of legal and technical operational requirements of Annexes IV&V of MARPOL 73/78 that concern Seafarers. Realize the importance of implementing the regulations of Annexes IV&V for marine environmental protection.

##### **8.4.2.5.2 Learning Objectives:**

- 1- State the definitions, rules of application, surveys, certificates, restrictions of discharge of sewage and exceptions of Annex IV.
- 2- Explain discharge conditions for sewage from ships.
- 3- Explain ship survey, certification, equipment and control of discharge requirements of Annex IV.
- 4- State definitions, rules of application, and exceptions of Annex V.
- 5- Explain restrictions on disposal of garbage.
- 6- Illustrate requirements of Annex V with respect to Garbage Record Book, Placards, inspections and certificates.

#### **8.4.2.6 Training Area 6: Requirements of SOPEP**

**8.4.2.6.1 Area General Objectives:** Recognise and understand the purpose, importance and details of the requirements of SOPEP.

##### **8.4.2.6.2 Learning Objectives:**

- 1- State that this plan is a requirement of Regulation 26 of MARPOL 73/78.
- 2- Explain factors relevant to the preparation of SOPEP.

- 3- State the main components of SOPEP.
- 4- Explain reporting procedures for oil pollution incidents.
- 5- Explain the actions to be taken by persons on board to reduce or control oil spill.
  - 5.1 In a case of an operational spill.
  - 5.2 In a case of a spill resulting from a casualty.

**8.4.2.7 Training Area 7:** Discussions and exercises.

**8.4.2.7.1 Area General Objectives:** Acquire the ability and skills of identifying and extracting the operational requirements of MARPOL 73/78 that can be applied to different ships in different circumstances.

**8.4.2.7.2 Learning Objectives:**

- 1- Solve exercises on different requirements of Annex I, including control of discharge of oil from different types of ships in different circumstances.
- 2- Solve exercises on different requirements of Annex II, including control of discharge of noxious liquid substances of different categories in different circumstances.
- 3- Solve exercises on different requirements of Annex III, including the use of the IMDG Code to extract requirements of packing, marking and labelling, documentation, stowage, and quantity limitations of certain harmful substances carried by sea in packaged forms.
- 4- Solve exercises on different requirements of Annex IV, including control of discharge of sewage in different circumstances.
- 5- Solve exercises on different requirements of Annex V, including control of garbage disposal into the sea in different circumstances.
- 6- Solve exercises on the procedures of preparation of SOPEP.
- 7- Illustrate that Regulations 8A, 15 and 8 of Annexes I, II and III respectively indicate that the ship when in a port or an offshore terminal of another party state is subject to inspection concerning operational requirements of MARPOL 73/78.

**8.4.3 Operational requirements of MARPOL 73/78 (ND 203)****Syllabus Outline and Timetable**

<b>Course (Code ND 203, 24 teaching hours, 1.0 credit hours)</b>					
<b>Syllabus Outline and Timetable (Time indicated in hours)</b>					
<b>Training Area</b>	<b>Th.L</b>	<b>Dis.&amp; Ex.</b>	<b>A/V</b>	<b>P.T.</b>	<b>T.T.D</b>
<b>1- An overview of MARPOL 73/78</b>	<b>2.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2.0</b>
<b>2- Legal and technical operational requirements of Annex I.</b>	<b>3.5</b>	<b>1.0</b>	<b>0.5</b>	<b>-</b>	<b>5.0</b>
<b>3- Legal and technical operational requirements of Annex II.</b>	<b>1.5</b>	<b>0.5</b>	<b>0.5</b>	<b>-</b>	<b>2.5</b>
<b>4- Legal and technical operational requirements of Annex III. (including IMDG Code)</b>	<b>2.5</b>	<b>0.5</b>	<b>0.5</b>	<b>-</b>	<b>3.5</b>
<b>5- Legal and technical operational requirements of Annex IV &amp; V.</b>	<b>1.5</b>	<b>0.5</b>	<b>-</b>	<b>-</b>	<b>2.0</b>
<b>6- Requirements of SOPEP.</b>	<b>2.0</b>	<b>1.5</b>	<b>-</b>	<b>-</b>	<b>3.5</b>
<b>7- Operational exercises.</b>	<b>2.5</b>	<b>3.0</b>	<b>-</b>	<b>-</b>	<b>5.5</b>
<b>Total Time</b>	<b>15.5</b>	<b>7.0</b>	<b>1.5</b>	<b>-</b>	<b>24.0</b>

**Table 8.3**

**Key words:** (Th.L) Theoretical lecture, (Dis.&Ex.) Discussion and Exercises, (A/V) Audio/Visual, (P.T.) Practical Training, (T.T.D) Total Time Dedicated.

The course ND 203 comprises 24 teaching hours constituting 1.0 credit hour to be taken in the 16 weeks of the third semester on a basis of 1.5 hour per week.

**8.5 Practical Operational Training of Oil Pollution Prevention and Response**  
**Course (Code ND 204, 16 teaching hours, 0.5 credit hours)**

**8.5.1 Course Framework**

**8.5.1.1 Subject Area:** Practical training on oil pollution prevention and response.

**8.5.1.2 Scope:** The course is intended for the students of the MBSP, nautical branch, at the AAST&MT in the fourth semester. The course covers, practically, the operational requirements of MARPOL 73/78, and practical exercises on oil spill response.

**8.5.1.3 Objectives:** To provide and develop high standards of practical operational skills of oil pollution prevention and response measures and procedures for prospective officers as required by international regulations.

**8.5.1.4 Prerequisite:** Course (ND 203).

**8.5.1.5 Staff Requirements:** The teaching staff should acquire ability, experience and qualifications concerning the practical operational requirements of international regulations concerning oil pollution prevention and response in general, and MARPOL 73/78 in particular.

**8.5.2 Summarised Teaching Syllabus.**

All objectives are understood to be prefixed by the words: " The expected learning outcome is that the trainee is able to -----".

**8.5.2.1 Training Area 1:** A Field study trip to the specialised training ship AIDA IV.

**8.5.2.1.1 Area General Objectives:** Recognise, understand and practice the practical operational requirements of MARPOL 73/78.

**8.5.2.1.2 Learning Objectives:**

- 1- Describe the practical procedures and steps of operating oil filtering equipment

and oil discharge monitoring and control systems, and the recording of all the required information in the oil record book.

- 2- Explain the layout and practical operating steps and procedures of a sewage treatment plant and a system to comminute and disinfect the sewage. Recognise the position of the holding tank for sewage, the pipelines and standard shore connection.
- 3- Explain the practical arrangements for keeping garbage on board until disposal to the shore reception facilities. Explain the principle and operation of the processing equipment and means of disposal. Explain recordings in the Garbage Record Book, principles of placards, documents and certificate requirements.
- 4- Identify and recognize all record books, documents and certificates required by MARPOL 73/78.

**8.5.2.2 Training Area 2:** Familiarization with computerised systems and aids to oil spill response.

**8.5.2.2.1 Area General Objectives:** Recognise the purpose, importance, the outline and principles of use of three computer software systems (ALOHA-CAMEO-MARPLOT) which can be used as an aid to oil-pollution response. Realise the purpose, importance and principles of using marine simulators in oil spill response. (A description of the three computer software systems and the oil spill response and crises management simulator is given in this document in Appendix III).

**8.5.2.2.2 Learning Objectives:**

- 1- Understand the purpose, importance and main principles of the use of the Aerial Location of Hazardous Atmospheres (ALOHA) Computer Software in emergency response procedures.
- 2- Understand the purpose, importance and main principles of the use of Computer Aided Management of Emergency Operations (CAMEO) in oil and hazardous

substances spill response.

- 3- Understand the purpose, importance and main principles of the use of Mapping Application for Response, Planning and Local Operational Tasks (MARPLLOT) computer software in oil and hazardous substances spill response and contingency planning.
- 4- Understand the purpose, importance and main principles of the use of the Oil Spill Crisis Management Simulator in oil spill response.

**8.5.2.3 Training Area 3:** Practical oil spill response exercise.

**8.5.2.3.1 Area General Objectives:** Understand and practise the operations and procedures of oil spill response in the sea. Recognise and operate oil spill response equipment.

**8.5.2.3.2 Learning Objectives:**

- 1- Understand the structure of the response team, and realises the responsibilities of each group.
- 2- Understand and practice the steps and procedures of oil spill response operations using mechanical recovery; understand the other methods of oil spill response.
- 3- Recognise and operate the equipment for mechanical recovery of an oil spill.



### 8.5.3 Practical operational training of oil pollution prevention and response

#### Syllabus Outline and Timetable

<i>Course (Code ND 204, teaching hours 16, credit hours 0.5)</i>					
<i>Syllabus Outline and Timetable (Time indicated in hours)</i>					
<b>Subject Area</b>	<b>Th.L</b>	<b>Dis. &amp;Ex.</b>	<b>A/V</b>	<b>P.T.</b>	<b>T.T.D</b>
<b>1- Practical operational requirements of MARPOL 73/78 ( A field study trip to the specialised training ship AIDA IV).</b>	1.0	1.0	1.0	7.0	10.0
<b>2- Familiarization with computerised systems and aids to oil pollution response.</b>	0.5	0.0	0.5	1.0	2.0
<b>3- Practical oil spill response exercise in the sea.</b>	0.5	0.5	0.5	2.5	4.0
<b>Total Time</b>	2.0	1.5	2.0	10.5	16.0

**Table 8.4**

**Key Words:** (Th.L) Theoretical Lecture, (Dis) Discussion, (A/V) Audio/Visual, (P.T.) Practical Training, (T.T.D) Total Time Dedicated.

The course ND 204 consists of 16 teaching hours, constituting 0.5 credit hours to be taken in three studying days during the 16 weeks of the fourth semester.

#### **8.6 Observations**

The criteria of dividing the 72 teaching hours dedicated for the proposed marine environmental protection courses were based on the relevance and importance of the different subject areas to seafarers and consequently to cadets as shown in Table 5.5.

<b>Criteria of Distribution of the Teaching Hours of the Proposed Marine Environmental Protection Curricula for the MBSP</b>						
<b>Subject</b>	<b>Th.L</b>	<b>Dis. &amp; Ex.</b>	<b>A/V</b>	<b>P.T</b>	<b>T.T.D</b>	<b>%</b>
<b>1- Baseline general information about marine environment and marine pollution.</b>	<b>7.0</b>	<b>1.0</b>	<b>1.0</b>	<b>-</b>	<b>9.0</b>	<b>12.5</b>
<b>2- International legal and technical regulations of marine pollution prevention, mitigation and control. (Preventive Regs.)</b>	<b>29.5</b>	<b>12.5</b>	<b>3.0</b>	<b>7.0</b>	<b>52.0</b>	<b>72.2</b>
<b>3- Liability and compensation of oil pollution damage.</b>	<b>1.5</b>	<b>0.5</b>	<b>-</b>	<b>-</b>	<b>2.0</b>	<b>2.8</b>
<b>4- International regulations and practical procedures of oil spill response. (Curative Regs.)</b>	<b>2.0</b>	<b>0.5</b>	<b>1.0</b>	<b>3.5</b>	<b>7.0</b>	<b>9.7</b>
<b>5- Marine pollution and the law of the sea - legal framework of enforcement of environmental legislation.</b>	<b>1.5</b>	<b>0.5</b>	<b>-</b>	<b>-</b>	<b>2.0</b>	<b>2.8</b>
<b>Total Time</b>	<b>41.5</b>	<b>15.0</b>	<b>5.0</b>	<b>10.5</b>	<b>72.0</b>	<b>100.0</b>

**Table 8.5**

Key Words: (Th.L) Theoretical Lectures, (Dis.&Ex.) Discussion and Exercises, (A/V) Audio Visual, (P.T.) Practical Training, (T.T.D) Total Time Dedicated, (Regs.) Regulations.

### ***8.7 Notes for effective 'Implementation'***

1- It is recommended that detailed teaching syllabuses of the proposed courses in this dissertation be established and that lessons plans for each training area be prepared. This can be done by following the same approach as the Guidance on the Implementation of IMO Model Courses.

2- The key words of success of implementing the developed courses are "planning and preparation" because fail to plan is a plan to fail. It is recommended that the Guidance on the Implementation of the IMO Model Courses be consulted during the preparation procedures for application to these courses. Following a check-list of preparation is the best way to guarantee fulfilment of all tasks and requirements of achieving successful courses. Preparation should include identification of suitable facilities and equipment. The notes on teaching techniques provided by the same guidance are also beneficial and could be studied by the teaching staff involved.

3- It is highly recommended that the marine pollution prevention and environmental protection rules and regulations be emphasised during the mandatory sea training period for cadets i.e. to give cadets the chance to apply practically, in a real situation, what they have studied during the MBSP.

4- It is important to apply the four proposed courses to the qualifying course for awarding the certificate of competency of Third Mate for individuals not graduated from maritime institutes. This is because it is the only route which does not include the MBSP. This route is illustrated in this dissertation in Appendix I, in I.1.1.2 and Figure I.2.

5- It is essential that the requirements of the revised STCW 1978, as amended in 1995, Regulation I/6 of the amended Annex, Section A-I/6 and B-I/6 of the STCW Code, regarding qualifications of instructors, supervisors and assessors be followed.

Finally, keeping the oceans clean with high seawater quality is not a utopian dream it is a vital necessity. Operational and accidental marine pollution from maritime activities do not just happen, they are caused mainly by contribution of the human element. Promoting marine environmental protection culture for cadets may help achieving the objectives and principles of international regulations concerning marine pollution prevention. Marine environmental education and training is the way of change which has been reviewed in this study with the aim of providing a change in the cadets' behaviour and attitude. A new generation of seafarers who recognize the value and great functions of marine ecosystems, realize rules and regulations of marine protection and acquire knowledge and skills would be more capable of protecting our marine environment for the benefit of the world. Consequently, a new era of sustainable development in maritime activities should start on a basis of advanced maritime education and training emphasising environmental culture.

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## Appendix I

### Maritime Studies Programs (MSPs) of The AAST&MT

#### I.1. Certificates of Competency of Second and Third Mate

**MBSP:** The two-year academic Maritime Basic Studies Program.

*Guided Sea Training (G.S.T.):* Sea training on board specialised sea training ship.

*Planned Sea Training (P.S.T.):* Sea training on board ships trading internationally, in a rank of a maritime cadet, and fulfilling the requirements of the Maritime Training Record Book.

*Sea Service (S.S.):* Sea service on board ships trading internationally, in a rank of seaman.

It should be noticed that the sea service/training periods are different for the different paths of the same certificate to give the G.S.T and P.S.T. a privilege in order to encourage cadets to join these paths, which are more beneficial for them.

##### I.1.1. Third Mate Certificate of Competency

###### I.1.1.1 Option (1) For the Graduates of the Maritime Institutes.

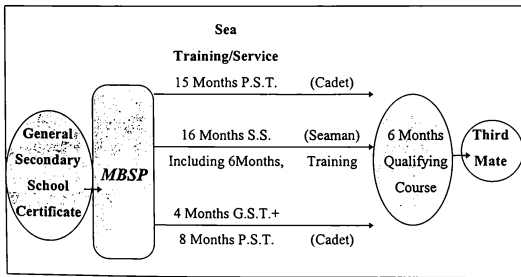


Figure I.1

### I.1.1.2 Option (2) For Individuals Not Graduated from Maritime Institutes

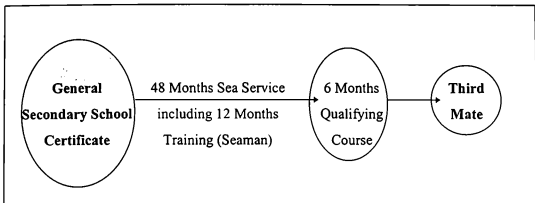


Figure I.2

### I.1.2 Second Mate Certificate of Competency

#### I.1.2.1 Option (1)

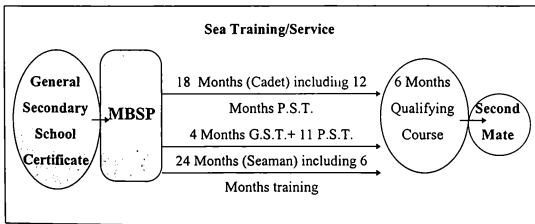


Figure I.3

### I.1.2.2 Option (2)

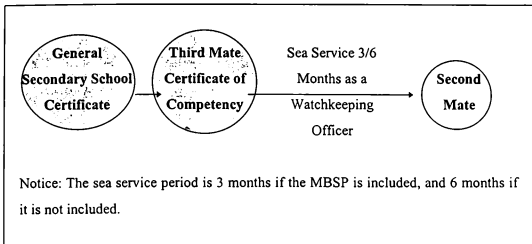


Figure I.4

### I.1.2.3 Option (3) B.Tech. + Second Mate

#### I.1.2.3.1 Option (3), Branch (A)

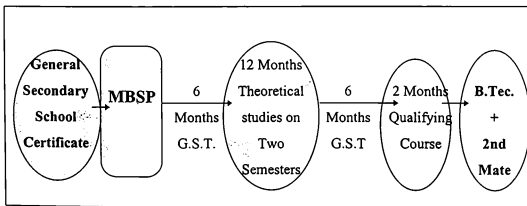


Figure I.5

### I.1.2.3.2 Option (3), Branch (B)

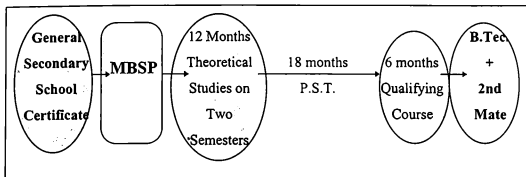


Figure I.6

## I.2 Maritime Basic Studies Program (MBSP)

This program is composed of 4 semesters in two years, two semesters each year. The semester is 16 weeks, each of which comprises about 30 hours of lectures, with two days weekly as a holiday. The program covers all the requirements of international regulations for prospective officers with respect to navigation, seamanship, meteorology, marine electronics, ship construction and stability, marine safety, cargo handling, watchkeeping and maritime law. In addition to the foregoing subjects, the program covers English language, mathematics, physics, computer, and chemistry.

### I.2.1 Academic Regulations

Academic rules and regulations govern the relationship between the Academy and its students. These regulations are effective upon announcement and are subject to amendments when deemed necessary. Commitment and full compliance by the students is imperative.

#### I.2.1.1 Registration

Registration takes place one week before the beginning of the semester. Schedules are announced in advance before the beginning of the semester. The student must

undertake the registration procedures for the hours of instruction, and must abide strictly by all the rules stated in the registration rules brochure.

#### **I.2.1.2 Credit Hour System (CHS)**

A Credit Hour comprises one hour of theoretical study (50 minutes) per week for one semester, supplemented by not less than two hours of practical or applied work (50 minutes each) per week for one semester, supplemented by not less than one hour of individual effort, or three hours of practical or applied work. The Credit Hour determines the course load for which a student is allowed to register in each semester.

#### **I.2.1.3 The Educational Load**

The student is allowed to register for a number of Credit Hours for the semester according to individual abilities and examination assessment results, usually between 12 and 18 or 19 Credit Hours.

#### **I.2.1.4 Grading System**

Students are graded as follows:

- The minimum passing grade for the guided (Directed) sea training is 70 %, and for the MBSP, it is 60 %.
- A, B and C are passing grades. D and D+ are conditional passing grades, which are not counted as passing grades unless the student achieves the proper Cumulative Grade Point Average (CGPA) for the registered credit hours. If these requirements are not maintained, a repeat of the courses with a grade of D or D+ is required to raise the CGPA. This is to be arranged with an academic advisor.
- This grading system is applied to all the courses, with the exception of specific approved courses, the standard of success of which is set higher than other courses or assessed on a pass/fail basis.

**The Weight Value of Assessment Grades and Percentage Equivalent**

<b>Grade</b>	<b>Points</b>	<b>Verbal Grade</b>	<b>Percentage Equivalent</b>
<b>A</b>	<b>12/3 = 4</b>	<b>Excellent</b>	<b>90% or above</b>
<b>A-</b>	<b>11/3 = 3.66</b>	<b>Excellent</b>	<b>85%-89.99%</b>
<b>B+</b>	<b>10/3 = 3.33</b>	<b>V.Good</b>	<b>80%-84.99%</b>
<b>B</b>	<b>9/3 = 3</b>	<b>V.Good</b>	<b>75%-79.99%</b>
<b>B-</b>	<b>8/3 = 2.66</b>	<b>V.Good</b>	<b>70%-74.99%</b>
<b>C+</b>	<b>7/3 = 2.33</b>	<b>Good</b>	<b>65%-69.99%</b>
<b>C</b>	<b>6/3 = 2</b>	<b>Good</b>	<b>60%-64.99%</b>
<b>C-</b>	<b>5/3 = 1.66</b>	<b>Pass</b>	<b>56%-59.99%</b>
<b>D+</b>	<b>4/3 = 1.33</b>	<b>Conditional Pass</b>	<b>53%-55.99%</b>
<b>D</b>	<b>3/3 = 1</b>	<b>Conditional Pass</b>	<b>50%-52.99%</b>
<b>F</b>	<b>0/3 = 0</b>	<b>Fail</b>	<b>Less than 50%</b>

**Table I.1**

- The semester Grade Point Average (GPA) is calculated by multiplying the grade value, which the student received in each course, by the number of credit hours that represents the course weight to get the points that the student received for that course. The same is done for all courses in that semester and all points are added to get the total points of the semester. Then, the total number of points of the semester is divided by the number of credit hours the student registered for in that semester. The CGPA and the GPA are calculated based on 4 points where a value of 4 corresponds to a grade of A. An example is given in Table I.2.

### Example for Calculating the Semester Grade Point Average

Courses	Weight of Course CHs	Grade	Value of Grade	Points	CHs Achieved
X	4	A	4	16	4
Y	3	C+	7/3	7	3
Z	3	B-	8/3	8	3
U	4	F	0	0	-
V	3	D	1	3	3
	17			34	13

**Table I.2**

Key words: (Chs) Credit Hours.

In this case, the semester GPA is equal to  $34/17 = 2.00$ . The CGPA is calculated at the end of each semester (for purposes of academic probation or dis-enrolment). It is calculated using the total points the student has acquired in all the courses he registered for up to the time of computation, and dividing the result by the total number of registered credit hours.

A General Grade is set out of 4 according to the Cumulative Grade Point Average indicated in Table I.3.

General Grade Value (Out of 4), Verbal and Percentage		
<b>Satisfactory</b>	From 2 to less than 2.4	50% - less than 60%
<b>Good</b>	From 2.4 to less than 2.8	60% - less than 70%
<b>Very Good</b>	From 2.8 to less than 3.4	70% - less than 85%
<b>Excellent</b>	From 3.4 and above.	85% and Above.

**Table I.3**



### **I.2.5 Codes of the Courses**

The code of the course is composed of 2 letters and three figures. The two letters represent the department to which the course belongs. For example ND represents the Nautical Department and SD represents the Safety Department. The first figure represent the year of study in which the course is applied. The second figure represents the subject area. The third figure represents the serial number of the course among a group of courses that belong to the same subject area.

For example course ND 203 is a course which belongs to the Nautical Department (ND), applied in the second year (the figure 2). The subject area of marine environment is referred to by the next figure (the figure 0), and the course is identified by the third figure in the group (the figure 3).

The figure "0" was chosen to represent the marine environment for the first time in this document since there is no subject area of marine environment at the present time in the MBSP.

## **Appendix II**

### **The main Practical, Operational, Technical and Legal Requirements of MARPOL 73/78, that concern marine officers.**

#### **II. 1 Introduction**

The information provided here is to highlight, in brief summary, the requirements of the MARPOL 73/78 Convention of concern to marine officers in their practical operational responsibilities. The review of the Convention takes into account the legal and technical requirements perspective.

#### **II.2 Important Items and Obligations of MARPOL 1973 Convention, and Protocol of 1978 relating thereto, to Marine Officers**

The 20 Articles of the Convention and the 9 Articles of the Protocol provide the legal framework of the treaty and the obligations of the contracting parties.

##### **II. 2.1 Definitions**

For the purpose of the Convention, unless expressly provided otherwise:

- "Harmful substance" means 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.

- "Discharge", in relation to harmful substances of effluents containing such substances, means any release however caused from a ship and includes any escape, disposal, spilling, leaking, pumping, emitting or emptying;

- "Discharge" does not include:

- (i) dumping within the meaning of the LDC 1972 Convention or;
- (ii) release of harmful substances directly arising from the exploration, exploitation and associated offshore processing of seabed mineral resources; or
- (iii) release of harmful substances for purposes of legitimate scientific research or in pollution abatement or control.

- "Ship" means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms.

### **II.2.2 Application**

The Convention shall apply to:

- (a) Ships entitled to fly the flag of a party to the Convention; and
- (b) Ships not entitled to fly the flag of a party but which operate under the authority of a party.

The Convention shall not apply to:

Any warship, naval auxiliary or other ship owned or operated by a state and used, for the time being, only on government non-commercial service.

### **II. 3 Protocol I: Provisions Concerning Reports on Incidents Involving Harmful Substances**

The Protocol provides provisions on:

Duty to report, when to make reports, contents of report, supplementary report and reporting procedures.

## **II. 4 Annex I: Regulations for the Prevention of Pollution by Oil**

Annex I applies to all ships to which MARPOL 73/78 applies. The discharge of oil into the sea is prohibited in some areas and severely restricted in others. Ships are required to meet certain equipment and construction standards and to maintain an Oil Record Book. With the exception of small ships, a survey is required and, for ships trading internationally, certification in a prescribed form is necessary. Ports are required to provide adequate reception facilities for oily mixtures and residues to meet the needs of ships using the ports.

### **II. 4.1 Requirements for Control of Operational Pollution**

The regulations 9, 10 and 11 of Annex I of MARPOL 73/78 contain detailed and very restrictive conditions under which it is permitted to discharge oil residues into the sea. They can be summarised as follows:

#### **II.4.1.1 Oil Tankers**

Any discharge of oil or oily mixtures is prohibited except when all the following conditions are satisfied:

1. The tanker is not within a special area.
2. The tanker is more than 50 nautical miles from the nearest land.
3. The tanker is proceeding *en route*.
4. The instantaneous rate of discharge of oil content does not exceed 30 litres per nautical mile.
5. The total quantity of oil discharged does not exceed:
  - 1/15,000 of the total cargo, for existing tankers.
  - 1/30,000 of the total cargo, for new tankers.
6. The tanker has in operation an oil discharge monitoring and control system and a slop tank arrangement as required by regulation 15 of Annex I.

**Remarks:**

- These provisions are not applied to the discharge of clean or segregated ballast.
- The oil residues which can not be discharged shall be retained on board or discharged to reception facilities.
- In a special area, any discharge of oil or oily mixture is prohibited.
- Annex I establishes the following special areas: Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, Gulf Area, Gulf of Aden and the Antarctic Area.

**II.4.1.2 Requirements for the Control of Discharge of Oil from Machinery Spaces Bilges. Applied to any Oil Tanker and other ships of 400 tons gross and above, outside Special Areas**

Any discharge of oil or oily mixtures is prohibited except when all the following conditions are satisfied:

1. The ship is proceeding *en route*.
2. The oil content of the effluent without dilution does not exceed 15 parts per million (ppm).
3. The ship has in operation an oil discharge monitoring and control system, and oil filtering equipment or other equipment as required by regulation 16 of Annex I of MARPOL 73/78.

**Remark:**

Until 6 July 1998, ships not fitted with equipment as required by regulation 16(1) or 16(2) of Annex I are allowed to discharge oil or oily mixtures from machinery spaces bilges with an oil content of less than 100 ppm when the ship is *en route* and more than 12 miles from the nearest land, the ship has in operation oily-water separating equipment and the oil is not mixed with oil cargo residues.

#### **II.4.1.3 Requirements for the Control of Discharge of Oil within Special Areas.**

##### **Any oil tanker and other ships of 400 tons gross and above:**

Any discharge of oil or oily mixtures is prohibited, but this is not applied to the discharge of clean or segregated ballast.

##### **Ships other than oil tankers of less than 400 tons gross:**

Any discharge of oil or oily mixtures is prohibited except when the oil content of the effluent without dilution does not exceed 15 part per million.

##### **All ships of 400 tons gross tonnage and above:**

Any discharge is prohibited except processed bilge water from machinery spaces when the following conditions are satisfied:

1. The bilge water does not originate from cargo pump-room bilges.
2. The bilge water is not mixed with oil cargo residues.
3. The ship is proceeding *en route*.
4. The oil content of the effluent without dilution does not exceed 15 ppm.
5. The ship has in operation oil filtering equipment complying with regulation 16(5) of Annex I.
6. The filtering system is equipped with a device which stops the discharge when the oil content of the effluent exceeds 15 ppm.

#### **II.4.2 Requirements for Ship Survey, Certification, Control of Discharges, Equipment and Construction**

For this purpose the definitions of new ship and existing ship as relevant to Annex I, regulations 1(6) and 1 (7), are as follows:

- New ship:    - Building contract after 31 December 1975; or  
                  - Keel laid after 30 June 1976; or  
                  - Delivery after 31 December 1979; or  
                  - Has undergone a major conversion (after dates as above).

Existing ship:   Not a new ship.

#### **II.4.2.1 Ships other than oil tankers of 400 tons gross and above**

*Survey:* Surveys are required to cover all requirements of Annex I (regulation 4) and the condition of the ship and its equipment are to be maintained and may not be changed without prior sanction of the marine administration.

*Certificate:* An International Oil Pollution Prevention (IOPP) Certificate is required for ships trading internationally. A certificate is not required for ships in domestic trade but may be required by the marine administration in conjunction with the required surveys (regulation 5).

*Control of Discharge of Oil:* The discharge criteria apply. Regulations 9(1)(b); 9(4), (5), (6), (7); 10 (2), (3), (4), (5); 11. (See items II.4 .1.2 and II.4.1.3 above).

*Equipment:* Ships of less than 10,000 grt require 15 ppm oil filtering equipment (regulation 16(1) and (4)). Ships of 10,000 grt and over require 15 ppm oil filtering equipment with alarm and automatic stopping device (regulation 16(2)and (5)). Note that 100 ppm oily-water separating equipment is acceptable until 6 July 1998 for ships built before 6 July 1993 but discharge is restricted to more than 12 nautical miles from nearest land (regulation 9(7)) (See II.4.1.2 above).

*Construction:* No ballast water to be carried in oil fuel tanks of new ships of 4,000 grt and above (regulation 14 (1)) nor of all other ships, as far as reasonable and practicable (regulation 14(3)). No oil is to be carried in a forepeak tank or tank forward of the collision bulkhead of ships built after July 1982 (regulation 14(4)) and of other ships, as far as reasonable and practicable (regulation 14 (5)). Ships should be provided with sludge tanks of adequate capacity (regulation 17).

*Records and Documents:* An oil Record Book is required (regulation 20) and instructional or operational manuals are required for oily-water separators and filtering equipment (regulation 16). A Shipboard Oil Pollution Emergency Plan is required (regulation 26).

#### **II.4.2.2 Oil Tankers of 150 gross tonnage and above**

*Survey:* Surveys are required to cover all requirements of Annex I (regulation 4); the condition of the ship and its equipment are to be maintained and may not be changed without prior sanction of the marine administration.

*Certificate:* An International Oil Pollution Prevention (IOPP) Certificate is required for ships in international trade. A certificate is not required for ships involved in domestic trade but may be required by the marine administration in conjunction with the required surveys (regulation 5). As different constructional requirements apply, oil tankers must be designated on the IOPP Certificate as either:

1. "Crude oil / Product carrier", which is allowed to carry either crude oil or product oil, or both simultaneously;
2. "Crude oil tanker", which is allowed to carry crude oil but is prohibited from carrying product oil.
3. "Product carrier", which is allowed to carry product oil but is prohibited from carrying crude oil.

*Control of Discharge of Oil:* The discharge criteria apply (regulations 9(1)(a); 9(4), (5), (6), (7); 10(2)(a), (3), (4), (5); 11). (See II.4.1.1 above).

*Construction:* The constructional requirements vary for the different designated types and sizes of oil tankers, so the requirements are outlined under each regulation as follows:

Regulation 13 - New crude oil tankers of 20,000 dwt and above - segregated ballast tanks (SBT) and crude oil washing system (COW). Existing crude oil tankers of 40,000 dwt and above - SBT or COW in accordance with regulation 13B. New product carriers of 30,000 dwt and above - SBT. Existing product tankers of 40,000 dwt and above - SBT in accordance with regulation 13A, which includes requirements for an operational procedures manual and an oil content meter.

Regulation 13B - COW to be in accordance with requirements established by the marine administration, and inert gas system (IGS) to be in accordance with SOLAS; tankers must have an operations and equipment manual.



Regulation 13C - Relates to the possibility of a waiver of the requirements of regulation 13 for SBT on existing tankers in specific trades, subject to strict conditions.

Regulation 13D - Relates to existing oil tankers which do not require ballast tanks.

Regulation 13E - Detailed equipment for protective location of SBT in new crude oil tankers of 30,000 dwt and above and new product tankers of 30,000 dwt and above.

Regulation 13F - Is a new regulation and applies to new oil tankers of 600 dwt and above - building contract after 6 July 1993

- keel-laying after 6 January 1994

- delivery after 6 July 1996

or major conversion - dates as above.

Oil tankers of less than 5,000 dwt - double bottom (regulation 13F(7)).

Oil tankers of 5,000 dwt and above - double hull separated by a space of up to 2 metres. As an alternative, tankers may incorporate the "mid-deck" concept under which the pressure within the cargo tank does not exceed the external hydrostatic water pressure. Tankers built to this design have double sides but not a double bottom. Instead, another deck is installed inside the cargo tank with the venting arranged in such away that there is an upward pressure on the bottom of the hull. (regulation 13F (2), (3), (4), (5) and (8)).

Oil tankers of 20,000 dwt and above - in addition, regulation 13F(6), which specifies bottom raking damage survivability, by subdivision and stability provisions.

Regulation 13 G - Is a new regulation applying to crude oil tankers of 20,000 dwt and above and to product carriers of 30,000 dwt and above which are contracted, whose keels are laid or which are delivered before the application dates of regulation 13F. After 6 July 1995, enhanced inspections, survey reports and condition evaluation reports are required. Such tankers are required to comply with regulation 13F not later than 25 years after delivery or, if the protective location of spaces that are not used for carriage of oil meet the requirements of regulations 13G(4), (5) or (7), not later than 30 years after delivery.

Regulation 14 - No ballast water to be carried in fuel oil tanks of new tankers (regulation 14 (1)) or of existing oil tankers as far as reasonable and practicable (regulation 14 (3)). No oil to be carried in a forepeak tank or tank forward of the collision bulkhead of all tankers built after July 1982 (regulation 14(4))and of other oil tankers, as far as reasonable and practicable (regulation 14(5)).

Regulation 15 - Requirements for all oil tankers for tank cleaning equipment, means of transferring residues and tank washings, slop tanks, oil discharge monitoring and control (ODM) systems and oil/water interface detectors.

Regulation 16 - As for other ships for machinery-space bilges (ODM system and oil filtering equipment).

Regulation 17 - Requirement for tankers over 400 grt to be fitted with sludge tanks of adequate capacity.

Regulation 18 - Requirements for pumping, piping and discharge arrangements.

Regulation 19 - Requirements for standard discharge connection.

Regulation 20 - Requirements for Oil Record Book (Part I - machinery space operations, Part II - cargo/ballast operations).

Regulation 26 - A shipboard Oil Pollution Emergency Plan (SOPEP) is required.

*Records and Documents:* The following are required to be carried by each tanker:

- Oil Record Books, Part I and Part II (regulation 20).
- Loading and Damage Stability Information Book (regulation 25).
- ODM operational manual (regulation 15.3).
- COW Operations and Equipment Manual (regulation 13B), if relevant.
- CBT Operation Manual (regulation 13A), if relevant.
- Instructional or operational manuals for oily-water separator and oil filtering equipment (regulation 16).
- Shipboard Oil Pollution Emergency Plan (regulation 26).

## **II.5 Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances**

### **II.5.1 Brief Explanation of Annex II**

Annex II applies to all ships to which MARPOL applies which carry noxious liquid substances in bulk. Substances posing a threat of harm to the marine environment are divided into four categories (A, B, C and D). Category A substances are those posing the greatest threat to the marine environment, whilst category D substances are those posing the smallest threat. Annex II prohibits the discharge into the sea of any effluent containing substances falling into these categories except when the discharge is made under conditions which are specified in detail for each category. For certain areas specified as "special areas", more stringent discharge criteria are given.

Under Annex II the special areas are the Baltic Sea area, the Black Sea area, and the Antarctic Area. Annex II requires that every ship is provided with pumping and piping arrangements to ensure that each tank designed for the carriage of category B and C substances does not retain, after unloading, a quantity of residue in excess of the quantity given in the Annex. For each tank intended for the carriage of such substances, an assessment of the residue quantity has to be made. In addition, an important requirement contained in Annex II is that the discharge operations of certain cargo residues and certain cleaning and ventilation operations may only be carried out in accordance with approved procedures and arrangements based upon standards developed by IMO. A manual is required which contains all particulars of the ship's equipment and arrangements, operational procedures for cargo unloading and tank stripping, and procedures for discharge of cargo residues, for tank washing, for slops collections, and for ballasting and deballasting as may be applicable to the substances the ship is certified to carry.

## II.5.2 Discharge Requirements

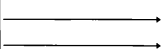
Discharge Conditions for Effluents Containing Noxious Liquid Substances Outside a Special Area				
Conditions Reg.(5)1,2,3,4	Category "A"	Category "B"	Category "C"	category "D"
Maximum Concentration of substance at time of discharge	<i>Virtually Nil</i>	<i>1 ppm in wake of the ship</i>	<i>10 ppm in wake of the ship</i>	<i>1 part of substance in 10 parts of water in discharge mixture</i>
Maximum quantity of cargo discharged from each tank	<i>Virtually Nil. Tank washed and transfer washings to reception facilities</i>	<i>1 cubic metre or 1/3000 of tank capacity</i>	<i>3 cubic metres or 1/1000 of tank capacity</i>	<i>No Limit.</i>
Discharge of effluent	<i>Below the waterline</i>			
Minimum depth of water	<i>25 metres</i>			<i>No Limit.</i>
Minimum distance from land	<i>12 nautical miles</i>			
Minimum speed of ship: - self propelled - not self- propelled				
	<i>7 Knots.</i>			
	<i>4 Knots</i>			

Table II.1

Source: MARPOL. how to do it, 1993.

Discharge Conditions for Effluents Containing Noxious Liquid Substances within a Special Area				
Conditions Regulation: (5)4, 7, 8, 9	Category A	Category B	Category C	Category D
Maximum Concentration of substance at time of discharge	<i>Virtually Nil</i>	<i>1 ppm in wake of the ship</i>	<i>1 ppm in wake of the ship</i>	<i>1 part of substance in 10 parts of water in discharge mixture</i>
Maximum Quantity of cargo discharged from each tank	<i>Virtually Nil. Tank partly washed and discharge washings to reception facilities</i>	<i>Virtually Nil. Tank partly washed and discharge washings to reception facilities</i>	<i>1 cubic metre or 1/3,000 of tank capacity</i>	<i>No limit</i>
Discharge of effluent	<i>Below the waterline</i>			
Minimum Depth of water	<i>25 m.</i>			<i>No limit</i>
Minimum distance from land	<i>12 nautical miles</i>			
Minimum speed of ship:				
- self-propelled	→			<i>7 Knots</i>
- not self-propelled	→			<i>4 Knots</i>

Table II.2

Source: MARPOL, how to do it, 1993

### **II.5.3 Ship design, construction and equipment.**

Ships carrying noxious liquid substances of categories A, B and C are, with few exceptions, chemical tankers. These ships are required to comply with the IBC Code or the BCH Code on pollution and safety grounds. Ships other than chemical tankers are required to comply with the requirements of the flag marine administration; these requirements should be based on these codes (regulation 13(4)).

Ships carrying substances of category B and C must have pumping, piping and unloading arrangements complying with regulation 5A, which includes requirements for stripping tests of tanks, pumps and piping systems in accordance with the standards for procedures and arrangements.

### **II.5.4 Survey and Certification**

Surveys are required for all ships to cover Annex II requirements (regulation 10); the condition of the ship and its equipment is to be maintained and may not be changed without prior sanction of the marine administration.

An International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances (NLS Certificate) is required for ships in international trade (regulation 11 and 12). A certificate is not required for ships in domestic trade but may be required by the marine administration in conjunction with the required surveys. Chemical tankers which have been surveyed and certified by the marine administration in accordance with the IBC Code or the BCH Code (regulation 12A) should be accepted as complying with the requirements of regulation 11 and do not require a NLS Certificate or an additional survey.

### **II.5.5 Records and Documents**

An NLS Certificate which includes the substance to be carried; an approved Procedures and Arrangements Manual and a Cargo Record Book.

*A properly trained crew should be ensured by the ship operators or owners as required by the new regulation 15 of Annex II.*

## **II.6 Annex III - Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form**

Annex III applies to all ships to which MARPOL 73/78 applies which carry harmful substances in packaged form. Harmful substances are those identified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG Code). Packaged form means any form of containment other than the structure of the ship and includes packaging, freight containers, portable tanks and road and rail tank wagons as identified or specified in the IMDG Code.

Annex III prohibits the carriage of harmful substances except in accordance with the conditions laid down in the Annex. These include requirements on packaging, marking, labeling, documentation, and stowage and quantity limitations and exceptions relating to the safety of the ship or saving life at sea.

### **II.6.1 Implementation by means of the IMDG Code**

Regulation 1.1.3 of the Annex makes reference to the IMDG Code for detailed requirements on the carriage of harmful substances, and this code has been adapted so that it can be used as the practical means of implementing Annex III. This is because the majority of harmful substances in packaged form (known as “marine pollutants”) were already classified as dangerous goods in the Code.

The IMDG Code consists of general requirements and schedules under each class of substance for individual substances or materials. Dangerous goods which are also marine pollutants will have this fact clearly stated on the relevant schedule. Shippers will therefore have to declare their shipment as a “marine pollutant” and comply with the Code’s requirements. This will usually mean adding a special “marine pollutant” mark to the package. If a marine pollutant is not also classified as a dangerous good it is listed under either of the two schedules, one for liquids and one for solids, in class 9 of the IMDG Code. These pollutants will need to be declared under the proper shipping name and the packaging and will have to conform to the

requirements of Annex I to the IMDG Code and be marked with the proper shipping name, the UN number and the pollutant mark.

The latest edition of the IMDG Code provides full details of these requirements.

### **II.6.2 Documentation, Surveys and Certificates**

A special list, manifest or stowage plan, showing the location of the packages on board, should be kept on the ship with copies being retained on shore in accordance with regulation 4(3).

No survey or certification of the ship is required under Annex III of MARPOL 73/78. Anyway, a certificate is required, under SOLAS, for dangerous goods. Regulation 1.3 indicates that legislation requiring compliance with the IMDG Code must be issued.

#### ***II.6.2.1 Port state control on operational requirements***

It is very important to mention that, Resolution 1 of the 1994 MARPOL Conference, Amendments to the Annex of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973, provided amendments to the Annexes I, II and III on port state control on operational requirements.

The amendments added a new regulation 8A after the existing regulation 8 of Annex I, a new regulation 15 to Annex II and a new regulation 8 of Annex III. These regulations indicate that the ship when in a port or an offshore terminal of another party is subject to inspection by officers duly authorised by such party concerning operational requirements under Annex I, II and III, where there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the prevention of pollution by oil, noxious liquid substances in bulk or harmful substances in packaged form, the ship shall not sail until the situation has been brought to order.



## **II.7 Annex IV - Regulations for the Prevention of Pollution by Sewage from Ships**

### **II.7.1 Brief Explanation of Annex IV**

Annex IV is the only annex of MARPOL73/78 not yet in force. It will apply to all ships except those under 200 grt carrying 10 persons or fewer. For new ships, application will be from the date of entry into force and for existing ships 10 years later. Ships will not be permitted to discharge sewage within 4 nautical miles of the nearest land unless they have in operation an approved sewage treatment plant; between 4 and 12 nautical miles from land, sewage must be at least comminuted and disinfected before discharge. Ships are required to meet certain equipment requirements. Survey is required and certification, in a prescribed form, is necessary for ships trading internationally.

### **II.7.2 Discharge Conditions for Sewage from Ships**

Regulation 8 of Annex IV provides the discharge conditions for sewage from ships as they are indicated in Table II.3.

<b>Discharge Conditions for Sewage from Ships</b>	
<b>Sea Area</b>	<b>Discharge Criteria</b>
<i>Within 4 nautical miles from land</i>	<i>No Discharge except from approved sewage treatment certified to meet regulations 3(1)(a)(i) and 8(1)(b).</i>
<i>Between 4 and 12 nautical miles from land</i>	<i>No Discharge except from:</i> <i>(1) approved sewage treatment plant certified to meet regulations 3(1)(a)(i) and 8(1)(b); or</i> <i>(2) an approved system for comminuting and disinfecting sewage meeting regulations 3(1)(a)(ii) and 8(1)(a).</i>
<i>More than 12 nautical miles from land.</i>	<i>Discharge from either (1) or (2) above; or, sewage which is not comminuted or disinfected when the ship is proceeding at not less than 4 knots and the rate of discharge is approved by the administration.</i>

**Table II.3**

Source: MARPOL how to do it, 1993.

### **II.7.3 Requirements for Ship Survey, Certification, Equipment and Control of Discharge**

Regulation 2, provides the application dates for “new” and “existing” ships as follows:

- New Ships* - building contract or keel-laying on or after entry into force of Annex IV;  
- delivery three years or more after entry into force of Annex IV.

*Existing Ship* - not a new ship.

Surveys are required for all ships trading internationally, in accordance with regulation 3(1), and appropriate measures (which are also likely to be surveys) to the marine administration’s requirements must be established for other ships (regulation

3(2)). The condition of the ship and its equipment is to be maintained and may not be changed without the approval of the marine administration.

An International Sewage Pollution Prevention Certificate (ISPP Certificate) is required for ships in international trade (regulation 4, 5 and 6). A certificate is not required for ships in domestic trade but may be required by the marine administration as part of the appropriate measures taken to ensure compliance with the requirements.

Ships are required to be fitted with:

1. a sewage treatment plant (regulation 3(1)(a)(i)); or
2. a system to comminute and disinfect the sewage (regulation 3(1)(a)(ii); or
3. a holding tank of adequate capacity (regulation 3(1)(a)(iii)) and
4. a pipeline and standard shore connection (regulation 3(1)(a)(iv) and 11).

## **II.8 Annex V - Regulations for the Prevention of Pollution by Garbage from Ships**

### **II.8.1 Brief Explanation of Annex V**

Annex V applies to all ships to which MARPOL 73/78 applies, including yachts, fishing vessels, all types of ships and offshore platforms. The regulations of this Annex prohibit or restrict the discharge of garbage into the sea as indicated in Table (II.4). Certain areas are designated "Special Areas", in which more restricted regulations are applied as indicated in table (II.4).

Additional restrictions apply to fixed or floating platforms while they are actually engaged in exploration, exploitation and processing work, and to other ships within 500 metres of such platforms.

## **II.8.2 Equipment, Record Books, Surveys, and Certificates**

Until issuing the 1995 amendments, there were no equipment, record books, surveys or certificates required for ships to comply with the requirements of Annex V. These amendments were adopted on 14 September 1995 and entered into force 1 July 1997, which added a new regulation 9 to deal with placards, garbage management plans and garbage record keeping.

Under the new regulation number 9 of Annex V "Placards, garbage management plans and garbage record-keeping", the requirements are as follows:

- 1- Every ship of 12 metres or more shall display placards which notify the crew and passengers of the disposal requirements of regulation 3 and 5 of Annex V, as applicable. They will be written in the official language of the flag state and English.
- 2- Every ship of 400 tons gross tonnage and above, and every ship which is certified to carry 15 persons or more, shall carry a garbage management plan in accordance with the guidelines developed by the organization.
- 3- Every ship of 400 tons gross tonnage and above and every ship which is certified to carry 15 persons or more and every fixed and floating platform shall be provided with a Garbage Record Book in the form specified in the appendix to Annex V.

Each discharge or incineration operation shall be recorded in the Garbage Record Book and signed by the officer in charge, and every completed page shall be signed by the Master of the ship. The entries should include date and time, position, description of garbage, and the estimated amount incinerated or discharged.

The Garbage Record Book shall be kept on board available for inspection. It will be preserved for a period of two years after the last entry. Entries will be made in cases of escape or accidental loss referred to in regulation 6 of Annex V.

- 5- The administration of the port state may inspect the Garbage Record Book and may make a copy of any entry and require the Master to certify that the copy is true copy of such an entry, which shall be admissible in any judicial proceedings.
- 6- In the case of ships built before 1 July 1997, this regulation shall apply as from 1 July 1998.

An appendix to Annex V is added to show the form of Garbage Record Book.

The ship's data should be recorded in the Garbage Record Book. The Garbage Record Book provides some information about garbage, garbage management plan, description and sorting of garbage, entries in the Garbage Record Book, receipts and amount of garbage. The appendix also provides a form of a Record of Garbage Discharges which is shown in Table II.4.

## RECORD OF GARBAGE DISCHARGES

Ship's name: \_\_\_\_\_ Distinctive No., or letters: \_\_\_\_\_ IMO no.: \_\_\_\_\_

**Garbage categories:**

- 1: Plastic.
- 2: Floating dunnage, lining, or packing materials.
- 3: Ground paperproducts, rags, glass, metal, bottles, crockery, etc.
- 4: Paper products, rags, glass, metal, bottles, crockery, etc.
- 5: Food waste.
- 6: Incinerator ash.

**NOTE: THE DISCHARGE OF ANY GARBAGE OTHER THAN FOOD WASTE IS PROHIBITED IN SPECIAL AREAS. ONLY GARBAGE DISCHARGED INTO THE SEA MUST BE CATEGORIZED. GARBAGE OTHER THAN CATEGORY 1 DISCHARGED TO RECEPTION FACILITIES NEED ONLY BE LISTED AS TOTAL ESTIMATED AMOUNT.**

Date/Time	Position of the ship	Estimated amount discharged into sea						Estimated amount discharged to reception facilities or to other ship	Estimated amount incinerated	Certification/signature
		CAT.2	CAT.3	CAT.4	CAT.5	CAT.6	CAT.6			

**Table II.4**

**Quantities estimated are in cubic metres.**

**Master's signature: \_\_\_\_\_ Date: \_\_\_\_\_**

## II.8.3 Restrictions on Disposal of Garbage

Restrictions on Disposal of Garbage. (Annex V regulation 3, 4, and 5)			
Garbage Type	All ships Outside Special Areas	All ships In Special Areas	Offshore Platforms and ships within 500 m of them
Plastics (includes synthetic ropes and fishing nets and plastic garbage bags)	<i>Disposal Prohibited</i>	<i>Disposal Prohibited</i>	<i>Disposal prohibited</i>
Floating dunnage, lining and packing materials.	<i>25 nautical miles offshore or more</i>	<i>Disposal prohibited</i>	<i>Disposal prohibited</i>
Paper, rags, glass, metal, bottles, crockery and similar refuse.	<i>12 nautical miles offshore or more</i>	<i>Disposal prohibited</i>	<i>Disposal prohibited</i>
All other garbage (including paper, rags, glass, etc.), comminuted or ground.	<i>3 nautical miles offshore or more</i>	<i>Disposal prohibited</i>	<i>Disposal prohibited</i>
Food waste not comminuted or ground	<i>12 nautical miles offshore or more</i>	<i>12 nautical miles offshore or more</i>	<i>Disposal prohibited</i>
Food waste comminuted or ground	<i>3 nautical miles offshore or more</i>	<i>12 nautical miles offshore or more</i>	<i>12 nautical miles offshore or more</i>
Mixed refuse types	<i>The more stringent requirements.</i>		
<i>Special Areas: Mediterranean Sea, Baltic Sea, Black Sea, Gulf Area, North Sea, Antarctic, Wider Caribbean Region.</i>			

Table II.5

Source: MARPOL how to do it, 1993.

## **II.9 Guidelines, Codes, and other IMO Publications Relevant to MARPOL 73/78**

A number of the regulations contained in the annexes of MARPOL 73/78 require procedures, equipment, construction, certifications and documentation, to be based on guidelines developed by the IMO or to comply with the IMO codes. Some of these guidelines have been reproduced and included in the consolidated edition of MARPOL 73/78. Other guidelines and codes exist as separate documents or are being produced. These are listed below:

### **II.9.1 Annex I - Guidelines**

1. Oily-water Separators and Monitoring Equipment (1987 edition);
  2. Dedicated Clean Ballast tanks (1982 edition);
  3. Crude Oil Washing Systems (1983 edition);
  4. Inert Gas Systems (1990 edition);
  5. Guidelines for Approval of alternative methods of design and construction of oil tankers as called for in regulation 13F(5);
  6. Guidelines on enhanced programme of surveys called for in regulation 13G(3);
  7. Guidelines for alternative tanker design under regulation 13G(7);
  8. Guidelines for the development of Shipboard Oil Pollution Emergency Plans (1992 edition);
- Guidelines for Surveys under Annex I of MARPOL 73/78 (1983 edition).

### **II.9.2 Annex II - Codes and Guidelines**

1. International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) (1990 edition);
2. Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) (1990 edition);



3. Guidelines for Surveys under Annex II of MARPOL 73/78 (1987 edition).

#### **II.9.3 Annex III - Code**

1. International Maritime Dangerous Goods Code (IMDG Code) (1992 edition).

#### **II.9.4 Annex IV - Recommendation**

1. Recommendation on International Effluent Standards and Guidelines for Performance Tests for Sewage Treatment Plants (1977 edition).

#### **II.9.5 Reception Facilities**

1. Guidelines on the provision of Adequate Reception Facilities in Ports, Parts I, II, III and IV. (the consolidated manual of 1994).

#### **II.9.6 Control of Ships and Discharges**

1. Procedures for the Control of Ships and Discharges (1986 edition).

#### **II.9.10 Protocol I**

1. Provisions Concerning the Reporting of Incidents Involving Harmful Substances under MARPOL 73/78 (1990 edition).

#### **II.9.11 Annex V**

1. Guidelines for the Implementation of Annex V - to include standards for shipboard incinerators.

## **Appendix III**

### **Computer-Aided Systems and Crisis Management Simulators as an Aid of Oil and Hazardous Substances Spill Response**

#### **III.1 Computer-Aided Management of Emergency Operations (CAMEO)**

The CAMEO computer program is designed to provide regional governments with a tool for the management of information about hazardous substances in or near their communities, and to help emergency teams and first responders plan for the safe handling of chemical accidents. It was developed by the Chemical Emergency Preparedness and Prevention Office of the US Environmental Protection Agency (EPA) in co-ordination with the Hazardous Materials Response Branch of the National Oceanic and Atmospheric Administration (NOAA) and the Industry and Environment Office of the United Nations Environment Programme (UNEP).

The CAMEO main menu comprises nine modules chemical information, facility information, transportation information, regional information, etc. In fact the system provides great benefit in cases of emergency operations including oil and hazardous substances spill response management by supporting the response team and the involved governments with updated quick necessary information and providing solutions for emerging problems that are involved in planning.

#### **III.2 The Aerial Locations of Hazardous Atmospheres (ALOHA)**

The ALOHA model is a tool for estimating the movement and dispersion of gases. The air model used by ALOHA estimates pollutant concentrations downwind from the source of a spill, taking into consideration the toxicology and physical characteristics of the spill site, the atmospheric conditions, and the circumstances of the release. Like many computer applications, it can solve problems rapidly and provides results in a graphic, easy-to-use format. This can be helpful during an emergency response or planning for such a response.

### **III.3 Mapping Application for Response, Planning, and Local Operational Tasks (MARPLOT)**

MARPLOT is a general purpose mapping application computer program. The program can be used in several purposes which involve response and planning. Subsequently, it is very useful in cases of marine oil spill response operations and planning. It allows the user to add objects to the maps. Objects include symbols, lines, rectangles, ellipses and polygons. Each object is named and has a number of graphical attributes the user can set. The objects are organized into overlays. For instance, the user may have an overlay containing all of a certain category objects on the map. Overlays allow the user to operate on a group of objects as a whole.

An important feature of MARPLOT is its ability to communicate with other programs, especially with certain "MARPLOT-aware" applications that are familiar with MARPOLT's protocol for sharing information. These programs can install menu items into MARPLOT to accomplish the mapping goals specific to those programs.

CAMEO, ALOHA and MARPLOT are available on a non-profit basis from the US National Safety Council to those individuals and organizations involved in the safe handling of chemicals.

### **III.4 Automated Data Inquiry for Oil Spills (ADIOS)**

It is a computer-aided initial oil spill response tool for emergency spill responders and contingency planners to use on either a Macintosh or Windows-compatible computer. ADIOS integrates a library of approximately one thousand oils with a short-term oil fate model to help users estimate the amount of time that spilled oil will remain in the marine environment. ADIOS calculations combine real-time environmental data that the user enters, such as wind speed, with the carefully researched chemical and physical property information in its oil library.

ADIOS is prepared by the US Coast Guard Research and Development Centre in co-operation with NOAA / Hazardous Material Response and Assessment Division.

### III.5 The Oil Spill Crisis Management Simulator (OSCMS)

The OSCMS is a part of the Integrated Simulators Complex in the AAST&MT. This simulator is based upon the requirement for training and conducting standardized (not yet fully standardized) procedures to respond and clean up oil spills.

The simulator is a system that could be used for actual spill response exercises, real situations, as well as for training purposes. As such, the input data could be either from on-scene reporting, or from an oil spill trajectory computer model that simulates an oil spill situation.

An Oil Spill Response Organization consists of a number of functions, which may vary upon the size of the spill and the material spilled. These spill management functions are spill response strategy, contractor oversight, logistics, training and government and public affairs. The simulator consists of the following main units:

1. Command and Control Centre (CCC): This is the nerve-centre of the facility. The spill commander has visual aids to assist in his view of the spill. It is also the communication centre, containing equipment for incoming/outgoing communications, visual presentations of data and ongoing operations, a position for resource/logistics co-ordinator, and a position for assistant spill commander.
2. Department of Environment On-scene Commander: A room adjacent to the CCC with duplicate geographical display and separate communication capability.
3. Simulator Instructor Control Station: Where the instructor(s) can start, control and monitor the oil spill exercise while having a view of the large screen presentation in the CCC.
4. Scientific/Archives Centre: This room houses the electronics of the operation. This space could also serve to house recording equipment for training purposes.
5. Accounting Personnel and Resource Management: A space devoted to recording the accounting, legal, personnel pay, etc., and administrative task training as they relate to the resources utilized in the oil spill response.
6. Training Facility Meeting Room: A large meeting room, classroom style equipped to show all information used in the spill response, used for trainee to learn and master skills required in simulator exercises.

7. Database: Several databases are existing with the Oil Spill Management System of various data and computer spill models.
8. Oil Spill Model: It is capable of simulating oil spill movement in environments including offshore, coastal, and estuaries as well as inland waters, rivers, and lakes. These models range from simple simulation models to one of the most sophisticated.