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WORLD MARITIME UNIVERSITY
Malmö, Sweden

**MARITIME EDUCATION AND
TRAINING IN NIGERIA:**

**Current problems in the light of new and changing
technology and international legislation.**

By

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Federal Republic of Nigeria

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

**MARITIME EDUCATION AND TRAINING
(Nautical)**

1999

Abstract.

Title of dissertation: **Nigerian Maritime education and training: Current problems in the light of new and changing technology and international legislation.**

Degree: **MSc.**

The Nigerian maritime education and training (MET) system was established in order to provide training for all levels of manpower for the maritime sector of the economy. However, due to new and changing technology and international conventions, the system presently faces a host of problems. For example, does it have sufficient and adequately qualified manpower, facilities and equipment to train modern day seafarers? What if Nigeria has not ratified or fully implemented relevant conventions, how will the MET system be affected? An aim of this study was to identify the various problems facing maritime education and training in Nigeria in the light of all this new and changing technology and international legislation. As part of an effort to achieve this aim, an intensive literature search of topics on maritime education and training with the focus on the area identified above was conducted. The results of the investigation was collated and analysed for problem identification.

Conclusions were drawn in the last chapter based on identified problems, and a number of recommendations were made to update the Nigerian maritime education and training system.

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List of Abbreviations

AB	Able Bodied Seaman
ARPA	Automatic Radar Plotting Aid
CAL	Computer Assisted Learning
CBT	Computer Based Training
BBC	British Broadcasting Corporation
CD - I	Compact Disc Interactive
CD - ROM	Compact Disc - Read Only Memory
COC	Certificate of Competency
CRS	Coast Radio Station
Dept.	Department
DGPS	Differencial Global Positioning System
DGZRS	German acronym for 'German Search and Rescue Services'
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
e-mail	Electronic mail
Eng.	Engineering
ENMM	Ecole Nationale de la Marine Merchande. Saint Malo, France.
EPIRB	Emergency Position Indicating Radio Beacon
FCFMT	Federal College of Fisheries and Marine Technology
FUTO	Federal University of Technology, Owerri
GIS	Government Inspectorate of Shipping
GCE	General Certificate of Education
GMDSS	Global Maritime Distress and Safety Systems
GPS	Global Positioning System
HF	High Frequency

HND	Higher National Diploma
HSH	Henrik Smith Hostel
IBS	Integrated Bridge System
ICS	Integrated Control System
IHO	International Hydrographic Organisation
ILO	International Labour Organisation
IMLA	International Maritime Lecturers' Association
IMO	International Maritime Organisation
IMSF	International Marine Simulators Forum
INMARSAT	International Maritime Satellite Organisation (as from April 1999 will be called the International Mobile Satellite Organisation - IMSO)
INS	Integrated Navigation System
ISM	International Safety Management Code
ISO	International Standards Organisation
IT	Information Technology
LAN	Local Area Network
MAN	Maritime Academy of Nigeria
MARAD	Maritime Administration
MARPOL	International Convention for the Prevention of Pollution from Ships
M/E	Marine engineering
MF	Medium Frequency
MFD	Multi - Feature Display
MET	Maritime Education and Training
METHAR	Maritime Education and Training Harmonisation
MMI	Man Machine Interface
MSA	Merchant Shipping Act
MSC	Maritime Safety Committee
MT	Middle Trade

NBTE	National Board for Technical Education
NMA	National Maritime Authority
NMEB	Nigerian Maritime Examinations Board
Naut.	Nautical
NC	Near Continental
NSL	Nigerian Shipping Law
NUC	Nigerian University Commision
OMBO	One Man Bridge Operation
OND	Ordinary National Diploma
PGD	Post Graduate Diploma
Prep.	Preparation
PTF	Petroleum Trust Fund
QSS	Quality Standards System
RSUST	River State University of Science and Technology
SLH	SkyLine Hotel (Students' residence)
SENC	System Electronic Navigation Charts
SOLAS	Safety of Life at Sea
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TRB	Training Record Book
UNDP	United Nations Development Program
USA	United States of America
VHF	Very High Frequency
WMU	World Maritime University.

Chapter 1

Introduction.

1.1 Background:

During the past two decades, research on various aspects of maritime education and training in Nigeria has proceeded rapidly, (Akinsoji, 1985; Anarah, 1985; Umejuru, 1988; Sota, 1991; Ekwere, 1996; Bereiweriso, 1997; Bob-Manuel, 1997; Ofori, 1997), but none of the above mentioned research works focussed on the problems facing maritime education and training in Nigeria. While reference was made in some of them to such problems, not only was there no detailed discussion of the issue, but also (and this is most significant for this paper) none addressed the impact of new technology and new international legislation on MET in Nigeria. Moreover, those works that made reference to the issue are now so old that they no longer provide an accurate understanding of the current problems of MET in Nigeria. Consequently, there is a pressing need for additional studies to update and improve knowledge and understanding of these problems, and in particular to highlight current problems created due to new technology and new international legislation. In this paper all the new international legislation that affect MET in Nigeria and their associated impact will be identified. In addition, new technologies affecting maritime education and training will be clearly examined, also for their impact on the Nigerian MET. Conclusions will then be drawn as to possible solutions to identified

problems, and proposals and recommendations made to update maritime education and training in Nigeria.

After an overview of MET in Nigeria in the next chapter, a survey of new international legislation will be given in chapter 3. This will be followed by a survey of new and changing technology in chapter 4, and a detailed discussion of the changes necessary to meet the objectives of the Nigerian MET system in chapter 5. The final chapter will present some conclusions.

Before continuing, perhaps it is important to mention that throughout this paper, the words 'instructor', 'lecturer', and 'teacher' have been used interchangeably.

1.2 Research Method:

The main method that was used to collect data for this work was literature search. This was undertaken both in Nigeria at the Maritime Academy of Nigeria and the Federal College of Fisheries and Marine Technology, and at the World Maritime University. Visits to these institutions in Nigeria was an opportunity to establish first - hand the present condition of things, that is, facilities, equipment, human resources, training aids etc. The Government Inspectorate of Shipping (GIS) was also visited to ascertain the status of international legislation in Nigeria. Colleagues and experts in maritime education and training who visited the World Maritime University were interviewed. Lastly, but not the least, every effort was made to collect all useful data that appeared during classroom lectures, field trips and even during ordinary discussions with people, for eventual follow-up and elaboration.

1.3 Limitation:

Writing an article about maritime education and training in Nigeria from Sweden, over 12000km away presents a unique problem. During the December holiday that was, among other things, to be used for collection of data for this work, it was difficult to collect all the data needed. Many factors contributed to this predicament; firstly, to collect any bit of data required travelling away from home, sometimes a whole day's journey, in order to get to the sources. Secondly, at that time the researcher had not yet come to fully understood what data was needed to enable a good job to be done. Consequently, as the research continued from Sweden, it became obvious that more data was needed from Nigeria than had been collected. It also became obvious that this data would have to be found some other way because of the lack of direct links to the sources. However, inspite of the foregoing difficulties, the investigation was thorough and most, if not all needed data was collected to successfully complete this work.

CHAPTER 2

MARITIME EDUCATION AND TRAINING IN NIGERIA

2.1 Background:

The beginning of maritime education and training in Nigeria may be traced to two important events viz. the discovery of crude oil in the country in 1958 and the attainment of independence from Great Britain in 1960. The aggregate result of these events among other things were:

- ❖ A rise in literacy level – resulting from free education in certain parts of the country, and the establishment of more institutions of higher learning.
- ❖ Economic growth – with the discovery of crude oil in Nigeria came many foreign investors, oil companies and offshore supply and service ship operators and others in the oil business.
- ❖ Increased trade – import and export in and out of the country was increased resulting in increased trade both in volume and revenue.

In 1959, the Nigerian government realising the important role of shipping in the development of a nation's economy, established a shipping company with six old ships. These were shortly increased in number and tonnage to enable Nigeria carry a fair share

of the total sea-borne trade generated along the West and Central African sub-region at that time, of which over 70% originated from Nigeria. However, there was maritime manpower shortage at this time: the newly established shipping company and other maritime institutions such as ship, cargo surveying, clearing and forwarding agencies were all virtually run by expatriates. In view of this, the Federal government of Nigeria decided to establish a nautical school to train all levels of manpower for the Nigerian maritime industry. Accordingly, in 1968 it commissioned an IMO body of experts to do a feasibility study for this purpose. In 1972, an internal body was appointed to follow up the first study. Finally in 1976, the third and final IMO sponsored body of experts was engaged to do the same feasibility study before the government gave the green light for the Nautical College of Nigeria to be established in 1977. However the school was declared open for classes for the first time on 6th October 1979. Following Nigeria's ratification of the STCW '78 convention in 1986, the status of the college was raised in 1988, its training responsibilities enlarged and the name changed to Maritime Academy of Nigeria. While the various committees for the establishment of the nautical school were still working, in 1969 the Federal School of Fisheries (now Federal College of Fisheries and Marine Technology) was established by the department of fisheries of the Federal Ministry of Agriculture to cater for the manpower needs in the fisheries sector. Before 1969, there was no state owned training school in the field of maritime education and training in the country. Whatever training people had at this time was on private company and individual basis. Intending navigators and marine engineers did their training outside the country.

2.2 Administrative Structure:

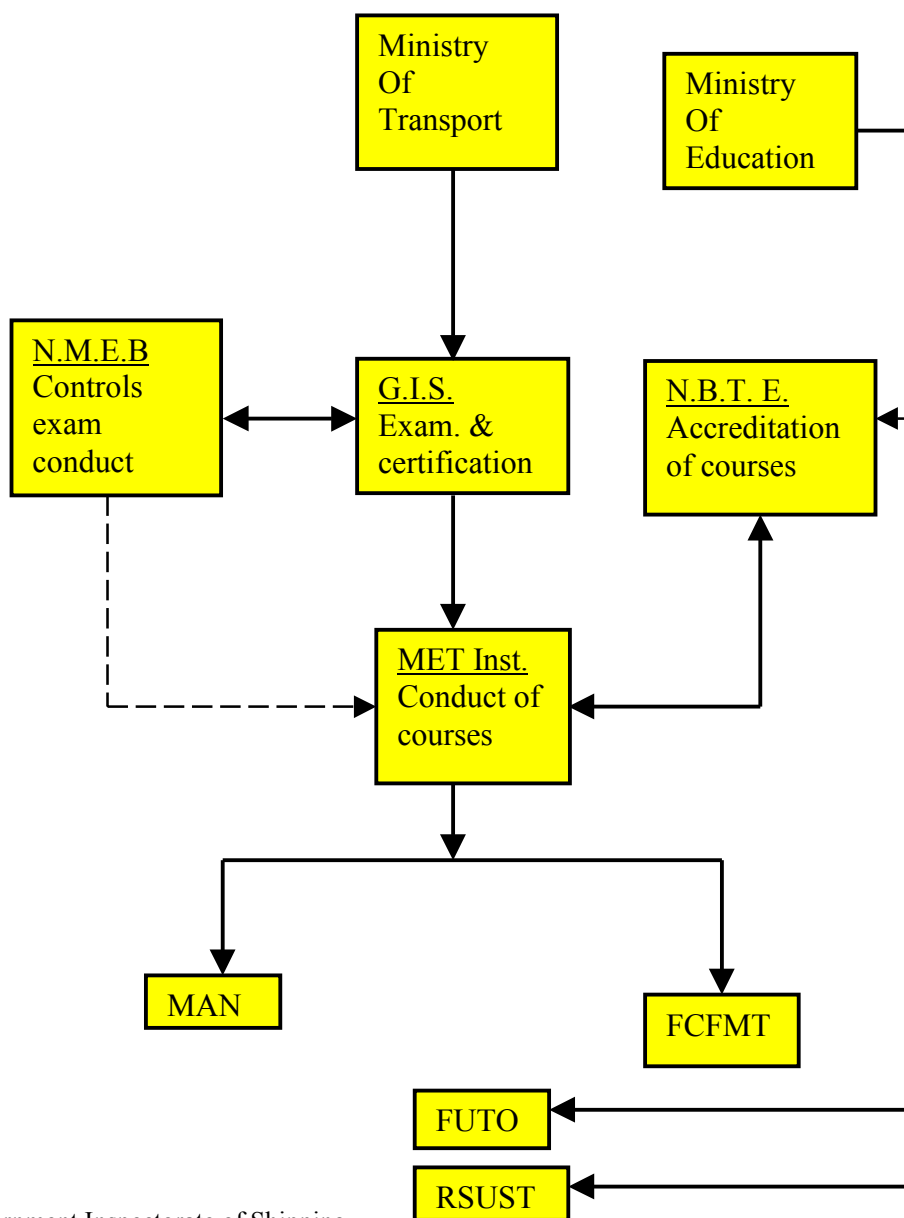
Maritime education and training in Nigeria is mainly done by one government institution - the Maritime Academy of Nigeria, Oron, which is also the only institution in the country directly affected by international legislation and world wide

technological changes in the maritime field. However, the Federal College of Fisheries and Marine Technology, Lagos also offers tertiary level training in fisheries technology, for marine engineers and navigators. In addition, the Federal University of Technology, Owerri and the River State University of Science and Technology, Port Harcourt, offer degree programs in marine engineering and management. The Government Inspectorate of Shipping (GIS), an arm of the Ministry of Transport, the Nigerian Maritime Examinations Board (NMEB) and the National Board for Technical Education (NBTE) are all part of the MET system in Nigeria as shown in figure 2.1.

The GIS is the government body responsible for the examination and certification of seafarers including fishermen, and for the approval of schools for the conduct of IMO mandatory courses and the issuance of certificates. It is the body that ensures implementation and enforcement of national and international regulations having to do with maritime education and training. On the other hand, NBTE controls the standard of education in higher institutions (other than Universities) including maritime schools that run national academic programs. The maritime examination board facilitates and monitors the conduct of the maritime examination.

2.3 Education System:

Today Nigeria operates a system of education popularly referred to as the ‘6-3-3-4’ System. This is a system whereby an individual is expected to spend six years in the primary school and three years in junior secondary school, at the end of which he or she may receive a junior secondary school certificate of education. At this point those who do not wish to continue with formal education may branch off for vocational courses while the educationally inclined spend another three years in senior secondary school to receive a senior secondary school certificate of education (equivalent to the British GCE ‘O’ level).



G.I.S. Government Inspectorate of Shipping.
 NBTE National Board for Technical Education.
 NMEB Nigerian Maritime Exam. Board.
 FCFMT Federal College of Fisheries and Marine Tech. Lagos.
 FUTO Federal University of Tech. Owerri.
 M.A.N Maritime Academy of Nigeria.
 RSUST Rivers State University of Science and Tech. P.H.

Figure 2.1 Administrative Structure of the Nigerian MET.

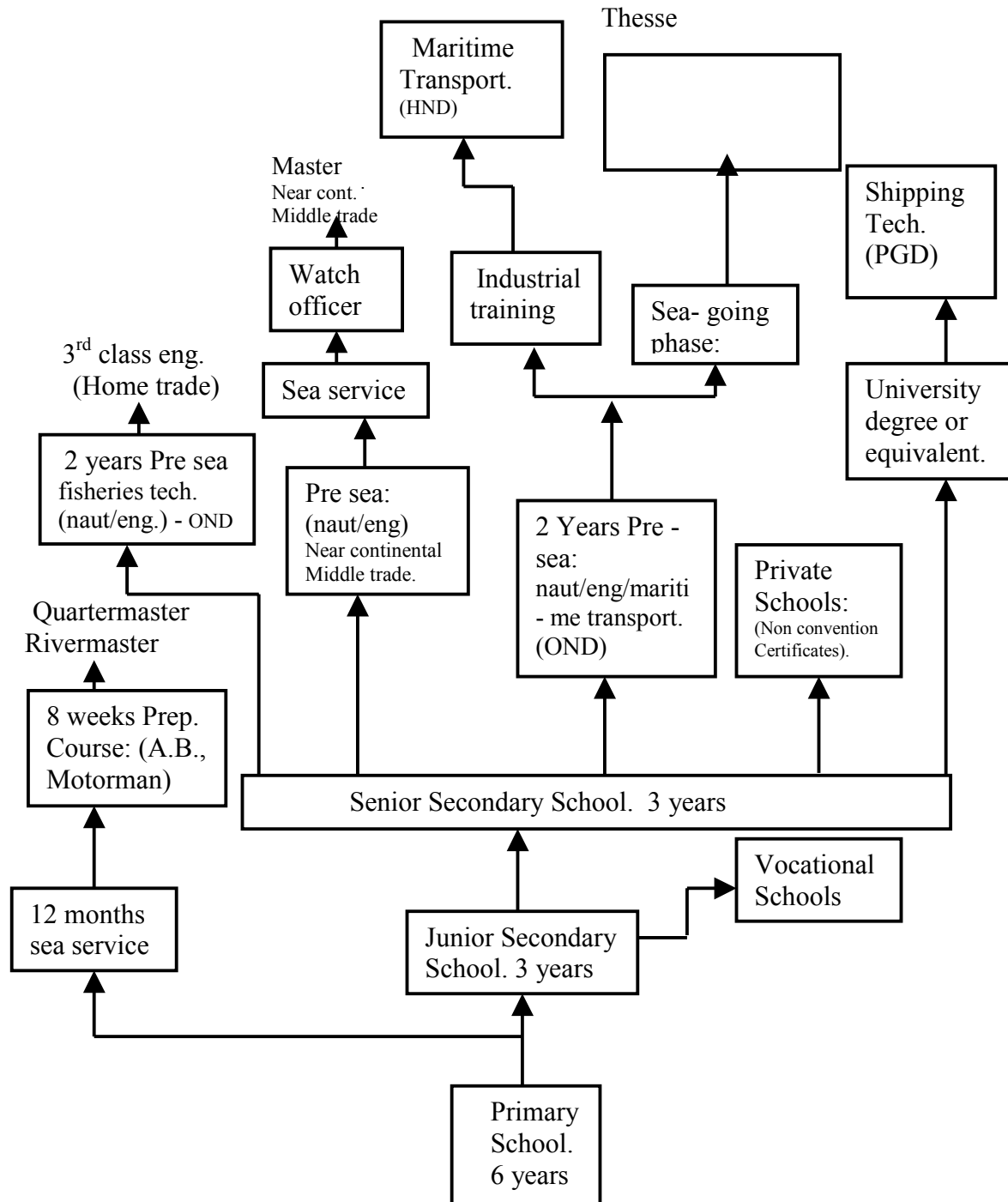


Figure 2.2. Education leading to maritime certification.

Thereafter he or she may proceed to the University for another four years degree program. Generally a candidate wishing to join any of the maritime institutions as a regular student must have successfully completed senior secondary education with credits in certain specified subjects. Figure 2.2 shows the education that leads to maritime certification.

2.4 The Role of the Maritime Academy of Nigeria and the Federal College of Fisheries and Marine Technology.

The roles of the Maritime Academy of Nigeria and the Federal College of Fisheries and Marine Technology, both of which belong to the government, have already been mentioned. It is important to differentiate clearly between the functions of the two institutions with respect to maritime education and training. The functions of the Maritime Academy are:

- ❖ ‘To admit and train the various levels of personnel required for running and operating ships of the Merchant Navy.
- ❖ To train technical manpower for Ports, Marine Engineering, Workshops, Piloting and Navigation, Marine Insurance, Hydrography and other related services, and
- ❖ To provide such other forms of instruction as the Academy may from time to time decide to undertake.’

In other words, the college is designed to be an integrated institution for the education and training of shipboard officers and ratings and shore-based management personnel. Figure 2.3 indicates the academic departments and the programs offered by the institution. The College of Fisheries and Marine Technology was originally established as a vocational training institute to address the manpower requirements of Nigeria’s inshore fleet. Its mandate was later expanded to include tertiary-level training in fisheries technology (nautical and marine engineering). The school is responsible for the training of all levels of technical manpower for the Nigerian fishing industry.

In view of this, further discussions will focus on the Maritime Academy of Nigeria as the sole MET institution in Nigeria, unless otherwise stated.

2.5 General Problems Facing Maritime Education and Training in Nigeria.

Apart from problems that face MET in Nigeria as a result of new and changing technology and international legislation, there are also additional problems of a more general nature. The former will be discussed in chapters three and four while the latter problems will be discussed presently.

2.5.1 One of the major problems plaguing MET in Nigeria is lack of maritime industry's support. Anarah, (1985) noted that the major problem of nautical education in developing countries is that those who provide funds for training are not always the same consumers of the products... He also remarked that since nautical colleges are established to train qualified marine personnel for shipping and related industries, that it is only common sense that they (the industry) should be actively involved in the formulation and design of the MET curriculum. In addition, Akinsoji remarked in an interview published in the Maritime quarterly October – December 1998 that 'Everybody wants to go to the streets to pick up a qualified person. Nobody wants to train anybody'. Sota (1991) also mentioned that ship owners and operators in general prefer to have well trained seafarers serving on their vessels, but there is however a reluctance on the part of some of them to invest in training. The foregoing is a very unfortunate situation because the maritime industry should be part of the Nigerian MET system in defining the content and conduct of courses, serving on the academic board and governing council of the MET institution thereby improving the standard of MET and certification in Nigeria. Being the end user of the products of MET institutions, the maritime industry stands to gain or lose from the improvement or otherwise of MET system in Nigeria.

2.5.2 Another problem facing MET in Nigeria is the lack of adequate resources. In order to train personnel to achieve the minimum knowledge and competency standards required by STCW '95, qualified maritime lecturers are needed. Unfortunately, Nigerian MET institutions do not have a single faculty in which all members have the necessary qualifications. This is a serious setback because as Zade (1997) rightly puts it 'The quality of the faculty in a MET institution is predetermined by the quality of its teaching staff, so is the quality of a MET curriculum. Closely associated with the above problem is the lack of adequate facilities and equipment. Akinsoji (1985) noted that it does happen that an institution exists without the basic requirements to make it function. An example of such institution he said is the Oron Nautical College. He was of course referring to the lack of experienced and competent staff, laboratories and other facilities in this institution. Cross (1990) in a paper presented at an IMLA workshop on the integrated training of deck and marine engineer officers pointed out that 'the teacher who still scribbles a blackboard full of notes and expects students to copy those as lecture notes belongs to a museum... .' Regarding the above assertion, Sota (1991) noted that dictation and writing on the blackboard and expecting students to copy are the most widely used methods of giving notes to students at the Maritime Academy. Umejuru (1988) commented that the MET syllabus of the Maritime Academy is deficient compared to that recommended by IMO (STCW'78). The reason for the deficiency he said is due to lack of sufficient number of adequately qualified training staff and teaching facilities. The point is that the problem of qualified lecturers and instructors, training equipment and other facilities in our MET institution has persisted until this day. Already it has been mentioned that the MET institution in Nigeria has no single faculty in which all members have the necessary qualifications. With regard to equipment, the Maritime Academy has an old-fashioned radar simulator (with one own ship and one console for the use of both trainees and instructors), and a small vessel 'T/S Orion' that passes for a training vessel. However, this training vessel is not adequate to

support the education curriculum in the form of a floating laboratory, on account of the type of equipment found on-board and its size. Computer assisted learning (CAL) facilities such as video based training, internet, on-line training, virtual reality, virtual world and others. The result is that Nigerian MET mainly relies still on the conventional methods of teaching and learning and does hardly benefit from the use of modern electronic teaching aids.

2.5.3 There is also the problem of maritime education being isolated from other academic education. Anarah, (1985) commented that marine qualifications are not recognised within the education system, and in most cases, seafarers are forced to start from scratch if they wish to further their qualification or re-train for other jobs. Considering this problem in the light of the fact that the trend all over the world is that people joining the seafaring career in recent years want to make it a short one, the result is that many young Nigerians are no longer attracted to the seafaring career.

2.5.4 Another problem facing the Nigerian MET system is that after nearly 20 years in business, the arrangements to enable the certificate of competency examinations to be conducted in Nigeria is yet to be finalised. Normally the conduct of these examinations lies in the hand of the GIS, and to assist it in this task, a Nigerian Maritime Examination Board was formed by the Federal Ministry of Transport. Whatever may be the problems of this bodies and the reasons for the delay in conducting the C.O.C. examinations in Nigeria, the result is glaring: most nautical and marine engineering cadets passing through our MET institution end up being stranded and frustrated because they can not take the examinations in the country at the end of their course neither can they afford to go abroad for this purpose due to financial constraints. These problems, aggravated by insufficient training vessels for cadets' on board sea service may eventually lead to the closing down of the maritime institution due to shortage of trainees to justify its continued existence.

2.5.5 The final problem to consider as facing MET in Nigeria is the non-implementation of international legislation that affects maritime education. Nigeria is a signatory to 16 IMO conventions (apart from MARPOL '73/78) including STCW '95. The problem is that most of these conventions including the STCW have not been incorporated into the National Shipping Law. Sota, (1991) observed that besides the decree number 16 of 1988 which established the Maritime Academy, no regulation has been made concerning MET in Nigeria since the entry into force of STCW '78 convention. In this regard presently Nigeria is operating under some subsidiary legislation made under section 427 of the Nigerian Merchant Shipping Act of 1962 which states that 'the Minister may make regulations for carrying out this Act into effect and in particular and without prejudice to the generality of the foregoing, such regulation may provide for ... (c) the qualifications for officers, Able bodied seamen and ship's cooks and the issue of certification thereof...' One such regulation is the Examinations for Certificate of competency (Deck) regulations 1963. The implication of this is that Nigerian-trained officers and rating are generally not always recognised internationally.

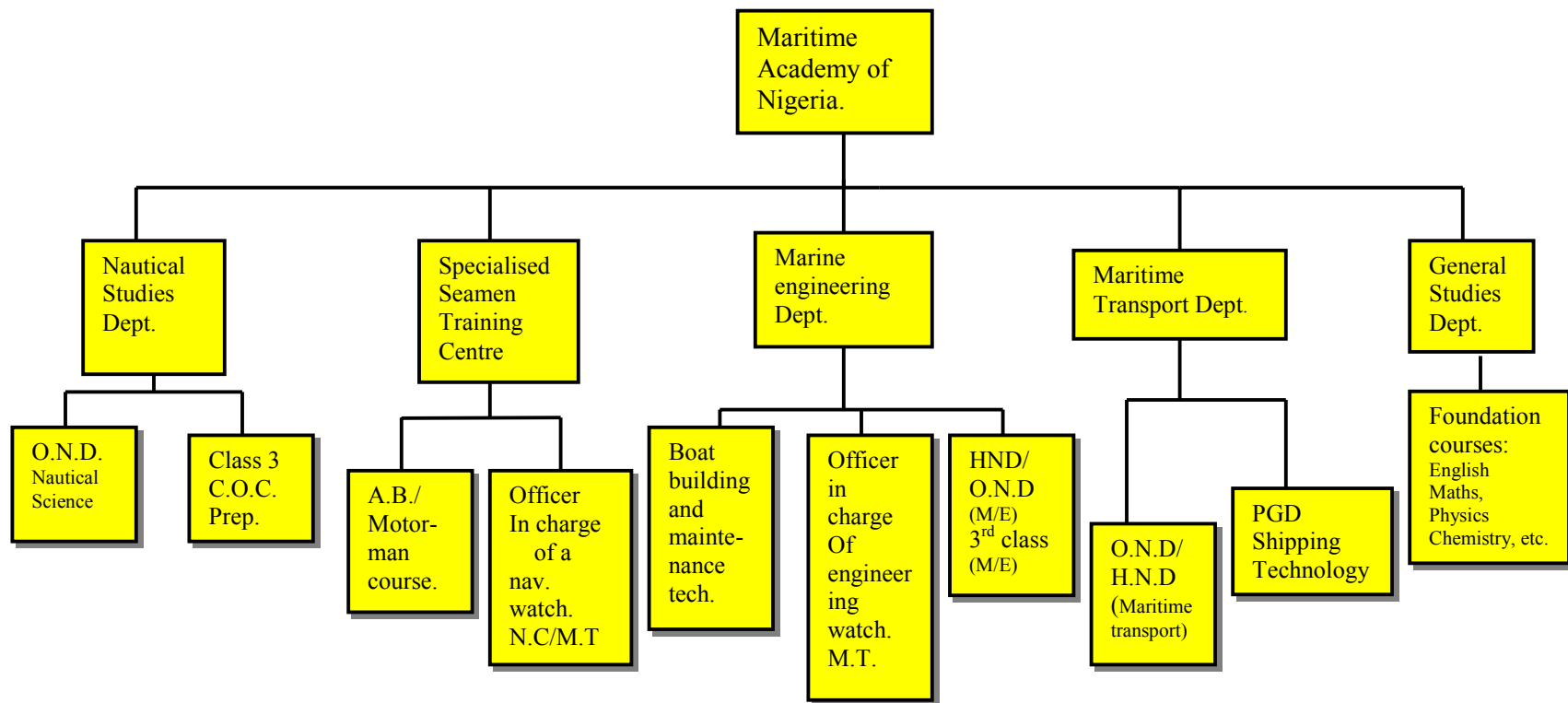


Figure 2.3. Academic programs offered by the Maritime Academy of Nigeria.

CHAPTER 3

SURVEY OF NEW INTERNATIONAL LEGISLATION.

3.1 The STCW '78 Convention.

3.1.1 Background.

It started in 1960 at an international conference on the Safety of Life at Sea, where a resolution on the education and training of seafarers was adopted. The resolution encouraged governments to ensure that seafarers' education and training was comprehensive enough and kept up-to-date as necessary. In addition, it recommended that the International Maritime Organisation (IMO) and the International Labour Organisation (ILO) work together and with governments towards the achievement of these ends. In 1964, a joint committee on training was established by the governing body of IMO's Maritime Safety Committee (MSC) and ILO. The committee prepared the 'document for guidance' which deals with the education and training of masters, officers and seamen regarding the use and operation of onboard safety equipment and instruments. This document was amended three times between 1975 and 1985, and despite its wide acceptance by the international maritime community, IMO was convinced that more needed to be done to improve and strengthen seafarers' standards.

Consequently in 1971, the IMO council requested the MSC to urgently look into the matter. This resulted in the formation of the sub-committee on standards of training and watchkeeping. In the same year the IMO Assembly decided to convene a

conference to adopt a convention on the subject. The conference met in 1978 and adopted the STCW '78 convention on July 7th; it came into force on 28th April 1984.

The STCW '78 convention at the time of its adoption reflected the highest practical standards that could be globally agreed. It was an important milestone towards the establishment of an international standard of competency. It was also unique in the sense that for the first time, codified global technical standards were targeted at seafarers instead of the ships. However, it had problems right from the very first day it came into force.

3.1.2 The Need for Revision.

The major problems that brought about the revision of the convention are as follow:

1. Within the six years between the adoption and entry into force of the convention, so many changes had taken place in the shipping industry that its effectiveness was undermined from the start.
2. The convention itself was broadly worded in some areas and therefore capable of a wide range of interpretations, for example, training and assessment was left 'to the satisfaction of the Administration'; knowledge being tested by examination, and actual application of the knowledge being learned 'on-the-job'.
3. The convention was weak in that it accepted certificates from non parties to the convention. This led to the expansion of 'open registries', and consequently a watering down of the expected standard.
4. Many years after the coming into force of the convention, human error still remained the main cause of shipping casualties. Consequently, there were both political and public pressures on IMO to revise the convention.

Under the foregoing circumstances, it was not only difficult to control compliance with the provisions of the convention, but also necessary to rectify identified deficiencies hence the need for revision.

3.2 The Revised STCW '78 Convention: (STCW '95).

A survey of the above convention reveals certain mandatory requirements upon MET institutions, Maritime Administrations (MARADs) and Shipowners:

3.2.1 Maritime Education and Training Institutions.

3.2.1.1 Approval of Training.

In the first place, MET institutions that conduct training and assessment of seafarers for certification under the new convention must:

- a) Have written training programs approved by the Administration and fully documented. This applies to both shore and sea-based programs.
- b) Structure all training and assessment (including use of simulators) within the written programs.
- c) Relate training aims and objectives as closely as possible to shipboard practices.

In this regard the Maritime Academy of Nigeria already has a written training program, the only problem is that it urgently needs to review the contents of each program in detail to make it competence based. This requires the introduction of changes to permit sufficient hands-on training onboard ship, in engineering workshops, navigation laboratories using simulators and other training aids. Further more, for each program, criteria used for evaluation of competence has to be developed using the relevant standard of competence tables.

3.2.1.2 Assessor Requirements.

Any person conducting in-service assessment of competence is required to:

- a) have appropriate level of knowledge and understanding of competence to be assessed.
- b) be qualified in the task.
- c) have received appropriate guidance in assessment methods and practice.
- d) have gained practical assessment experience.

3.2.1.3. Instructor Standards.

Instructors must be appropriately qualified and experienced for the particular types and levels of training and assessment of competence both onboard and ashore, and as trainers.

In addition they must appreciate the training program and understand its specific objectives as well as be qualified in the training task.

Lack of qualified assessors and instructors is one of the biggest problems facing MET in Nigeria as a result of the new STCW convention. Neither the institution nor the GIS has sufficient number of appropriately qualified and experienced assessors and/or instructors to carry out training as required by the convention. This problem also will have to be decisively dealt with before maritime education and training in Nigeria can meet international standards.

3.2.1.4. Quality Standards System.

- a) Education and training objectives of an institution and related standards of competence and required knowledge, understanding and skills are to be clearly defined.
- b) A quality standard system is to be applied to all STCW education, training, assessment, certification, endorsement and revalidation activities as well as to qualification and experience of instructors and assessors.

- c) An independent evaluation by qualified persons (external auditors) is to be conducted every five years to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the objectives.
- d) A quality Assurance (self-study) System is to be put in place by MET institutions to ensure that the defined objectives are achieved.

The Nigerian MET system has not made any progress in this direction. Although there is a quality standard system in place in the Maritime Academy, it is administered by the National Board for Technical Education (NBTE) and for the national diploma programs only. Therefore there is an urgent need for both the institution and the GIS to come up with a quality standard system that meets the STCW '95 convention standards and also covers the entire training and certification system.

3.2.1.5 Port State Control (PSC) Officers' Training.

The STCW '95 convention places on contracting parties the responsibility to ensure that control procedures laid down in the convention are complied with. Article X, Regulation 1/4, code A-1/4 all detail the role of the PSC officer while B-1/4 gives guidance on control procedures. As part of the Maritime Administration's duties to give full and complete effect to the provision of the convention, it must train officers to be authorised to execute Port State Control in accordance with the requirements of the convention. In regions where there is co-operation between states (Memorandum of Understanding) on PSC matters, the onus is usually on maritime institutions to organise the necessary training.

For the West and Central African region, there was recently an agreement on a draft MOU at a meeting in Conakry in January this year. The MOU itself is expected to be adopted in Nigeria come October 1999. In view of this, work is already underway

by the participants to develop a regional training program for flag state surveyors and port state control inspectors. Consequently, there is need for the Nigerian maritime education and training institution to be prepared to introduce port state control officers' training into its curriculum at the appropriate time, especially in view of the fact that the secretariat of the new MOU states will be in Nigeria.

IMO recommends that instructors for this course be ships' surveyors and/or ships' officers who have undergone some form of training related to PSC. In this regard, the Maritime Academy if it decides to run this course will necessarily have to train instructors through relevant short courses and advanced training programs.

3.2.1.6 Use of Simulators.

- a) The STCW '95 convention makes the use of simulators mandatory when conducting radar and ARPA training and assessment.
- b) It also requires that performance standards and other provisions prescribed in code A of the convention be complied with in regard to simulators when used for
 - Mandatory (radar and ARPA) training and assessment.
 - Assessing competence and
 - Demonstration of continued proficiency.

The problem facing the Nigerian MET system in view of the foregoing requirements are many and varied. In the first place, the maritime institution needs a radar simulator that meets both course training objectives and STCW convention performance standards, in order to be able to conduct the required radar and ARPA training. Like a recurring decimal, lack of experienced and qualified (simulator) instructors and assessors is another problem to deal with. Thirdly, the institution will also as a matter of legality have to modify its existing curriculum to make radar and ARPA training part of the whole and no longer a separate modular package. Finally, it has to consider how it intends to use the simulator to assess trainees' performance of competence.

The GIS also has to contend with all the above-outlined problems before it can seriously implement the convention's requirements on use of simulator.

3.2.1.7 Impact on the MET Institution.

Without prejudice to the foregoing, the Maritime Academy of Nigeria as the only institution mandated to conduct training in line with the STCW '95 convention has already started to tailor its programs towards fulfilling the provisions of the convention as follows:

- a) All new programs developed post STCW '95 have been designed to meet the provisions of the convention.
- b) New mandatory courses have been introduced and all certificates reflect the relevant section of the convention satisfied by that particular training program.
- c) Presently there is a plan to establish refresher/upgrading courses.
- d) A training vessel 'M/v Trainer was acquired recently and is now being used to assist cadets in fulfilling the on board training requirement of the convention.

3.2.2 Maritime Administrations.

3.2.2.1 A Maritime administration for its part is mandated inter alia to:

- a) Compare STCW'78 standards with STCW'95 to determine the extent of refresher and upgrading training.
- b) Approve education and training programs and simulators in regard to performance standards.
- c) Ensure internal review of processes and procedures.
- d) Arrange for external independent evaluation reports.
- e) Forward reports on MET standards to IMO (MSC).
- f) Ensure lecturers, instructors and assessors are appropriately qualified and have relevant experiences.

- g) Monitor training and assessment programs and any simulators in use for compliance with the convention standard.
- h) Communicate to IMO concerning:
 - i. Details of laws, decrees etc., promulgated to give effect to the provisions of the convention.
 - ii. Details of study courses and national examinations and other requirements for each certificate issued in compliance with the convention.
 - iii. Specimen certificate issued in compliance with the convention and
 - iv. Such other information as may be required under the code on other steps taken to give full and complete effect to the convention.
- i) Ensure that the aims and objectives of simulator based training are defined within the overall training programme, and that specific training objectives and tasks are selected so as to relate as closely as possible to shipboard tasks and practices.

3.2.2.2 Certification and Records.

Regulation 1/9 provides that MARADs ensure that certificates are issued only to those candidates who comply with the requirements of the convention in regard to proof of identity, age, seagoing service and standards of competency. In addition, the MARAD must register all certificates and endorsements it issues to officers and ratings. A record is to be kept of the details of their date of expiry and their revalidation, suspension, cancellation, and reported loss or destruction.

3.2.2.3 The Impact of STCW '95 Convention on the Nigerian MARAD.

In general the Nigerian Maritime Administration is yet to wake up to its obligation according to the STCW convention as outlined above. It was represented at the seminar on the implementation of the convention in Accra, Ghana in November 1996, it is also aware of its obligations under this convention, especially regarding article IV and Regulation 1/7, 'communication of information' yet it has done little or

nothing to comply. That action is urgently needed by the MARAD (GIS) to give full and complete effect to the provisions of the convention cannot be over emphasised. The consequences of a lack of such action will be too great for the country in general and for the maritime industry in particular. In principle, it means that before long, certificates of competency issued by and on behalf the Nigerian government will lose completely whatever legal standing it had outside Nigerian waters.

3.2.3 Shipowners and New Training Requirements.

STCW '95, Regulation 1/14 section 1.1 states that:

Each Administration shall, in accordance with the provisions of section A-1/14, hold companies responsible for the assignment of seafarers for service in their ships in accordance with the provisions of the convention and shall require every such company to ensure each seafarer assigned to any of its ships holds an appropriate certificate ...

It is to be noted that this Regulation does not apply directly to the shipping companies, but any that fails to conform to its requirements, will be guilty of infraction of the Administration's requirements. Such non-conformity may also contravene some other requirements of the convention. There is therefore an implied responsibility under this Regulation for companies to train or at least employ only officers and crew that hold appropriate certificates. Such certificates will include those required under chapters V and VI on 'Special training for Persons on certain ship types,' and 'Emergency, Occupational safety, medical care and survival functions' respectively.

The Maritime Academy has already introduced all these short courses into its curriculum except that of 'Proficiency in fast rescue boats'. Even so, it lacks both the equipment and the facilities necessary to conduct training and assessment on 'Proficiency in survival crafts according to the convention requirements as stated in table A-VI/2-1 of the code.

3.3 MARPOL '73/78 and ISM Code.

3.3.1 MARPOL '73/78

MARPOL '73/78 convention contains a large number of operational requirements to be complied with by ships' personnel and to be controlled by the Administration. To this end, one of the major duties of the Administration is to ensure that seafarers have adequate training to be able to meet these requirements.

From a MET point of view there are many topics of great interest in relation to marine pollution, which should be taught in the maritime academies. Although pollution control operations are organised and conducted by shore-based personnel, the master and ship's officers are usually on the scene before any shore personnel. For this reason, generally, they should have knowledge of the general principles involved in reducing the effects of pollution. They should also know their obligations under the MARPOL '73/78 convention, as well as understand the principles and operations of onboard anti-pollution equipment and devices. The STCW '95 code, tables A-II/1, II/2, A-III/1 and III/2 give the minimum standards of competence required for various categories of officers with respect to marine pollution prevention.

The implication of this is that MET institutions in general will be required to introduce new materials into their syllabuses and improve the training system in order to enable the updating of seafarers' knowledge for the compliance of MARPOL requirements.

To comply with the above minimum requirements, (Pardo, 1999) in a European Union METHAR project proposes two syllabuses suitable for maritime institutions to introduce marine pollution in their curriculum at the basic level and at degree level. (Appendices 1 and 2).

For Nigeria in particular, the foregoing is expected to impact on maritime education and training. Although the Maritime Academy has introduced MARPOL related courses into its curriculum, modification is needed in some areas so that STCW standard of competence can be achieved. The researcher recommends the use of the framework in appendices 1 and 2 as a model for development in the Nigerian Maritime Academy.

3.4 ISM Code.

The International management code for the safe operation of ships and for pollution prevention (ISM code) was made mandatory under a new chapter IX of SOLAS'74 and adopted in 1994. It is to pave the way for the provision of an international standard for the safe management and operation of ships and for pollution prevention. It may be applied to all ships, but at present it is in force for tankers and passenger ships only.

The objectives of the code are to ensure safety at sea, prevention of human injury or loss of life and avoidance of damage to the environment, in particular to the marine environment and property. Under the code, the ship operator frequently addressed as 'the company' is given a list of responsibilities. The ISM code has no direct application to MET institutions, nevertheless they are just as much involved in the implementation of the code as are ship operators and MARADs. That training has to be established for the purpose of effectively implementing this code is implied in the following sections:

1.2.2 Safety management objectives of the Company should, inter alia...

1.2.2.3 Continuously improve safety management skills of personnel ashore and aboard ships ...

6.3 The company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and

protection of the environment are given proper familiarisation with their duties ...

- 6.4 The company should ensure that all personnel involved in the Company's Safety Management System (SMS) have an adequate understanding of relevant rules, regulations, codes and guidelines.
- 6.5 The Company should establish and maintain procedures for identifying any training that may be required in support of the SMS and ensure that such training is provided for all personnel concerned.

Botterill (1997) suggests that once the initial stages of establishing the safety and environmental policy, appointing designated person, selecting shore staff project team etc., have been taken care of, the next stage should be training. He suggests further that the training should begin with the designated person and the shore staff team. MET institutions around the world are expected to be on hand to offer training courses in relation to the ISM code. The important role that maritime education and training institutions should play towards the implementation of the code is summed up succinctly in a European Union METHAR project reported on by Horck, (1999):

It is commonly agreed that ISM code should not be organised as an ad-hoc professional course but be included in the syllabuses for the certificates of competency.

The above assertion strongly suggests that ISM related training should be run by none other than maritime education and training institutions.

As yet the ISM code has not had any impact on the Nigerian maritime education and training system in any way. There are no doubts however that in the near future, ISM related training courses will form part of the Nigerian MET institution's programs. Many software packages are now available from classification societies - Lloyds, Det Norske Veritas, Bureau Veritas and other organisations such as the International Shipping Federation, United Kingdom P & I club and Videotel. The Maritime Academy of Nigeria may run an ISM training program as a separate short

course or as part of the college's main training program. Whichever choice it makes, the program will be greatly enhanced by the use of existing software packages.

3.5 Status of Legislation.

Nigeria is a signatory to 16 of the 35 IMO conventions including STCW '95. For Nigeria the problem is much more one of implementation and enforcement rather than that of becoming a signatory. The federal government of Nigeria has not made any legislation concerning maritime education and training since the entry into force of the STCW '78 convention apart from decree number 16 of 1988 that established the Maritime Academy.

Consequently, maritime education and training programs are mainly conducted in line with the provisions of the Nigerian Merchant Shipping Act (MSA) 1962. Regulations made under this Act deal with manning and examination and certification requirements for the various certificates of competency, which regulations falls short of the STCW requirements.

Table 3.1 highlights some of the major areas of disparity between the provisions of the STCW '95 convention and the Nigerian MSA in relation to maritime education and training.

Table 3.1. Key differences between the provisions of STCW '95 and the Nigerian MSA 1962.

Provisions	STCW '95	Nigerian MSA
Training and Assessment	To be administered, supervised and monitored.	No provisions.
Trainers and Assessors	Trainers and Assessors must be appropriately qualified.	No provisions.
Quality Standards	Training and assessment of competency, certification, endorsement and revalidation activities to be continuously monitored through a Quality Standard System.	No provisions.
Medical Standards - Issue and registration of certificates	Candidates for certification must: Meet standards of medical fitness regarding eyesight and hearing. Complete an approved compulsory shore based education and training program	Candidates for certification as deck officers must pass eyesight test. No provision for compulsory attendance at a Maritime institution, although provision is made for some exemption in the event of any such attendance
Use of Simulators for training and assessment	Compulsory for Radar and ARPA training and assessment	No provisions

CHAPTER 4

SURVEY OF NEW AND CHANGING TECHNOLOGY.

4.1 Maritime Communication:

Technology and techniques in the shipping industry change very rapidly. The introduction of the Global Maritime Distress and Safety System (GMDSS) marks the biggest change to maritime communication since the invention of radio.

4.1.1 The GMDSS.

This has been introduced in stages between 1993 and 1st February 1999. It is a system that applies to all cargo ships over 300 gross registered tonnes and to all passenger ships regardless of size, on international voyages. The basic concept of the system is that search and rescue authorities ashore, as well as ships in the vicinity will be rapidly alerted in the event of an emergency: figure 4.1. The GMDSS makes great use of satellite communications provided by INMARSAT but also uses terrestrial radio. The equipment required by ships varies according to the area of operation. The GMDSS also provides for the dissemination of general maritime safety information such as navigation and meteorological warnings and urgent information to ships. STCW '95, Regulation IV/2, requires every person in charge of or performing radio duties on a ship required to participate in the GMDSS to hold an appropriate certificate related to the GMDSS, issued or recognised by the

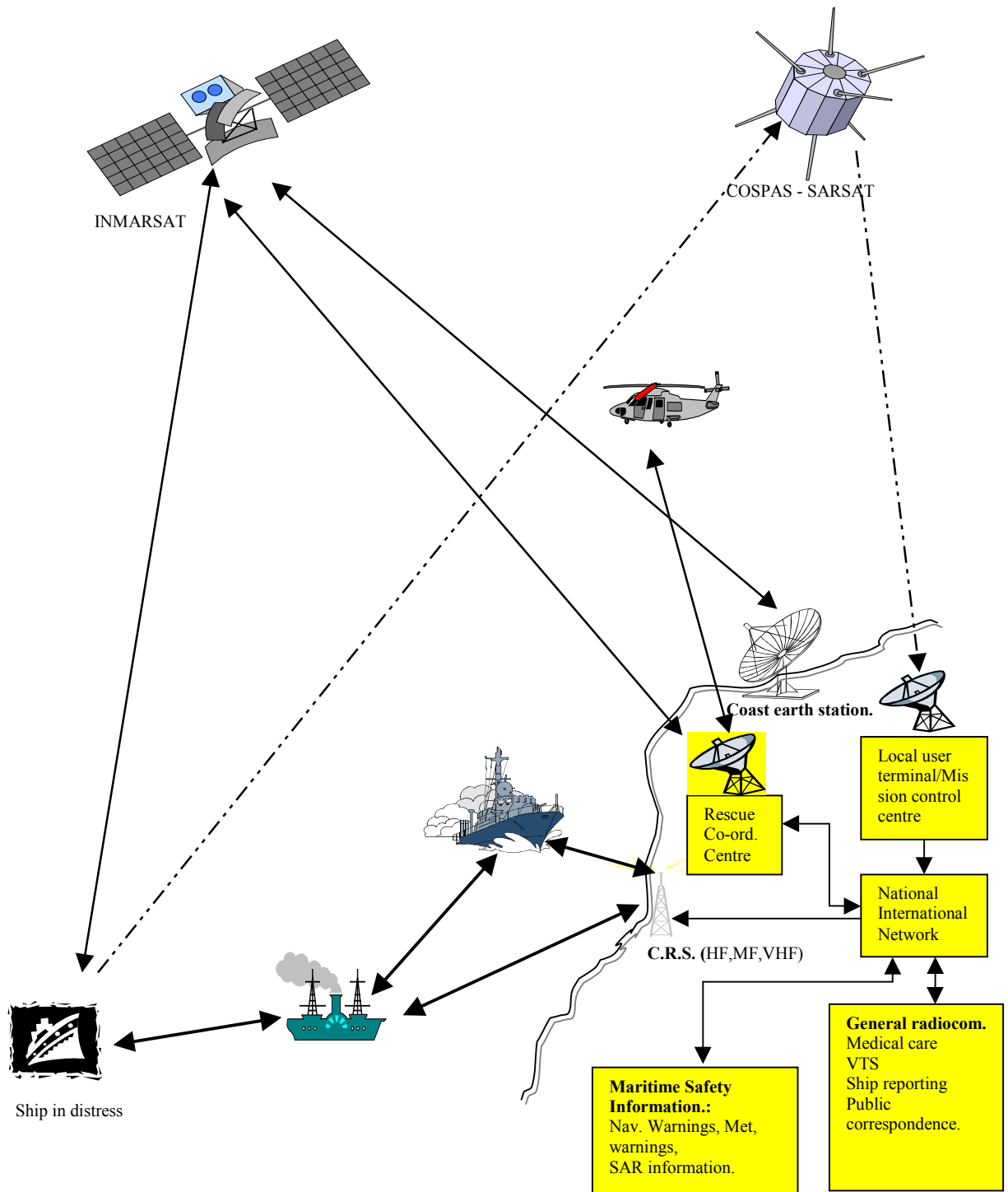


Figure 4.1. Basic concept of the GMDSS.

Administration, under the provisions of the Radio Regulations. In view of this, MET institutions (that have not yet done so) are expected to prepare and conduct courses relating to at least the General Operator's Certificate or Restricted Operator's Certificate.

4.2 Marine Simulation.

Although use of simulation technology for training purposes has been a feature of several industries especially the aircraft industry for many years, it is still relatively new in the maritime and related industries. The first attempt at ship bridge simulation appeared in Sweden and the Netherlands in the late sixties, being initially intended for research work only. It was not until 1976 that the first simulator designed with the specific aim of training seafarers was installed at La Guardia Marine Terminal, New York.

The basis for using simulators in education and training is captured in the old adage, 'Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand.' According to Ringard (1993), the role of simulation is to reproduce practical situations so that experience can be gained in a selective manner under controlled and repeatable conditions. This means that for participants the result of simulation should not just be the cognitive perception but also experience. Taking this same line of thought, Jones (1987), defines simulation as follows:

A simulation ... (in education) ... refers to untaught events in which the participants have roles and are required to accept the responsibilities and duties of professionals. Central to simulation therefore is neither the hardware nor software but the participants. Simulators are a proven tool in providing a highly realistic training environment for all mariners, and have the potential to improve training efficiency in many different tasks. They can also provide for the assessment of knowledge and skills and for their transfer to shipboard practice because they enable maritime

academies to offer close-to-reality training for important relatively complex and potentially dangerous tasks without any physical effect on ships and trainers.

4.2.1 Types of Marine Simulators.

Marine simulators are classified according to the type of simulation performed. Relevant types are listed below:

a) Navigation equipment simulator.

This may stand-alone or be coupled to a radar/navigation simulator. It incorporates various modern electronic navigation instruments such as ARPA, radar and GPS, and is used for training in operating procedures and accuracy theory.

b) Communication equipment simulator.

Radio communication systems incorporating various radio communication equipment, for example, VHF, MF, HF, Digital Selective Calling (DSC), search and rescue EPIRB, and linked to bridge system or stand-alone. In full configuration it fulfils GMDSS general operator's certificate requirements.

c) Radar simulator.

A radar simulator, also called blind pilotage simulator, consists of basic ship equipment: rudder, telegraph, turn rate indicator and depth indicator. It is fitted with various real radar and ARPA displays, a radar simulator instrument controls and interfaces; without outside view. The system is designed to give a realistic representation of a ship's bridge procedures. It is used for training in radar observer techniques.

d) Radar navigation simulator.

A radar navigation simulator has all the controls and functions of a radar simulator as described above, with real or generic navigation equipment - GPS, ECDIS, GMDSS, Decca are added to facilitate training in navigational procedures.

e) Ship handling simulator.

Consists of a complete ship's bridge equipped with full navigation instruments and communication equipment. It incorporates all components of radar navigation simulator plus visuals, and various types of internal and external effects (roll, pitch, vibration, day and night, sea and weather condition) introduced.

f) Liquid cargo handling simulator (originally oil tanker simulator).

Simulates the dynamic procedures of filling and emptying tanks, cargo distribution and stability/stress characteristics. It is used especially in training for complicated operational procedures such as in gas, chemical and product carriers.

f) Propulsion plant simulator.

Replica of engine control room, alarm and control panels as in engine room, actual engine being usually replaced by mimic consoles. There is added noise to create life-like operational influences. It may be coupled to a bridge simulator.

In addition, marine operation simulation falls into four classes or categories namely: Full mission, Multi-Task, Limited Task and Special Task as shown in Table 4.1. (see also definitions below). This classification does not necessarily have world-wide acceptance, it is basically an attempt by the International Marine Simulators Forum (IMSF) to provide non-simulator specialists such as MARADs and shipowners/operators with a better understanding of the various types, for licensing and training requirement purposes.

Full Mission simulator is an instrument or facility that is capable of simulating a total environment e.g. the sophisticated shiphandling simulators used for port development studies, advanced manoeuvring and pilot training. Full mission engine room, cargo and docking simulators come into this category.

Multi-task or Hybrid simulator is an instrument or facility that is capable of simulating a limited environment e.g. navigation simulator with limited visual field of view and limited shiphandling capability.

Limited of Part-Task simulator is an instrument or facility that is capable of simulating a single ship's system or a limited combination of tasks relating to a system e.g. radar/navigation blind pilotage simulator, cargo and ballast control simulators including networked interactive personal computer based systems.

Single Task simulator is any simulator where all humans are placed outside the environment e.g. radar simulator, VHF simulator, Inert Gas simulator and engine subsystems.

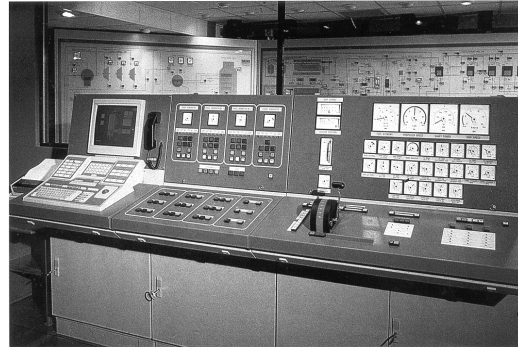
Simulation has become a powerful didactic strategy in fulfilling certain training objectives, particularly in the affective and psychomotor domains. It can be invaluable in teaching everyday manoeuvres as well as teaching both advanced manoeuvring techniques and emergency procedures applicable to merchant navy cadets, experienced navigators and pilots. In addition, it can be used to provide specific ship training for shipping lines introducing new ships, especially when there are significant changes in things such as ship size or rudder, propeller, thruster performance, etc. A summary of the capabilities and limitations is given below.

4.2.2 Capabilities of Marine Simulator.

- (a) It provides a highly effective form of training: On the simulator, the mariner can make errors without costly and catastrophic consequences and receive corrections



(a) Radar simulator. (Source: ENMM)



(b) Engine room simulator.



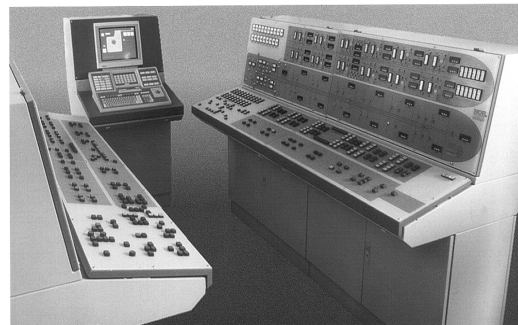
(c) GMDSS simulator.



(d) Cockpit - style OMBO bridge.



(e) Shiphandling simulator.



(f) Cargo handling simulator.

Figure 4.2. Common marine simulators. (b,c,e,f): Cockpit bridge. (d)

Source: Norcontrol

to assist in improved performance. Skills required for the navigation and handling of vessels in all environments and situations can be acquired and evaluated without risk to ship or danger to life. Besides, different situations can be repeated until a satisfactory conclusion is reached.

Table 4.1 Classification of marine simulators operations.

Classification	Bridge	Engine Room	Cargo Handling
Category 1 Full Mission	Capable of simulating a total environment, including capability for advanced manoeuvring and pilotage training in restricted waterways.	Capable of simulating a total environment, including capability to operate all main propulsion and auxiliary systems.	Capable of simulating a total environment, including capability to operate all cargo and ballast systems.
Category 2 Multi-Task	Capable of simulating a near total environment, but excluding certain environmental elements.	Capable of simulating a total environment, but excluding certain environmental elements.	Capable of simulating a total environment, but excluding certain environmental elements.
Category 3 Limited Task	Capable of simulating an environment for limited (blind) navigation and collision avoidance training.	Capable of simulating an environment for limited engine operation and procedural training.	Capable of simulating an environment for limited cargo and/or ballast operation and procedural training.
Category 4 Special Task	Capable of simulating particular instruments, or limited navigation/manoeuvring operation but with the operator located outside the environment.	Capable of simulating particular instruments, or limited engine room operation but with the operator located outside the environment.	Capable of simulating particular instruments, or limited cargo handling and/or ballast operation but with the operator located outside the environment.

Source: IMSF, 1998.

b) It covers emergency situations: Some tasks such as emergency procedures, manoeuvring in difficult conditions for instance, cannot be ordinarily experienced at sea, but the mariner can be trained on the simulator in these tasks. In real life situation such training is impracticable.

- c) It provides an assessment medium: The simulator can also be used to assess the trainee's competence. Criterion values for the various parameters can be set by the instructor in advance, and will be the same for every trainee's performance. It is therefore possible to provide a structured and objective assessment of trainees' competence using the simulator.
- d) It reduces training time and cost: The simulator cannot replace the real ship experience, but it can provide an opportunity for the mariner to improve his/her skills in certain seamanship and navigation tasks over a very short period.
- e) It provides skills based training medium: One of the most common skills needed by the mariner in the command and operation of a ship is that of shiphandling. The shiphandling simulator is designed in such a way that the mariner is enabled to acquire such skills during training.
- f) It provides exercise flexibility: Exercises can be varied or changed easily in terms of exercise areas, internal and external parameters or to meet different training objectives.

4.2.3 Problems of Training and Assessment by Simulators.

In order for trainees to derive optimum benefits from simulator training courses, certain problems that arise when using simulators for training and assessment have to be dealt with first or at least taken into account:

- a) One of the greatest difficulties to be resolved is that of the lack of instructors with sea-going experience, pedagogic skills and instructional techniques in the use of simulators. This calibre of instructors is hard to come by in the developing countries.

- b) There is always the problem of how to balance the number of trainees against the time available for training: The recommended group size for most training objectives is between 3 - 6, and it is expected that each trainee should have sufficient hands - on opportunities to acquire the desired skills.
- c) There is also the need for course aims and objectives and training strategy to be formulated. Examples abound world wide of training institutions that possess a simulator but do not care how it is used.
- d) Equipment characteristics and limitations limit the instructor's control. Certain tasks can only be demonstrated onboard in a real life experience and the instructor has no way of demonstrating them on the simulator.
- e) As with training, so it is with assessment, certain elements are difficult to assess by means of a simulator, e.g. attitude, human interaction and fatigue. For these elements, different means will need to be used to reach an evaluation.
- f) Achieving a valid assessment in some skills using the simulator is another problem. The evaluation of, for instance, shiphandling skills on the simulator can hardly be a valid measurement of how the trainee will perform in real life at sea. As long as the simulator does not produce a mirror copy of the real world, it cannot produce an accurate and valid assessment of skills.

4.3 Information Technology (IT).

The term Information Technology is used to refer to a nexus of modern Electronic - based technology used for handling information. It incorporates the Internet, audio/video technology, satellite communication system and computing.

a) The Internet:

The Internet may be defined as a network of computer networks, and is one of IT's fastest growing developments. It originated in the United States of America in the mid 1960s, when it was basically an emergency military communications system operated by the U.S. Department of Defense's Advanced Research Project Agency (ARPA). The whole operation was then referred to as ARPANET. Over the years the Internet has gone from a military pipeline to a communication tool for scientists, and finally today businesses are making use of it. The Internet facilities are provided through a large set of different services. The relevant ones include:

- i) Electronic mail (e-mail) - certainly the most widely used service - facilitates the exchange of any type of information that people might use paper mail or telephone for, e.g. as in correspondence courses.
- ii) On-line conversation - facilitates real time "conversation" with other users anywhere on the net. Useful when chatting with people on other continents, particularly, when one party is not a native English speaker.
- iii) Information retrieval - many computers have files of information that are free for all seekers. The files cover anything from library card catalogues to digitised pictures and an enormous variety of software.

b) Audio/Video technology (covered under satellite communication systems in the next section).

b) Satellite communication system.

The components of the satellite communication system are the:

- ❖ Satellite, which acts as a repeater in the active mode, and in the passive mode, serves as a signal reflector.
- ❖ Transmitting station, which transmits the signal to the satellite.
- ❖ Receiving station, tuned into the frequency transmitted from the satellite.

The system has evolved into everyday life, and it has become commonplace for the bulk of transoceanic telephone and data communication to travel by satellite. Other applications of the satellite networks include:

i) Its use by the broadcasting industry in carrying programming from the originator (TV networks) to the final point of distribution (broadcast TV stations and home dishes).

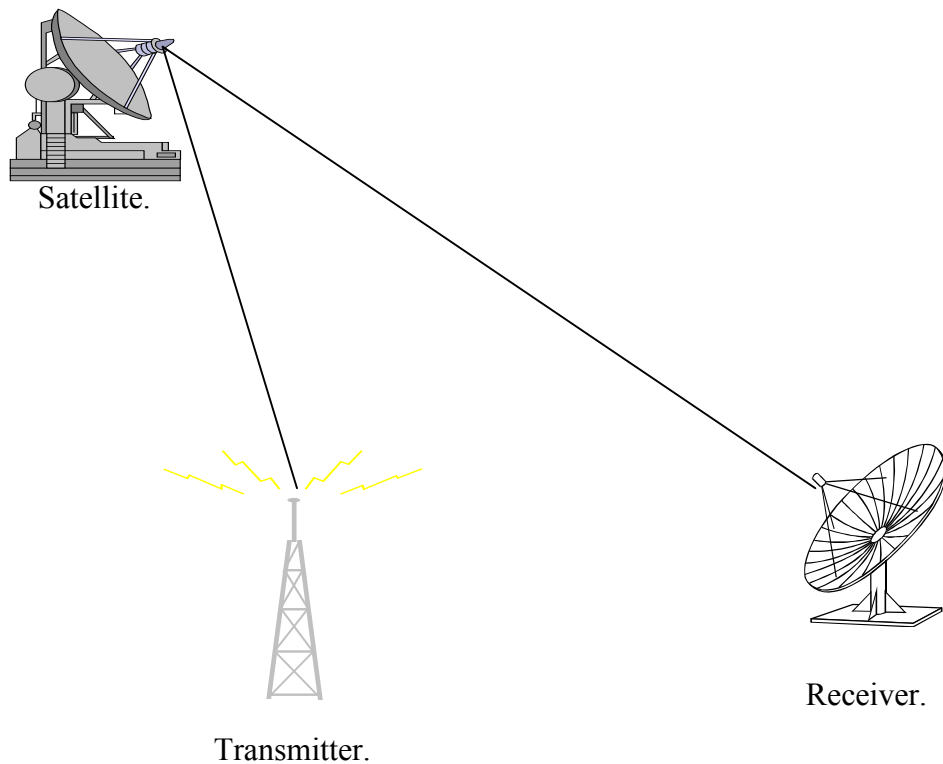


Figure 4.3. Satellite communication system.

ii) Compressed video conferencing - used in business meetings for example to link one or more distant locations. Also suitable for presentations consisting of colour slides or computer graphic images. Due to the digital compression of signals, a full-motion colour TV signal with sound can be transmitted .

iii) Its use in the delivery of high quality audio services by satellite to broadcast radio stations. One way that this is done is in using point-to-multi point connection which

enables sound to be uplinked to the satellite. The satellite acting as a repeater transmits the information to be distributed to the receiver only earth stations.

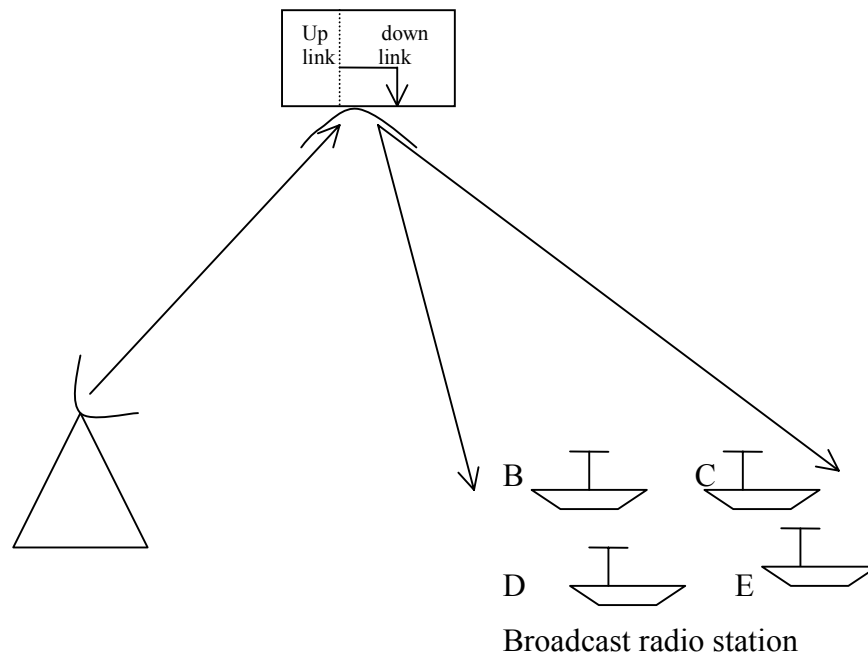


Figure 4.4. Satellite broadcast network: Point-to-multi point connection.

d) Computing.

The application of computer technology today is widespread in all sectors within the shipping industry. Just as is the case in everyday life, computers are present in every field of vessel operation and management, from design and planning to navigation and maintenance scheduling. In the field of maritime education and training this technology has ushered in many new possibilities of improving the efficiency and quality of education.

Already many shipowners and operators are planning for a future increasingly centred around the operation of the 'IT office at sea' (use of information technology in the daily management and operation of the ship). For the shipowner IT is useful in

many ways: it can be used in ship operation management, safety management and onboard training, especially in respect of safety management practices (ISM Code), new equipment and familiarisation training (STCW '95) for new crew members. By implication, ship owners and operators will be seeking to retain or employ new officers and crew who have the capability to use such equipment, programs and services. This is going to impact on training needs.

Regarding maritime education and training, IT can be used in two ways viz. in formal education and training in an academy and in guided distance learning aboard ship. The latter will be discussed under distance education.

4.3.1 Computer Assisted Learning (C.A.L.)

Computer assisted learning, sometimes known as computer based training (C.B.T.) may be defined as a method of presenting a pre-programmed schedule of events using a computer. The events may consist of audio, text, photographs, graphics and moving pictures such as animation. This combination of various forms of technology is also known as multimedia. Computer assisted learning has been proven to increase retention by up to 80% and reduces training time to almost a half thereby providing cost savings for the shipowner. It can be used as a substitute for a range of on-the-job-training, the trainee for instance is exposed to relevant experience through the performance of tasks selected to meet specific objectives. Meaningful results can therefore be achieved in an enhanced intensive manner.

4.3.1.1 Types of Computer Assisted Learning:

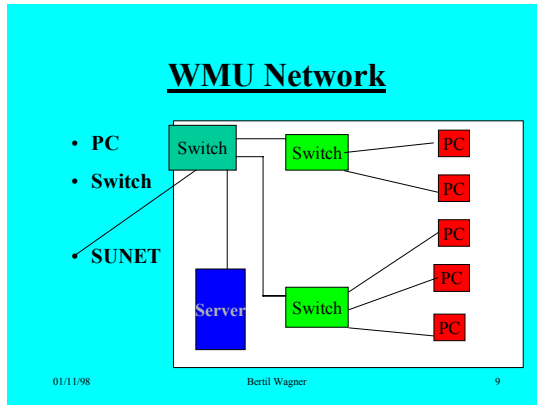
a) Compact Disc - Read Only Memory (CD - ROM).

The CD - ROM is fast becoming the most utilised method of information transfer and at the same time becoming a popular platform for the delivery of training. In

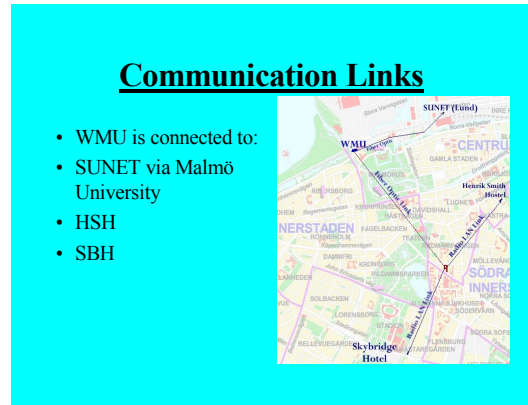
appearance it looks like the audio CD-ROM commonly available everywhere. In use the disc is inserted into a CD-ROM player installed as a hardware component in the computer. Users have the ability to select specific parts of the training or even specific subjects. It is ideal where a large amount of information needs to be stored and retrieved 'on demand', due to its large storage capacity and the ability of the average computer to play audio and display good video images. This form of technology will support and enhance the overall capability of trainers.

b) Local Area Networks (LANs) and the Internet.

LAN is a communications network capable of providing an intra-facility internal exchange of voice, computer data, word processing, video conferencing, video broadcasting, telemetry, and other forms of electronic messaging. In the MET institutions, LAN - the linking of a number of personal computers to a file server within a network system, provides flexibility by enhancing the learning process for the student and providing lecturers with new ways to achieve learning and assessment objectives. Training material is stored on the server to enable students to access a wide range of training programs within the curriculum without lecturer involvement, and student performance can be monitored from the instructor's own personal computer. E-mail provides communication links, and information and databases can be assessed directly from libraries, CD-ROM stack or Internet. Having access to the Internet apart from providing such basic services as e-mail and information resources, also implies the use of data transfer and interactive conferencing. An enormous amount of reference material is available through this technology. It can be used while connected on line sometimes if required with the assistance of a tutor. Alternatively, it can be used when disconnected from the Internet or off line by downloading the information into the user's computer for use at a later time. Figure 4.5 Shows part of the World Maritime University local network: the computer rooms and how they are linked.



(a) Connection within the WMU.



(b) Connections to students' hostels.



(c) Henrik Smith students' hostel.



(d) S.L.H. (students' residence)



(e) University computer room 205.



(f) University computer room 308

Figure 4.5. World Maritime University Local area network.

Source: Wagner, (1999).

4.3.1.2 Benefits of Computer Assisted Learning:

- a) It requires little or no assistance from the trainer during their operation. He or she is freed from the need to train the basic and repetitive items. This makes time available for complicated or detailed functions of the training.
- b) Students can proceed at their own speed with little or no pressure and can learn in a more relaxed environment, which makes for greater receptibility.
- c) Computer assisted learning can be used for groups or for individuals. Learning can be focussed according to need levels and capabilities.
- d) Training programs are widely available for most widely used subjects e.g. buoyage and Rules of the Road.
- e) Programs are easy to access and use even without too much computer experience.
- f) It allows the trainee to respond and explore the displayed screens by interactions which encourages greater participation at all levels.
- g) Students' response and progress can be better recorded, monitored and evaluated.
- h) Progress can be directed to specific learning objectives.
- i) Access to computer facilities extend the time window of learning.
- j) Subjectivity is reduced in computer based assessment procedures.

4.3.1.3 Disadvantages of CAL

- a) It involves teaching students to follow fixed rules and procedures rather than to think for themselves.
- b) The computer lacks cognitive power of classroom group.
- c) Students tend to become isolated from the peer groups, by working in a vacuum.
- d) Computing facilities are costly to buy and maintain.
- e) The technology is constantly changing, requiring costly re-investment and re-training.

Computer application in MET is not limited to the teaching process. It has been discovered that the most suitable way for checking out students' knowledge is the man-machine interface (MMI). In the former USSR it was usual for computers to be used in higher marine schools for individual consolidation of theoretical knowledge received during lectures in the classrooms. Yakushenkov (1993).

Despite the disadvantages, combined with networks and multimedia capabilities, computer assisted learning is a formidable educational tool. Flisi (1995), claims that 'we learn 20% of what we see, 40% of what we see and hear, and 70% of what we see, hear and do'.

4.4 Distance Education.

Distance education is an evolved form of correspondence education but with a wide application of the concept. It is synonymous with distance learning in that it is learning at a place removed from the source of tuition. It is learner centred, that is, work is set with the individual student's circumstances or abilities in mind. It may be regarded as a part of open learning, an umbrella term for any scheme of education or training which seeks systematically to remove barriers to learning whether they be time related, place or pace.

Distance education programs normally consist of professionally developed and instructionally designed learning units with built-in teaching and learning mechanisms for student interaction, feedback and evaluation and provision for tutor contact. (Muirhead, 1998). A typical distance education unit in turn will consist of a unit guide and study guide supplemented by a readings book. A textbook, computer software, or other media such as audio or video tapes, CD ROM or laser discs and Internet sources may be used to support it. Related TV programs offered at specific times through national broadcasters such as BBC or public network (PBS in the USA) may be used to support the units. In addition, use of teleconferencing, video

conferencing media and attendance at a summer school may all form part of the program. The units are structured so as to provide the student with the sense of communicating and interacting with the delivering institution and the designated tutor. E-mail links for tutor interaction are an increasing feature of modern approaches. According to Chugani (1997), the science and technology of education is changing the entire approach to teaching at all levels and distance education is becoming a traditional process to achieve the desired outcome of learning.

To both the institution and student distance education is cost saving. In addition, the student can study at sea through courses instructionally designed for shipboard use using a range of instructional media tools. The student will be enabled to take a degree or further his/her education at sea without the traditional requirement of attending a course.

4.4.1 Application in Maritime Education and Training.

Maritime education and training institutions can offer training programs by distance learning, as is already the case in some institutions in Europe and Australia. A research project reported on by Muirhead (1998) has shown how satellite communication is used to provide the link between the trainees or student and the training officer at sea or tutor ashore. Assignments can be transmitted, assessed, recorded and returned within a short time, questions can be responded to in a matter of hours by either fax, telex or telephone. There is also the possibility of monitoring training programs and individual performances on board from ashore (shipping company or institution), especially where the on board training forms part of the MET program being recognised by an authority for competency purposes.

A form of distance education in use at present by maritime institutions and shipping companies for the training of individuals undertaking training in line with STCW '95 is the Training Record Book (TRB). This involves the cadet performing a number of training tasks or duties during the on board training period. The tasks are initialled

by a qualified officer, when in his/her opinion, the trainee has achieved a satisfactory standard of proficiency. In between voyages the TRB is examined and endorsed by the company's training officer. The successful completion or otherwise of the guided tasks in the TRB usually forms part of the criteria used in deciding the competency of the prospective officer.

However, there are still many problems to be overcome before IT can be effectively used in MET, especially in on board training programs.

- a) In the first place, cost of data transmission is very high, to the extent that individual seafarers are not able to afford the cost of undertaking personal study at sea.
- b) The problem of access to computing and communication technology on board, plus availability of time and motivation on the part of the seafarer.
- c) Monitoring the individual for competency standards will not be easy.
- d) Many available distance education programs will require modification for on board use, particularly in the area of tutor contact, access to resource materials and design of assignment and assessment material.
- e) Changing training programs to meet new technology training demands maintaining networks at sea.
- f) In developing and delivering distance education courses, certain critical issues must be addressed. For instance, materials must be of good quality, easily updated and is supported by good communication and effective management, otherwise the program will fail.

4.5 Other Forms of Technology Impacting on MET.

4.5.1 Compact Disc Interactive (CD-I):

As the name implies, the system allows very effective interaction and participation by the trainee, it can be used by an individual or a group and it covers a wide range of training subjects. CD-I discs look very much like the CD discs and CD-ROM but suffer the disadvantage that in all cases, a dedicated CD-I player is required as it can not be used with other technologies. The system offers training sessions in three different modes: individual learner mode, group training mode or trainer led group mode. In the first two modes guidance and feedback will be provided by the system to enable the user(s) to proceed – similar to the method used in CAL. In addition, there will be introduction with training goals and objectives similar to the CAL approach and design. Any part of the program can be selected for use by an individual, thus increasing the flexibility of the system. On completion of the training program, summaries are normally made of the key points, suggested readings or study materials may also be given.

4.5.2 Video Training Programs:

The video based training program is another very powerful tool for training and education. It covers a wide range of subjects from basic to advanced and can also be used by individuals or group training sessions. It has the added advantage of moving images, to support the learning points. It can be particularly helpful to make lectures less abstract such as in safety videos involving abandon ship procedures, etc., where trainees have had no practical knowledge of the subject. Thus it enhances understanding and effectiveness of the courses and can form a basis for instruction for the trainee. Like the others, groups or individuals can use it very effectively.

4.5.3 Integrated Bridge System (IBS) and One Man Bridge Operation (OMBO).

An IBS has been defined as a combination of systems that are interconnected to allow centralised access to sensor information or command /control from workstations, with the aim of increasing safe and efficient management of the ship.

An IBS consists of:

- ❖ The integrated navigation system (INS) – that part of the system used in the navigation and conning of the vessel.
- ❖ The integrated control system (ICS) – that part of the system that allows for information exchange between the different computer based monitoring and control systems on board and
- ❖ The individual steering and propulsion control.

Figure 4.6 Shows typical equipment of an IBS.

IBS has many advantages, including cost saving on fuel, reduced manning benefit, increased navigation efficiency and overall ship safety. The trend in vessels fitted with an IBS is that the whole ship function is controlled from a central position. The navigator or pilot is provided with all the information needed to navigate the ship, plus a communications control (GMDSS), control of engine, ballast system and cargo system. The goal is ‘one screen, one set of controls and control of any shipboard operation from one location. A ship fitted with an IBS may be designed to an OMBO specification if the owner desires. A classification society has to certify the ship on behalf of the Administration.

At present, only the larger European shipowners are installing the fully integrated bridge system. Although IMO in May 1998 decided to end OMBO trials during hours of darkness, some shipowners that have IBS fitted ships have gone ahead to apply for an

OMBO notation. Manufacturers for their part are also moving towards IBS and OMBO in the type of display being developed, such as the Kelvin Hughes Multi-feature Display (MFD). One of the disadvantages of the IBS and OMBO is that good training is vital to ensure effective use. Graveson (1998), is of the opinion that the level of crew training for this technology falls short of what is required. It is noteworthy also that there is yet no laid down training regime for the IBS although there has been a proposal by the Finnish government on the conduct of such training, certification and refresher courses. Consequently, it is left to the individual academies in consultation with shipowners to identify training needs and conduct IBS training accordingly.

4.5.4 Electronic Chart Display and Information System (ECDIS).

ECDIS is a navigation information system that can be accepted as up-to-date chart which is required by SOLAS 1974, chapter V, to be carried on ships. It must have adequate backup arrangements and should be capable of displaying selected information from a System Electronic Navigation Chart (SENC) together with positional information from navigation sensors to assist the mariner in route planning and monitoring. It has many advantages and some disadvantages also, including the need for additional training for safe use. Apart from learning the generic concept of the system, operation and limitation, the user will also learn the new colours and symbols recommended by the International Hydrographic Organisation (IHO) for use with ECDIS.

The foregoing technologies as a whole have implication for future MET in Nigeria. In considering the necessity for the Nigeria MET to keep pace with these new and changing technology, many questions spontaneously come to mind?

- ❖ Can the Nigerian MET institution meet the training challenge?
- ❖ Does it have instructors sufficiently skilled themselves in order to prepare seafarers for the technology world?

- ❖ Does it have the necessary simulators, computers, communication equipment etc?
- ❖ How can it ensure that it is involved in providing skilled seafarers for this technology world?
- ❖ The answers to these questions and others are provided in the succeeding sections.

4.6 The Need for Changes:

Nigerian MET system, presently faces a host of problems in the light of new, and changing technology and international legislation. Inevitably, changes need to be introduced to the whole system as necessary in order for it to remain relevant to the training of modern day seafarers, as well as be able to achieve its objectives of training, examination and certification of both local and international seafarers. Therefore changes to the system are required in the following areas:

- a) Equipment for information technology, simulation and GMDSS. The Nigerian MET centre (Maritime Academy) generally lacks this equipment.
- b) Recruitment, training and re-training of staff. Nigerian MET system not only lacks equipment but also lacks skilled staff, that is, staff who are appropriately qualified and staff who understand how to use new training methods brought about by new technology.
- c) Training efforts will have to be re-focussed to take into account new international legislation such as STCW '95, MARPOL '73/78 and the ISM code in particular, and also new and changing technology such as the GMDSS, simulation, computing, etc.
- d) On board training, to conform to STCW '95 requirements.
- e) Relationship and co-operation with the industry. For example, the industry needs to be clearer on its objectives, and on the level of skills needed on its ships in the future. It needs to work closer together with MET institution i.e. the Maritime Academy to develop relevant cost effective training programs. This type of co-

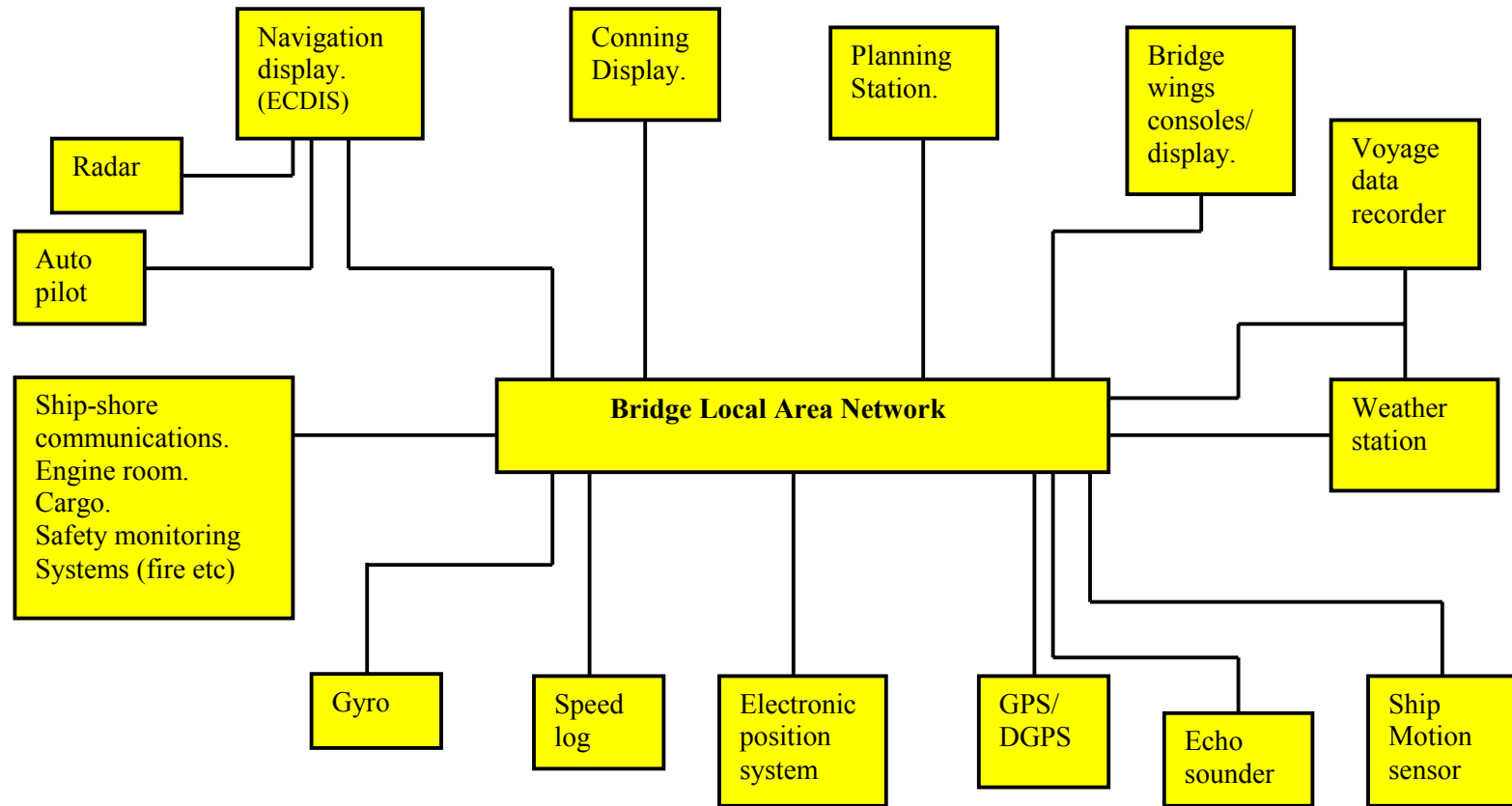


Figure 4.6. Block diagram of an integrated bridge system.

operation is actually lacking in Nigeria, but it is very important for effective maritime education and training.

- f) The status of STCW '95 convention, including the communication of information required by Article IV and Regulation 1/7. It has already been pointed out that without such changes the Nigerian MET will be in no position to train international seafarers.
- g) Changes not resulting directly from new technology and international legislation are also necessary. For instance, there is the need to change a system that has been seen as the isolation of maritime education from other academic education. What is required in Nigeria is a front-ended system of maritime education that simultaneously combines maritime studies with other Academic studies, as is the case in many parts of the world especially Western Europe, U.S.A., some parts of Asia and Latin America. The beauty of such a system can be seen from two angles: In the first place, it attracts young students to the noble career of ships master and chief engineer, while assuring them of the possibility of working ashore at the same social status if they decide to quit seafaring. In addition, it is more economical for the shipowner/government. It provides better labour mobility while ensuring that mariners are kept within the industry.

4.7 Equipping the Nigerian MET.

Equipping the Nigerian MET was highlighted in the previous section as being one of the essential changes necessary for the MET system to continue training seafarers for the technology world. There are three aspects to this problem:

- ❖ Identification of needed equipment.
- ❖ Funding of equipment purchase.
- ❖ Training and re-training of staff for effective use of equipment.

4.7.1 In addition to modern laboratory and workshop equipment and a well equipped library, other equipment needed includes:

4.7.1.1 Suitable simulators – The Nigerian MET system may require as many as four of five different types of simulators:

- a) Radar navigation simulator – full mission or multi- task, (not required if there is a shiphandling simulator).
- b) Communication equipment simulator – special task.
- c) Liquid cargo handling simulator – full mission or multi-task.
- d) Propulsion plant simulator – full mission or multi-task.
- e) Shiphandling simulator - full mission or multi task.

4.7.1.2 Computers, colour projectors, video/TV equipment, CD-ROM players and CD-I players plus relevant training programs.

4.7.1.3 Training vessels – at least one specially equipped vessel should be maintained by the Academy for use in routine training.

4.7.2 Provision of funds for the purchase of modern training equipment. This can be achieved in many ways. It is often said that charity begins at home, this being the case, the source for funds should begin from within the country.

4.7.2.1 As per Decree number 10 of 1987 (the Nigerian shipping policy Decree), the National Maritime Authority (NMA) is to facilitate the development of Nigeria's maritime manpower. In fact, section 3 of the Decree identified the objectives of the policy as being inter alia to:

‘... encourage ... the achievement of indigenous skills in maritime transport technology, promote the training of Nigerians in maritime transport technology and as seafarers.’

The point is that the NMA should be the number one source of the necessary funds, as a matter of legal obligation.

4.7.2.2 The Petroleum Trust Fund (PTF) also should come to the rescue of the Nigerian MET system by making funds available for the purchase of equipment.

4.7.2.3 Funds may be provided by ship owners (Nigerian Association of ShipOwners). This type of assistance is already being provided by the industry in many countries around the world. Unfortunately, Nigerian shipowners are yet to realise that training is an investment for the future, and results in better work quality, safer ships and ultimately reduced running cost.

4.7.2.4 The funds may come from private donors and the private sector including those outside the maritime industry. The DGZRS – Germany’s search and rescue services, a multi-million dollar venture is entirely supported by individuals and the private sector, so is the Royal National Lifeboat Institute in Britain. These are not maritime training institutions as such, but the examples prove that adequate funding is possible through private donors.

4.7.2.5 The government is also expected to help in the provision of funds to purchase the necessary equipment.

4.7.2.6 The Maritime Academy of Nigeria has established and maintains relations with many international agencies including the International Maritime Organisation (IMO) and the United Nations Development Program (UNDP). By virtue of its association with these agencies (through IMO's technical assistance program), funds may be raised for the purchase of training equipment.

4.7.3 Training and re-training of staff: In the main, training and retraining of maritime lecturers involves taking part in a formal course as run by most maritime universities and colleges, in particular the World Maritime University (WMU). Updating of knowledge can be achieved to a limited extent by reading publications and communication with shipboard and shipping companies. Upgrading requires a return to the profession and a visit to manufacturers of advanced shipboard equipment. All three can be achieved through lecturers' involvement in relevant seminars, workshops and conferences. Training and re-training can, and should be jointly sponsored by the NMA, shipowners and other donors listed above with the NMA leading the way. Bob - Manuel (1997), believes that the National Maritime Authority should be greatly involved in sponsoring the training and retraining of 'purely' academic lecturers and facilitating their involvement in seminars, workshops and conferences where modern techniques are discussed.

CHAPTER 5

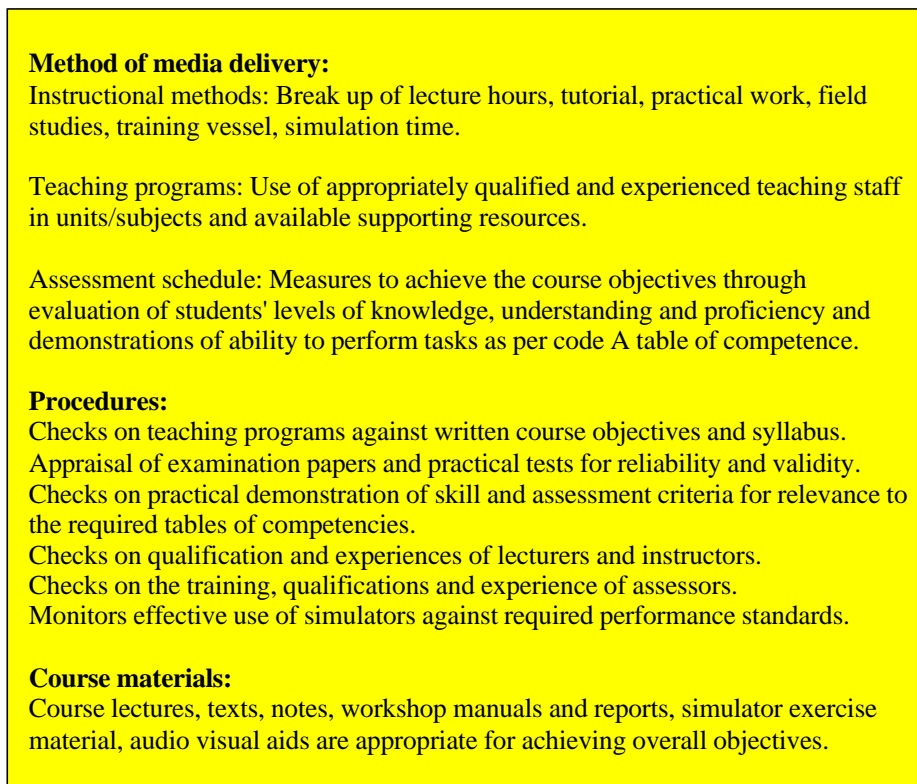
MEETING THE OBJECTIVES OF THE NIGERIAN MARITIME EDUCATION AND TRAINING.

Once again, briefly stated, the Nigerian MET system exists for the purpose of training seafarers and other maritime workers, as well as workers in the maritime related industries for the Nigerian maritime sector. It was pointed out in section 4.6 that in order to carry out this purpose, certain changes will have to be made to the entire MET system. One such change was also identified as the re-focussing of training efforts to take into account the STCW '95 convention. The Nigerian MET system prides itself in training seafarers in line with the Nigerian Merchant Shipping Act and STCW. There is no doubt that its training is in line with the MSA but it only pays lip service to the STCW training. In this chapter, some of the changes that must be made to the system in view of this convention will be examined in greater detail together with the methodologies for effecting such changes.

5.1 Need For a Quality Standards System (QSS).

Firstly, it is to be noted that the requirements for a quality standards system are not affected by the transitional provision (Regulation 1/5) of STCW '95. The implication of this to the Nigerian MET system which is said to be conducting training in line with the convention is that all training, assessment, certification, endorsement and revalidation as well as instructors' and assessors' qualification from February 1, 1997 should be subject to a quality standards system. 'Say what you do

and show that you do what you say' has become a popular saying these days in regard to quality standards. Consequently, what is required of the Nigerian MET system is that it demonstrates clearly that it 'does what it says'. To do this requires four important steps namely; documentation processes, compliance with procedures, self-assessment of the operation and an external independent evaluation by approved quality authority or body.



Method of media delivery:
Instructional methods: Break up of lecture hours, tutorial, practical work, field studies, training vessel, simulation time.

Teaching programs: Use of appropriately qualified and experienced teaching staff in units/subjects and available supporting resources.

Assessment schedule: Measures to achieve the course objectives through evaluation of students' levels of knowledge, understanding and proficiency and demonstrations of ability to perform tasks as per code A table of competence.

Procedures:
Checks on teaching programs against written course objectives and syllabus.
Appraisal of examination papers and practical tests for reliability and validity.
Checks on practical demonstration of skill and assessment criteria for relevance to the required tables of competencies.
Checks on qualification and experiences of lecturers and instructors.
Checks on the training, qualifications and experience of assessors.
Monitors effective use of simulators against required performance standards.

Course materials:
Course lectures, texts, notes, workshop manuals and reports, simulator exercise material, audio visual aids are appropriate for achieving overall objectives.

Figure 5.1 Typical elements of a MET program documentation.

Source: Muirhead, 1998.

5.1.1 Documentation Processes.

This involves clearly defining and fully documenting the goals and learning objectives of the training programs, curriculum details including entry standard,

course structure and syllabus, means of delivery, examination methods, assessment of competency and details of supporting resources. It also includes the qualification and experience of instructors and assessors, identifying in which areas of the syllabus they are teaching or assessing. Figure 5.1 illustrates typical elements in such documentation.

5.1.2 Compliance with Procedures.

Having ‘said what we do,’ the next step is to ‘show that we do what we say.’ For this, a quality standards system framework has to be developed or an existing international or national model adopted, to facilitate compliance with claimed objectives and procedures. IMO does not adopt a standard model, so it will be left to the Nigerian MET institution to adopt any that appears suitable to its needs or develop its own. Such model should incorporate a mission statement of quality, objectives to achieve it, organisational structure, responsibilities, procedures and resources necessary to achieve quality management of the activities and operational techniques and activities needed to ensure quality control. The institution’s policies covering its commitment to quality, and the achievement of its stated aims and objectives should be set out in a clear and concise manner in the mission statement.

5.1.3 Self-Assessment.

This will form a part of the quality standards model adopted or developed in 5.1.2. Basically, what is required is for an arrangement to be put in place by the institution so that an internal review of the entire quality standards system can be undertaken in order to measure the achievement of defined objectives. The internal reviews form the basis for the periodic external evaluations.

For the Government Inspectorate of Shipping (GIS), in addition to the obligations already stated in 3.2.2.1(b) – (d), (f) – (g) and (i), and also 3.2.2.2, it has to ensure

that all its policies related to STCW, as well as their operation and management controls are covered by a quality standards system.

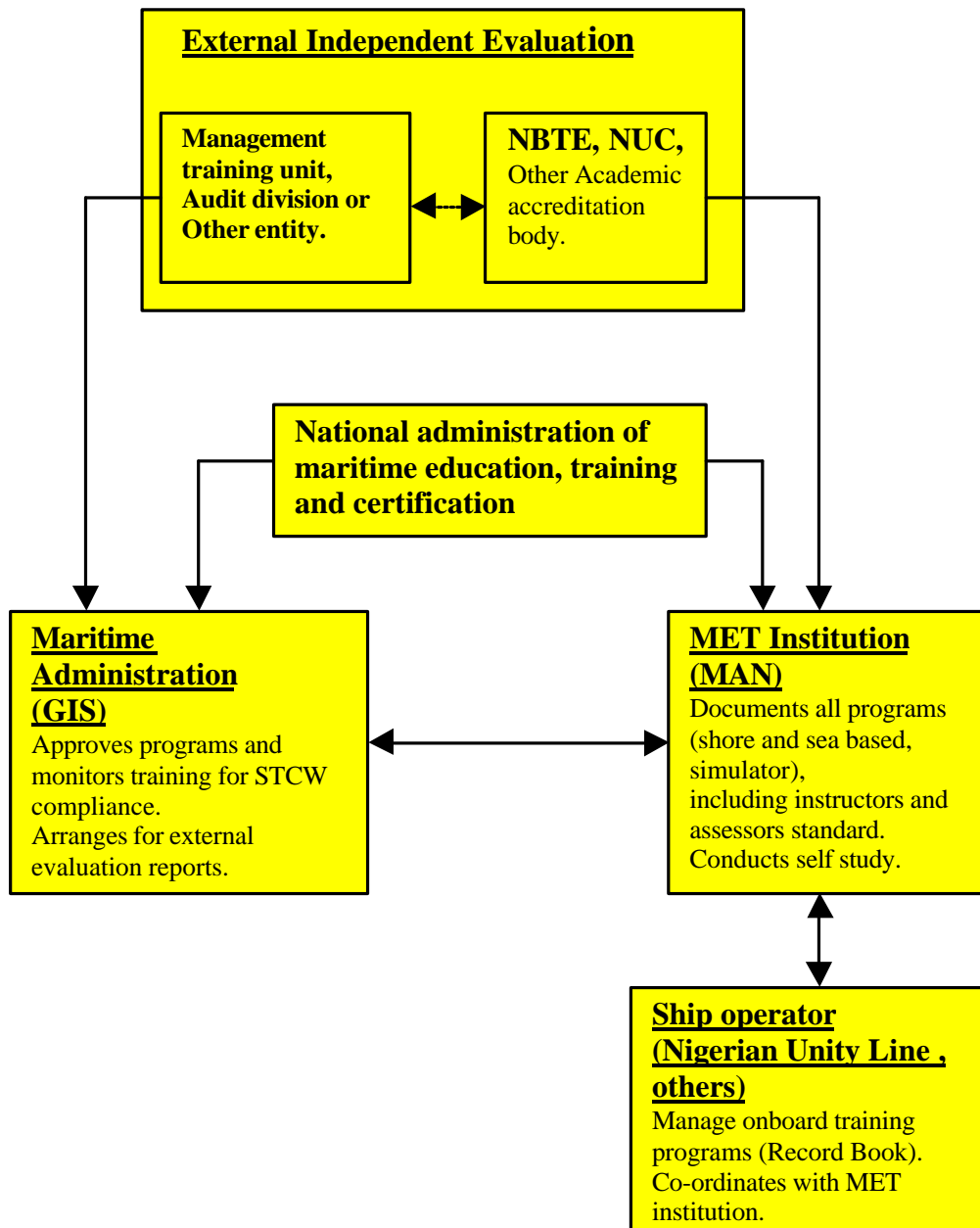


Figure 5.2. Model QSS for the Nigerian MET system.

The quality standards system whether applied to the training institution or to the GIS should also incorporate provision for an independent evaluation to be conducted at intervals of not more than five years. This evaluation provides an independent check of the effectiveness of the quality standards arrangements. For the Nigerian MET institution, it may be carried out by any recognised academic accreditation body such as the NBTE or the Nigerian University commission (NUC). For the GIS, it may be carried out by an operational audit division of the office of the Auditor general of the Federation or an equivalent authority. It could also be carried out by another department of the Ministry, a management training unit or other entity.

A typical QSS for the Nigerian MET system is represented in a schematic diagram (figure 5.2) above.

5.2 Need for Competence-Based Training.

At the heart of the STCW '95 convention lies the concept of competence. In the 1978 version it was mostly a direct examination of knowledge, but under the revised convention the emphasis has shifted from knowledge-based to competence-based: Accordingly, the revised convention code A lays down standards of competence for various categories of seafarers – deck officers/ratings, engineer officers/ratings and GMDSS radio operators. In addition, it lays down minimum knowledge, understanding and proficiency required to achieve competence, as well as methods for demonstrating competence and criteria for assessment. Code B - (II – IV) gives guidance on the conduct of competence-based training and assessment.

To achieve competence, a trainee has to acquire some knowledge and develop some abilities. Therefore competence-based training, in contrast to knowledge-based, means that the trainee is not only taught how to do it, but is also shown how to do it practically, and in addition, allowed to practice or put the knowledge acquired into demonstration. In the same way, in competence-based assessment, the trainee may be required to describe how to do, but most importantly he/she will also be required

to actually demonstrate in the presence of an assessor. Both training and assessment require equipment for demonstrations during training and assessment.

What is required of the Nigerian MET institution in this regard, is to review existing programs by examining the standards of competency tables in code A, and then to develop clear skill and competency objectives within such programs. It also needs to adopt a criterion-based training and assessment approach. Assessing the trainees competence and skill could be achieved using any of the methods listed below as provided for in the convention:

- a) Direct observation of work activities.
 - practical experience on board.
 - laboratory equipment training.
 - simulator training.
- b) Skills/proficiency/competency tests.
- c) Projects/assignments/workshops.
- d) Evidence from previous experience and
- e) Questioning techniques.
 - oral.
 - written.
 - computer-based.

One or more of the methods (a) – (c) is recommended by the STCW for use to provide evidence of ability, in addition to appropriate questioning techniques to provide evidence of supporting knowledge and understanding.

It is to be pointed out that for the Nigerian MET system to be able to meet the convention standards in regard to the foregoing, the institution will need instructors experienced in teaching and curriculum development and design, in addition to well-trained assessors, and well-trained and experienced simulator instructors. The GIS also requires examiners that are well trained and experienced in the use of simulators for assessment. At present, this is one of the biggest problems and

challenges facing MET in Nigeria. How to meet this challenge and solve the problem is discussed in section 5.4.

5.3 Need for simulator-Based Training.

In the first place, STCW makes the use of simulators mandatory for radar and ARPA training and assessment. It lays down performance standards for radar and ARPA simulators in part A of the code to be met by all new simulators after 1st February 2002. Existing simulators or those brought into use before 2002 must also comply with the performance standards from 1st February 1997 unless exempted. Also from 1st February 1997 all simulators must comply with the general provisions in part 2 of the A-1/2, which deals with training and assessment procedures to be used and qualifications and experience of instructors and assessors. STCW also encourages the use of simulators for training and/or assessment of competence and demonstration of skills in other areas such as navigation and watchkeeping, ship handling and manoeuvring, cargo handling and stowage, radio communication and auxiliary machinery operation. Part B - 1/2 of the code contains guidance on recommended performance standards for simulators used in these non - mandatory areas.

In order to meet the requirements of the convention in regard to simulator-based training and assessment, the Nigerian MET institution must take inventory of its existing simulation facilities and resources, including instructors and assessors.

First there is the need to ascertain whether these facilities and resources are capable of meeting course objectives. It should be borne in mind that initially the institution will be running two types of simulator courses namely:

- short term training courses mainly for seafarers who did not undergo simulator training as part of their overall training program and as part of the structure of refresher and updating courses associated with the revalidation of certificates and

- simulator-based training forming part of a planned and structured overall training program leading to STCW certification for the new generation of seafarers.

This implies two types of radar simulator training programs, one separate (short course) program for the former course, and for the latter, a simulator training program forming an integral part of the overall college training program.

Secondly, any serious deficiencies identified from the inventory will necessarily be made good before any meaningful and acceptable training can be commenced.

5.4 Resource Persons.

The Maritime Institution unfortunately suffers from lack of well-trained and experienced instructors and assessors. It is no secret that the factor that has contributed most to this ugly situation is unattractive terms and conditions of employment. As a result, well-qualified and experienced staff are not willing to join the institution and even the few that join are continually being lost to the industry, some, just when they are starting to make an important contribution to the institutional standards. In a changing world, teachers do not only need to know their subjects thoroughly but also have to keep up to date with new theories and current practices. Bob-Manuel (1997), observes that changes in technology coupled with the need for effective training of cadets requires the retraining of maritime lecturers. Since the objectives of the Nigerian MET system can not be achieved without first settling the instructor and assessor problem, it is only sensible that improving the qualification of maritime lecturers, and attracting well qualified individuals should be taken seriously by the powers that be. (Anarah, 1985), draws attention to the need for developing countries in particular to be more aware of the teaching staff problem. The Nigerian system is not alone in this problem though, so it can borrow a leaf from other MET institutions that have suffered and overcome this problem. In addition, expert advice is also available on how this need may be met.

Ofori (1997), advocates that the government should as a matter of priority begin to treat teachers in the maritime field as their counterparts serving at sea. This he says will lead to an influx of teachers to the maritime institution.

He suggests also that teaching staff in the Maritime Academy, especially those involved in professional courses should be provided with constant practical training. He goes on to say that the government, in conjunction with the Academy's governing council, should work out a special scheme for this purpose. Peters (1998), shares the same view, he says that the government should ensure that a Nigerian maritime training scheme is developed and put in place. He continues that the scheme should be worked out by the Maritime Academy of Nigeria, the Institute of Marine Engineers, the Maritime Safety Agency, the National Board for Technical Education, the Maritime Examination Board and other professional bodies. Meanwhile, other methods of improving Nigerian MET instructors' qualifications have been identified as follow:

a) A system used in University of Plymouth for the staff could be adopted. This is a system according to George (1992), that requires all new staff to take the University's staff induction course, unless they have a teaching certificate or have completed more than three full years' teaching. The aims of the course among other things, he says are

- a) To help course members to facilitate learning by selecting appropriate strategies.
- b) To introduce course members to the range of media and resources available to them.
- c) To introduce course members to the principles and methods of assessment, including self and peer assessment, and to relate these to their own courses as appropriate.
- d) To develop the abilities of course members to communicate in order to enhance their own effectiveness as educators.

b) The use of IMO model courses, especially, model courses 6.09 and 3.12 to give instructors formal training in teaching pedagogic skills is another viable and easy option. In the Philippines for instance, this method has been adopted and is now used in all the existing maritime training institutions. The system has the advantages of being relatively cheap, and not requiring the instructor to leave his work completely. In addition, it already has an IMO approved syllabus and a compendium, plus guidance on implementation.

c) A more expensive but highly recommended alternative is a MET course in the World Maritime University, where the MET courses are designed to help train in pedagogic skills.

d) Understudying at another simulator institution.

e) Following the guidance provided in the revised STCW codes, which was developed by experienced IMLA and IMSF simulator instructors.

f) Learning on the job under the guidance of a colleague or a mentor. Zade (1997), observes that the majority of maritime lecturers continue to be trained in this way.

g) Undertaking a simulator manufacturer's training course. Although these rarely teach pedagogic skills, they can provide a good start.

The drive for well-trained and experienced personnel has to be extended to the maritime administration (GIS) also. Otobo (1997), highlights one of the problems of the GIS as an insufficient number of highly qualified, trained and experienced marine surveyors/examiners. He attributes the situation to a poor civil service structure, which discourages the right calibre of marine professionals from joining the division.

5.5 The Role of the Federal Government.

The Federal government of Nigeria has a great role to play to assist the Nigerian MET system in meeting its established functions and objectives.

5.5.1 Revision of the Nigerian Shipping Law (NSL).

If the government is really serious about meeting its responsibilities under the new STCW convention, then it has to take all necessary steps to see that changes are made to structures, processes and programs that go with the implementation of the convention. The first of such changes as earlier mentioned should be the revision of the NSL. Aluko (1997), asserts that there is an urgent need for the formulation of a national policy on the reform of the NSL. Actually, under an IMO assisted project financed by the UNDP in 1988, a review and updating of the NSL was carried out. Whether the government adopted this review still remains to be seen. For example, the NSL does not at present contain any version of the STCW convention. Therefore the role of the government should begin with this all-important task of ensuring that the NSL is revised, and the STCW and other ratified conventions are incorporated into it.

5.5.2 Closely associated with the above is the need for the government to formulate a policy that will involve private shipping lines, especially those that have been granted national carrier status to provide placement for cadets on board their ships for practical sea training.

5.5.3 The government should do more also to provide for infrastructure development, purchase of equipment and training of MET personnel. Akinsoji (1998), is of the view that government funding of the Maritime Academy has not been bad, but at present not absolutely satisfactory.

5.6 The Role of the Industry.

The task of meeting the objectives of the Nigerian MET system is enormous and should not be left to the government alone. The maritime industry, that is, shipping companies, port authorities, offshore services and other beneficiaries of MET institution products also have a very important role to play. Akinsoji (1998), believes that it is the prerogative of the maritime industry to establish the Nigerian MET institution, with government support. However, the Federal government of Nigeria established the Maritime Academy in the hope of training manpower for the industry whereas in fact the industry ought to train its own people. It is only fair that since the government has established the institution on behalf of the industry, that the industry should give maximum support to the institution. This, they can do in the following ways:

5.6.1 Co-operation with the Institution.

The fact that the maritime industry in Nigeria should be part of the MET system cannot be overemphasised. It has been said earlier that the industry should assist the institution in defining course contents and conduct of courses, they should serve on academic boards and governing council of the institution. The foregoing boils down to the fact that the industry should work closer together with the institution. It should be on hand to inform the institution of the type of jobs that need to be done, so that the institution can match training needs to such identified objectives. For instance, operating a ship in the IBS/OMBO mode requires officers to have certain levels of training. In addition, such persons must hold appropriate certificates according to classification society rules. Depending on the shipowner, they may also be required to be dual purpose officers. The point here is that such operational needs of the industry should be communicated to the training institution. It should know how the shipowner wants to run his ship of the future, to be able to develop a cost-effective program. Without this sort of co-operation, the Academy will waste its valuable

time, efforts and money developing and conducting courses that are not relevant to the needs of industry.

5.6.2 Provision of Funds for research projects and staff training.

For a maritime institution, there are two main reasons for being involved in research. Firstly, it enhances, supports and strengthens the teaching programs providing up-to-date information to both staff and students. Secondly, it can be a source of extra income when the research makes use of professional staff of the institution and/or its facilities. For the industry, the benefits are many depending on the type of research work undertaken. It could be a simple fact finding research for the provision of statistics among other things. It could be an applied research that targets a specific problem facing the industry. The latter type may be used to provide explanation to a theory, for reasons of innovation within the organisation, improvement of an existing process or it may be used for the purpose of trying out a new system and so on.

As for the training of staff, it is to be recalled that the product of a maritime institution largely depends on the quality of the teaching staff. Therefore the industry will do well to fund staff training, as this has direct impact on the quality of its future staff. A well-trained crew is generally regarded as an investment in safety, better economy in the long run and a safeguard against detention of ships in foreign ports.

5.6.3 Provision of Assistance for the Purchase of MET Teaching Aids and Books.

The maritime industry is expected to provide financial and material assistance to the MET system especially, the Maritime Academy for the purchase of training equipment most of which have been listed in section 4.7.1.

In addition to this, ship operators should be willing to provide placement for cadets on board their ships during their (the cadets) practical sea period.

5.6.4 Provision of Financial Support in Organising Seminars and Workshops.

With the help of the industry in this area, STCW, MARPOL, ISM and other convention and technology related seminars and workshops could be organised. Such seminars and workshops provide a forum for lecturers to update their professional knowledge, in addition, it provides a forum for interaction and a sharing of expertise and experience between professionals. For the industry, they could be a way of training or familiarisation for staff with regard to these new conventions and technologies.

5.6.5 Provision of Resource Persons.

The industry can also provide resource personnel on secondment to the maritime institution to assist in specific activities that fall within their expertise and/or experience. The defunct Nigerian National Shipping Lines assisted the Maritime Academy in this way up to the time it went bankrupt. It is now left to other shipping companies and other maritime corporations to pick up the baton and continue from where the National Lines left off.

CHAPTER 6

Conclusion and Recommendations

6.1 Summary:

This paper has provided a systematic study of the current problems facing maritime education and training in Nigeria in the light of new technology and international legislation. It is to be noted that other problems of a general nature have also been addressed in the hope that their solution contributes in no small way to the overall solution of the main problems. An obvious direction the concluding discussion could take therefore is to infer that there are basically seven problems militating against effective maritime manpower training in Nigeria. These problems run like a thread through the pages of this paper, and they are summarised below:

6.1.1 Lack of Qualified Instructors and Assessors.

It has been shown that this is one of the biggest problems facing maritime education and training in Nigeria as a result of new technology and legislation. It was traced to the poor salary and unattractive conditions of employment prevailing at present in the system. This problem requires urgent solution for two reasons: the main reason is that STCW demands that lecturers be appropriately qualified, if the institution is to be approved and recognised by both the IMO and the international shipping community. Secondly, (and this is also very important) the quality of a maritime institution's teaching staff determine the quality of its faculties and its curriculum.

As conclusion is drawn, it is worth emphasising that the purpose of establishing the Nigerian MET system cannot be achieved unless this issue is resolved once and for all.

6.1.2 Inadequate Training and Assessment Tools.

The Nigerian MET system lacks basic training and assessment tools. It was pointed out earlier that the Maritime Academy of Nigeria - the only institution in the country given the mandate of training all levels of manpower for the maritime industry - has one radar simulator. It is worthy of note that this simulator is not in use at present, partly because no meaningful training can be undertaken with only one console for trainees and instructor, and partly because of a lack of radar simulator instructors. It was equally mentioned that the Academy has virtually no training vessels for routine practical exercises. Besides, it does not have enough computer assisted learning facilities and seagoing training vessels for cadets' seagoing phases. This study has also shown that a radar simulator is mandatory for MET systems that train international seafarers, and that competence-based training requires in addition, training tools such as seagoing training vessels. Furthermore, any MET institution that wishes to train 21st century seafarers must be up-to-date in modern teaching aids.

6.1.3 Failure of the Federal Government of Nigeria and the GIS to Give Full and Complete Effect to the Convention.

It is to be recalled that since the entry into force of the STCW '78 convention in 1984, Nigeria has not made any law concerning maritime education and training except decree number 16 of 1988 which established the Academy. Consequently, and as this study has revealed, Nigeria cannot expect to be in the 'white list' presently being compiled by the IMO unless it complies with the requirements of the convention in this regard. If Nigeria is not placed on the white list, the Maritime

Academy might as well forget its objectives of training all levels of manpower for the maritime industry.

6.1.4 Lack of a Quality Standard System.

One of the conditions for any country to be in the white list is that a quality standard system be put in place both for the institution and the examination and certification body. This, it was discussed involves the documentation process, compliance and procedures as well as self - assessment. It has been shown, unfortunately that neither the institution nor the GIS has established a quality standard system in compliance with the convention.

6.1.5 Lack of an Up-to-date Convention Compliant Curriculum.

This study highlighted the need for both competence - based training and simulator based training for the maritime institution to comply with the STCW. It was shown also that the Nigerian MET system needs to review its training programs in order to make them competence and simulator-based.

6.1.6 The Isolation of Maritime Education from National Education.

The Nigerian MET system runs the risk of a slow death in the light of this problem. This study has revealed that with the current trend around the world of those engaging in seafaring not wanting to spend long years at sea, the Nigerian maritime education and training system will eventually run into difficulties with economy of scale due to low student population. The country needs a system of education that will attract young Nigerians to the noble profession of shipmasters and chief engineers while assuring them of easy job mobility at the same social status whenever they desire to quit seafaring.

6.1.7 Lack of Industry Support.

Lack of support from the industry was identified as one of the problems facing MET in Nigeria. The fact that the maritime industry in particular, should be part of the maritime education system was pointed out. Most importantly, it was mentioned that because of the enormity of the task of meeting the objectives of the Nigerian maritime education and training system, the institution needs the industry's support. Accordingly this study identified various ways the industry should assist.

Finally, this article has demonstrated that both from a MET and a MARAD perspective, the only way for the Nigerian maritime education and training system to conform to international standards is by making necessary and definite changes in the identified areas to update maritime education in Nigeria. In view of the foregoing conclusions, the following recommendations are made.

6.2 Recommendations.

6.2.1 To Attract, Train and Retain Qualified Lecturers and Assessors.

- a) A policy structure to attract, employ, and retain qualified maritime lecturers should be established by the Maritime Academy.
- b) Special salary and fringe benefits for maritime lecturers should be organised by the Academy, assisted by the industry.
- c) A maritime training scheme worked out by the Maritime Academy to ensure systematic training and retraining of lecturers should be established.
- d) A staff development policy should be formulated by the school to ensure that lecturers are up to date, able to contribute to the development of the department and the Academy, while also enhancing their career prospects.

6.2.2 To Procure Training and Assessment Tools.

- a) The development of a project that will make it possible for both government corporations and private organisations to be involved in the support of the Maritime Academy (already underway) should be pursued with vigour and brought to a successful conclusion.
- b) The Maritime Academy should make the government, the industry and other relevant organisations believe in what it (the Academy) is doing, through advertisement and feedback.
- c) The Federal Government should make funds available for the purchase of a full mission simulator for STCW compliant training of cadets and other seafarers.
- d) The Federal Government should make it mandatory for Nigerian registered ships, especially those granted national carrier status to provide berths on their ships for cadets during the seagoing phase.

6.2.3. To Give Full and Complete Effect to the Convention.

- a) The Federal Government of Nigeria should as a matter of urgency take all necessary steps to incorporate STCW '95 convention into the national shipping law.
- b) The GIS should expedite action to fulfil its obligations under Article IV and Regulation 1/7 of the convention.
- c) A quality standard system for the Maritime Academy and the Maritime Administration should be established.
- d) A complete revision of the Maritime Academy's curriculum (with the exception of those units developed in 1998) should be embarked upon without delay.

6.2.4. To Integrate Maritime Education into National Education.

- a) The Maritime Academy of Nigeria should seriously consider changing to an integrated system of education that leads to the award of a degree as well as a certificate of competency.
- b) A four-year integrated maritime education and training program is therefore proposed for the Nigerian MET system. (Appendix 3)

6.2.5. To Build Support from the Industry, Government and Non - government Agencies.

- a) Every opportunity should be taken by the Maritime Academy to consult these agencies on relevant matters.
- b) An advisory board comprising members from the industry, government and non - government agencies for all major courses viz. nautical science, marine engineering etc., should be set up.
- c) Lecturers should be encouraged and motivated to get actively involved in national and international consultancy missions, mostly on behalf of the maritime industry.
- d) The maritime industry should be represented in the Academy's academic board and governing council.
- e) The Maritime Academy should take a leading role in organising seminars and workshops to be attended by participants from the maritime industry and other relevant agencies.

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Appendix 1

Basic Syllabus for Maritime Pollution Prevention and Fighting in the Maritime Training Institutions.

1. Marine Pollution.

- 1.1 Definitions, basic principles and history cases.
- 1.2 Characteristics of main marine pollutants.
- 1.3 Fate and movement of pollutants spilled into the sea.
- 1.4 Effects of pollutants on marine and coastal resources.

2. Marine Pollution Prevention.

- 2.1 Introduction to MARPOL Convention.
- 2.2 Main operational regulations concerning seafarers.
 - 2.2.1 Applications, Certificates and surveys.
 - 2.2.2 Control of discharges: oil and noxious liquid substances.
 - 2.2.3 Special areas.
 - 2.2.4 Equipment and operations to prevent pollution from oil tankers.
 - 2.2.5 Equipment and operations to prevent pollution from chemical tankers.
 - 2.2.6 Reception facilities in ports.
 - 2.2.7 Oil record book and cargo record book.
 - 2.2.8 General notions of annexes III, IV and V of MARPOL convention.

2.2.9 Annex VI: Air pollution from ships.

3. Sources of Marine Pollution.

3.1 Maritime transport

3.1.1 Oil tankers.

3.1.2 Chemical tankers.

3.1.3 Transport of dangerous cargoes.

3.1.4 Other ships.

4. Organisation of Accidental Pollution Combating.

4.1 Contingency planning.

4.2 Shipboard oil pollution emergency plans, IMO guidelines.

4.3 Practical organisation, logistic means.

5. Combating Accidental Pollution.

5.1 Evaluation of pollution, aerial surveillance, reporting.

5.2 Planning of operations to combat an accidental pollution.

5.3 Containment of oil and protection of sensitive areas. Use of booms and other means.

5.4 Recovery of spilled pollutants. Use of skimmers and other means.

5.5 Use of dispersants, absorbents and other means.

5.6 Bio - remedial techniques.

6 International Conventions and Agreements.

6.1 General knowledge of other international conventions on the protection of marine environment.

6.2 Regional agreements on co-operation for combating pollution incidents.

Source: Pardo, F (1999).

Appendix 2

Advanced Syllabus for Marine Pollution Prevention and Fighting in the Maritime Training Institutions.

1. Marine Pollution.

1.1 Definitions.

1.2 Physical, chemical and biological characteristics of sea water.

1.3 Description and characteristics of the main marine ecosystems.

1.4 Physical and chemical characteristics of main marine pollutants.

2. Fate and Impact of Marine Pollutants.

2.1 Fate and movement of hydrocarbons spilled into the sea.

2.2 Fate and movement of other noxious liquid substances spilled into the sea.

2.3 Impact of oil spills on the following ecosystems: Open sea waters, coastal waters, ports and bays, rocky coasts, sandy beaches, sheltered waters and mud flats, marshes, mangroves and coral reefs.

2.4 Impact of other noxious liquid substances in the same ecosystems.

2.5 Impact of oil and other noxious liquid substances on fishes, crustaceans, molluscs, birds and mammals.

2.6 Impact of sewage and garbage on marine flora and fauna.

2.7 Impact of radioactive substances on the marine environment.

3 Sources of Marine Pollution.

3.1 Maritime transport, operational and accidental pollution.

3.1.1 Oil tankers.

3.1.2 Chemical tankers.

3.1.3 Transport of dangerous cargoes.

3.1.4 Off-shore installations for oil exploration and extraction.

3.1.5 Other ships, fishing vessels, yachts, small boats, etc.

3.2 Land-based sources of pollution.

3.3 Natural pollution.

3.4 Air pollution from ships.

4 Prevention of Pollution from Ships.

4.1 MARPOL Convention.

4.1.1 General description.

4.1.2 Certificates.

4.1.3 Inspections.

4.1.4 Violations.

4.1.5 Evidence to court

4.1.6 Report on incidents.

4.2 Annex 1 of MARPOL Convention.

4.2.1 Application.

4.2.2 Control of discharge of oil.

4.2.3 Special areas.

4.2.4 Reception facilities in port.

4.2.5 General description of oil tankers, segregated ballast tanks, double hull tankers and other alternatives.

- 4.2.6 Retention of oil on board.
- 4.2.7 Crude oil washing and Inert gas system.
- 4.2.8 Monitoring and control systems for oily-water separating equipment.
- 4.2.9 Oil record book.

4.3 Annex II of MARPOL Convention.

- 4.3.1 Application.
- 4.3.2 General description of chemical tankers.
- 4.3.3 Categorisation and listing of noxious liquid substances.
- 4.3.4 Regulations on discharge of noxious liquid substances.
- 4.3.5 Control of discharges.
- 4.3.6 Reception facilities in port.
- 4.3.7 Cargo record book.
- 4.3.8 Standards for procedures and arrangements for discharge of noxious liquid substances.

4.4 Annexes III, IV, and VI of MARPOL Convention.

- 4.4.1 Application.
- 4.4.2 Regulations on discharge and disposal.
- 4.4.3 Documentation.
- 4.4.4 Reception facilities in port.

5 Organisation of Accidental Pollution Combating.

5.1 National and international contingency plans for pollution emergencies.

- 5.1.1 Basic principles.
 - 5.1.2.1 Command structure.
 - 5.1.2.2 Combating equipment and other resources.

- 5.2 Shipboard oil pollution emergency plans, IMO guidelines.
- 5.3 Local, national and international organisation regarding marine pollution emergencies.
- 5.4 Specialised equipment, personnel and support logistics.

6 Pollution Emergencies.

- 6.1 Activation of contingency plan.
- 6.2 Organisation of combating operations.
- 6.3 Logistics.
- 6.4 Communication media and public relations.
- 6.5 Reporting.

7 Pollution Combating Operations.

- 7.1 Evaluation of pollution: Aerial surveillance and other monitoring of spill.
- 7.2 Planning of combating operations.
- 7.3 Containment of spill and protection of sensitive areas. Use of booms and other means.
- 7.4 Recovery of spilled substances. Use of skimmers and other means.
- 7.5 Use of dispersants, absorbents and other products and oil burning.
- 7.6 Bio-remedial techniques.

8 Public Relations.

- 8.1 Collection of information.
- 8.2 Elaboration of reports
- 8.3 Relations with Authorities and personnel of operations.
- 8.4 Relations with the public and communications media.

9 Storage, Treatment and Disposal of Recovered products and Wastes.

- 9.1 Temporary storage of recovered substances and wastes.
- 9.2 Transport of recovered substances and wastes.
- 9.3 Organisation of wastes storage on board vessels or barges and land installations: refineries, reception facilities, industry.
- 9.4 Treatment of recovered oily wastes: incineration, land farming, land filling and burial.
- 9.5 Treatment of recovered chemicals and their wastes.

10 International Conventions on the Protection of the Environment and Co-operation on Emergency Response.

- 10.1 International convention on oil pollution preparedness, response and co-operation, 1990.
- 10.2 Convention on the prevention of marine pollution by dumping of wastes and other matter (London Convention).
- 10.3 General knowledge of Regional Conventions and Agreements on co-operation for the protection of marine environment with special emphasis on conventions applied to the region where the Maritime Institution is located.

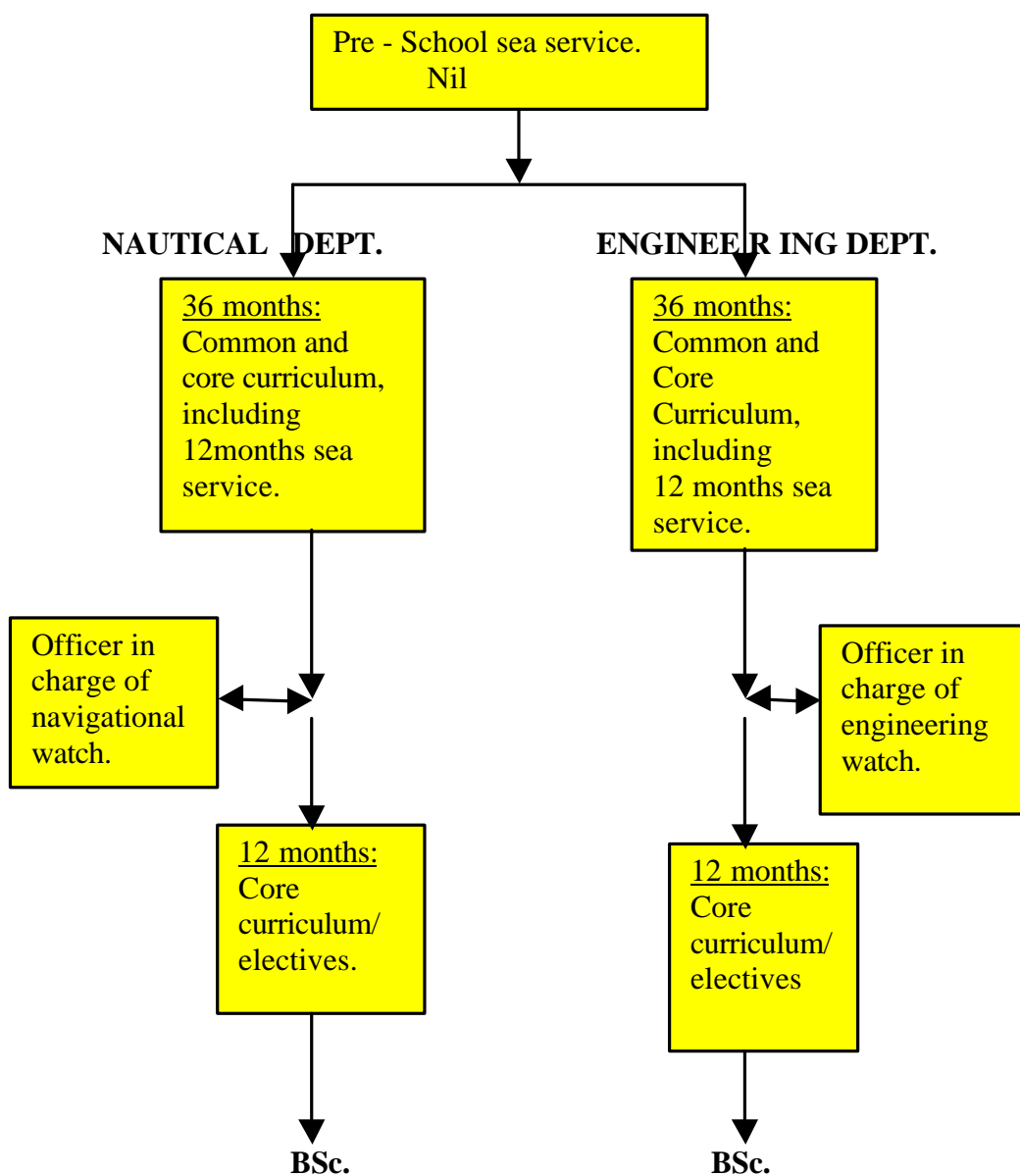
11 Pollution Compensation Schemes.

- 11.1 International convention in the framework of IMO.
 - 11.1.1 International convention on civil liability for oil pollution damage.
 - 11.1.2 International convention on the establishment of an international fund for compensation for oil pollution damage.

Source: Pardo F (1999)

Appendix 3

Proposed 4 - Year Integrated Education for the Nigerian MET System.



YEAR 1	
SEMESTER 1: COMMON COURSES.	
English Language I.	Mathematics I
Marine pollution prevention 1.	Physics I
Introduction to computer science.	Introduction to marine engineering.
Nautical Knowledge.	Personal survival.
Basic fire – fighting.	Medical first aid.

YEAR 1		
	NAUTICAL	ENGINEERING
SEMESTER 2	Navigation I. Watchkeeping I. Electronic nav aids I. Meteorology. Ship manoeuvring and handling I. Cargo handling and stowage I. Communications I Ship construction and stability I. Physics II Marine pollution prevention II.	Introduction to marine engineering materials. Marine engineering drawing and design I. Introduction to marine electrotech. Hand power tools. Machine tools I. Fabrication, Welding, Joining and Cutting I. Marine engineering maintenance I. Marine plant operations. Marine pollution prevention II.

YEAR 2		
	NAUTICAL	ENGINEERING
SEMESTER 1	Navigation II Watchkeeping II Nav. Aids II Ship construction and Stability II Communication II. Physics III. Magnetic & Gyro compasses. I. Marketing	Marine Electrotechnology. Thermodynamics. Mechanical Science. Introduction to ships & ship routine. Marine engineering materials. Marine heat engines. Advanced workshop Practice. Industrial chemistry. Finance and Accounting.
SEMESTER 2	Computer Usage. Navigation III. Watchkeeping III. Nav. Aids III. Magnetic & Gyro Compasses II. Meteorology and Oceanography. Ship manoeuvring and handling II. Ship construction and Stability II. Economics I. Communication III.	Naval Architecture and Ship construction I. Thermodynamics and Heat transmission. Mechanics and Hydromechanics. Operation Principles of Diesel installation. Operation and maintenance of machinery. Physical and chemical properties of fuels and lubricants. Technology of materials.

YEAR 3		
	NAUTICAL	ENGINEERING
SEMESTERS 1 AND 2	SEAGOING PHASE (TRAINING RECORD BOOK)	SEAGOING PHASE (TRAINING RECORD BOOK)/ WORKSHOP PRACTICE.

YEAR 4		
	NAVIGATION	ENGINEERING
SEMESTER 1	Navigation IV. Ship construction, Stability and damage control I. Cargo handling and Stowage II. Emergency procedures. Maritime Law. Personnel management, organisation and training. Economics II. Medicare. Advanced firefighting. Proficiency in survival crafts.	Marine electrotechnology, electronics and electrical equipment. Fundamentals of Automation, instrumentation and control system I. Naval arch. and ship construction II. International maritime Law, agreements and conventions. Personnel management, organisation and training. Organisational behaviour. Proficiency in survival crafts. Advanced firefighting. Medical emergency.
SEMESTER 2	Maritime Law and Insurance. Ports operations Human resource management. Managerial process. Business Law. Statistics. Principles of transportation. Nautical electives	Probability and Statistics for management. Principles of management. Managerial process. Engineering design and operations. Engineering design management. Engineering economics. Production management. Engineering electives.