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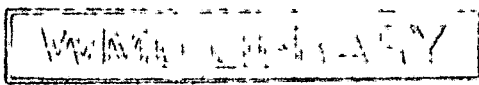
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WORLD MARITIME UNIVERSITY
MALMOE, SWEDEN

PROPOSALS FOR THE UPDATING OF THE ALGERIAN
MARINE ENGINEERING EDUCATION AND TRAINING SYSTEM.

by

L.TAHRI
ALGERIA

A paper submitted to the faculty of the World Maritime
University in partial satisfaction of the requirements
for the award of a

MASTER OF SCIENCE DEGREE
in
MARITIME EDUCATION AND TRAINING
(MARINE ENGINEERING)

The contents of this paper reflect my personal views and
are not necessarily endorsed by the UNIVERSITY.

Signature:
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ABSTRACT

The subject of this paper is to give an overview of the Algerian Maritime Education and Training (MET) system and how to update it. The results of new technological developments in shipboard applications will considerably affect the actual role of the marine engineers.

Adjustments in MET of many developed countries have been made to suit the needs of shipowners to stay competitive internationally.

The experience of such MET systems can be used as a guideline to suit the needs of one's country.

The marine engineer of the future must possess the required skills and knowledge to be able to operate safely and efficiently the highest automated ships of the future. It is essential that his education and training must be adapted to suit the requirements of new technologies used on board ships.

In my paper I have described the actual structure of the Algerian MET system and the training facilities at the Maritime Institute. An emphasis has been put forward on few MET systems adopted in some developed countries.

The final section of the paper provides the reader with proposed solutions for the updating of the Marine Engineer Education and Training courses with regard to technological changes and the International requirements.

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CHAPTER I

INTRODUCTION:

Algeria is a maritime country located in North Africa between Morocco on the west and Tunisia on the east, with a coast line of 1200 kms.

Just after its independence, in 1962, an urgent programme of industrialisation was set up by the Government which involved the imminent need for a national fleet with an appropriate Maritime Administration under the auspices of the Ministry of Transport. To be able to gain self-reliance vis a vis its principal foreign partners, Algeria decided to establish its own national shipping company denominated "CNAN" (Compagnie Nationale Algerienne de Navigation) Several types of natural resources (iron ore, phosphates, oil and gas) and agricultural products were already available in the country and in very high demand from the developed countries. This caused Algeria to purchase specific vessels for this kind of trade. However the manning of all the ships was carried out by foreign officers with the exception of ratings who were chosen among Algerian Nationals with little or no sea experience. The need for training Algerian nationals as seafarers was imperative and few selected candidates were sent to well reputed maritime academies abroad.

The rapid expansion of the national fleet forced the government for a decision to establish a national maritime training institution. In 1974 the Algerian Maritime Training Institute (Institut Superieur Maritime) was created with the consultancy of the International Maritime Organisation. The aim of the Institute was to train nationals as deck and engine officers, radio officers, port officials and maritime administrators for the needs of the Algerian Merchant Fleet. The curriculum and the trai-

ning were developed and carried out by expatriates.

Algerian seafarers proved themselves aboard national vessels and the gradually took over the high ranking positions of expatriates.

However shipping is an international activity which is under constant pressure to develop new types of ships to meet changing trade patterns and to update existing designs so that they can take advantage of advanced technology in communication systems, navigation, machinery systems etc.

International conventions such as SOLAS, MARPOL and STCW are endeavouring to secure safer ships and cleaner oceans. It is against this background that training must be developed. Therefore the updating of an educational programme should consist of removing topics of decreasing importance as well as adding topics of increasing importance. Also the introduction of short courses related to specific uses in shipping can be programmed over special periods to avoid over loading the student if spread over a whole academic year. The special short courses would be very appropriate for those marine officers with long sea going experience but who are not familiar with the newly introduced technology. A new approach for the training of future marine engineers (which is the subject of my paper) should meet the needs of shipping companies to stay competitive internationally.

CHAPTER II

2.1 HISTORICAL:

Algeria gained its independence on July 5th ,1962. The Algerian National Shipping Company was created officially by a Governmental Act on 31 December,1963. The Ministry of Transport was given the responsibility for all maritime activities including the National Shipping Company designated C.N.A.N. (Compagnie Nationale Algerienne de Navigation). The essential mission of C.N.A.N. was to promote Algerian foreign trade with a consequent participation in maritime transport. The company's objective (still to be attained) was to carry 50% of Algeria's own trade. This was mainly in order to secure the country's imports and the freedom of commercial exchanges.

Consequently our national fleet expanded very rapidly with the purchase of new ships for all types of commercial traffic. Today, the Algerian National Fleet consists of 77 transport vessels and 30 tugs. The need for national human resources thus became imminent as a means of securing a profitable trade and self-reliance. The quick expansion of the National Fleet and the inevitable long term need for national seafarers therefore catalyzed the Government's decision to establish a national maritime training institution. In September 1974, the Algerian Maritime Training Institution designated "INSTITUT SUPERIEUR MARITIME" was built in Bou-Ismaïl, a seaside town situated at 45 kms on the west coast of Algiers. The Institute was entrusted with the following main tasks:

- To ensure the education and training of seagoing officers (i.e. deck, engine, radio) for merchant and fishing vessels.
- To ensure the education and training of administrative

personnel for the merchant marine, the ports and the fisheries departments.

-To organise seminars, conferences and short courses for practical training and updating of seafarers.

The Algerian national shipping company (CNAN) possessed five ships in 1969. This figure has increased to 69 in 1985 in addition to 30 modern ocean going tugs. The company's vessels include nine methane carriers and ten tankers. Four crude oil tankers have been sold recently. Today CNAN possesses a total of 77 ships and 32 ocean going tugs. The training of Algerian maritime personnel is centred at the "Institut Supérieur Maritime" (ISM). The Institute caters to the training of merchant marine officers, administrators in maritime affairs and port officials.

Fleet expansion demanded a parallel strengthening of the Transport Ministry, particularly with regard to the preparation/implementation of new legislation, safety of navigation measures and maritime training. Part of the project involved the training of professional marine personnel, the establishment of an efficient system of co-operation between all organisations responsible for maritime affairs and the establishment of a fire fighting centre.

2.2 ORGANISATIONAL STRUCTURE OF THE TRAINING INSTITUTION:

The Algerian Maritime Institute (ISM) was created by Statutory Order no.74-86 on the 17th September, 1974.

2.2.1 The Institute and its educational aims:

The aims are to educate and to train students as maritime personnel so as to provide them with a professional qualification which will make them immediately

acceptable as employees within industry and commerce. In an institute of higher education, employment and education are a two-way function. Students always come to study with future employment in mind and the courses which are run are based on the needs and demands of the industrial and commercial world. The work of a student at the Maritime Institute is probably better supervised than that of a student at a University and this often suits the more practically biased person who needs to know that there is always someone near at hand to whom he can turn for advice and information.

The education programme of the Institute corresponding to each level of certification is defined in collaboration with the Ministry of Transport and the Ministry of Higher Education. Tuition, boarding, text books and uniforms are all free and provided by the supporting body which is the Ministry of Transport. An extra substantial monthly grant is allocated to each student with the exception of final year students who normally receive a salary from their respective employers.

2.2.2 Administrative Organisation:

The Director-General of the Institute is appointed by presidential decree after nomination by the Minister of Transport. He assumes the responsibility for the management of the Institute and he is assisted in his duties by:

- The Secretary General who is appointed by order of the Minister of Transport on the Director's nomination. He/she is in charge of all the general administration and the co-ordination between the different administrative services of the Institute.
- The Director of Studies who is in charge of all the academic matters. He/she is appointed by order of the

Minister of Transport on the Director's nomination.

The Director General of the Institute assumes , personally and under his own authority ,the responsibility for the entire Institute and ensures its proper functioning. The Director represents the Institute in all legal aspects.He' also effects the nomination and dismissal of any employee placed under his authority with the exception of employees appointed directly by the Ministry of Transport.

The Director formulates the budget and approves expenditure and signs all contracts ,agreements and conventions in accordance with the state regulation .At the end of each fiscal year he draws up a general report on the administrative activities of the Institute which is in turn submitted to the Ministry concerned.

The Director of the Institute attends all meetings of the Board of Directors as an Adviser.He also assumes the secretarial work of the board .

2.2.3 The Board of Governors:

The Board of Governors consists of 8 members:

- A representative of the Ministry of Transport as president.
- A representative of the Ministry of Defense .
- A representative of the Ministry of Finance.
- A representative of the Ministry of Civil Service.
- A representative of the Ministry of Higher Education and Scientific Research.
- The General Directors of the Merchant Shipping Companies or their representatives.
- The Director General of the National Fishing Company or his representative.

-The Director General of the National Port Authority or his representative.

All members of the Board of Directors are appointed for a period of three (3) years by ministerial order of the Ministry of Transport after being nominated by their respective authority.

If any of the members, whoever, interrupts his mandate within the 3 year period, the newly designated member will succeed him until the expiration of the tenure. The Board of Directors meets at least twice a year on notification of meeting issued from the president of the Board.

The Board can also meet in an Extraordinary Session on notice from the President or at the request, either of the Director of the Institute, or of one third of its members (a quorum).

The agenda of the Board of Governors is fixed by the President at the request of the Director of the Institute.

The summons stating the agenda is addressed to the members of the Board at least 15 days before the date of the meeting. The period in question can be reduced for extraordinary sessions.

The Director can deliberate only if there are at least half of members present. The decisions are taken by simple majority of members present.

In the case of equally divided decisions, the vote of the president is decisive.

The Board of Governors deliberates in particular on :

- The internal regulations of the Institute .
- The budgets and accounts of the Institute .
- The acquisitions ,sales or renting of accommodations and facilities necessary for the functioning of the establishment .

- Loans to contract .
- Acceptance of donations and legacy .
- The Annual Report presented by the Director of the Institute .

The deliberations of the Board of Governors are certified by statements entered on a special register and signed by the President and the Secretary of the session. The decisions of the Board of Governors are implemented one month after the statements have been transmitted to the Ministry concerned ,unless the latter is opposed to the decisions taken.

Decisions concerning budgets , accounts ,financial regulations , loans , acceptance of donations and legacy , acquisitions , sales , exchanges and construction of buildings ,are not be carried out until full approval of the Ministry of Transport and the Finance Ministry is given within two months subsequent to submission.

The Academic Board:

The Academic Board of the Institute is encharged with studying all measures relative to the functioning of the Institute in particular:

- The organisation of studies;
- Educational methods;and
- General organisation of the education system.

The academic board is composed of :

- The Director of the Institute,as President;
- The Heads of all administrative and academic departments of the Institute;
- Two representatives of the teaching staff of the Institute;
- Two elected representatives of students from the Institute;
- Two representatives of the Merchant Marine

officers;and

-Two representatives of the Navy.

The Academic Board can appoint any person judged competent in the field of training and scientific research to improve the activities of the Institute.

Members of the academic board are appointed for a three year period by order of the Ministry of Transport after nomination by their respective authority.

If any of the members breaks the required tenure of office for any reason, the newly appointed member will succeed and continue the relevant mandate. The Academic Board meets in ordinary session at least once every three months at the request of its President. The Board can also meet in Extraordinary Session - The agenda, fixed by the President, is circulated to the members of the Academic Board, eight days before the date of the meeting.

The Board deliberates financial arrangements necessary to effect proper training at the Institute in terms of resources and expenditure.

Resources include:

- Grants for the functioning and equipments allocated by the state, national and private organisations benefiting the training offered at the Institute.
- Donations and legacy, including donations from the state and international organisations.

Expenditure entails:

Expenditure for the operation of equipment for education and general expenditure necessary for the realisation and objectives of the Institute.

The estimations of income and expenditure are prepared by the Director of the Institute and addressed simultaneously to the Ministries of Transport and

Finance with useful justifications.

These records have to be submitted at least two months before the beginning of the relevant financial year. The approval of the budget is definite after a mandatory period of 45 days from the date of submission, unless opposed by one of the Ministers.

In the latter case the Director of the Institute submits a new budget within 15 days for approval.

Full and final approval of the budget is given after 30 days from the date of submission.

If the approval of the budget is not secured at the beginning of the budgetary year, the Director of the Institute may incur expenses within authorised spending limits. The Institute can take out short or long term loans in accordance with state regulations.

The accounts of the Institute are run according to the rules of the public accountancy. An Accountant is nominated by order of the Ministry of Finance and works under the authority of the Director of the Institute.

All cheques, giro transfers and other type of payments issued by the Institute must have the signatures of the Director of the Institute and the Accountant.

The management expense account is submitted by the Director to the Board of Governors before the closure of the budgetary year followed by a report containing all developments and useful explanations on financial activities of the Institute. It is then submitted to both Transport and Finance Ministries followed by a report of the Director and comments of the Finance Officer of the Institute who is nominated by the Ministry of Finance.

The basic organisational aspect of the Institute, in terms of its didactic and scientific activities resulting from the type of the studies, is that of a maritime training centre.

There are three departments at the Institute involved in the academic training :

- The Nautical department
- The Engineering department
- The General Education department

All the departments are linked to the directorate of studies which supervises all academic activities.

2.3 RELATED ORGANISATIONS:

The Institute is under the supervision of the Ministry of Transport. Within the Ministry of Transport there are three directorates which forecast, initiate, co-ordinate and lead the objectives of the Institute. These are:

- The Directorate of Maritime Administration
- The Directorate of Planning and Training
- The Directorate of General Administration.

The Directorate of Maritime Administration is composed of the Merchant Marine Directorate and the Ports Directorate.

The Merchant Marine Directorate:

The objectives of this directorate are directed towards the elaboration and the proposition of elements for the orientation of the national policy aims as regards to maritime transport and navigation. This Directorate is also responsible for the safety of the maritime navigation. Its connection with the Maritime Training Institute is defined through its participation, in collaboration with the concerned maritime structures, in the establishment of the training programme and the upgrading of maritime training personnel.

It defines the conditions of certification regulations of the seafarers and studies and proposes the professional status of the seafarers in connection with the concerned structures. It also participates in the elaboration of the training programme of seafarers on board the National Merchant Fleet vessels and ensures the well being of the seafarers according to the laws and rules which are in force.

Port Directorate:

The Port Directorate elaborates and proposes elements of orientation of objectives of the National policy as regards to harbour activities based upon studies and research.

This Directorate is mainly involved, in connection with the Institute, in defining the criteria and programmes for the training of port officials with respect to the needs and National policy.

Directorate of Planning and Training:

The activities carried out in this Directorate with respect to the seafarers' training involve the following aspect:

- The conditions of recruitment and the intake number of students per academic year at the Institute are defined at least three months in advance in connection with the organisations concerned.

The Sub-Directorate responsible for Training is in permanent contact with the Institute and functions as a co-ordinator between the maritime organisations and the training centre (the Institute).

On top of the training activities co-ordinated with the respective directorates, the Sub-Directorate can programme and arrange, at the demand of the user, training in Algeria

or abroad for the upgrading of national seafarers, for the specialization of lecturers, for the cadets' sea training and for administrator trainees within various maritime sectors in Algeria or abroad. It does also act as the intermediate official body between the Institute and foreign organisations involved in the maritime field, such as merchant marine academies, international organisations for financial aid etc.

Any changes in the curriculum of the Institute should be submitted to the sub-directorate of training for approval.

The Institute should supply any information on the academic activities if requested by the sub-directorate of training.

The Institute should be ready to send, to any official meeting on Education and Training, a qualified representative familiar with all academic activities of the Institute and be able to take up initiative when needed.

The Directorate of General Administration:

This Directorate consists of three sub-directorates involved respectively in the following matters: staff, budget and finance, legal aspects.

The sub-directorate responsible for the budget allocates a yearly financial budget to the Maritime Training Institute and appoints through the Ministry of Finance, a finance officer who controls the spendings, the accounting and budget systems, reports and the monitoring of expenditure.

2.4 DIDACTIC ACTIVITIES:

The didactic activity of the Institute is carried out by the directorate of studies which supervises three depart-

ments respectively responsible for nautical studies, engineering studies and general studies.

The studies aim to the best possible versatile preparation of highly skilled officers for the Merchant Marine and to the operators specializing in port operations and maritime activities.

The Algerian Maritime Institute also provides Education and Training for pilotage at the special request of the port administration.

The pilotage course is provided to seafarers with a long sea experience but who are not so familiar with the safety of navigation of vessels in ports, bays or narrow channels.

Intramural Studies:

The intramural studies at the engineering and nautical departments last four academic years. The students spend an obligatory sea training period of (22) months aboard wrong 24 national merchant ships between the third and the fourth year of their studies. During their first and second year summer break they spend at least one month sea training. The candidates for the intramural studies should meet the following requirements to join the Institute:

- age not exceeding 25 years to the 31 December before the entry exam;
- hold a baccalaureat in scientific subjects or an equivalent certificate of any secondary school.
- passing the entry exam and competing in the following subjects:
 - a) Mathematics
 - b) Physics, mechanics
 - c) Composition in general culture
 - d) English language

The selected candidates will be invited for two final

tests:

- Psychotechnic test
- Interview with a panel

The list of the candidates finally admitted is established and circulated to the candidates in the same day of the last tests.

Women are not admitted to the Institute, due to the difficulty of the work on board ships and other social factors

The students are all accommodated in a campus within the Institute ground and they are provided with uniforms. Breakfast, lunch and dinner are served in the Institute restaurant at specific hours.

The first, second and third year students receive a fixed monthly grant from the government through the Institute.

The final year students receive a monthly salary from their own shipping company.

On completion of his studies and after successfully presenting his final year project, the graduate obtains a degree in the given specialization.

The degree allows the student to become captain or chief engineer on board all types of ships after having accomplished the required period of sea time.

For both nautical and engineering courses, there are two main exams at the end of the third and fourth year of academic studies. The third year exam leads to the merchant marine officer diploma which becomes a certificate of competency after 12 months of sea time.

The fourth year exam leads to the degree of higher merchant marine officer which becomes a certificate of competency when the graduate has completed 18 months of sea time.

The Algerian Maritime Institute does not possess a training ship, therefore the cadets practical training is carried out aboard the National Merchant vessels.

The Teaching Syllabuses for the Engineering Department:

The teaching syllabus for this department is extensive. It reflects the degree of complexity of a modern ship's machinery space whose efficient and safe operation may be provided for the officers trained to meet the challenge of new technologies.

The syllabuses for the four academic years contain the following groups of subjects:

First Year:

Theoretical subjects:

-Mathematics	96 hours
-Physics, Chemistry, Thermodynamics	114 "
-Automation	64 "
-Electrical Eng., Electronics	128 "
-Machinery	160 "
-Machine tools, Technical Drawing	95 "
-Languages	128 "

Practicals:

-Fire safety	16 hours
-Electrical Eng., Electronics	64 "
-Automation	64 "
-Physical Education	64 "

Second Year:

Theoretical subjects:

-Electronics	64 hours
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Theoretical subjects (cont.):

-Electrotechnics	64	hours
-Automation	64	"
-Strength of materials	32	"
-Machinery	224	"
-Fuel technology, lubricants	64	"
-Fire fighting	32	"
-Languages	128	"

Practicals:

-Electrotechnics	64	hours
-Electronics	64	"
-Automation	64	"
-Workshop	96	"
-Physical Education/Boat handling	64	"

Third Year:

Theoretical subjects:

-Electrotechnics	96	hours
-Electronics	96	"
-Automation	96	"
-Machinery	224	"
-Fire Fighting, Ship safety	48	"
-Naval architecture	48	"
-Ships' Theory	48	"
-Languages	96	"

Practicals:

-Electrotechnics	64	hours
-Electronics	64	"

Practicals (cont.):

-Automation	64 hours
-Aux.Machinery,Machining	64 "
-Physical Education,Boat training	48 "

Fourth Year:

Theoretical subjects:

-Electronics	64 hours
-Electrotechnics	64 "
-Automation	64 "
-Computing	48 "
-Case study reports	32 "
-Management	32 "
-Maritime Legislation	32 "
-Ship Hygiene	32 "
-Ship Machinery Installations	160 "

Practicals:

-Electrotechnics	64 hours
-Electronics	64 "
-Automation	64 "
-Computing	48 "
-Physical Education,Boat handling	48 "

The students have also to present a project paper on a topic relevant to their course of study.

Most of the practical sessions are given in well equipped laboratories.

The knowledge acquired in lecture rooms and laboratories is then broadened and confronted with the reality during

sea and on shore training that the marine engineering students undergo over the required period.

The academic year is divided into two semesters. The first semester starts in mid september and last until the end of january. The second semester begins at the end of february and lasts until the end of june.

Summer holidays are partly devoted to obligatory sea training of at least one month.

The teaching language is French and foreign students who wish to join the Institute have to prove their efficiency in the French language.

As my paper is mainly devoted to the training of marine engineers, the syllabuses for the other departments will not be mentioned.

All students at the Institute attend lectures five days a week. They have Thursday and Friday off which is the Algerian week-end.

The number of teaching hours for each course varies between 28 and 32 hours per week. The Education system is intensive and very rigid. The students should be highly motivated due to the amount of study work required from them.

The selection procedure is very demanding. Candidates all over the country have to compete through an entry exam as there are only 100 places available for all specialities. The total number of students at the Institute is around 400.

The number of sea going officers and administrators who graduate each year varies between 120 and 150.

The Institute employs about 50 academic lecturers and instructors:

- 6 Full-Time Professors,
- 16 " Assistant Professors,

-28 Part-Time Lecturers and Experts in crew training and ship operation.

Some of the full-time teachers are expatriates. A programme of Algerianisation has already been undertaken and by the year 1990, all the staff will be Algerianised.

Practical Training and Facilities:

The increase in the level of Education and Training was accompanied by an expansion of laboratories and training facilities.

During the study period at the Maritime Institute, all students have intensive physical training and a good opportunity in boat handling and sailing techniques at a nearby fishing port.

During the first and second year summer vacation break, all students are sent on board National ocean going vessels for one month training period. Once aboard the ship, each student carries out his specific task in his area of specialisation following instructions developed in a workbook by the teaching staff. The Master or the Chief Engineer aboard that ship submits to the Institute his comments on the student conduct and ability on board. The Fire Fighting practical training course is given for the second year students and higher classes. The training is supervised by a qualified training officer of the Institute and, also by officers of the local fire brigade. The training lasts two weeks and is based on the fighting of fires and smokes on board a ship. Different types of surface fires are also tackled by various combating means.

A huge project for the establishment of a fire training and rescue centre within the Institute area has been undertaken but delayed because of financial problems.

However, one's hoping that this project will see the light in the nearest future.

Regular visits, on board merchant ships and to shore industries manufacturing shipboard equipments are programmed to all students during the academic year. These visits are usually very short and last a day or two.

The long periods of sea training aboard National Merchant ships apply to graduates holding a watchkeeping certificate and to students having successfully accomplished their third year of study.

The students receiving an officer's diploma from the Institute must spend 22 months of effective sea time aboard ocean going vessels. This prerequisite is essential for students who intend to go for a higher certificate.

During the 22 months training period, the trainee officer should receive his certificate of competency as a watchkeeping officer after ten months at sea. The other essential requirement to join the highest course is that the student should spend at least twelve months of effective sea time as a watch officer.

Once the required sea time is completed, the students return to the Institute for their final year of study. At the end of the fourth year of study at the Maritime Institute, students receive the degree of merchant marine officer. All graduate students are then appointed to their respective shipping company and spend 18 months of effective sea training before receiving the highest certificate of competency of captain or chief engineer.

Graduates are expected to have sound specialised knowledge and an excellent sense of responsibility, and display initiative, diligence, modesty and perseverance.

After a certain period at sea with proven sound experience, they can be appointed as captain or chief engineer depending on their area of work.

The Institute has modern laboratories for electrical engineering, ships' electronics, automation, marine engine operation, navigation, radio communications, morse, experimental physics etc. Some workshop facilities including welding equipment, machine-tools and diesel engine structures are also available.

There is only one simulator in the Deck department for the teaching of radar navigation. This simulator is Redifon made which is out of date, but gives a unique opportunity for the nautical students to perform various types of navigation passage and manoeuvring. Unfortunately the ARPA system cannot be introduced in this particular simulator. Procedures to renew the actual simulator have already been taken by the Institute.

In my opinion the use of simulator training could reduce the number of accidents by 50 percents.

The didactic laboratories are used, in the first place, to widen the practical knowledge and to illustrate the theory presented as vocational subjects during academic studies.

There is a modern language laboratory for the practice of foreign languages, especially English.

The Maritime Institute has no training ship, therefore all students sea training is carried out aboard National merchant ships. So far there have been no difficulties in appointing students to specific ships.

The Institute library supports the didactic and scientific activities. It is mainly a maritime library and it provides students with books, magazines and journals which are not available on the market. It also enables students involved in project work to have a fast access to foreign publications on the latest development in the shipping industry.

The library includes a large reading room, a leading section and a teachers' working area. The book collection comprises about 18,000 volumes and 2,000 annual periodicals. Books and periodicals can be borrowed by students for a period of two weeks or more depending on the request. The library is also engaged in a scientific exchange, in terms of book lending, with other libraries. The printing office of the Institute comprises photocopy machines, stencil machines, an offset equipment and a chart copy machine. These equipments are mainly used for students and teachers needs. Handouts for the students, printing of exam papers and general information related to the Institute activities are the principal publications.

The students are accommodated in fully furnished living quarters, either in single or double rooms. The students admitted to the Institute are guaranteed good living conditions. The accommodation within the Institute is limited to 450 students. The living quarters are divided into three hostels. There is a large cafeteria, two T.V. rooms and table tennis rooms which students can use during their free time. There are also student clubs and societies (photographic club, music club, social club etc.) A large well equipped conference hall of 500 places is used for the projection of movies once a week, for seminars, social activities and ceremonies.

The Institute restaurant serves full day meals.

All students are provided with cost-free uniforms to be worn at the Institute and during official ceremonies. The students should always be impeccably dressed and be proud to wear a seamen's uniform as a membership indication of this beautiful profession so important to the society. It also obliges the students to have proper attitudes and to take care of the Institute reputation.

The medical centre of the Institute provides the students with the best and free medical care.

The Institute has full time staff and excellent facilities of all forms of physical education, and every encouragement is given to students to join in some form of recreational activities. The Institute has its own playing fields - football, tennis, basketball, volleyball, handball and all the necessary arrangements for athletics. Various sports competitions are held at the Institute during the academic year.

A great attraction for future seamen is a possibility of yachting and rowing in a nearby port.

CHAPTER III

3.1 MARITIME EDUCATION & TRAINING (MET) IN FEDERAL REPUBLIC OF GERMANY (FRG)

Since 1970 most independent MET schools in FRG were amalgamated with other colleges of higher education to form large polytechnics and so became departments within the polytechnics.

MET schools offer the main professional courses leading to three different certificates of competency for the deck department issued by the Federal Ministry of Transport, as well as a number of short courses for the seafarers and shore based personnel from the shipping industry, port authorities et al. As a maritime department of the polytechnic it awards the degree of Maritime Studies to its full time students.

The objective of the professional courses offered by any maritime school in the FRG is to prepare candidates aiming at certificates of competency for deck and engine departments for their future profession aboard ship or ashore in the shipping and transport or other related industries and bodies.

These courses educate and train the students to be able to apply the principles taught and the insights gained to any task with which they may be faced in their career. The Certificates issued by the Federal Ministry of Transport are:

LICENCES FOR DECK
OFFICERS & MASTERS

1. Deck officer/master
near continental trade
(limited 1,000 Grt.)
2. Deck officer/ Master
Foreign going trade
3. Deck Officer/Master
Foreign going trade
(unlimited tonnage)

LICENCES FOR ENGS/SHIPS
ELECTRICAL TECHNICIANS

1. Ship's electrical
tech./state examined
technician
2. Engineer officer
C Naut./Continental
trade up to 600 kw pro-
pulsion power
3. Chief Engineer up
to 3000 kw propulsion
4. Chief Engineer Offi-
cer up to 8000 kw
propulsion power
5. Chief Engineer Offi-
cer/ unlimited propul-
sion power (all trading
areas)

The licences for ship's electrical technician and engineer officer (nautical) are not part of the three different schemes. The admission for professional education and training aiming at three different licences corresponds to three levels of general education. The general education starts at the age of six. Three different levels can be achieved. The lowest level after nine years of schooling plus approximate general certificate of education; the medium level after ten years and the highest level after 12-13 years.

It has been rendered possible during the last few years for officers holding a medium licence to be upgraded to deep sea master or chief engineer (unlimited tonnage) by additional general and professional studies.

Some maritime schools are authorised by the Federal Ministry of Transport to set and hold examinations and the Federal Ministry of Transport issues the appropriate certificates after the candidate has been declared successful in examinations. After the required sea service, presently nine months, aboard a ship, appropriate to the class of his certificate, the holder may exchange his watchkeeping certificate for the corresponding Master's/Chief Engineers certificate without any further studies or examinations.

Students aiming at the highest class of certificate, follow the polytechnic course: a three year full time degree course level at first degree level at the end of which they are awarded the polytechnic degree in nautical science or engineering and obtain the highest certificate of competency from the Federal Ministry of Transport. Thus they are not only qualified to serve as deck or

engine officers but also for graduate entry to marine oriented industries, administrations and other activities. The degree is aimed at the technology and business methods of the marine field.

Hence, students seeking employment in the management of shipping or other related industries rather than serving as ship's officers, can follow the degree course after industrial training instead of the sea service necessary for the certificates of competency.

According to the tonnage of vessels, navigation areas etc, the qualification and certification of officers are shown in appendix A.

Junior officers having completed the required seetime could go back to school for further studies and take a higher certificate. Similar sandwich systems are still in use all over the world, including the Netherlands.

A one year follow up course was introduced in 1976 for interested apprentices from any of the Dutch nautical schools. This was the start of the training of dual purpose officers in the Netherlands and apparently it met students' and shipowners' requests. This type of follow up course was continued during the period of change of nautical education system from a two year course to a four year course which was fully implemented in the Netherlands by 1982. The third year of this four year course was spent at sea. A special work book was kept by students which was reviewed by the Ministry of Transport and the school.

The review of the workbook plus a successful final examination at the end of the fourth year offered students a third mate's certificate or an "A" certificate as engineer. Officers acquired higher certification through sea time but without further examination other than a radar navigation course for applicants of the master's certificate.

The year 1985 brought upon Dutch higher vocational education a process of voluntary mergers, initialised by government and co-ordinated by the higher vocational education council. Besides this process, due to further decline of the number of trainee-carrying ships, the decision was taken by the Ministry of Education to phase out three institutes of nautical education, at the same time imposing dual purpose officer training on the remaining

institutes. This will leave the Netherlands with four institutes training dual purpose officers.

In the recent past the Dutch shipowners' association, seafarers' trade unions and the Dutch Ministry of Transport had produced a skills list as minimum required knowledge and abilities for future dual purpose officers in compliance with STCW 78 Convention and the Dutch National legislation.

Under the instruction of the Ministry of Education, the remaining training institute set out to produce syllabuses and curriculums under conditions that :

1. Basis for the syllabus is the job profile designed by shipowners, Ministry of transport and trade unions.
2. Including seetime duration, the course is not to be longer than four years;
3. Successful students are to obtain both bridge and watchkeeping certificates according to the law in force and higher vocational education diplomas;
4. Entrants must be in possession of at least HAVO leaving certificate (highest secondary school certificate) and pass a physical, eyesight and oral test for deck officers.

Students are expected to gather knowledge ,acquaintance and ability in a four year learning process,during which period all items of the job profile will be lectured supported by the necessary theory at appropriate level.

In order to amalgamate training of deck officers and marine engineers into that of the dual purpose officer, distribution must be made between items which

- are part of the examination programme
- are part of subjects lectured in the final year but do

not necessarily have to be examined

-are concluded at the end of the students' year at sea

-are concluded in first and second academic year.

These conditions ,existing time-tables for various subjects, joint first, second and third years amounted to:

34 weekly lecture hours into the first year.

34 " " " " " second year.

28 " " " " " fourth year.

A rough division of subjects over first and second years is as follows:

	1st Year	2nd	Year
1. General subjects	15%	10%	
2. Exact science	35%	12%	
3. Professional subjects	18%	26%	
4. Navigation/seamanship	15%	26%	
5. Marine engineering	17%	26%	

A break down of items 1 to 5 covers the following subjects:

1. Dutch language, English language, shipmasters business, management, pre-sea, first aid.
2. Mathematics, physics, computing.
3. Automation, electrical engineering, ship construction, radiotelephony.
4. Maneuvering, meteorology, navigation, navigational instruments and systems, passage planning, cargo handling, rules of the road.
5. Practical engineering, workshop practice, propulsion systems, auxiliary systems.

In the first and second academic years, all students spend a fortnight aboard a training vessel on the North Sea. The aim of the third year, which all students spend at sea is:

- to gain experience in ships' operations;
- to compare the acquired theoretical knowledge with the daily practice aboard;
- to support and supplement the theoretical knowledge with the daily practice aboard ship;
- to prepare the student for his future job as a dual purpose officer.

This year of industrial experience has a very important double function. In the first instance, in a very definite manner, it is part of the tutorial process. In the second instance, it offers the trainee the possibility to acquire sea time for future watchkeeping certification.

The dual purpose officer should be employable within the total shipboard operation as watchkeeping officer, and for this reason, the major part of the trainee shipboard service must be aimed at acquiring operational skills. It is therefore of utmost importance that the trainees attention be drawn to unexpected occurrences aboard ship, irrespective of whether it is on deck, bridge, or in the engine room.

Due to the versatility of ships' operations, this will call for extreme involvement of the trainee's shipboard mentor as well as other staff. The activities and instructions to the trainees can be carried out with the aid of a "trainee's workbook". Besides a checklist of operational skills, this workbook will contain a limited number of items on which the trainee has to report to the Institute.

Before the beginning of the fourth year, trainees forward their workbooks to their school where it is reviewed by MOT and the Institute. Should it be considered insuffi-

cient on a limited number of items concerning operational abilities, after final examinations extra seetime may be ordered.

In the fourth (final) year of study, specialization is introduced so that the students must make a choice between navigation or marine engineering for future highest certification, after the required seetime and an updating course. Examination in the fourth year consists of three parts:

Part I	NAVIG.	MAR. ENG.
(Preliminary Examination)		
1. Health and first aid		
2. Automation		
3. Ship construction	35%	35%
4. Maneuvring		
5. Meteorology and oceanography		
6. Practical work: machinery/ electrical engineering		
 Part II		
(Examination)		
1. Navigation, instruments, systems		
2. Passage planning	35%	20%
3. Cargo handling		
4. Rules of the road		
5. Propulsion systems		
6. Auxiliary systems	20%	35%
7. Electrical engineering		
 Part III		
Thesis	10%	10%

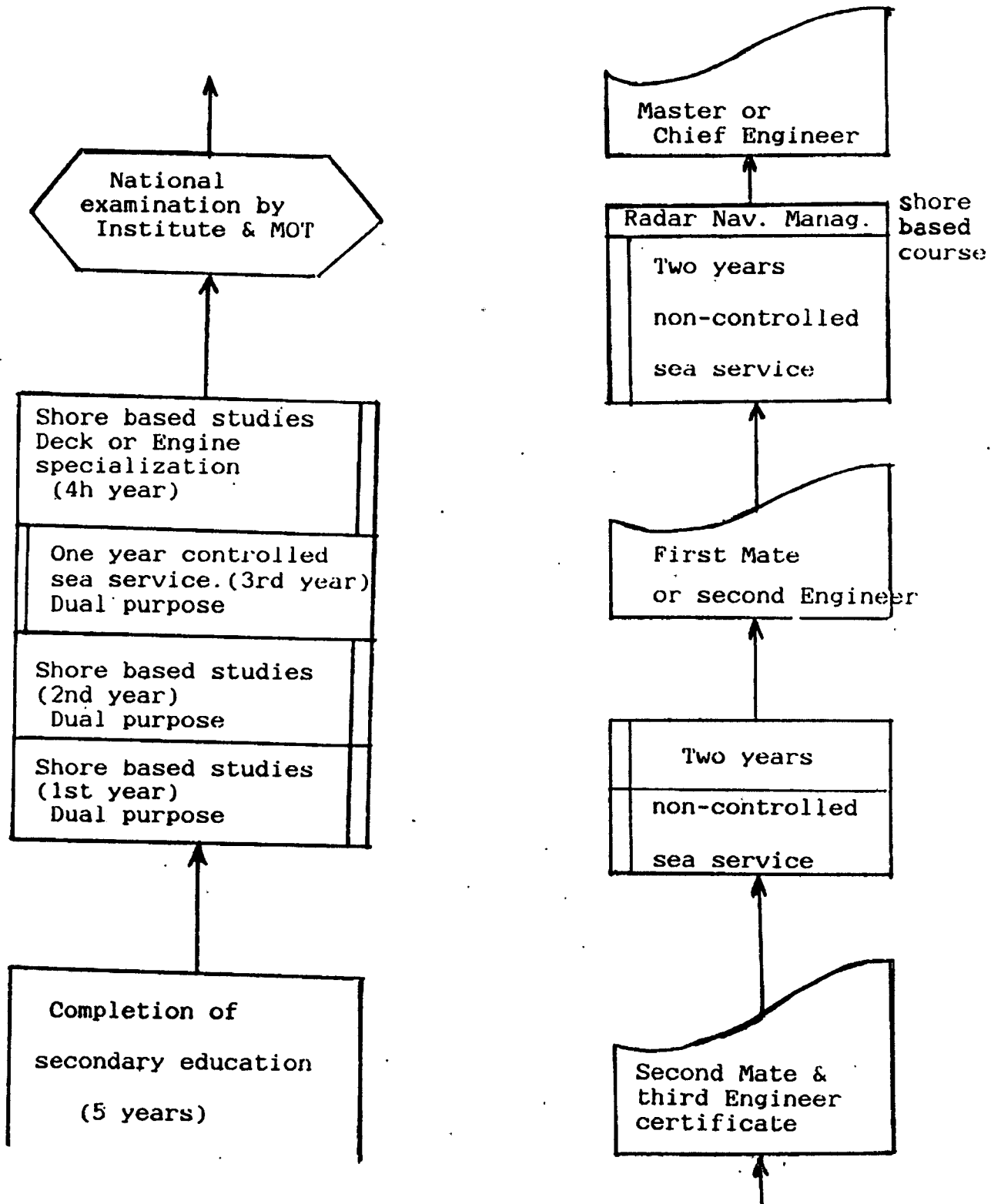
Training of dual purpose officers for the Dutch Merchant fleet is not a solitary item within the Nautical Education System.

Education and training of monodisciplinary officers is still in operation by means of the sandwich system as well as training and education of radio officers.

About ten years ago dual purpose ratings were introduced and are still employed as such on the majority of Dutch ships.

A particularity to the Dutch system of maritime training was the establishment of the maritime teachers training college. The main purpose of the initiation of the training college was to provide for maritime lecturers who would be able to teach the newest techniques and methods to the students of the National Colleges in the Netherlands. The updating of maritime lecturers, due to rapid changes in technology, has been an important part of the activities of the Maritime Teachers Training College. Up to 1987, 23 updating courses have been developed and taught at the Teachers' College, and due to the rapid developments in maritime technology, another eight (8) future planned courses have been programmed.

Structure of Maritime Education and Training of Maritime Officers in the Netherlands. (Dual purpose)



3.3 MET IN JAPAN:

Educational Institutions for training seamen are operated by the Government and to some extent by private corporations. Education for seamen is divided into education for ships' officers and for ratings. For the education of ships' officers there are two mercantile marine universities and five mercantile marine technical colleges under the jurisdiction of the Ministry of Education and the Institute for Sea-Training under the jurisdiction of the Ministry of Transport.

Candidates deciding on undertaking a sea career are required to have successfully finished their junior high school (nine years of general education) which is compulsory in Japan. Some training schemes require the candidates to have successfully finished their senior high school (which is 12 years of general education).

For safety of navigation at sea, the law for ship's officers is instituted, prescribing the qualification of the officers and the obligation of their manning on the vessels. Before April 1983, this law prescribed eight classes for officers (Grade A Captain is at the highest), eight classes for engineers (grade A Chief Engineer is at the highest), three classes for ship's radio operators and four classes for small vessel operators. This law was amended according to the requirements of the STCW Convention which entered into force in 1984. Therefore six classes are prescribed for both officers and engineers. According to the tonnage of vessels, navigation areas etc., the qualification of officers are prescribed. The example of ocean-going ships of not less than 5,000 gross tons and 6,000kw propulsion power is as follows:

Ship's Officers	Qualification
Captain	1st grade Maritime Officer (nav)
First Mate	2nd grade Maritime Officer (nav)
Second Mate	3rd grade Maritime Officer (nav)
Third Mate	3rd grade Maritime Officer (nav)
Chief Engineer	1st grade Maritime Officer (eng)
First Engineer	2nd grade Maritime Officer (eng)
Second Engineer	3rd grade Maritime Officer (eng)
Third Engineer	3rd grade Maritime Officer (eng)
Chief Radio Officer	1st grade Maritime Officer (radio)

Training Schemes:

There are different schemes for education and training of seafarers in Japan, qualifying candidates for different certificates. These schemes are executed through different educational Institutions.

1.The Marine Technical College:

It is the sole government-run Institute with the following specialised functions:

- to provide training facilities to enable seamen to obtain certificates of competency as marine officers;
- to provide refresher and revalidation courses for existing officers to enable them to update their skills;
- to provide correspondence courses for seagoing mariners;
- to provide training for existing officers and ratings to enable them to obtain the dual qualifications necessary to work as watch officers and dual purpose crew (DPC) in "highly automated ships" in a modern fleet.

2.Integration of Deck and Engine Departments:

Training to achieve this started in 1980 at the Marine

Technical College. The DPC concept was implemented in its entirety in a number of selected experimental ships in which manning levels were gradually reduced to 18. However, at officer level only the third Officer and the third Engineer roles were combined and the new job classification of "watch officer" came into existence. This position can be filled by a dual purpose officer. In 1983, the "watch officer" and the DPC systems were incorporated into Japanese manning regulations. In this way the government has indicated the principal requirement for future training. All maritime educational institutions are already in the process of preparing future graduates for this dual role. The first trainees to complete their entire course under this new system will graduate in 1988. The training curriculum for the dual licence is available both for officers from the old system who want to acquire these new qualifications and for new-comers to the Industry.

The requirements for admission, training curricula and training methods for the four different training courses at the Marine Technical College are as follows:

i. Advanced Course:

The aim is to train officers and engineers of foreign going vessels to give them higher navigational techniques, with fundamental cultural subjects so that they may be cultivated as leaders. To be admitted to such a course, the applicant must hold the certificate of competency of second officer or higher and have sea experience as an officer or an engineer for one year or more. The total training period is two years.

Liberal art subjects and fundamentals for technical subjects are mainly given in the first school year and in

the second school year most subjects are on practical techniques. The subjects are divided into compulsory and elective and the students can decide their majors for themselves.

Practical training on board a training ship is included. To help the students attain leadership qualities they are required to be aggressive in student board activities, public service and also as instructors' helpers. All students take the national examination for the first and second grade.

ii. Special Training Course:

Classes include captain, chief officer, and second officer on the navigation side, and chief engineer, first engineer and second engineer on the engineering side. In each class, ocean-going officers or ratings are trained to obtain the certificate they aim for and to be able to operate ships safely and effectively. For admission to the course the applicant should be :

- (a) an ocean going officer or engineer who has sea experience satisfactory to take the national examinations after finishing this course. (captain, chief officer, chief engineer, first engineer classes)
- (b) an ocean-going rating (deck or engine) who has sea experience of 43 months or more (second officer and engineer classes)

The training period is of one year for each class.

Subjects are composed of technical matters required for the national examinations which are prescribed by the law of ships' officers and some liberal arts. Further, the contents of the technical subjects fully satisfy the certification shown in the STCW Convention. Captain,

chief officer, chief engineer and first engineer classes are generally given theoretical knowledge through lectures to complement the experience they have already received.

Second officers and engineers classes who have no previous experience as officers or enough sea experience, are to be given fundamentals on navigational techniques through lectures and application through "practices". For the higher class (captain), they are compelled to take the national examinations after completion. Second officers and engineer classes are exempted from the written examination but they are required to take the oral examination later on.

iii. Short training course: The course is designed mainly to meet the watch officer system based on "modernization" policy of the MOT. Navigation techniques, mainly on watchkeeping are given so that trainees may work as watch officers (deck or engine). The requirements for admission to the sections are as follows:

(a) Navigation (senior):

Those having sea experience of one year or more as engineer officers; or of two years or more as radio officers, both on board unmanned type engine room vessels.

(b) Engine (senior):

Those having sea experience of one year or more as navigational officers; or of two years or more as radio officers, both on board UMS vessels.

(c) Navigation (junior):

Those having sea experience of 33 months or more as deck ratings.

(d) Engine (junior):

Those having sea experience of 33 months or more as engine ratings.

(e) Dual purpose officer:

Those having sea experience as engine ratings are sent to the navigation class and those having sea experience as deck ratings are put in the engine class.

The training periods are four months for the senior classes, six months for the junior classes, and three months for the DPC class.

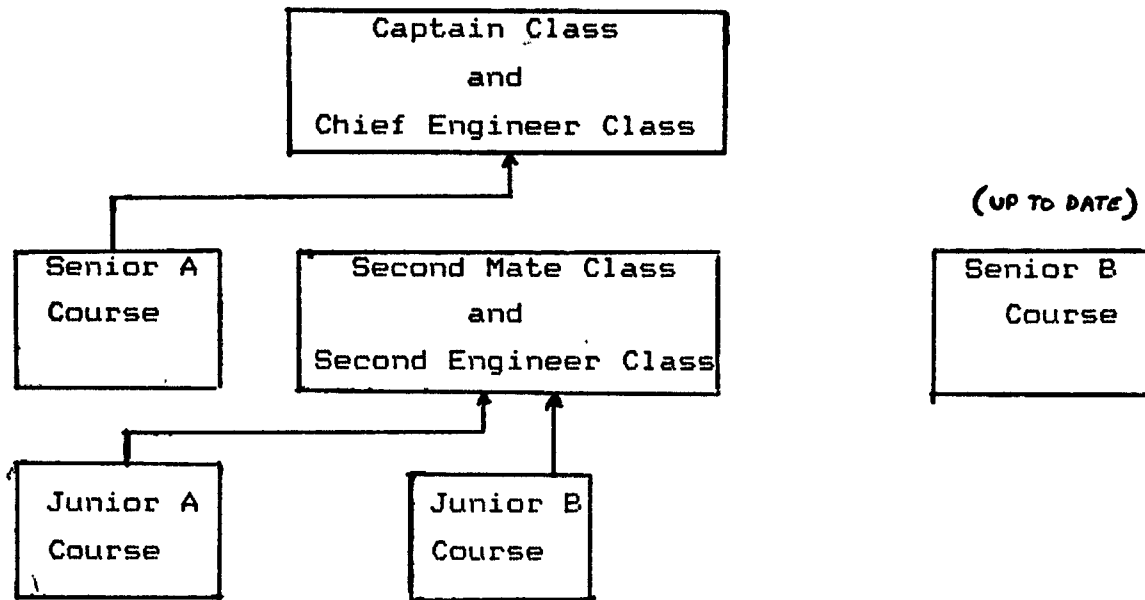
All the subjects are composed of such technical ones as are required in the national examinations prescribed by the law of ships' officers. In addition, they satisfy the items of certification shown at Regulation II/4 and III/4 of the STCW Convention. All but DPC classes are exempted from the written portion of the national examinations concerned and after having experienced practical sea training of six months, they sit the oral examination.

iv. Correspondence course:

This course is designed to give the student the technical knowledge necessary for carrying out higher level duties and the fundamental knowledge necessary for obtaining the marine certificates in future, in connection with the special training course.

This course is divided into senior and junior sections, and they are composed in such a way that the graduates of junior A course, that is those who entered the course after 1 April 1975, are judged to have the same, or higher scholastic level as general high school graduates upon entering the University.

The diagram below outlines the relationship between the correspondence and special training courses.



3. Merchantile Marine Universities compared with Merchantile Marine Technical Colleges.

Entry to these institutions is by means of a written examination.

For the universities, entry is by means of the common university entrance examination. Students from the marine technical colleges can change over to a university after a period of three years, i.e. after an equivalent level of high school education.

The emphasis at the universities is on research. At the marine technical colleges the stress is on ship operating skills. The main purpose of the colleges is to teach the specialized art and science intensively and thus to develop the necessary ability to be a competent ship's officer in the future.

The universities are in addition entrusted with a development role in the shipping industry. The graduates of both types of institutions are put through an equally demanding training curriculum on ships of the Institute of Sea Transport.

The education and training period in the universities is of four years plus six months for sea training, whereas at the merchantile marine technical colleges it is of five and a half years. One full year of practical training on board a training ship is also included in the five and a half years period.

Graduates of the merchantile marine colleges are exempted from the written examination for second officer or second engineer certificates but are qualified for the oral examination.

Graduates of the universities are exempted from the written examination for second officer or second engineer certificates.

To the question- which type of graduate do employers prefer? - There is no clear cut answer. In the present climate, of the limited openings, 45% of places are reserved for university graduates and 55% for college graduates. There is said to be no preference as regards a sea-going job but for shore employment within and outside the shipping industry there is a definite bias towards university graduates.

4. Seamen's Training Schools:

Entrance to seamen's schools is also by means of a written examination (Japanese, English and Mathematics). Candidates are required to be graduates of a secondary school at the age between 15 and 19, hometrade officers

course candidates, of an upper secondary school at the age of 18 and 20.

Students of the advanced two year course are educated and trained as DPC. From the second term of the second year they have to select either the navigation or the engineering section.

However, this only applies to students who have passed either the examination of fifth grade maritime officer (navigation) or the fifth grade maritime officer (engineering). This qualification is soon to be raised to fourth grade maritime officer once the graduate has spent one year and a half of sea service on board a ship.

The DPC also will have to be able to perform two thirds of the duties of a third grade maritime officer. Some independent watchkeeping is involved. The clear trend is towards narrowing the gap between the qualifications of officers and crew. Only students trained as DPC can obtain employment on "Modernized" ships.

Students who cannot meet the requirements for "Modernized" ships can find work on the older type of ships or hometrade ships and in some cases even outside the shipping industry.

The course for hometrade officers is held in only one of the ten schools of seamen's training, the period of study is one year and technical subjects are taught.

Graduates from the hometrade officers course shall be exempted from the written examination of the fourth grade maritime officer (navigation or engineering) after two years on board service.

Examination and Issuing of Certificates:

All professional certificates are only issued after a written and oral examination conducted by a special

branch of the Ministry of Transport.

The graduates from the merchantile marine universities are exempted from sitting the grade three (3) written examination.

Application for such certificates shall be made within one year after the applicant has successfully passed the examination.

The valid period for a certificate of competency is five years and may be renewed on application at the time of its expiration. As a prerequisite to this renewal, medical fitness and period of sea-going experience must be met in accordance with the STCW convention.

Examination are conducted by the Ministry of Transport seperately for each qualification. The purpose of such examination is to judge whether or not the candidate has the appropriate knowledge and skills as a ship's officer. The marine technical examiners are appointed by the Ministry of Transport and chosen among the professional staff.

The curriculum for the advanced course, special training course and short training course are shown in appendix B.

3.4 MET in USA:

Maritime Education and Training in the USA goes back as far as 1874 when a two-year "schoolship" curriculum was conceived by Stephen B Luce (later as Admiral of the Navy).

Just after World War II, a four year course was instituted to train young men as deck and engine officers.

Few of the maritime Academies in the USA are operated by the Maritime Administration of the US department of transportation.

The aim of the academies is to train young men and young women as officers in the American Merchant Marine to operate commercial ships and also serve in such other capacities such as ship designers (Naval Architects), Maritime Lawyers, Port Engineers, Shipping Company Executives, Naval Officers, Coast Guard Officers and Oceanographers.

The four year course leads to the Bachelor of Science degree and a US coast guard license as a third Mate or third Assistant Engineer or both. In addition, the students are enrolled as midshipmen in the US Navy Reserve and, if eligible, are commissioned upon graduates as Ensigns in the US Navy Reserves.

At the Federal Merchant Marine Academy in King's Point, New York, the training is based on four major programmes:

- Marine Transportation for the preparation of Deck officers;
- Marine Engineering and Marine Engineering Systems for the preparation of Engineering officers;
- Dual License program; a combined curriculum which leads to a license in Deck and Engine speciality.

The Marine Engineering Systems which, in addition to

leading to a third Assistant Engineers' license, is accredited by the Accrediting Board for Engineering and Technology. This curriculum includes greater depth in mathematics and a significant engineering design component as compared to the marine engineering curriculum.

All midshipmen must also take Naval Science courses prescribed by the department of the Navy.

The Dual license program started in 1969 after a lot of pressure from the US shipowners. This course, same as the previous ones, is designed for a four-year period and is not open to all the students as there is a selection procedure with a limited number of places.

This course is mainly designed for very bright students with a very high "I.Q.". The Dual license students join both transportation and engineering courses.

The academic year at the Academy is divided into four academic quarters which span about eleven months, generally from last week of July to the end of June.

All four classmen follow a common program of study for the first two quarters of their freshman year (first year). During this period, in addition to basic courses in mathematics, science and the humanities every shipman takes introductory courses in nautical science and marine engineering. The new shipman is thus given an opportunity to determine intelligently an area of special interest before choosing a major field of concentration.

As part of the professional training, each midshipman participates in a co-operative educational program consisting of two quarters of the sophomore year (third class) and two quarters of the junior year (second class) at sea (approximately five months for each sailing period) aboard commercially operated merchant ships.

The shipboard training program provides all shipmen with

the opportunity to use a ship as a sea going laboratory. Midshipmen are given a study guide called a "sea project" and, in addition to performing shipboard duties are required to complete written assignments which are submitted to the academy for evaluation and grading.

The assignments are carefully designed to ensure that, while aboard ship, midshipmen apply the knowledge and skills learned in the academy classrooms and acquire a firm foundation for advanced study upon their return to the academy. Aboard ship, marine transportation students are assigned to the Deck department and engineering students to the Engineering department where as dual license students spend half of their time at sea in each department and their study program is designed to ensure intensive experience in both specialities.

Between periods of shipboard training during sophomore and junior years, each midshipman returns to the Academy and continues academic work in his or her chosen field. Every midshipman is required to complete a specific number of elective courses.

To meet the elective requirements, midshipmen may choose an elective course for which they have the prerequisites, or they may complete a prescribed sequence of courses leading to a concentration in a specific academic discipline.

The four-year program of study at the Academy is shown in appendix three.

For the grading of written assignments, laboratory work and examinations, a letter grading system with corresponding quality points is used.

Quality point values per quarter credit hour are assigned in accordance with the following table:

Letter scale	Quality point	value
A	4.00	
B+	3.50	
B	3.00	
C+	2.50	
C	2.00	
D+	1.50	
D	1.00	
F	0.00	

To be eligible for graduation, a midshipman must, as a minimum, satisfactorily accomplish or complete the following:

- Pass all required courses
- Earn the minimum number of credit hours prescribed for his/her curriculum
- Earn a cumulative Quality Point Average of at least 2.00
- Pass the appropriate US Coast Guard license examination
- Apply for and accept, if offered, a commission in the US Naval Reserve
- Complete satisfactorily an appropriate internship program

The choice of the required course of study depends on the student ability to take more majors. However the enrollment in the Dual license curriculum is limited to thirty midshipmen. A minimum 3.00 quality point average with strong math/science grades during the first quarter of plebe year is usually required for consideration.

Admission Requirements:

All candidates must meet certain requirements of citizenship, age and moral character, but the Academy considers qualified candidates without regards to race, color, sex or national or ethnic origin.

To be eligible for admission, a candidate must be an American citizen, at least 17 years of age and not older than 25 and of good moral character.

Candidates must meet the physical, security, and character requirements for appointment as midshipman, US Naval Reserve.

Applicants must have satisfactorily completed a high school education at an accredited secondary school or the equivalent and have earned at least 15 units of credits. Included in the credits must be at least three units of English, three units of mathematics (algebra, geometry and trigonometry) and one unit of either laboratory physics or chemistry.

Foreign students who wish to enrol at the Academy are subjected to the same entry requirements as the US citizens but the nominating authority - instead of a member of congress, it should be the representative of the administration or a diplomatic representative of the United States in the candidates' own country of residence who will be designated as the candidate's sponsor.

An indoctrination program is conducted during the first two weeks after arrival of the new class. It is an extremely intensive program, both physically and mentally. The aim of the indoctrination program is to provide a basic orientation, to instill motivation, and to develop a sense of achievement and pride in the plebe candidates.

Licensing of Maritime Personnel:

Candidates for the higher grades of license such as

second Mate or second Engineer up to Master/Chief Engineer, are requested to sit for an examination in order to demonstrate their proficiency and qualifying experience. The licensing is carried out by the US Coast Guard Marine Inspection.

During the year, several periods of examination are programmed and tests last between four to five days. Prior to sitting for a license examination, applicants must meet certain requirements.

Applicants must be at least 21 years of age at the exception of third mates who must be at least 19 years of age. A minimum qualifying sea experience is required for each grade of license.

The basic requirement is one year sea service as second mate or second engineer to qualify for chief mate or first engineer and one year sea service as chief mate or first engineer to qualify for master or chief engineer.

All applicants must be citizens of the United States.

A license application may be obtained by a written request.

All statements of sea service must be supported by documentary evidence, issued by responsible persons, officers in charge or related organisations.

Upon acceptance and approval of his application for a license, the candidate will be sent for a physical check up.

3.5 MET in France:

Since the reform of the maritime education and training system in 1967, education and training of officers is provided at two levels.

Level I:

This is the highest level corresponding to the rank of first class captain of merchant navy (C1NM). The main characteristic of this level is that the training is specifically dual purpose (Deck and Engine). ie The officers can work either on the deck or in the engine room.

Level II:

At this level, the training is given in two separate streams, either deck or engine and from there the officers can reach the level I (dual purpose) for deck and engine specialization.

The two streams are:

- The technical officer (OT) for the engine room;
- the watchkeeping officer (OCQ) for deck.

Officers from both streams, after some theoretical training and sea time, can become second class captain of the merchant navy (C2NM) and then follow the dual purpose officer training to reach the highest level.

Entry requirements in the different streams:

In order to be admitted to the different levels of selection programmes, prospective students must pass a competitive entrance examination.

To be legible to follow the dual purpose course, the candidates should hold a scientific Baccalaureat (highest

secondary school certificate) and pass the competitive entrance examination.

The open competition is open to navigating and non-navigating personnel.

For the lower courses (technical officer and watchkeeping officer) the minimum required level of entry is the attendance certificate of the last secondary school year. Due to the limited number of places the open competition is very challenging.

To be able to reach up to the second captain merchant navy certificate level, a special exam is required for maritime personnel holding OT's and OCQ's certificates.

Education and training syllabuses:

The level I consists of a four year full-time course. The academic year is of eight months and the total effective sea time is of sixty (60) months.

The first three years of the course are spent at the Maritime school and after spending twenty (20) months at sea, the students return to the training institution for their fourth and final year of studies. The weekly lecture hours vary between 30 and 32.

During the school holidays at the end of the first and second year, all students spend two months at sea.

Special examinations are programmed at the end of the third and fourth year. The first exam leads to the merchant navy officer diploma which becomes a watchkeeping certificate after ten months of sea time.

The second exam leads to the diploma of higher education of the merchant navy which becomes a certificate of competency of first class Master Mariner when the officer concerned has accomplished 46 months of sea time including sixteen (16) months minimum on deck and sixteen (16) in the engine room.

In general the syllabuses are based on subjects taught in the streams for deep sea captains and first class engineer officers and also to take into account the developments of today's technology.

The detailed curriculum and the system structure are given in appendix D.

Some relevant particulars of the training programme show that during the second year, the students spend short training periods at sea on board a training vessel.

It is also important to note that the high level of practical work carried out during the third year and scientific courses such as radar and engine simulations during the fourth year.

This type of maritime training is only given in two National schools for the merchant navy all over France (Le Havre and Marseille).

The schools are equipped with up-to-date bridge simulators, electrical, electronics and automation laboratories, small steam prime mover and engine room fittings. One has to bear in mind that it takes about ten years of full-time education and sea training to obtain the certificate of captain first class of the merchant navy (dual license). However this certificate allows one to become a Master or a Chief Engineer on any type of ship of any power. This unique opportunity to work aboard a ship as a master or a chief engineer is very much welcomed by shipowners as the crew costs are getting higher.

Students from level II holding a certificate of second class captain of the merchant navy have the possibility of joining level I cycle starting straight at the third year after being selected through an open competition as the intake number of students is limited to twenty (20) per academic year.

The training programme is periodically adapted taking into account the technical developments in shipping. For the officers already trained, updating courses exist for their retraining. The shipping companies welcome this idea and are expected to contribute financially to the set up and to reward those concerned in the framework of the new law concerning professional training.

The maritime education and training is virtually free for all students. A particularity exist for the students in the fourth academic year who continue to be paid by their respective shipping company. Other students not receiving a salary can claim a grant:

Either from the shipping companies on the condition of signing a contract of employment or from the state.

3.6 MET in United Kingdom:

In the UK, the established service scheme was introduced in 1974 to replace the reserve pool (which has been established by an essential work order during the second World War) and to combat the casual nature of sea-going employment which has been the case before the war. The whole purpose of this scheme is to provide some security of employment and to provide a single source of supply of seamen. This source is jointly controlled by the employers and employees (various seafarers' union). This scheme is administered and financed by the employers commission which plays a mayor role in the recruitment and training of most ratings, and also in seeking deck and engineer cadets for appointment to shipping companies. The whole recruitment policy is co-ordinated by the Merchant Navy Training Board.

Looking at entry standards, the most common entry requirement is the completion of the secondary or high school education throughout the world, other requirements often vary depending on the choice of the course.

Range of courses:

Main stream courses provide the education and training required by deck and engineer officers to meet the needs of the shipping industry and to satisfy the certification requirements of the UK department of transport.

BTEC (Business and Technical Education Council) courses lead to the award of National Diplomas and Higher National Diplomas in nautical science and in engineering. Degree schemes are at an advanced stage of preparation and a significant number of maritime research projects are being undertaken.

A wide variety of ancillary courses in specialist areas

is provided. These include the carriage of hazardous cargoes, safety and survival at sea, shipboard firefighting, navigation and passage planning, shipboard management, on board training in engineering plant management, control engineering, welding, ratings skills enhancement.

Marine Engineer Cadet course:

Complex problems arising in the high technology of the modern automated merchant vessel, oil tanker, high speed container ship or liquified gas carrier require accurate assessment, prompt decisions and effective correction measures.

The training involved in such a career is therefore detailed and requires dedication.

A career in marine engineering is not confined to service at sea, it offers employment in the many shore based industries which not only provide the construction, maintenance and support services for the merchant fleet, but also in the engineering industries in general.

The offshore industry in the North sea has absorbed many marine engineers into their managerial structure. The training for the marine engineer is well diversified so to cover the wide range of job opportunities.

BTEC Higher National Diploma in Marine Engineering:

Duration: Three year sandwich course.

Applicants should hold or expect to obtain a minimum of four GCE (General Certificate of Education) ordinary level or equivalent to grade C or above, including mathematics, physics, English and one other subject. In addition and more importantly they should have studied mathematics and physics at advanced level and passed in

at least one subject at this level.

Training programme:

Phase I for HND (Higher National Diploma) entry consists of a 36 week college based full-time course involving both academic and practical work..

Phase II is the first period at sea service generally about three to three and a half months' duration, during which time the cadets follow a programme of guided technical studies. During this period they receive operational and maintenance training and experience.

Phase III consists of a 36 week college based full time course including academic and practical work for the higher national diploma.

The final practical phase is spent at sea and is of sufficient duration to bring the total sea service as cadet, to not less than nine months.

(AT the end of the training scheme students sit for an oral examination for the class four certificate of competency (watchkeeping certificate).

Successful completion of the cadet training scheme gives exemption from the various parts of The Department of Transport class one and class two engineers certificates of competency.

BTEC National Diploma leading to BTEC Higher National Diploma in Marine Engineering:(Four year sandwich course)

Applicants should hold or expect to obtain a minimum of four GCE ordinary levels or equivalent to grade C or above, including mathematics, physics, English and one other

subject.

Course outline:

Phase I:

This is a two year full-time course including academic and practical work. On completion of six terms, cadets will take the BTEC National diploma in marine engineering, but cadets who show good academic ability may sit the examination after four terms in the academic subjects of the diploma.

These cadets will start working towards the BTEC Higher National Diploma.

Phase II:

At the end of the two year period in college, cadets normally proceed to sea for approximately one year. During this period they undertake a planned guided study programme of practical work aboard ship in a somewhat similar manner to the third year scheme. One important point to consider is that if a shipping company wishes to take up sponsorship of a cadet who has entered the four year scheme of training, it may be that the company would wish the cadet to be transferred to the three and a half months sea time followed by the phase III.

Phase III:

Cadets return from sea service to college to continue studies on a one year full-time course leading to the completion of the Higher National Diploma. On successful completion of the course cadets are then employed as junior officers on completion of class four Department of Transport watchkeeping certificate.

This course also gives substantial exemptions to both class one and class two Department of Transport engineers

certificates of competency.

Course content:

the range and breadth of both academic and practical studies in both three and four year schemes are:

Mathematics	Instrumentation/Control
Computer Studies	Naval Architecture
Applied Thermodynamics	Marine Electronics
Applied Mechanics	Marine Power Plant Tech.
Electrical/Electronics	Control Engineering
Engineering Drawing	Marine Safety Equip.
Workshop Process/Materials	Marine Machinery Syst.
Marine Eng. Practice	Marine electrical Pract.
Supervisory/legislative studies	

Other activities include boatwork, fire fighting and practical training using the machinery space simulator.

Department of Transport Certificate of competency:

(courses for marine engineering officers).

These full-time courses are intended for serving officers in the merchant navy who wish to prepare for The Department of Transport examinations for certificates of competency. The courses consist of lectures, laboratory work and tutorials together with practical demonstration of marine equipment.

Class I certificate, parts A and B:

The part A and part B courses provide revision of class II work, together with additional material; necessary for class I.

Parts A and B must be taken separately. The average time taken to prepare for each examination is about twelve

weeks. Full exemption students eg. ex-cadets, who have only to take the engineering knowledge subjects in part B are specially catered for and usually only require about eight weeks preparation.

Entry requirements:

Class I part A students must possess class II certificates. Class I part B students must have completed their qualifying sea service and have passed or be exempted from part B.

Class II certificate parts A and B:

The part A course covers the examination syllabus in about twelve weeks. After passing part A the student can transfer to part B course which normally requires a further twelve weeks of study. Part A and part B must be taken separately. A special eight weeks course is available for students (usually ex-cadets) who are exempt from part A and all of part B except for the engineering knowledge subjects.

Entry requirements:

Class II part A students must be engineer officers in the merchant navy who have the necessary workshop service.

Class II part B students must have completed the necessary sea service and have passed or be exempted from class II part A.

Class III certificate Parts A and B:

This eight week course covers the syllabus for both parts A and B.

The students enrolling for this course should make sure from the Department of Transport that they are eligible to take the examination before enrolling on the course.

Class IV Certificate:

The college offers one week course leading to this certificate which is an oral examination only. No formal lectures are offered, but guided study programme is available and lectures are available for tutorials.

Annexed to these certificate which are made compulsory by the Department of Transport. Short courses are also run on maritime operations and safety. These short intensive in service training courses became of an increasing requirement from industry. The most popular courses are:

- Fire fighting and safety courses;
- Maritime survival courses;
- Petro-chemical courses ;
- Ship management courses;
- Maritime simulation courses.

Nautical science Cadet Courses:

The procedure for recruitment and certification is similar to the marine engineer cadets but courses contents are different.

Department of Transport certificate courses for deck officers:

Courses for class I and class II are of two terms' duration and commence each term. The courses are fully structured and cover the whole of the nautical syllabus. Courses for class IV are of one terms' duration and are held each term.

Cadet courses:

The career structure begins with a cadetship, sponsored by a shipping company which covers a period of approximately three and a half years.

The cadet will study for a BTEC National Diploma in nautical science and sit the department of Transport class four certificate of competency at the end of this period. The successful cadet will now become a junior officer. In due course with experience and further study the officer will be able to progress to obtain a class two certificate and a BTEC Higher National Diploma in nautical science. A further period at sea and the officer is eligible to sit for the class one certificate which is required before becoming captain of a foreign going ship.

BTEC National Diploma in Nautical Science:

Admission to the course is normally confined to young persons aged between 16 and 18 who are sponsored as cadets by shipping companies .

The academy requirements are a minimum of four GCE ordinary levels at a grade C or better to include Mathematics, Physics and English language. Also the candidates for selection must be medically fit and have passed the Department of Transport's eye sight test. The main intakes for the course are in September and January of each year.

The course is a sandwich course of college phases and industrial training at sea with a sponsoring company.

There are three college phases, a four week induction phase, a 36 week academic phase covering the diploma studies and a final phase of 14 weeks leading to the Department of Transport class four certificate of competency.

The industrial phases consist of a minimum of 20 months service at sea to qualify for the class four examination. A further four months at sea service will entitle the successful diploma and class four holder to be issued with a class three certificate.

Course content:

It includes studies in safety, fire fighting and survival techniques in the induction phase. The mid college phase places considerable emphasis on Mathematics, Applied Science, Navigation and Seamanship topics.

There is also a significant practical element in this phase aboard the training vessels. The final phase deals with the professionally examined subjects of practical Navigation, Chartwork, Meteorology and general ship knowledge. The cadets are required to undertake a guided studies course in each sea phase to reinforce past work and prepare for the new.

The first sea phase enables the cadet to get to know his working environment and he/she will be expected to get involved with all the work of the ship and its cargoes. The second sea phase will be largely spent on the bridge of the ship under studying the officer of the watch and learning his duties and responsibilities.

Cadets on the final college phase may enrol for stage one of a Higher National Diploma and assessment successfully undertaken at this stage will qualify him/her for entry to the BTEC HND on returning to college for the class two certificate of competency.

Another possibility for joining a cadet course is also open to students who have studied at the highest level of the secondary school and have been successful at Advanced level standard and then decided on a career at sea as a

navigating officer. This scheme leads directly to a Department of Transport class three certificate.

Entry requirements for GCE "A" level scheme:

1. Students must have GCE ordinary level passes (grades A, B or C) in at least five subjects including Mathematics, an acceptable Physical Science subject and English language.
2. A pass at Advanced level in either Mathematics or an acceptable Physical Science subject.

The course programme and course content is similar to the Diploma scheme with the main difference being that the college phases are reduced in length to a total of 30 weeks.

There are also degrees and graduate schemes.

CHAPTER IV

4.1 STCW REQUIREMENTS.

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, (referred to as the STCW Convention) was adopted on 7 July 1978 by the International Conference on Training and Certification of Seafarers held in London under the auspices of the International Maritime Organization (IMO) and attended by delegations of seventy two maritime states.

The aim of the STCW 78 Convention was to provide certain rules in view of securing safety of life and property at sea and protecting the marine environment. The STCW Convention entered into force on 28 April 1984.

Amendments to be made to implement the provisions of the STCW Convention:

1. Amendment relating to the extent of ships controlled by law according to the principle of the Maritime Flag State. Article 3 of the Convention requires that, as a rule, the Convention is to be applied to sea-going ships with the flags of parties and that the parties whose flags the ships fly are responsible for satisfying the requirements of the Convention. Thus, the Convention follows the principle of the flag state.

2. Changes in the "ships' officers qualification system" to satisfy requirements of the STCW Convention.

a) Qualification requirements and qualification classifications.

The STCW Convention is based on the fundamental idea that the duties of the ship officers should be first

divided into three classes, viz:

- duties of Master (Chief Engineer Officer);
- duties of Chief Mate (Second Engineer Officer) and;
- duties of deck officer(engineer officer) and that

the differences are taken for granted between the divisions in the scope and level of minimum necessary knowledge and capabilities.

Therefore, the STCW Convention clearly indicates that the examination of candidates for certification as Master (Chief Engineer officer) or Chief Mate (Second Engineer officer) should include details that are broader and deeper as compared to the examination of candidates for certification as deck officer (engineer officer).

- b) Introduction of the "Limitation by experience system":

The STCW Convention makes it mandatory for every ship's officer holding a certificate to be checked for medical fitness and professional competence at regular intervals not exceeding five years so that, with a view to safety of ship navigation at sea, he can continue to qualify for sea-going service by up-dating his capabilities and having up-to-date maritime knowledge required of ships' officers.

- c) Introduction of the "Training for permission system"

The knowledge required to become a ship's officer is definitely prescribed in the Annex to the STCW Convention: From Regulation II/2 to Regulation II/4 (Deck Department), from Regulation III/2 to Regulation III/4 (Engine Department) and the supplement to Regulation IV/1 (Radio Department). It includes mandatory training, particularly in such matters as fire fighting and desirable practical knowledge through training in which certain teaching materials are used, as in the case of certain matters concerning radar.

3. Setting up of "Certificate of Competency Renewing System":

The STCW Convention makes it mandatory for every ship's officer holding a certificate to be checked for medical fitness and professional competence at regular intervals not exceeding five years so that, with a view to the safety of ship navigation at sea, he can continue to qualify for sea-going service by up-dating his capabilities and having up-to-date knowledge required of ships' officers. The certificate of competency in this respect will be renewed on application at the time of its expiration.

If therefore, the prescribed renewal procedure is not completed when the certificate of competency expires, it becomes void, making it impossible for its bearer to go abroad a ship as a ship's officer. Even in this case, however, his qualification as a marine technical officer is valid and he can resume service as a ship's officer if he has his certificate of competency re-issued upon completion of the necessary training. In other words, the "certificate of competency renewing system" is not directly related to the validity of the qualification for the Marine Technical Officers. The Qualification itself, once acquired, is of lifelong validity, provided that such validity is not negated for reasons such as misconduct while performing duties as a ship's officer, or incapacity owing to mental or physical defects.

4. Setting of the "Port State Control of Foreign System".

Article 10 of the STCW Convention provides that each

party mutually control the qualifications of crew members or the watch arrangements of ships, whether state-owned or foreign ships, or whether or not the flag state is party to the Convention. Therefore, it is possible for a state which is signatory to the STCW Convention, to exercise the right of control over ships of states which are non-signatory.

Further, if it is found upon examining such certificates etc., that the ship's officers are unqualified, the captain must be notified in writing to that effect and, if no corrective measures are taken, and it is deemed that human life, property or the marine environment is in danger, it is possible to order that the ship is detained.

Article 6 of the STCW Convention makes it obligatory for the responsible administration to endorse certificates for Masters/ Chief Engineers and Officers, in the form prescribed in Regulation I/2 of the Annex. This is considered to be most effective for smooth control.

4.2 The Training Requirements for Modern Maritime Technology:

The shipping industry until very recently has been perceived as a mature industry with few, if any, vacancies or opportunities. This is especially true in the fields of maritime education and administration in most of the traditional maritime nations.

Very recently, in the last twenty years, huge technological advances have been made which are just beginning to find their application in the shipping industry. This trend of technological developments is

likely to accelerate for safer shipping and international competitiveness in the future. Unless shipping is conducted as a bilateral agreement or subsidized, only shipping industries with the social, professional and economic capacity to absorb this technology, will survive. The new technological developments are aimed at ultimately producing the "intelligent ship", that is a completely automated, unmanned ship.

Due to world economic pressure, shipowners' demands are based on fast sophisticated ships with the minimum operating costs. This has resulted in significant changes in shipboard organization, particularly in the high reduction of the manning scale. Today's vessels with unattended engine rooms have crews of approximately 20, however the ships of the future (intelligent ships) will most likely have crews have ten (10) or less. The striking dichotomy in crew demands that is taking place, and which will accelerate as the crew size decreases to single numbers, is that the aggregate technical skill levels required aboard the vessel will increase while crew numbers decrease. The net result is that the technical skills of remaining individuals will need to be augmented.

Ships will require mariners with different skills. This in turn will affect maritime education and provide a focus for all maritime training establishments involved with this new trend.

Ships of today have increasing reliability with very high levels of automation. Therefore to prepare the merchant marine officer for these types of vessels, more electronics and automation concepts are essential. It will

be necessary to educate individuals in fundamentals and to some degree, sacrifice the skilled training in some of the more task orientated functions. The officers aboard the minimum reduced crew vessels are not going to have the same mundane day to day functions of their predecessors, but will have more of a "stand-by" or problem solver function. The new training requirements for the officers of the future should be based on understanding the functional aspects of the equipment and a readiness to make a diagnosis when problems occur. For all practical purposes, today's crews are aboard to perform certain supervisory functions such as overseeing the operation of automatic control systems, performing certain "cleaning" and maintenance functions or performing certain short duration labour intensive functions such as handling lines.

As crews shrink to the very low levels made necessary by international shipping competition the skill of the crew will change of necessity. The number of positions for deck officers will decrease, but on a relative basis it will increase, while the engineering officers will decrease. An obvious consequence of this will be that deck officers of the future will have to be technically educated and will have to assume the responsibility for some of the areas of technical competence necessary for the operation of future ships. In some countries, the new system of maritime education and training is directed towards dual training of crews. The officers trained in this way will be highly qualified to work either on deck or engine room. It is believed that this new specialization will close the gap between deck and engine specialties.

The on board marine engineer of the future will be a system specialist with a very strong background in control and electrical engineering. He will be a person whose education and training goals can be summarized as follows:

- i) to develop the technical proficiency necessary to operate all systems under the control of the ship's engineering department;
- ii) to perform the necessary maintenance and repair functions on equipment and systems under the jurisdiction of the engineering department;
- iii) to apply engineering principles and common sense to the solution of problems affecting the technological needs of the ship.

The first two of the stated goals may be addressed by using focused lectures and laboratory experiments such as "procedures for starting a main propulsion diesel engine" or "trouble shooting a low voltage protection motor controller" and in actuality are not difficult to achieve. The last of the stated goals is the most difficult one to achieve -it is not taught by a single course or a series of lectures but rather an in-depth, extended series of courses covering a broad range of engineering subject matter complemented by an appropriately designed sea experience aimed at developing a sophisticated thought process and a keen "engineering sense". It is believed that the marine engineer being educated today will most likely serve aboard a vessel where he will be the only person who has received in-depth education and training in systems oriented mechanical engineering. He will be the resident expert in mechanical devices such as diesel engines, boilers, turbines, evaporators, pumps etc. Unfortunately he will

not have the luxury of having sailed for a few years as an Assistant Engineer prior to becoming "The Chief". At best he will have a short "qualifying period" as an assistant prior to becoming a chief.

This is not the normal regulating agencies procedure but when the economical pressures come to bear the rules will be changed to adopt the new ways. Educators should ensure that the "finished product", the graduate, is prepared to take on the challenge and responsibilities.

They must also prepare him to learn new technologies as they are adopted in the marine environment so that he does not become technically obsolete. The individual must have instilled in him the desire to continue learning and developing professionally.

The teaching of a good operating marine engineer must be based on fundamental science and mathematics and must address the engineering principles required for a well rounded engineer. To an operating marine engineer the level of mathematics encountered during his education should be capable of supporting the full understanding of scientific and engineering principles. The teaching of mathematics should not be limited to the level needed to solve shipboard technology (of an engineer in charge of the watch). The mathematics and scientific education level should form a strong foundation for long life learning. Maritime lecturers should not hesitate to teach beyond today's needs, for there is no such thing as an over-educated marine engineer.

The increasing development in maritime technology makes it inevitable for a review of the principal technical and professional subject matter to take place. The core technical programme for a marine engineer is that of a

mechanical engineer and involves subject matters such as thermodynamics, fluid mechanics, heat transfer, basic mechanics, material science, strength of materials and machine elements. To those conventional mechanical engineering subjects, are added electrical engineering courses covering basic circuits, electrical motors and electronics. The coverage of mechanical and electrical engineering subjects in a manner appropriate to modern marine engineers requires a strong knowledge of the use of computers. The shipboard labour-saving systems, such as monitoring devices, logic systems, automatic controls and others require that a good marine engineer studies instrumentation and controls and specifically their application to mechanical and electrical devices and systems. These subjects, so fundamental to the profession of marine engineering, should be studied in the purest form, using relevant classical text books, and then applied to the marine field by specific examples. Modern technology migration is from ashore application to marine application and the study of classical engineering subjects (thermodynamics, electrical engineering etc.) is the same for an ashore environment as for an at-sea environment. Most of the classical text books are not written for the marine environment, therefore the choice of good and appropriate text books should be well defined. The operating engineer must gain proficiency in various professional subjects, most of which are built on the general scientific and engineering knowledge forming the core of the education. If a marine engineer lacks fundamental knowledge, this will prevent him from adapting to unexpected circumstances or to modern technologies.

A marine engineer must be experienced in systems of

specific subjects such as main propulsion, electrical and mechanical power generation, refrigeration, ship construction, cargo handling, hotel and ship sanitation and fire fighting. The knowledge and experience gained in the respective areas must be broad and deep enough to enable the operating marine engineer to operate and maintain the equipment and systems in a general routine inspection and when a failure occurs. In the two different circumstances of operation and maintenance, the marine engineer should be ready to apply the thinking process to tackle the unexpected failure occurring in a different environment than the day-to-day routine environment.

The marine engineering course should not consist of the study of specific manufacturer's marine equipment. Marine engineers aboard ships must be able to, with the aid of technical manuals, operate and repair all systems and equipment encountered during their professional life. Therefore basic concepts applicable to all manufacturers systems should be covered in depth with specific examples of components which use the principles. Shop work and laboratory work play a significant part in the education and experience of the marine engineer. Marine engineers must be capable of operating basic machine tools such as lathes, drill presses, grinders and milling devices in a skillful manner. They should also have basic skills in gas welding and electric arc, necessary in emergency repairs. The marine engineer should be prepared to execute unexpected emergency mechanical repairs aboard the vessel. Through his formal education, the marine engineer should have built within himself a sense of professionalism - a sense that he is a highly educated and trained individual capable of thinking and

making decisions affecting the lives of shipmates and the safety of the ship.

Marine engineering design courses should be introduced in the curriculum to cope with modern technological developments in shipping. This is an essential support that a shipboard marine engineer, to be able to operate as the premier trouble shooter and problem solver, he must be totally familiar with the design of systems and components.

As ships and engineering systems on board become more and more sophisticated, so should the education of the operators. Appropriate technologies based on strong classical fundamental subjects should be taught in the first stage and sea practice be given in the second stage. This is done with a programme that balances basic scientific principles with applied professional training.

4.3 Proposed solutions for improving the Maritime Education and Training of Algeria:

The maritime education and training system in Algeria was inspired by the old French system with two distinct, departments one for deck officers and the other for marine engineers. Since its inception in 1975, little changes have been made regarding some technical subjects. The standard of education is high enough but does not automatically follow the trend of modern technology which shipping is facing at present.

To improve the educational quality of young officers who will operate the Algerian Merchant Marine it is necessary to make changes and reform the current system

by training seafarers in a way that they may attain the knowledge and skills required to man automated vessels.

Before dealing with the measures to be taken to reform the marine engineering officers curriculum, it is essential to discuss the different co-ordinations which should exist between the various organisations involved in the training and employment of seafarers.

The maritime training institution, the merchant shipping companies and port authorities are all under the jurisdiction of the Ministry of Transport. The two national shipping companies are financially autonomous, one is responsible for general cargo and the other responsible for gas and petroleum trade.

Even though there is a well established system of co-ordination between the organisations concerned, little has been done in practice especially from the shipping companies side, to improve the quality of education and to inform the training institution through the Directorate of Merchant Marine on the needs regarding employment opportunities. So far the number of students recruited each year has been determined by the administration of the Institute based on certain facts, such as the existing number of expatriates who are still employed by the merchant companies and the number of new ships ordered by the Government. At present the shipping industry is declining and this could result in training seafarers to be unemployed in the future. I would propose that a co-ordination centre for the sea training, certification and employment exchange service for seafarers should be set up within the Merchant Marine Directorate of the Ministry of Transport.

The establishment of such a service would enable the national shipping companies to define the number of officers needed in deck and engine departments well in advance for the training institution to decide on the recruiting quota. The selection procedure of individuals can also be determined by the employer.

The Maritime Training Institute does not possess a training vessel, therefore the sea training of seafarers is carried out aboard national merchant ships. It has been difficult in the last five years to find training for all first and second year students during their summer vacation. The required training period of two months has been reduced to one month due to the limited number of national ships. As ships are becoming more and more sophisticated, shipping companies are not very keen in taking up young trainees who have not gained enough technical knowledge to understand the existing systems aboard the ship. The imminent need for a training vessel is the only acceptable solution in the long run.

The cost of a new training vessel is undoubtedly a sacrifice. On the other hand, national shipping companies have "got rid of" some small old ships at almost the scrap value. The donation of one of those ship would have benefitted the Institute tremendously, and would have rendered considerable service to the shipping companies. If such a ship is allocated to the training Institution, it cannot only be used for sea training but also for commercial to make it profitable. In this aspect most of the operating and maintenance costs can be absorbed. The manning of the ship can be done by the teaching staff with long sea experience. This can also make the selection process of new recruits more stringent by introducing an induction sea training period of one or two months.

During the sea training, instructors aboard can automatically decide on which individual would make a good seaman.

For a more effective selection, the selected candidates should undergo an indoctrination programme during the first two weeks of the start of their year course. It should be an extremely intensive programme, both physically and mentally. The aim of the indoctrination programme is a basic orientation to instill motivation, and to develop a sense of achievement and pride. This programme is based on extreme physical fitness and moral behaviour. It is similar to a regimental programme for obedience and readiness. Individuals who are unable to cope should voluntarily withdraw during this long two week period. The candidates who are finally selected to join the Maritime Training Institute should well understand their commitments regarding:

- their motivation and interest in attending the institution and serving in the merchant marine;
- their ability to adjust to the new life and follow the rules of the institution ;
- their willingness to perform academically in a rigorous manner;
- their personal desire to attend the institute. That is, the decision is theirs and theirs alone and not that, for example of their parents.

It has been found that most of the students who leave or are asked to leave, do so as a result of one of the above

reasons.

All selected students receive a scholarship which includes the costs of:tuition, room and board and a monthly stipend provided by the Ministry of Transport. Uniforms are also supplied by the Institute. All students are paid a salary by the shipping company while they are assigned aboard a ship. The yearly budget allocated to the Training Institute by the Ministry of Transport to cover all expenses is approximately two million US dollars. This budget has not been revised for the last ten years. This restricts the possibility of the Institute to invest in new equipment and facilities.

This heavy burden imposed on the administration could be lessened by a decision of the government for the shipping companies to take over the expenses of students with regards to lodging and monthly allowances. This would allow the Institute to purchase new laboratory equipment and simulators to meet the modern developments of shipping technology.

Before beginning their first year of study, new students would have a briefing by an appointed representative, on the history and recent development of each national shipping company and would have a chance of choosing to join either of the two companies. The student will then be given a detailed contract of employment to read and sign. Restrictions concerning bad behaviour or poor academic performance may be contained in the contract. This gives students more motivation towards their future professional career.

The shipping companies can also contribute a great deal towards the quality of education and training of their seamen by donating to the institute all unused engines or good engines which are no longer in use or any other shipboard equipment which would be of assistance to the teaching staff for practical demonstrations. In this respect, students may practise on shipboard equipment which they may encounter on board ships.

The close link between the training institute and the national shipping companies would enable the students to feel professionally responsible while training. Qualified personnel from the shipping companies can be regularly invited to the Institute to give lectures and seminars on new developments in shipping and new acquisitions of ships so that the students would be continuously informed of such developments and changes. Organised visits for the students on board ships could also be organised during the academic year in order to allow for a better familiarisation of the work surroundings. Guided tours of the respective ships could then be given by first or second officers (deck and engine) and the students would be able to ask specific questions.

The sea training for first and second year students will be carried out aboard the training vessel during the summer period. However the third year students, depending on the availability of trainee positions aboard merchant vessels, would then spend their required period of sea training in order to obtain the watch keeping certificate either on a training vessel or aboard such ocean going merchant ships. After having worked as watch keeping officers for at least twelve months these students are then appointed to their chosen shipping company for

further training before obtaining a higher certificate of competence.

Although the shipping companies are government owned, they have to maintain a certain degree of international competitiveness. The development of sophisticated automation technology aboard today's ship makes it inevitable for any maritime education and training system to be reformed. Manning levels are to be specifically reduced with the unmanned operation of the machinery space coming into existence. Automatic systems placed under micro computer control are rapidly taking place in new ship designs. Most educational organizations were unable to adapt smoothly to the changes involved. Consequently radical changes in maritime education are needed. A good system must have both stability and flexibility to accommodate changes brought about by changing circumstances.

The Algerian Maritime education system is based on four year full time program of study interrupted by a twenty (20) month compulsory sea training between the third and fourth year of study. This lengthy program of training has been proved to be effective for producing high quality seafarers. The program content for all courses and the education standard are in the process of being totally supervised by the ministry of higher education in collaboration with the ministry of transport. This would enable the graduate from the Maritime Institute to receive qualifications that are recognised throughout the country. Opportunities for seagoing jobs can, and do, fluctuate. Therefore shore based occupations are open to all graduates.

According to the present syllabus of first year students of deck and engine departments, it would be more appropriate to join the two courses and design a common curriculum. The first year is particularly based on the teaching of fundamentals such as mathematics, physics, chemistry and languages. However some major technical subjects can also be programmed and depending on the area of interest of the student and after approval of the lecturer concerned, the specific subjects can be taken. This would enable the administration of the institution and training staff to predict in advance the number of students that will be joining either the engineering or nautical courses. A limited quota will be decided for each course to avoid having too many students joining a particular course.

In every curriculum design it is essential to define the subjects and number of teaching hours. An example of a proposed curriculum for the common first year course can be defined as follows:

FIRST YEAR CURRICULUM:

First Semester:

SUBJECTS	LECTURE HOURS	LABORATORY HOURS	HOURS/ WEEK
MATHEMATICS I (College Algebra)	5	0	5
PHYSICS			
CHEMISTRY (general)	4	1	5
ENGLISH (grammar)	2	1	3

SUBJECTS	LECTURE HOURS	LABATORY HOURS	WEEK HOUR
NAUTICAL SCIENCE I (Seamanship I)	3	0	3
DRAWING I (Mechanical)	0	4	4
PHYSICAL EDUCATION & PRACTICE	0	2	2
ARABIC	2	0	2
WORKSHOP (Machinery Theory)	1	2	3
SECOND SEMESTER:			
MATHEMATICS II (Plane trigo., Ana. Geom.)	4	0	4
MECHANICS(thermodynamics)	4	0	4
MARINE ENGINEERING	2	2	4
ELECTRICAL ENGINEERING	2	2	4
NAUTICAL SCIENCE II **	3	2	5
ENGINEERING WORKSHOPS	1	2	3
DRAWING II (Engineering)*	0	4	4
LAW	1	0	1

SUBJECTS	LECTURE HOURS	LAB HOURS	WEEK HOURS
ENGLISH II (Grammar & Composition)	2	1	3
ARABIC	2	0	2
PHYSICAL EDUCATION	0	2	2

* Marine Engineers Majors only

** Nautical Science Majors only

During the summer break marking the end of the first year all successful students should spend one month sea training aboard a training vessel or a national merchant vessel. The professors in charge of each subject submit a draft plan of teaching contents and hours based on certain fundamental ideas of designing a curriculum to the department meeting. After a series of serious discussions the plans are placed before the curriculum committee, which is normally presided over by the director of the Institute and composed of heads of three departments plus several other professors. The Committee will then investigate and decide on various matters related to the curriculum.

The final decision is made after going through proper debates at the faculty meeting by the whole body of professors. Depending on the student's choice and interest and qualifications of entry, the professor in charge of the Committee will decide (with the consent of

other colleagues) whether a particular student should be accepted to the relevant course.

On the other hand a student is considered to be in satisfactory academic standing if he has met the specific requirements of the Institute's academic policies, which generally are: to pass all required courses and have a cumulative average score of at least 50% students who fail to maintain the satisfactory academic standing are considered to be academically deficient and in accordance with the rules and regulations of the Institute, will be placed on academic probation. If no improvement is shown, disenrollment will be the director's final decision.

In the second year of studies students will be separated into their respective programs of study, that is, marine engineering or nautical studies. In this paper, I will concentrate on the marine engineering curriculum only.

After having acquired the necessary general knowledge and training during the first year of study, the selected and technically minded students will join the marine engineering department for three more years of full-time education before graduation. One has to bear in mind that all students undergo a sea training period of twenty (20) months before graduation.

A proposed curriculum for the second year marine engineering would include the following subjects:

SECOND YEAR (Marine Engineering):

SUBJECTS	LECTURE HOURS	LAB. HOURS	HOURS/ WEEK
MATHEMATICS (Differential equa.)	2	0	2
ELECTRICAL ENGINEERING	2	2	2
STRENGTH OF MATERIALS	1	0	1
ENG. MECHANICS & THERMO.	2	0	2
COMPUTER TECHNOLOGY	1	1	2
MARINE ENGINEERING			
- Steam Engine	2	0	2
- Diesel Engine	2	2	4
- A.C. Machinery	1	1	2
ELECTRONICS	2	2	4
INSTRUMENT. & AUTOMATION	2	2	4
WORKSHOP MACHINE PRACTICE	0	2	2
ENGLISH	2	0	2
PHYSICAL EDUCATION	0	2	2

Summer holidays are partly devoted to obligatory sea training of at least one month. The third year of the marine engineering curriculum mostly includes technical and professional subjects.

THIRD YEAR (Marine Engineering):

SUBJECTS	LECTURE HOURS	LAB. HOURS	HOURS/ WEEK
ELECTRICAL ENGINEERING	2	2	4
NAVAL ARCHITECTURE & SHIP CONSTRUCTION	4	0	4
SHIP'S ELECTRONICS	2	2	4
MARITIME LAWS	1	0	1
MARINE AUTOMATION	2	2	4
SHIP'S AUXILIARIES	2	2	4
SHIP'S REFRIGERATION & AIR CONDITIONING	2	2	4
DIESEL ENGINEERING	2	2	4
STEAM ENGINEERING & TURBINES	2	2	4
ENGLISH	2	0	2
PHYSICAL EDUCATION	0	2	2
FIRE FIGHTING COURSE	(one to two weeks)		

The successful students who fulfil the Institute examination requirements are appointed aboard

commercially operated merchant ships for a 20 months training period. The training Institute in collaboration with the national shipping companies should make all possible efforts to assign trainees to several different vessels during their sea training.

In this respect the student would be more familiar with the performance and operating characteristics of various classes of ships and with the diverse operating of different trade routes while at the same time gaining valuable practical experience in the performance of shipboard duties. The assignments given to students aboard ships should be carefully designed to ensure that every trainee applies the knowledge and skills learned in the Institute classrooms and acquires a firm foundation for advanced study upon their return to the Institute. The Institute applies all the requirements stated in the STCW 78 Convention. Therefore all students assigned aboard ships for twenty (20) months training spend at least ten (10) months as a trainee after which he receives his certificate of competency as a watchkeeping officer. He would also have to spend a minimum of twelve months working as a watch keeping officer aboard ocean going vessels before being considered for a higher level of study at the Maritime Institute.

The fourth year of study at the Institute is only conducted for officers who comply with the above requirements. The eligible officers should be appointed by their respective shipping company for one full-time academic year at the Maritime Institute. The process of all formalities of application and acceptance should normally go through the Merchant Marine within the Ministry of Transport.

The shipping companies should be informed well in advance of the quota for the officers training. All officers should be fully sponsored by their respective company. It is expected that students enrolled in the fourth year of study should have gained enough experience on shipboard machinery.

The fourth year of study should be designed for marine engineers who are expected to take leadership positions in the Maritime Industry, that is up to chief engineer position aboard ships and later on a wide range of on shore positions.

A typical curriculum for the fourth year could be shown as follows:

SUBJECTS	NO.	OF	HOURS/	YEAR
SHIP'S ELECTRICAL EQUIPMENT	64	Lectures &	64	Lab hrs.
SHIP'S ELECTRONICS	64	"	"	"
INTERNAL COMBUSTION ENGINES	64	"	"	"
AUTOMATED SYSTEMS OF:				
SHIP'S DIESEL ENGINES				
& GAS TURBINE	64	"	"	"
SHIP'S POWER PLANT CONTROL	64	"	"	"
MARITIME LAW	32	LECTURE HOURS		
APPLIED ECONOMICS	32	"	"	"
MARINE SAFETY & HYGENICS	32	"	"	"
REPORTS	32	"	"	"
ENGLISH	64	"	"	"
COMPUTING FOR MARINE ENGINEERS	48	LECTURES & LAB.		
PHYSICAL EDUCATION	64	PRACTICALS		

The graduates (students who are considered to be in satisfactory academic standing and who have met the Institute academic requirements) should receive a degree

in Marine Engineering with an extra specification such as "OFFICER OF THE MERCHANT MARINE". This degree award would have a valuable potential nationally and internationally . This would open job opportunities ashore for the Institute's graduates with the same or higher fringe benefits than other graduates.

The recognition of the Institute graduate degree by the Ministry of Higher Education would increase considerably the selection of candidates to the Institute and consequently the quality of officers aboard ships.

All graduates are appointed to their respective shipping company and they undergo a minimum sea training period of eighteen (18) months before they are eligible for the certificate of competency of first class engineer on ocean going vessels. This does not mean that he automatically takes the position of first engineer aboard a ship as soon as he receives this certificate. He may have to start as third engineer and work his way up after gaining experience. However he will not be examined for his knowledge or experience if promoted to a higher position.

All certificates of Competency to national seafarers are delivered by the directorate of Merchant Marine at the Ministry of Transport. However, Merchant Marine officers are exempted from sitting for examinations. The exemption to this rule can be argued in many ways. One of which could be a shortage of qualified maritime examiners within the Ministry of Transport. The other consists of exemption which would be more understandable, is that the administration could approve the quality of courses and training given at the Institute and Diploma or Degree

obtained.

Even if the quality of the maritime Education and training is of high standard, the setting up of a commission within the directorate of Merchant Marine responsible for seafarers' examination and certification can only acknowledge this standard if not improve it. The competent authority for the seafarers examinations and certification may adopt the minimum requirements stated in the STCW 78 Convention. Algeria has not yet ratified this convention which entered into force on 28th April 1984.

The application of such a structure for the enforcement of national laws related to Maritime Education and Training, Examination and Certification of seafarers would in no doubt enable Algeria to become a signatory to this Convention in the immediate future.

The commission responsible for the examination and certification of marine officers can be constituted of professional maritime specialists and instructors with relevant experience in maritime education and sea training.

The duties of the commission would be the preparation and supervision of examinations and the marking of papers. The commission should also be responsible for studying any improvement in seafarers training and certification. The regulations governing examinations and certification for marine officers in Algeria consistent with the STCW Convention should cover the following elements:

- a) Navigation areas, classification of tonnage and propulsion power;

- b) Basic requirements for the candidates: age, health condition sea service and subjects of examination;
- c) Dispensation;and
- d) main contents of the certificate and language.

4.4 THE IMPORTANCE OF PROVIDING SPECIALISED MARITIME SHORT COURSES AS AN AID TO IMPROVING STANDARDS.

Apart from the basic fire fighting course, no specialised Maritime short courses are currently offered at the Institute. There is an increasing demand from the Marine Industry for short intensive in-service training courses. These courses of practical training should be available as refresher and updating courses for serving Maritime personnel. The short training courses required for Marine Engineers and recommended by the STCW convention should include:

- Survival Training
- Fire Fighting
- First Aid
- Tanker Safety Course
- Chemical Tanker Safety Course
- LPG/LNG Tanker Safety Course

These courses should be run during special periods not affecting the continuous curriculum programme for students on full-time education. However these courses can be programmed for students on request from the shipping companies or other Maritime Organisation. To carry out such courses effectively, adequate facilities and up-to-date equipment should be used.

The instruction for such training courses should be given by qualified and specialised personnel who are fluent with all safety aspects and operation procedures.

Certificates of proficiency should be issued to partici-

pants upon successful accomplishment of the course requirements. These certificates should be authenticated by the National Maritime Administration which is the Directorate of the Merchant Marine.

If such courses come to exist at the Maritime Training Institute, they should be provided nationally and internationally. This would not only give the Institute a worldwide reputation but it would also attract foreign currency to the state.

Fire Fighting Course:

This course does already exist at the Institute. A new modern fire fighting centre is under construction within the Institute. The centre is expected to be completed in 1988. Training instructors carry out the basic fire fighting course as required by the STCW convention. It should be noted that the new fire fighting centre must include an instructional team combining the expertise of professional mariners of the Institute staff and the serving fire officers of the local fire brigade. The duration of such a course should not last more than two weeks. All practical fire fighting exercises must be supervised by fire officers.

The fire fighting courses may be programmed at various levels of education and duties. A feasible example for such a course can be arranged as follows:

STAGE I Fire Fighting Course For New Entrants:

Duration: one week

This course should mainly be designed for new entrants into the Merchant Marine and also for serving ratings. The course should consist of approximately 50% theoretical and 50% practical work. Theoretical content should include maintenance of equipment, rules for fire prevention and

action on discovering fire. Practical work should include the wearing of breathing apparatus in smoke and dark and the use of all types of fire extinguishers , hoses and nozzles.

STAGE II Fire Fighting Course For, First Certificate Officers and Others:

Duration: Two Weeks ..

Mandatory for first certificate officers (third year students) but also as a refresher course for serving officers and senior ratings.

The course should consist of 50% theory and 50% practice. The theoretical content should include a fuller understanding of the causes of fire, methods of control and extinguishment and shipboard organisation for dealing with emergency situations. The practical work should include the use of all types of fire fighting equipment, the demonstration of fixed installations, the wearing of breathing apparatus in heat and smoke and leadership in dealing with real fires in simulated shipboard situations.

STAGE III Fire Fighting Course For Senior Officers:

Duration: one week

Practical work would consist of a series of comparative demonstrations showing newer extinguishing mediums and equipment. The main part of the course should be concerned with management of the on board fire risk and the strategy and tactics of fire fighting from the point of view of the senior officer. Considerable use should be made of simulated fire situations and case studies.

LPG Fire Fighting Course For all Personnel Sailing on LPG

Carriers:

Duration:3 days

The course should consist of approximately 50 percent theoretical and 50 percent practical work. The theoretical work would include explanation of the basic fire hazards, methods of controlling various sources of fire, films and case histories. The practical work would include demonstrations and the use of different types of fire fighting equipment on LPG fires.

A safety course highly requested by shipping companies and welcomed by the STCW convention is the CARRIAGE OF PACKAGED DANGEROUS GOODS.

The Duration of such a course can vary between three days to one week. This course should be primarily intended to ship's personnel but would also be very advantageous to shore personnel, especially freight forwarders and those responsible for the packing of containers. The course should include just enough chemistry and theory to give a better understanding of words used in official documentation. There should be exercises in the use of dangerous goods and emergency response codes. The course should mainly be designed to instill confidence that these goods could be carried safely provided that safe practices are followed. The course should also give an indication of what action might be taken if things go wrong.

Facilities to carry out a Fire Fighting Course:

A two-deck steel ship model for practical fire fighting a fire pit, LPG installation and a building equipped for the demonstration of fixed fire fighting installations. A purpose built fire school offering a fully equipped fire/chemistry laboratory, lecture room for instruction in the use and maintenance of breathing apparatus, showers

and changing areas.

A certificate of attendance should be issued to participants on satisfactory completion of the course.

It should also be recommended to shipping companies and others that regular checks of fire fighting equipment and drills would be carried out especially on board ships.

SEA SURVIVAL TRAINING COURSE:

Duration:3 days

To meet the standards of IMO's STCW convention 1978, all seafarers are now required to attend "shore based survival courses".

The aim of the survival course is to give all seafarers the essential basic knowledge and experience of personal survival principles and techniques that can be applied to minimise their chances of survival in the event of a marine casualty.

The course should cover the following items:

- Knowledge of personal survival techniques to be able to maximise chances of survival in the event of immersion in cold water or exposure to hostile marine environments.
- Actions to be taken prior to, and at, abandonment of a vessel.
- Launching and boarding an inflatable lifecraft correctly, how to assist other survivors and how to survive in a lifecraft until rescued, using the equipment supplied.
- How to deal effectively with lifecraft emergencies such as capsize or a tube deflation.
- How and when to operate location aids to summon assistance and have a knowledge of the various rescue

methods which may be employed.

-Have a basic knowledge of national and international Search and Rescue organisations.

A certificate of attendance should be issued to participants on satisfactory completion of the course.

FIRST AID AT SEA:

Duration:3-5 days

This course in First Aid is required for seafarers under the STCW convention.

This course should lead to the issue of a certificate after examination and should include both theoretical training and practical demonstrations.

The First Aid at sea certificate should normally be valid for 5 years from the date of issue and successful candidates may have details of the certificate entered in their discharge book of any marine office.

This course should contain the following elements:

- Principles of First Aid
- Causes preventing natural breathing
- Mouth to mouth artificial ventilation
- Detecting when the heart has stopped beating
- External cardiac massage
- The need to use the recovery position
- Control of bleeding
- Types of wounds and the application of dressings
- Treatment of bleeding from special areas
- Practical session -use of dressing
- Shock and unconsciousness-levels of response
- Burns,scalds and poisoning
- Symptoms of burns and rules for the treatment
- Fractures -signs,symptoms,fractures types
- Management of fracture patients and transport of

patients

Medical doctors and trained specialists would be the most appropriate instructors for such a course.

PETRO-CHEMICAL COURSES:

These courses should be run in a petro-chemical centre which would be operated by professional mariners (specialists or Institute lecturing staff) who have a wide experience across the whole spectrum of petro-chemical tanker and terminal safety /operational training.

1. Petroleum Tanker Safety Course:

Duration: 1-2 weeks

This course is applicable to the carriage of liquid petroleum cargoes in bulk, in crude, product and combination carriers including coastal tank vessels. This course would be open to all seafarers at officers level but would not be suitable for cadets.

The objective of the course is to ensure that the course participants with immediate responsibility for cargo operation (as per IMO regulation V/I) gain a thorough understanding of state pollution free handling and transportation and to enable course participants to supervise and train other personnel in operation procedures.

Synopsis of Course:

- Physical properties of crude oil and distillates carried in bulk and their principal characteristics.
- Flammability and explosion hazards, sources of ignition and their practical significance.
- Safety precautions and practices concerned with all ship operations.

- Safety equipment fitted and supplied to ships.
- Inert gas systems.
- The requirements for effective ship/shore liaison.
- Emergency procedures.
- Dangers of entry into and repair work in enclosed spaces; testing atmospheres.
- Toxic effects and other medical aspects of cargoes carried .
- Local, national and international safety and pollution control regulation and codes of practice.

This course meets the requirements of IMO STCW 1978 convention regarding certificate endorsements.

2. Chemical Tanker Safety Course:

Duration:1-2 weeks

This course is applicable to the carriage of liquid chemicals in bulk in chemical tankers.

This course should normally be open to all seafarers at the exception of cadets. An adequate sea service is necessary.

The objective of this course is to ensure that the course participants with immediate responsibility for cargo operations (as per IMO regulation V/2), gain a thorough understanding of safe pollution free handling and transportation of bulk liquid chemicals and to enable course participants to supervise and train other personnel in operation procedures.

Synopsis of course:

- Physical and chemical properties of chemicals carried in bulk and their principal characteristics.
- Tank construction and arrangements for chemicals

carried in bulk.

- Flammability and explosion hazards, sources of ignition and their principal characteristics.
- Safety precautions and practices concerned with all ship operations.
- Cargo instrumentation and control systems.
- Fixed and portable safety equipment aboard ship.
- Inert gas system
- The requirements for effective ship/shore liaison
- Emergency procedures
- Entry into and repair work in enclosed spaces ; testing atmospheres.
- Toxic effects and other medical aspects of cargoes carried.
- Local, National and International safety and pollution control regulations and codes of practice.

This course meets the requirements of IMO STCW 1978 convention for certificate endorsements.

3. Liquified Gas Tanker Safety Course:

Duration:1-2 weeks

This course is applicable to the carriage of liquified gases carried in bulk in fully refrigerated, semi-refrigerated and fully pressurised ships.

This course should be open to all seafarers with the exception of cadets.

The objective of this course is to ensure that the course participants with immediate responsibility for cargo operations (as per IMO regulation V/3) gain a thorough understanding of safe pollution-free handling and transportation and to enable course participants to supervise and train other personnel in operational

procedures.

Synopsis of course:

- Physical and chemical properties of liquefied petroleum and chemical gases carried in bulk and their principal characteristics.
- Cargo containment systems for liquid gas in bulk
- Flamability and explosion hazards, sources of ignition and their practical significance.
- Safety precautions and practices concerned with all ship operations.
- Cargo instrumentation and control systems.
- Safety equipment fitted and supplied to ships.
- Inert gas systems.
- The requirements for effective ship/shore liaison.
- Emergency procedures.
- Dangers of entry into and repair work in enclosed spaces; testing atmospheres.
- Toxic effects and other medical aspects of cargo carried.
- Local, National and International safety and pollution control regulations and codes of practice.

This course meets the requirements of the STCW 78 convention for certificate endorsements.

If a Governmental decision for the establishment of a petro-chemical training centre comes into practice, other courses of similar importance than the previous ones can also be run :

-Crude oil washing course:

This course would be of short duration and last a day or two. It should be based on the recommendations contained in Appendix II to the IMO "specifications for the design, operation and control of crude oil washing systems".

-Inert gas systems:

This course would be designed for all marine officers serving in tankers. Its objective would be to familiarise tanker officers with the design, operation and maintenance of an Inert gas system in order that the full benefit of tank protection against fire and explosion may be achieved.

-Chemical tanker operations, Liquified gas tanker operations and Petroleum tanker operations:

These three courses would be suitable for senior maritime personnel. The duration for each of these courses should not be more than one week.

Nowadays, simulator training has become one of the outstanding training tool of the on-job training. Simulator training allows experience to be gained in those operational situations that are too dangerous, costly, time consuming or impractical to exercise on board ship. It also provides an experience that would take years to gain on board ship. It is a cheaper method of professional training and gives a better control of the training process.

The occurrence of accidents and failures aboard ships and at sea are due, in 75 percent of cases to human error. Consequently seafarers have to be better trained to achieve a reduction in the accident rate.

Marine simulators do exist. Simulator training is not compulsory but mostly recommended by shipowners and maritime administrations.

The machinery space simulator course is highly recommended to marine engineers.

The usual name for such a course is: "Plant Operation for Marine Engineer Officers".

The aim of this course is to produce an efficient and reliable operational engineer officer who can carry out routine and emergency procedures in confident, safe, efficient and cost-conscious manner.

Such a course would normally be designed for marine engineer watchkeeping officers who have completed at least ten months sea service in the machinery space of a merchant vessel.

Special designed courses and exercises are usually provided by simulator manufacturers as a package deal when a simulator is purchased.

The duration for a course could be fixed to one week. However, depending on the complexity of the simulator and the exercises, more time would be allowed.

A certificate of attendance will be issued at the end of the course.

As an encouragement to owners and shipping companies to provide money for this training, I would propose that a sea service remission would be given to those that attend such a course.

The Algerian Maritime Institute does not possess an engine simulator. Such an acquisition would considerably benefit the Institute and mostly the engineer officers.

simulator is of course expensive, but by contributing positively to the safety and the efficiency of ship operations, it is sure to pay off.

The highly automated "ships of the future" are here to stay and there is no doubt that training of future marine engineers with the aid of simulators would be a very effective method of updating and maintaining their standards of proficiency and competency.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS :

The proposed solutions stated in this paper for the updating of the marine engineering courses at the Algerian Marine Institute are based on the current trend of developments in ship technology and the requirements of the STCW 78 convention.

Marine engineers for the ships of the future are expected to be trained up to a sufficiently high level of understanding of the ship as a system together with an in depth knowledge of the operational and logistical requirements.

Although changes have to be made regarding the examination and certification of seafarers to meet the STCW 78 requirements, it is essential that the standard of maritime education and training have to be maintained to a sufficient level of understanding and knowledge.

The links between the Maritime Training Institute and the related organisations/authorities need to be properly established and strengthened.

Particular attention needs to be paid to the well-balanced supply of manpower. The development of specialised techniques for reliable forecast of manpower needs should be encouraged with a view to matching supply and demand. It is essential that Maritime Education and Training should be adapted to suit the changes and requirements put forward by the new technologies aboard ships and international regulations .

Updating courses for upgrading the knowledge of serving seafarers must be run on a regular basis at the Maritime Training Institute using the adequate training equipment

of shipboard applications.


National shipping companies must contribute towards the improvement of the training by means of donations of any kind and they should also bear the total cost for board, lodging and stipends of all cadets who are linked to them by a contract of employment during their training at the Institute.

The National policy in seafarers' training is not based on exporting highly trained seamen and partly solving the country's unemployment problem which is mostly the case for many developing countries.

The National needs in marine officers have not been completely fulfilled and yet many expatriates are still needed to man Algerian ships.

One cannot tolerate the traditionalism in Maritime Education and Training .Technological revolution is taking place and changes have to be made even if one has to restructure entirely the traditional system.

To produce marine officers of a high quality, one would need highly skilled and knowledgable instructors and teachers.

 The training of the teaching staff has become an indispensable condition to provide a maritime institution with maritime education of good quality.

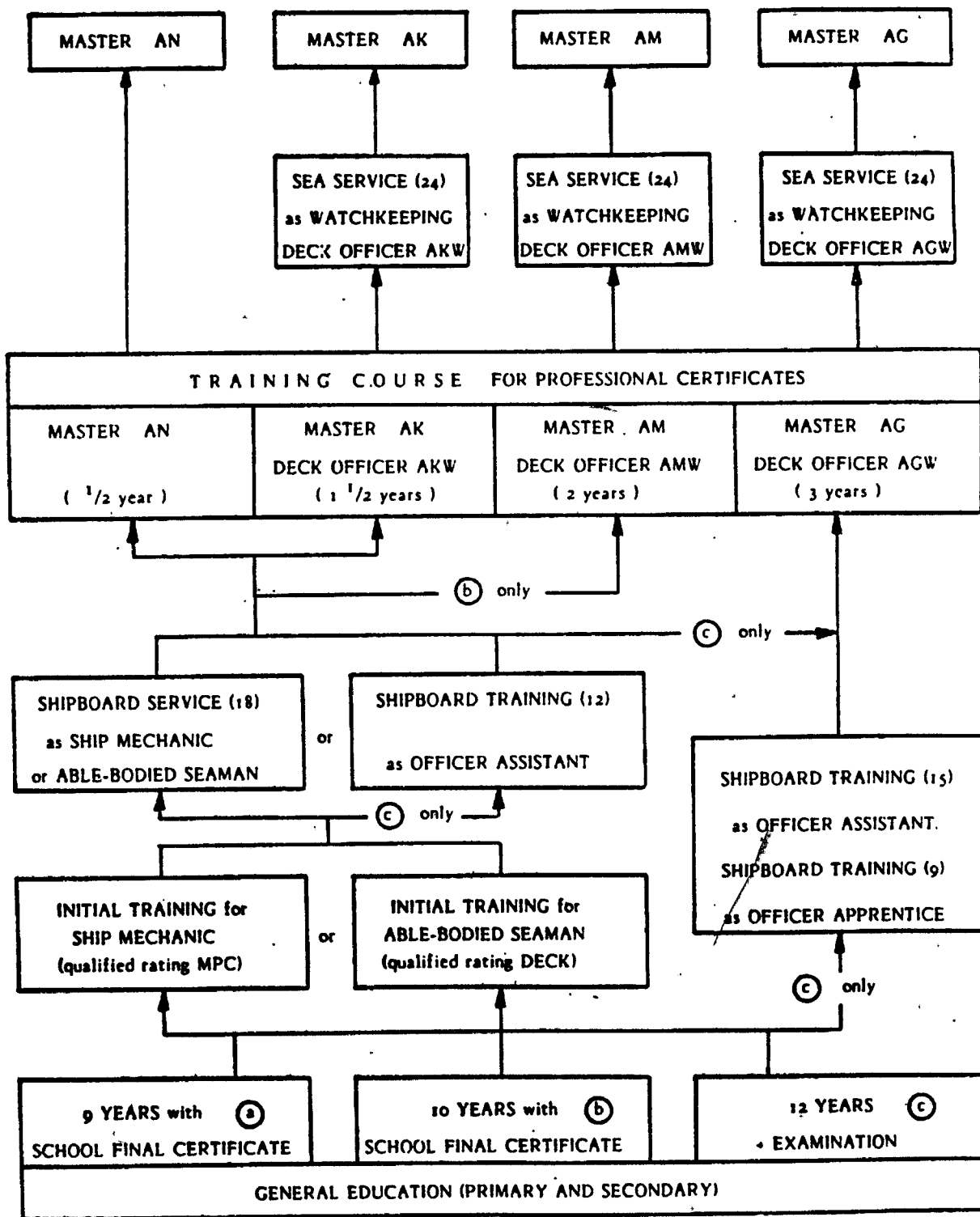
The teachers and instructors at the Maritime Institute can update their knowledge through short training periods given by senior maritime personnel within the establishment or through special fixed training courses such as those offered at the World Maritime University.

Teachers and instructors should be encouraged to attend maritime siminars and conferences and also be given the opportunity to embark on board National merchant ships during school holidays and appropriate periods.

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY

GENERAL SCHEME OF NAUTICAL TRAINING
FOR DECK OFFICER AND MASTER LICENCES



numbers in () = duration in months

Remarks

Analogical Scheme for Fishery and Engineer Licences

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY	
Course Title	MASTER AG
Certificate/Degree Obtained	DECK OFFICER AGW/ Polytechnic Degree in Nautical Science
Qualification	foreign going trade (unlimited tonnage)
Course Duration	3 years
Max. No. of Students/Participants	no restriction
Starting Date/Frequency	twice a year; details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none
Minimum Entry Requirements:	<p>1) School final certificate (with examination) after 12 years of primary and secondary education.</p> <p>2.1) Successful initial training for ship mechanic¹⁾ or able-bodied seaman²⁾ and 18 months shipboard service as ship mechanic, respectively able-bodied seaman, or (instead of 18 months shipboard service) 12 months training as nautical officer assistant,</p> <p><u>or</u></p> <p>2.2) 9 months shipboard training as nautical officer apprentice and 15 months shipboard training as nautical officer assistant.</p>
COURSE CONTENTS:	
Fundamental segment: (1st section of studies)	<ul style="list-style-type: none"> - mathematics, physics, chemistry - informatics (EDP) - basic economics, basic law - psychology/sociology - shipbuilding, marine engineering - communications - medical training
Advanced segment: (2nd section of studies)	<ul style="list-style-type: none"> - navigation, maritime law, seamanship/ship technology (including simulator training: radar + shiphandling) - meteorology/oceanography - maritime economics and shipping management - automation - personnel management - nautical English - passage planning and shipmaster's business
Remarks	<p>1) "SHIP MECHANIC" - qualified rating for deck <u>and</u> engine room service (MPC)</p> <p>2) The training regulations for initial training of ABLE-BODIED SEAMEN were cancelled, effective on July 31, 1986.</p>

APPENDIX A

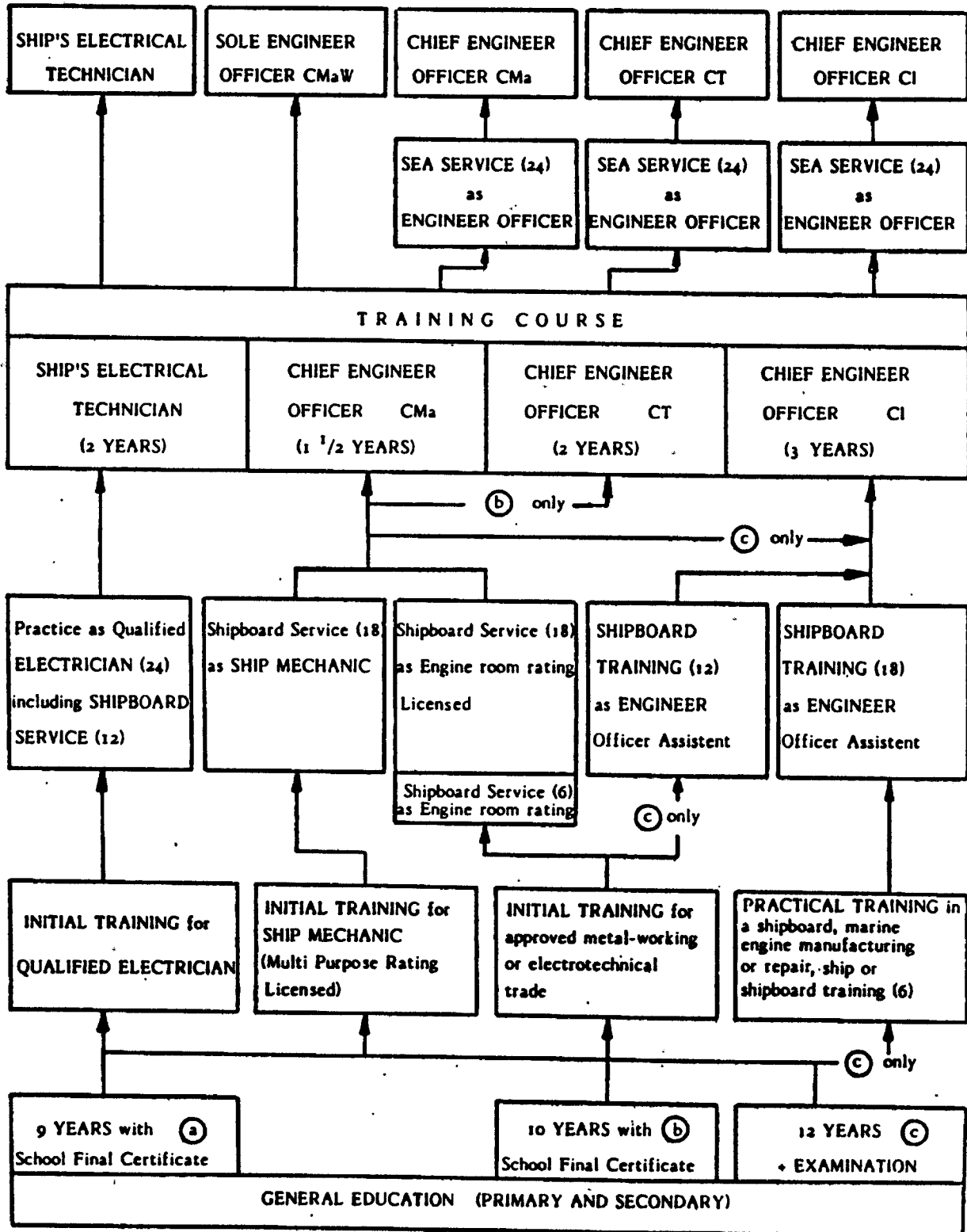
MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY	
Course Title	MASTER AM
Certificate/Degree Obtained	DECK OFFICER AMW/ State-examined Mariner
Qualification	foreign going trade (limited to 4000 grt)
Course Duration	2 years
Max. No. of Students/Participants	no restriction
Starting Date/Frequency	once or twice a year; details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none
Minimum Entry Requirements:	<p>1) School final certificate after 10 years of primary and secondary education.</p> <p>2) Successful initial training for ship mechanic¹⁾ or able-bodied seaman²⁾ and 18 months shipboard service as ship mechanic respectively able-bodied seaman.</p>
COURSE CONTENTS:	<ul style="list-style-type: none"> - mathematics, physics, chemistry - politics and shipping management - German language - English language - personnel and work management - navigation - seamanship including simulator training (radar + shiphandling) - maritime law - meteorology/oceanography - marine engineering - communications - medical training
Remarks	<p>1) "SHIP MECHANIC" - qualified rating for deck <u>and</u> engine room service (MPC)</p> <p>2) The training regulations for initial training of ABLE-BODIED SEAMEN were cancelled, effective on July 31, 1986.</p>

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY	
Course Title	MASTER AK
Certificate/Degree Obtained	DECK OFFICER AKW
Qualification	near continental trade (limited to 1000 grt)
Course Duration	1 1/2 years
Max. No. of Students/Participants	no restrictions
Starting Date/Frequency	once or twice a year; details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none
Minimum Entry Requirements:	<p>1) School final certificate after 9 years of primary and secondary education.</p> <p>2) Successful initial training for ship mechanic¹⁾ or able-bodied seaman²⁾ and 18 months shipboard service as ship mechanic respectively able-bodied seaman.</p>
COURSE CONTENTS:	<ul style="list-style-type: none"> - mathematics, physics, chemistry - politics and shipping management - German language - English language - personnel and work management - navigation - seamanship including simulator training (radar + shiphandling) - maritime law - meteorology - marine engineering - communications - medical training
Remarks	<p>1) "SHIP MECHANIC" - qualified rating for deck <u>and</u> engine room service (MPC)</p> <p>2) The training regulations for initial training of ABLE-BODIED SEAMEN were cancelled, effective on July 31, 1986.</p>

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY

GENERAL TRAINING SCHEME
FOR ENGINEER LICENCES AND SHIP'S ELECTRICAL TECHNICIANS



numbers in () = duration in months

Remarks

Analagical Scheme for Nautical and Fishery Licences

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY	
Course Title	CHIEF ENGINEER OFFICER CI
Certificate/Degree Obtained	ENGINEER OFFICER CIW Polytechnic Degree in Marine engineering
Qualification	unlimited propulsion power (all trading areas)
Course Duration	3 years
Max. No. of Students/Participants	no restrictions
Starting Date/Frequency	once or twice a year, details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none
Minimum Entry Requirements:	<p>1) School final certificate (with examination) after 12 years of primary an secondary education.</p> <p>2.1) Successful initial training for ship mechanic¹⁾ or another recognized metal working or electrical trainee occupation according to ship mechanic and 18 months shipboard service as ship mechanic respectively engine room rating licensed²⁾ or (instead of 18 months shipboard service) 12 months shipboard training as engineer officer assistant or</p> <p>2.2) 6 months basic training for a metal working occupation and 18 month shipboard training as engineer officer assistant.</p>
COURSE CONTENTS:	
Fundamental segment: (1st section of studies)	
<ul style="list-style-type: none"> - mathematics, physics, chemistry - informatics (EDP) - basic economics, basic law - personnel and work management - technical English - mechanics - material technology 	<ul style="list-style-type: none"> - operating materials - thermodynamics - electrical engineering - electronics - measurement engineering - basic monitoring and control engineering - basic nuclear engineering - technical drawing
Advanced segment: (2nd section of studies)	
<ul style="list-style-type: none"> - engineering components - shipbuilding - diesel engineering - steam engineering - machinery dynamics 	<ul style="list-style-type: none"> - electrical machinery and plants - applied control engineering - ship's auxiliaries and plants - maritime economics and shipping management
Remarks	<p>1) "SHIP MECHANIC" = qualified for deck and engine room service (MPC).</p> <p>2) "ENGINE ROOM RATING LICENSED" = qualified for engine room service after successful initial training for one of those metal working or electrical trainee occupations and 6 month qualifying shipboard service as engine room rating.</p>

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY

Course Title	CHIEF ENGINEER OFFICER CT
Certificate/Degree Obtained	ENGINEER OFFICER CTW State-examined Technican
Qualification	up to 8000 kW propulsion power (all trading areas)
Course Duration	2 years
Max. No. of Students/Participants	no restrictions
Starting Date/Frequency	once or twice a year, details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none

Minimum Entry Requirements:

- 1) School certificate after 10 years of primary and secondary education.
- 2) Successful initial training for ship mechanic¹⁾ or another recognized trainee occupation according to ship mechanic and 18 month shipboard service as ship mechanic respectively engine room rating licensed²⁾.

COURSE CONTENTS:

- politics and shipping management
- German language
- English language
- mathematics
- physics
- thermodynamics
- electrical engineering
- mechanics
- engineering components
- operating materials
- material technology
- personnel and plant management
- diesel engineering
- steam engineering
- electrical machinery
- plant engineering
- ship's automation
- shipbuilding

Remarks

- 1) "SHIP MECHANIC" = qualified for deck and engine room service (MPC).
- 2) "ENGINE ROOM RATING LICENSED" = qualified for engine room service after successful initial training for one of those metal working or electrical trainee occupations and 6 month qualifying shipboard service as engine room rating.

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY	
Course Title	CHIEF ENGINEER OFFICER CMa
Certificate/Degree Obtained	ENGINEER OFFICER CMaW
Qualification	up to 3000 kW propulsion power (all trading areas)
Course Duration	1 1/2 years
Max. No. of Students/Participants	no restrictions
Starting Date/Frequency	once or twice a year, details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none
Minimum Entry Requirements:	<p>1) School final certificate after 9 years of primary and secondary education.</p> <p>2) Successful initial training for ship mechanic¹⁾ or another recognized metal working or electrical trainee occupation according to ship mechanic and 18 months shipboard service as ship mechanic respectively engine room rating licensed²⁾.</p>
COURSE CONTENTS:	<ul style="list-style-type: none"> - politics and shipping management - German language - mathematics - physics - thermodynamics - electrical engineering - mechanics - personnel and plant management - technical English - operating materials - diesel engineering - steam engineering - plant engineering - ship's automation - shipbuilding
Remarks	<p>1) "SHIP MECHANIC" = qualified for deck and engine room service (MPC).</p> <p>2) "ENGINE ROOM RATING LICENSED" = qualified for engine room service after successful initial training for one of those metal working or electrical trainee occupations and 6 month qualifying shipboard service as engine room rating.</p>

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY	
Course Title	SHIP'S ELECTRICAL TECHNICIAN
Certificate/Degree Obtained	State-examined Technician
Qualification	unlimited
Course Duration	2 years
Max. No. of Students/Participants	no restrictions
Starting Date/Frequency	once a year, details on demand
Foreign Students/Participants	admitted
Course Language	German
Fees	none
Minimum Entry Requirements:	<ol style="list-style-type: none"> 1) School final certificate after 9 years of primary and secondary education. 2) Successful initial training for a recognized electrical trainee occupation and at least two years practical experience in an occupation in this field including at least one year shipboard service.
COURSE CONTENTS:	<ul style="list-style-type: none"> - German language - English language - political and economic sciences - mathematics - physics - chemistry and material technology - technical drawing - data processing - basic electrical engineering - measurement engineering - business management - ship's automation - ship's electrical machinery and plants - ship's auxiliaries - communication and navigation equipment engineering - basic electronics - electronic engineering
Remarks	

APPENDIX A

MARITIME TRAINING COURSES IN THE FEDERAL REPUBLIC OF GERMANY

Course Title	ENGINEER OFFICER CNaut	Only for holders of a German Master's or Deck officer's Certificate
Certificate/Degree Obtained	ENGINEER OFFICER CNaut	
Qualification	up to 600 kW propulsion power with machinery approved for unattended operation, continental trade	
Course Duration	160 hours	
Max. No. of Students/Participants	no restrictions	
Starting Date/Frequency	details on demand	
Foreign Students/Participants	admitted	
Course Language	German	
Fees	none	

Minimum Entry Requirements:

- 1) 9 years of primary and secondary school education.
- 2) Holding a German Master's or Deck Officer's Certificate of Competency.

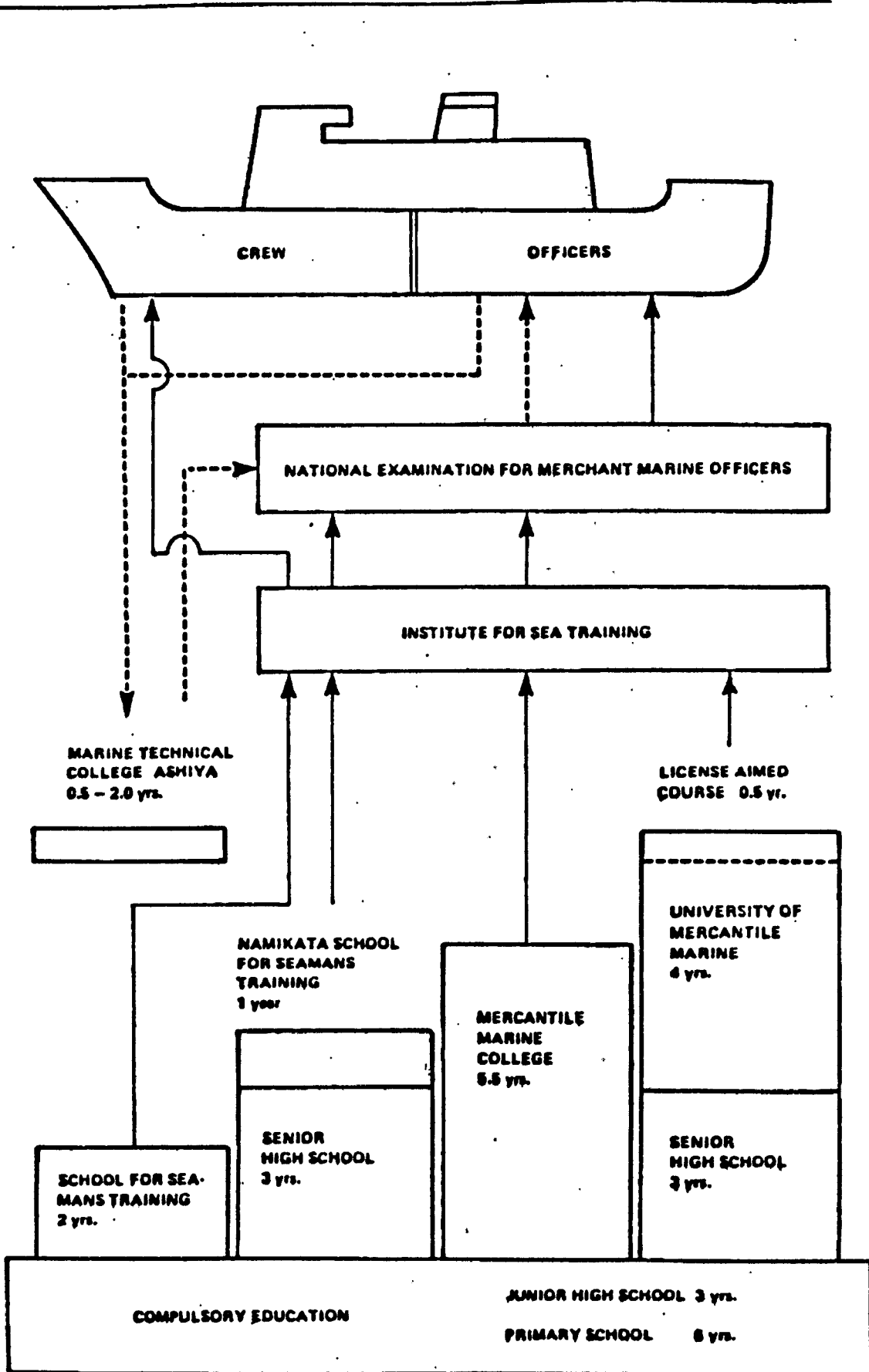
COURSE CONTENTS:

- plant management
- operating materials
- measurement and control engineering
- electrical engineering
- diesel engineering

Remarks

APPENDIX B

DIAGRAM OF NATIONAL INSTITUTE FOR MERCHANT MARINE EDUCATION SYSTEM



APPENDIX B

Table 1. The curriculum of the advanced course

Navigation class			Engineering class		
Subjects	Hours/Week		Subjects	Hours/Week	
	1st year	2nd year		1st year	2nd year
Ethics	2	1 (1)	Ethics	2	1 (1)
English	8	7 (2)	English	7 (1)	7 (3)
Maritime Law	1	3 (1)	Maritime Law	1	1 (1)
Economics	(2)		Economics	(2)	
Ocean Transportation	(2)		Ocean Transportation	(1)	(1)
Mathematics	4	1 (1)	Mathematics	4	1 (4)
Physics	2 (1)	(2)	Physics	2 (1)	
Chemistry	2	(1)	Chemistry	2	
Health & Physical Education	1		Health & Physical Education	1	
Navigation	1.5	1.5 (0.5)	Marine Steam Boiler		0.5 (0.5)
Meteorology	1	1 (1)	Marine Steam Turbine		0.5 (0.5)
Oceanography	2	(1)	Internal Combustion Engine		1 (1)
Navigation Aids & Instruments	1	3 (1)	Auxiliary Machinery		0.5 (0.5)
Control Engineering	1	2 (1)	Hydraulics		1 (1)
Laws & Regulations of the Road	1	1 (1)	Ship Propulsion		(1)
Ship Maintenance	2	1	Fuel & Lubrication		:
Ship Handling	1	1	Applied Dynamics	4 (3.5)	
Maritime Casualties		1	Metal Materials	(1.5)	
Marine Cargo Operation	1	(1)	Electric Engineering	2	(2)
Safety Management		1	Electronic Engineering		2
Mechanics for Deck Officers	1	(1)	Computers & Information		2
Naval Architecture	1	(1)	Marine Instrumentation	1	
Radio Engineering	2 (1)		Control Engineering		1 (1)
Electric Engineering	1 (1)		Marine Safety Engineering		(1)
Nuclear Power Engineering		1 (1)	Machine Design	1 (1)	
Computers & Information		(1)	Workshop Technology	(1)	
Marine Sanitation		1	Naval Architecture	1	
Outline of Marine Engineering		1	Nuclear Power Engineering		(2)
Practices		2	Practices	2	
Special Study		4	Special Study		4

Notes: The figures in the parentheses above show the hours of the elective subjects.

APPENDIX B

Table 2. The curriculum of the special training course

Navigation Department				
Subjects	Kinds of Classes	Captain Class	First Mate Class	Second Mate Class
Ethics		1	1	1
Japanese				0.5
English		5	5	5
Jurisprudence		1		0.5
Mariner's Labour Law		1	1	1
Maritime Law		1	1	0.5
Maritime Commercial Law		2	1	
Ocean Transportation		1	1	
Economics		1		
Mathematics		2	2	2
Fundamental Chemistry		1	1	
Physics		1	1	1
Health & Physical Education		0.5	0.5	1
Geo-Navigation		2.5	2.5	4
Celo-Navigation		2	2	3
Navigational Aids & Instruments		1	3	3.5
Radio Engineering		2	2	1
Electric Engineering				1
Laws & Regulations of the Road		2	2	2
Maritime Meteorology		2	2	1.5
Ship Maintenance		1	1.5	1.5
Ship Handling		1.5	1.5	1
Maritime Casualties		0.5	0.5	0.5
Marine Cargo Operation		1.5	2	2
Safety Management		0.5	0.5	0.5
Mechanics for Deck Officers		1.5	1.5	1.5
Naval Architecture		1	1	1
Control Engineering		1	1	1
Navigation Watch				0.5
Ship Communication				0.5
Marine Sanitation				0.5
Outline of Marine Engineering		0.5	0.5	0.5
Practices		3	3	4

Notes: The figures show number of the studying hours per week.

APPENDIX B

Table 2. (continued)

Engineering Department				
Subjects	Kinds of Classes	Chief Engineer Class	First Engineer Class	Second Engineer Class
Ethics		1	1	1
Japanese				0.5
English		4	4	5
Maritime Rules & Regulations		1.5	1.5	1.5
Jurisprudence		0.5		
Mathematics		2	2	2
Physics		1	1	1
Fundamental Chemistry		1	1	1
Health & Physical Education		0.5	0.5	1
Marine Steam Boiler		2	2	2
Marine Steam Turbine		2	2	2
Internal Combustion Engine		2.5	2.5	2.5
Ship Propulsion		1	1	1
Auxiliary Machinery		1	1	2
Hydraulics		1	1	
Marine Instrumentation		1	1	1
Control Engineering		2	2	2
Electric Engineering		1.5	1.5	2
Electronic Engineering		1	1	1
Fuel & Lubrication		1	1	1
Fluid Mechanics		1	1	
Thermodynamics		1	1	1
Strength of Materials		2	2	1
Materials of Machines		1	1	1
Design & Drawing		0.5	1	
Engineering Drawing			0.5	1.5
Workshop Technology				1
Nuclear Power Engineering		0.5	0.5	
Engine Management		1	1	
General Management of Engineering				1.5
Marine Sanitation				0.5
Marine Technical English				0.5
Outline of Navigation				0.5
Naval Architecture		0.5	0.5	
Practices		2	2	2

Notes: The figures show number of the studying hours per week.

APPENDIX B

Table 3. The curriculum of the short training course

Navigation Department		Engineering Department	
Subjects	Hours/Week	Subjects	Hours/Week
Geo-Navigation	6	Marine Steam Boiler	3
Celo-Navigation	4	Marine Steam Turbine	3
Navigation Aids & Instruments	5	Internal Combustion Engine	6
Radar Practice	1	Ship Propulsion	3
Naval Architecture	1	Auxiliary Machinery	4
Ship Maintenance	3	Electric Engineering	3
Marine Cargo Operation	4	Electronic Engineering	2
Navigation Watch	1	Control Engineering	4
Ship Handling	2	Marine Instrumentation	2
Maritime Casualties	1	Fuel and Lubrication	2
Maritime Meteorology	2	General Management of Engineering	3
Ship Communication	1	Maritime Laws	2
Marine Sanitation	1	English	2
Maritime Law	5		
Mariner's Law	1		
English	2		
Practice of Radar Observation	1		
Practice of Radar Simulator	1		

Four-Year Program of Study

Elebe Year (Fourth Class) Curriculum

First Quarter

Calculus and Analytic Geometry I
 Chemistry I
 English I
 Engineering Graphics I
 Marine Safety I
 Nautical Science I
 Physical Education

Second Quarter

Calculus and Analytic Geometry II
 Chemistry II
 English II
 Engineering Graphics II
 Marine Engineering I
 Engineering Shop I
 Physical Education

Third Quarter

Calculus and Analytic Geometry III
 Physics I
 Nautical Science II*
 Engineering Graphics III***
 Marine Engineering II***
 Engineering Shop II***
 Naval Science Fundamentals
 Physical Education
 Marine Transportation I*

Fourth Quarter

Calculus and Analytic Geometry IV
 Physics II
 Nautical Science III*
 Safety of Life at Sea I
 Nautical Science IV****
 Engineering Graphics IV**
 Electrical Engineering ***
 Metal Cutting Processes I***
 Metal Joining Processes I**
 English III
 Physical Education

Marine Transportation Curriculum

Third Class (Sophomore Year)

Physics III, IV
 Safety of Life at Sea I
 Engineering Science
 Statistics
 Introduction to Computer Engineering
 History I
 Economics I, II
 Meteorology
 Managerial Process
 Naval Weapons Systems
 Physical Education

Second Class (Junior Year)

Marine Materials Handling I, II
 Marine Electronics I
 Seamanship I
 Navigation I
 Accounting for Management
 History II, III
 Business/Maritime Law
 Naval Operations I
 Physical Education
 Elective

First Class (Senior Year)

Bridge Simulator Training
 Advanced Cargo Stowage and Ship Stability
 Marine Safety II, III
 Seamanship II
 Navigation II
 Marine Electronics III, IV
 Principles of Naval Architecture
 Marine Transportation II
 Marine Insurance
 Naval Operations II
 Maritime Labor Relations
 License Seminar
 Physical Education
 Option:

Humanities Sequence or Comparative Culture
 Sequence or Foreign Language Sequence
 Electives

Marine Engineering and Marine Engineering Systems Curricula

Third Class (Sophomore Year)

Introduction to Linear Differential Equations
Physics III, IV
Safety of Life at Sea I
Introduction to Computer Engineering
Introduction to Materials Engineering
Engineering Mechanics I, II
Thermodynamics I
Economics I, II
Naval Weapon Systems

Second Class (Junior Year)

Strength of Materials
Principles of Naval Architecture
Fluid Mechanics I
Thermodynamics II, III
Electric Circuits I, II
History I
Managerial Process
Naval Operations I
Physical Education
Elective or
For Marine Engineering Systems:
Differential Equations I

First Class (Senior Year)

For Marine Engineering:
Marine Refrigeration
Alternating-Current Machinery

Electronics I
Marine Engineering I, II, III
Internal Combustion Engines I, II
History II, III
Marine Transportation
Naval Operations II
Physical Education
Option:
 Humanities Sequence or Comparative Culture Sequence
Electives

For Marine Engineering Systems:

Fundamentals of Engineering Design
Machine Design I
Basic Ship Design
Marine Refrigeration
Alternating-Current Machinery
Electronics I
Marine Engineering I, II, III
Internal Combustion Engines, I, II
Thermal Systems Analysis
Automatic Control Systems I
Elective
Marine Transportation
Naval Operations II
Physical Education
History II, III
Option:
 Humanities Sequence or Comparative Culture Sequence

Dual License Curriculum

Third Class (Sophomore Year)

Metal Joining Processes I
Introduction to Computer Engineering
Engineering Mechanics I, II
Thermodynamics I
Business/Maritime Law
Economics I, II
Introduction to Linear Differential Equations
Physics III, IV
Naval Weapons Systems

Second Class (Junior Year)

Marine Electronics I
Marine Materials Handling II
Seamanship I
Meteorology

Navigation I
Strength of Materials
Principles of Naval Architecture
Fluid Mechanics I
Thermodynamics II, III
Electric Circuits I, II
Physical Education

First Class (Senior Year)

Alternating-Current Machinery
Marine Refrigeration
Marine Engineering I, II, III
Internal Combustion Engines I, II
History I, II, III
Humanities IV
Marine Transportation
Managerial Process
Marine Insurance
Marine Materials Handling III
Marine Safety II, III
Communications
Seamanship II
Navigation II
Marine Electronics III, IV
Naval Operations I, II
Physical Education

**Marine Transportation majors only*

***Marine Engineering and Marine Engineering Systems majors only*

****Marine Engineering, Marine Engineering Systems, and Dual License majors*

*****Dual License majors only*

'The curriculum is subject to change.

APPENDIX D

FRENCH SYSTEM OF MARITIME EDUCATION AND TRAINING

FIRST YEAR:

Theoretical Courses	Hours/Week
Mathematics	4.5
Electrical Eng.	1.5
Celestial Nav.	1.5
Navigation	4.0
Thermodynamics	4.0
English	2.0
Laws	1.0
Rules of the Road, Port Signals	1.0
Workshop technology	3.0
Engineering Drawing	3.0
 Practicals	
Electrical Eng.	1.0
Fuel Tech., Lubricants, Combustibles	0.5
Workshop Machines	1.5
Signals	0.5
Practical Navigation	0.5
 Seamanship	
Knots	1.0
Boat Handling	1.0
Life Saving	0.5
 Physical Education & Sports: One after-noon a week	

SECOND YEAR:

Theoretical Courses	Hours/Week
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Mechanics & Strength of Materials	2.5
Electrical Eng.	2.0
Radio Electronics	1.5
Fluid Mechanics	4.0
English	2.0
Navigation, Charts	4.0
Maritime Legislation	0.75
Ship Construction	0.75
Plan Drawings	3.0

Practicals

Machinery	1.5
Electrical Eng.	1.5
Electronics	0.5
Navigation	1.0

Training aboard small ships	6.0
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Physical Education & Sports: One after-noon per week

THIRD YEAR:

Theoretical Courses	Hours/Week
Electrical Eng.	1.5
Radio Electronics	1.5
Machinery	5.0
Theory of Navigation	0.75
Navigation, Charts	2.25
English	2.25
Manouvering	0.75
Commercial Law	1.0
Ship's operation	0.5
Automation	2.0
Meteorology	1.0
Hygenics	0.5
Rules of the Road, Buoyage, Port signals	0.5
Practicals	
Machinery	1.0
Steam Turbine	3.0
Electrical Eng.	3.0
Electronics	1.0
Navigation	1.0
Automation	1.0
Seminars, field trips to ship yards etc.	1.0
Physical education & Sports: One after-noon per week	

FOURTH YEAR:

Theoretical Courses	Hours/Week
Electrical Eng.	1.5
Radio Electronics & Practicals	2.5
Machinery	1.5
English	1.5
Theory of Navigation	1.5
Navigation	1.25
Practice of Formalities	1.0
Ship Handling	0.75
Reports	1.5
Ship Operation	1.0
Practical study of boarding regulations	1.5
Safety, Accident damage	0.75
Automation	2.5
Maritime commerce	1.0
Legislation & Accounting	1.5
Hygenics	0.5
Practicals	
Electrical Eng.	1.5
Electronics	3.0
Automation	1.5
Hygenics	0.5
Seminars, conferences and field trips	2.0
Physical Education & Sports: One after-noon per week	

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