IAMU Proceedings

INAUGURAL GENERAL ASSEMBLY

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES

EDITOR

Prof. Dr. Osman Kamil SAĞ

CO-EDITOR

Assist. Prof. Dr. İsmail ÇİÇEK

ISTANBUL TECHNICAL UNIVERSITY

MARITIME FACULTY

26-29 JUNE, 2000

ISTANBUL, TURKEY

日本財団

The Nippon Foundation

International Association of Maritime Universities (IAMU)

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PROCEEDINGS

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NIPPON FOUNDATION

ABOUT THE NIPPON FOUNDATION

Background –
The Nippon Foundation formerly the Sasakawa Foundation, is a private non-profit organization that was founded in October of 1962, when it was written into law that a portion of revenues from motorboat racing be channeled to philanthropic activities. According to the rules and regulations governing the motorboat racing industry, 75% of revenues must revert back to the public in the form of winnings. Of the remaining 25% most of which goes to cover organizers' costs, 3.3% becomes the Foundation's operational funds.

Philosophy –
In keeping with the late chairman Ryoichi Sasakawa's belief that **"THE WORLD IS ONE FAMILY AND ALL MANKIND ARE BROTHERS AND SISTERS"**, the Foundation's activities are geared toward the alleviation of human suffering, the advancement of human welfare and the promotion of world peace. Such activities are conducted over and beyond considerations of politics, ideology, religion or race.

Size –
The Foundation has the largest operating budget of its kind in the world, out of which funds are allocated to support both domestic and international projects. In 1996, 60 billion yen (US$600 million) was available for disbursement, of this amount, 8.1 billion yen (US$81 million) was earmarked for overseas assistance.

Overseas Activities –
The Foundation's overseas support covers a range of areas, including welfare, human resource development, academic and physical education, health care, population, agricultural and rural development, human rights, environment, hunger relief, refugee aid, and international understanding. All proposals in these areas are welcome, but those aimed at covering operational costs, debt repayment, physical infrastructure development, or the promotion of commercial, religious or political purposes, will receive low priority in the Foundation's funding decisions.

Some of the Foundation's current major projects are :
- agricultural development in Africa to foster self-sufficiency in staple food production (since 1986);
- establishing fellowship funds at major universities around the world that support post-graduate studies;
- leprosy control, in collaboration with WHO (since 1975);
- promotion of primary health care in developing countries, in collaboration with UNICEF and local governments (since 1992).

The Nippon Foundation is pleased to announce that in the most recent funding period seventy seven donations and grants have been allotted to projects in more than thirty-five countries, in such areas as education, health, international understanding, agriculture, development, environment, and refugee relief.

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IAMU INAUGURAL GENERAL ASSEMBLY

WELCOME TO THE INAUGURAL GENERAL ASSEMBLY OF IAMU IN ISTANBUL - TURKEY

Istanbul, the only city in the world built on two continents stands on the shores of the Strait of Istanbul (Bosphorus) where the waters of the Black Sea mingle with those of the Sea of Marmara and the Golden Horn. Here on this splendid site, Istanbul guards the precious relics of three Empires of which she has been the capital; a unique link between East and West, past and present.

However, Istanbul is not only historic, it is a magnificent city, fascinating and vividly alive. Beneath the unchanging sky line of her domes and "Minarets" there is the continual bustle and movement of crowds, the rumbling of vehicles along ancient cobblestone streets, the incessant coming and going and the cries of street sellers mingling with shipping sounds in the busy port.

Istanbul has infinite variety: museums, ancient churches, palaces, great mosques, historical sites and monuments bazaars, and the strait of Istanbul (Bosphorus). However long you stay, just a few days or longer, your visit will be unforgettable in this eclectic city.

Turkey has been for ages involved in the Mediterranean and World Seafaring life. The Merchant Maritime tradition and a high rank of Turkish Shipbuilding in the world are a guarantee of the successful development of this branch of economy. More than 40 private and state shipyards as well as numerous shipping companies are included in the economy of the country.

The Maritime Faculty of Istanbul Technical University, situated at Tuzla - a suburb of Istanbul, is very much involved in the Merchant Maritime activities continuing the famous maritime tradition of TURKEY since 1884.

We therefore hope that TURKEY, and İSTANBUL will prove to be an appropriate venue for the Inaugural General Assembly of IAMU.

On behalf of the Organizing Committee of the host University, ITUMF I have the honour and privilege of welcoming you to the Inaugural General Assembly of IAMU.

Prof.Dr. Osman Kâmil SAĞ
IAMU - CHAIR

FOREWORD

FOREWORD

The Inaugural General Assembly of International Association of Maritime Universities (IAMU) will be held in Istanbul, TURKEY during 26-29 June, 2000 and will be hosted by the Maritime Faculty (MF) of Istanbul Technical University (ITU) at Maslak and Tuzla Campuses.

The Association was established by the seven (7) Universities from the five (5) Continents of the World on 11th, and 12th November, 1999 in Istanbul, TURKEY.

Those Universities are (1) Maritime Faculty, Istanbul Technical University of Turkey for Central / Eastern Europe and the Mediterranean, (2) Kobe University of Mercantile Marine of Japan for Asia, (3) Arab Academy for Science and Technology and Maritime Transport of Egypt for Africa, (4) Australian Maritime College of Australia for Oceania, (5) Department of Maritime Transport, Cardiff University of U.K. for Western Europe, (6) Maine Maritime Academy of the U.S. for the Americas including the Caribbean's, and (7) World Maritime University of Sweden for the general representation.

IAMU has been most generously supported including financially by the Nippon Foundation of Japan. Mr. Hiroshi Terashima, Executive Director attended the meeting from Tokyo, Japan, and signed the Basic Agreement as one of the newly elect Vice Chairs.

IAMU has clear objectives of establishing the worldwide network among the Maritime Universities of Excellence, and of enhancing the safety of the International Ocean Traffic through establishing new framework of International Maritime Society towards the next millennium based on the scientific and academic approach.

It has been agreed that IAMU have Madam Ayako SONO, Chairperson of the Nippon Foundation as the Honourable Chair, Prof.Dr. Osman Kamil SAĞ, Dean of Maritime Faculty, Istanbul Technical University as the Founding Chair (till June, 2001), Prof.Dr. Kiyoshi HARA, President of Kobe University of Mercantile Marine as Senior Vice Chair who will take over the Chair in June 2001. The other Vice Chairs are Mr. Leonard TYLER, President of Maine Maritime Academy, Dr. Karl LAUBSTEIN, Rector of World Maritime University, and Mr. Hiroshi TERASHIMA, Executive Director of the Nippon Foundation.

It has also been agreed that the Inaugural General Assembly to be hosted by Prof.Dr. Osman Kamil SAĞ, Dean of Maritime Faculty, Istanbul Technical University in Istanbul in June, 2000. The second Annual General Assembly will be hosted by Prof.Dr. Kiyoshi HARA, President of Kobe University of Mercantile Marine in Kobe in 2001.

IAMU will pursue tangible results out of its activities. Some of the unprecedented and most ambitious features are :

1. To pursue "Tangible Results" of the activities in academic and scientific terms,

2. The activities to be formed into the three areas as the "Working Groups" to focus the precious energies and resources of the members. Those working groups are:

(A) [Working Group - I] Maritime Education and Training

Head : H.E. Dr. Gamal El Din Mokhtar, President
Arab Academy for Science and Technology and
MaritimeTransport - EGYPT

(B)[Working Group - II] Safety Management System

Head : Dr. Neil Otway, Principal
Australian Maritime College - AUSTRALIA

(C)[Working Group - III] Global Standardization

Head : Prof.Dr. John King, Head of Department of Maritime
Transport, Cardiff University - UNITED KINGDOM

IAMU is the uniquely innovative organization by the World's Maritime Universities of Excellence based on the common ground of the capability and rich assets in the field of Scientific and Academic Research and Development.

For the clearly shared values and goals among the member universities, IAMU has even a perspective of the mutual recognition of academic credit hours including the post-graduate level courses, as well as international uniform curricula among the member universities for the degrees.

OFFICERS OF
INTERNATIONAL ASSOCIATION OF
MARITIME UNIVERSITIES
IAMU

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SECRETARIAT	-	**Prof.Dr. K. INOUE** *Vice President KUMM – JAPAN* **Mr. H. YAMAMOTO** *Senior Lecturer ITUMF - TURKEY*

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WMU – IMO	Prof.Dr. G. ZADE

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Cardiff University – U.K.

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AMC – AUSTRALIA	-
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WMU – IMO	-

WORKING GROUPS

IAMU WORKING GROUPS

WORKING GROUP I – MARITIME EDUCATION AND TRAINING SYSTEM

1. THE GOALS :

1) The contribution of individual seafarers to the safety and the environmental protection.
2) Improvement of the methods and the contents of Maritime Education and Training at IAMU Member Universities / Faculties, and the international cooperation therefor.

2. THE ACTIVITIES :

1) Current Reality, and the future needs of the maritime society, focusing on:

   i. The analysis and assessment of the positive / negative impacts of the "Globalization" on the standards of M.E.T. at the IAMU Member Maritime Universities / Faculties at ;

   (a) International convention, and legal framework level
   (b) The respective country level
   (c) The individual university level
   (d) The individual company level
   (e) The students level

2) Response to the globalization of the world maritime labor force :

   i. To design through the scientific and academic approach the highest standards of M.E.T. system which the IAMU Member Maritime Universities / Faculties shall satisfy,

   ii. To design scientifically and academically the practical boundary conditions in all areas of the university activities which the IAMU Member Maritime Universities / Faculties are required to satisfy.

   iii. To assess and identify academically the legal and institutional

   (a) Barriers to be abolished, and (b) new framework to be introduced, including the utilization of "Flexible Learning Techniques" such as (1) Multi-Media Technologies, (2) Satellite and internet.

3) Required level of competency and ability for the future seafarers :

   i. The establishment of requirements in specific terms, including the requirements for the teaching staff and trainers,

   ii. Designing curricula, examinations, assessment and evaluation methods,

   iii. Defining and designing required resources and educational techniques, including the use of simulators.

4) International excellence of the maritime education system :

   i. The establishment of the optimum system of M.E.T. at the IAMU Member Maritime Universities / Faculties based on the academic and scientific analysis and approach,

ii. The evaluation and assessment of the above from the legal and institutional perspective.

5) Improvement of the existing certification system for competency for the graduates of the IAMU Member Maritime Universities / Faculties :

   i. Designing the optimum uniform examinations, and assessment systems for evaluating the level of competency,

   ii. To establish the uniform system for the certification of competency applicable internationally to the graduates of the IAMU Member Maritime Universities / Faculties through academic approach.

WORKING GROUP II – MARITIME SAFETY MANAGEMENT SYSTEM

1. THE GOALS :

   1) Establishment of the safety management system from shore side in the international maritime society.

   2) Establishment of the methods and the contents of education and training of maritime safety management system at the IAMU Member Maritime Universities / Faculties and the International Cooperation.

2. THE ACTIVITIES :

   1) Current realty, and the future needs of the maritime society.

   2) Analysis and assortment of Maritime Safety Management from shore side from the viewpoint of :

      i. International convention level

      ii. Respective country level

      iii. Individual company level

      iv. Safety managers

   3) Scientific and academic analysis approach to develop necessary skills and techniques which support maritime safety management system.

   4) The establishment of the curriculum on maritime safety management system at the IAMU Member Universities / Faculties.

   5) The shared images on the various practical activities of maritime safety managers in the maritime society.

   6) The structure of the maritime society which provides employment opportunities for maritime safety managers.

   7) The international excellence, and certification for maritime safety management system.

WORKING GROUP III – PROMOTING GLOBAL MARITIME EXCELLENCE

1. The initiation of the international maritime education and training system which emcompasses every aspect and element of m.e.t. at four (4) year education and training period.
2. The initiation of the international certification system for seafaring officers, including common examination, and evaluation standards and methods.
3. The initiation of the international certification system for the new concept of qualified maritime safety manager.
4. The new paradigm of the international maritime society on the safety management system which includes the safety management system from the shore side.
5. The members of iamu are to pursue mutual academic recognition among iamu post-graduate studies.

IAMU MEMBERS

COMPREHENSIVE LIST OF IAMU MEMBERS AS OF INAUGURAL GENERAL ASSEMBLY

1. Admiral Makarov State Maritime Academy / RUSSIAN FEDERATION
2. Arab Academy for Science and Technology and Maritime Transport / EGYPT
3. Australian Maritime College / AUSTRALIA
4. Cardiff University / UK
5. Constanta Maritime University / ROMANIA
6. Constanta Maritime Training Center / ROMANIA
7. Dalian Maritime University / PEOPLE'S REPUBLIC OF CHINA
8. *Dokuz Eylul University / TURKEY
9. Far Eastern State Technical Fisheries University / RUSSIAN FEDERATION
10. *Far Eastern State Maritime Academy / RUSSIAN FEDERATION
11. Gdynia Maritime Academy / POLAND
12. *Kiev State Maritime Academy / UKRAINE
13. Kobe University of Merchantile Marine / JAPAN
14. Korea Maritime University / KOREA
15. Liverpool John Moores University / UK
16. Maine Maritime Academy /USA
17. Maritime Faculty of Istanbul Technical University / TURKEY
18. Massachusetts Maritime Academy /USA
19. Mokpo National Maritime University / KOREA
20. Nicola Y. Vaptsov Naval Academy / BULGARIA
21. Odessa State Maritime Academy / UKRAINE
22. Rijeka College of Maritime Studies / CROATIA
23. Shanghai Maritime University / PEOPLE'S REPUBLIC OF CHINA
24. Southampton Institute / UK
25. Szczecin Maritime University / POLAND
26. Tokyo University of Merchantile Marine / JAPAN
27. *Turkish Naval Academy / TURKEY
28. University of Cantabria / SPAIN
29. University of Catalunya / SPAIN
30. University of Plymouth / UK
31. World Maritime University / IMO

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*New Candidate Universities for IAMU

HOST UNIVERSITY

ISTANBUL TECHNICAL UNIVERSITY - ITU

A. LEADER THROUGH THE AGES –

ITU is the oldest, and the most reputable Technical University among the 74 Universities of Turkey which was founded by SULTAN MUSTAFA III in 1773 as the Imperial Naval Engineering School, an institution dedicated to the training of Shipbuilders and Cartographers.

In 1795, the school was further commissioned to train technical military staff for the Ottoman Army. In 1845, the curriculum of the school was expanded with the addition of a program devoted to the training of Architects.

The name of the Engineering School, established in 1883, was changed again in 1909, and it became a University aimed at training Civil Engineers who would work to establish the infrastructure of the rapidly developing country. By 1928, the Institution had gained formal recognition as a University of Engineering that provided education in both Engineering and Architecture.

In 1944, the name of the Institution was changed to ITU, and in 1946, the Institution became an autonomous University with Architecture, Civil, Electrical, and Mechanical Engineering Faculties.

Today ITU is spread over an area of 250 hectares in six campuses, in different districts of Istanbul. These campuses enhold eleven Faculties, one Junior College carrying out Undergraduate Studies, three Graduate Schools (Institutes) for Postgraduate Studies, three Rectorate Departments, nine Applied Research Centres, an Advanced Classical Music Research Center, and a Turkish Music Conservatory.

The MARITIME FACULTY (1992) and the Maritime Junior College (1997) are situated at TUZLA Campus. The Rectorate, the Faculty of Electrical and Electronic Engineering (1944), the Faculty of Sciences and Letters (1982), the Faculty of Naval Architecture and Ocean Engineering (1971), the Faculty of Mines (1953), the Faculty of Aeronautics and Astronautics (1983), the Faculty of Civil Engineering (1944), Science and Technology Institute, Nuclear Energy Institute, Eurasia Earth Sciences Institute, and Department of Physical Education are situated at AYAZAGA Campus.

The Faculty of Architecture (1944), Institute of Social Sciences, and the Department of Fine Arts are situated at TAŞKIŞLA Campus. The Faculty of Management Engineering (1977), Department of Languages and History, Turkish Music Conservatory (1982), Advanced Classical Music Research Center (1999) are situated at MAÇKA Campus. The Faculty of Mechanical Engineering (1944) is situated at GÜMÜŞSUYU Campus. Recently acquired (1999) BEYKOZ Campus is the sixth Campus of ITU situated along the Istanbul Strait (Bhosphorus).

The total number of Academic Staff Members at ITU is 1804 comprising of 377 Professors, 177 Associate Professors, 245 Assistant Professors, 75 Senior Lecturers, 704 Research Assistants, 81 Lecturers, and 145 Language Instructors.

The total number of Students at ITU is 18841; 13,477 of whom are Undergraduate Students, and the remaining 5,367 are PhD (1163), and Masters Degree (4201) students. 25.3% of the total student body is female, and there are 449 foreign students at ITU.

Prof.Dr. GÜLSÜN SAĞLAMER, an Architect, is the first ever FEMALE RECTOR in ITU History in office since 1996.

HOST INSTITUTION

GENERAL INFORMATION ABOUT THE ITU, MARITIME FACULTY

EXPERIENCE AND CONTEMPORARINESS IN MARITIME EDUCATION

HISTORY -

ITUMF was inaugurated in 1884 under the name of "Merchant Masters Boarding School" within the Campus of the Naval Academy in Heybeliada, Istanbul, as a special Division of the Academy. The goal was to meet the top level manpower requirements of the Maritime Transportation in Turkey.

This establishment was moved to Azapkapı, Istanbul in 1909 under the name of "National and Private Merchant Masters and Engineering School" providing 4 years of non-boarding Deck and Engine Divisions Education after Junior High School. The school continued education at Yüksekkaldırım, Azapkapı, Paşalimanı/Üsküdar districts of Istanbul till 1927.

In 1927, the school was moved to Feriye PALACE / Ortaköy-Istanbul and in 1928 the status was changed to a "Merchant Maritime State High School" of the Ministry of Economics. Later, the status was changed to a four years Merchant Maritime Institution, the first two years as a Vocational High School Training, and the latter two years as a Merchant Maritime Junior College of Deck and Engine Departments.

The Institution again became a Boarding School in 1930, and was named "Merchant Maritime State College" in 1934, and the training periods of both Deck and Engine Departments of the College were expanded to three years. The "Merchant Maritime State College" was brought under the administration of the Ministry of Communication and Transport in 1939, and the Vocational High School Division was terminated in 1945.

In 1946, the College was transformed to a four year Higher Education Institution with Deck and Engine Departments under the administration of the Ministry of Transport and was renamed as the "Merchant Maritime Academy". The Harbour Department (1953-1956), and the Transportation and Administration Department (1975-1982) served to train Harbour Masters and Administrative Personnel for the Sea, for short spells.

In 1981, the Academy was moved to TUZLA Campus under the administration of Turkish Naval Forces. In 1988, the Academy was transferred to ITU Administration as a "Merchant Maritime College". The college was upgraded to the standards of a Faculty on July 3, 1992 and was renamed as "ITU, Maritime Faculty".

GENERAL INFORMATION -

The ITUMF, one of the eleven Faculties of ITU carries out 4 years (8 terms) of Undergraduate Education for High School Graduates with sufficient proficiency in English Language at Deck and Marine Engineering Departments.

Maritime Transportation – Management, and Basic Sciences Departments of the Faculty provide support to the Undergraduate Education of Deck and Engine Departments.

High School Graduates without sufficiency in English Language, attend to the English Preparatory Class of ITU, Department of Languages for one year (2 terms) before initiating their Undergraduate Education.

Throughout their Undergraduate Education, cadets are required to attend at least to 30% of their Undergraduate Curriculum in English Language, and the remaining in Turkish.

ITUMF is a boarding Higher Education Institution for both male and female cadets wearing uniforms. The cadets of ITUMF continue their education under certain rules and regulations of the Turkish Merchant Maritime discipline and traditions accumulated over one hundred years and within a framework of respectful vertical relationships. Thus, the education at ITUMF has very unique characteristics of its own, and rather different than the other Faculties of ITU.

ITUMF has a total cadet body of 750, admitting 100 Deck (20 female), and 50 Engine (10 female) cadets per year. These 150 cadets have to rank in the top 9-10% of the 1.5 Million High School Graduates who take the General University Entrance Examination in Turkey every year, as well as satisfying the very rigid health, physical fitness exams, and the interview.

The ITUMF is situated at TUZLA CAMPUS (70,000 m^2) at the Marmara Sea Coast, east of Istanbul, 70 km away from the main ITU Ayazağa Campus. The TUZLA Campus has a 400 m shoreline at the Marmara Sea enholding 47 independent buildings of 13,000 m^2 indoors area.

The ITUMF has a total body of 80 Academical Staff Members 22 of whom are Part time Senior Lecturers from the Turkish Maritime Sector. 5 Professors (2 Japanese), 4 Associate Professors (2 Japanese), 4 Assistant Professors, 21 Senior Lecturers (2 Japanese, 1 Canadian, 1 American), 5 Lecturers, 14 Research Assistants, 5 English Language Instructors are Full Time members of the Faculty Academical Staff. The Faculty also employs a total of 111 Administrative Staff.

The Dean, serving for a period of three years is the Head of the Faculty. 3 Vice Deans (one for Regimental System) assist the Dean in running the Faculty.

Department Heads are responsible to run the Academical work of each Department. The Division Heads assist them within this framework. The Faculty Secretary General is the Head of all Administrative Staff of the Faculty, and directly responsible to the Dean. The Head of the Regimental System takes care of the Boarding Life at the Campus, and directly reports to the Dean.

The Executive Committee of the Faculty deals with the Administrative issues where as the Faculty Committee deals with the Academical issues. Dean is the Head of both Committees.

UNDERGRADUATE EDUCATION AT ITUMF –

ITUMF Deck Department Curriculum leading to Oceangoing Masters Certificate of Competency covers 3062 hours of courses (IMO Model Course 7.03 – 1606 Hours, IMO Model Course 7.01 – 931 Hours, Turkish Higher Education Mandatory Major / Minor Area Courses –

525 Hours) in 4 years plus 840 hours of Maritime English in Preparatory Class totalling to 3902 hours.

This is equivalent of 223 credit hours, much above the standard 150 credit hours of the other ITU Faculties.

IMO Model Courses 7.01 + 7.03 education recommended by IMO (STCW '95) and Turkish Administration totals up to 2537 hours.

ITUMF Marine Engineering Department Curriculum leading to Oceangoing Chief Engineers Certificate of Competency covers 3533 hours of courses (IMO Model Course 7.04 – 1986 hours, IMO Model Course 7.02 – 1022 hours, Turkish Higher Education Mandatory Major / Minor Area Courses – 525 Hours) in 4 years plus 840 hours of Maritime English in Preparatory Class totalling to 4373 hours.

This is equivalent of 231 credit hours, again much above the standard 150 credit hours of the other ITU Faculties.

IMO Model Courses 7.02 + 7.04 education recommended by IMO (STCW '95) and Turkish Administration totals up to 3008 hours.

Deck Department graduates are granted a Bachelor of Science (BSc) Degree where as Engine Department graduates are granted a Bachelor of Engineering (B.Eng) Degree from ITU Senate.

Deck, and Engine Department Cadets upon the completion of their 12/6 Months on Board training respectively at the end of their 6th term at ITUMF, are eligible to sit for Oceangoing W/O, and W/E Certificate of Competency Exams, one year before their graduation from ITUMF.

ARPA-RADAR Simulator, GMDSS Laboratory, Navigation Laboratory, Seamanship Laboratory, Meteorology Laboratory, Marine Engineering Laboratory, Internal Combustion Engines Laboratory, Steam Turbine Laboratory, Physics/Chemistry Laboratory, Computer Centre, Maritime Library, Metal/Wood/Welding Workshops are the units utilised by the cadets throughout their education.

The Onboard Training Vessel of ITUMF, M/S AKDENİZ is a Passenger Ship of 148 m length, 18.6 m width, 7864 gross tons (3536 DWT, 2360 NRT), and enholding 120 cabins sleeping 350 cadets, and 80 crew.

REGIMENTAL SYSTEM AND EXTRA CURRICULAR / SPORTS ACTIVITIES AT ITUMF –

Vice Dean responsible for the Boarding System is the Head of the Regimental System. 3 Deputies / Company Officers, and 14 Research Assistants (all ITUMF Graduates) assist him.

To develop the concepts of leadership and responsibility within cadets, a Head Cadet Officer and a Committee of Cadet officers elected by the Final Year Cadets work in cooperation with the Regimental System Office in applying the essentials of discipline of the Maritime

Faculty. Through the authority given to them, they arrange and control the vertical relationship among classes within mutual love and respect. The Group of Final Year Cadets on duty every day are directly responsible to the Head Cadet Officer, and the Committee of Cadet Officers.

Distinct from other Faculties of ITU is the way that all cadets of ITUMF are boarding; apart from weekends and other holidays, they are required to live together for 24 hours per day, so that they can be fully prepared for their professional career.

According to the time schedule at ITUMF, cadets spend their leisure time in activities such as ship modelling, photography, music, journalism, environment, theatre, cinema, chess and bridge, painting clubs.

Olympics Indoors Swimming Pool, Gymnasium, Physical Fitness Center, Illuminated Football pitch, Basketball / Volleyball / Table Tennis and Track facilities as well as rowing, sailing, underwater diving activities utilising approximately 70 fiberglass / wooden boats (FD, Finn, Snipe, 470, 380, Cadet, Optimist, Windsurf, Rowing) are some of the main facilities utilised by the ITUMF Cadets during their education.

POSTGRADUATE EDUCATION AT ITUMF –

Postgraduate education leading to Masters Degree in all Deck, Marine Engineering, and Maritime Transportation – Management Departments with a capacity of 10 Graduates / Year / Department has been commenced at the Faculty as of the 1993/94 Academical Year.

Postgraduate education leading to PhD in all above Departments is in the process of initiation.

Graduates of Maritime Faculty, Naval Architecture and Ocean Engineering Faculty of ITU, Engineering Faculty of Istanbul University, and Naval Academy make up the main body of the postgraduate students at the campus.

SECTORAL ACTIVITIES OF ITUMF –

1. MARINE SAFETY TRAINING CENTER (MSTC) OF TURKEY –

ITUMF is the only IMO approved Maritime Center of Excellence in Turkey to conduct continuing education for seafarers. A 3 year UNDP Project implemented by IMO / ITUMF (1993-1996) with a USD 4.5 Million budget financed the establishment of

- Olympic indoors survival at sea training / swimming pool
- Closed survival craft utilisation platform
- Fire-fighting training center
- First aid instruction center
- ARPA RADAR and GMDSS Simulators
- Maritime Library
- MSTC Administration building and Guest Houses for seafarers within the TUZLA Campus.

Approximately 50 internationally trained staff carry out 18 different continuing education at the Center like ISM / ISO 9002, GMDSS, ARPA/RADAR, Marine Fire Fighting, Survival at Sea, First Aid, Closed Survival Craft Utilisation, Personal Safety and Social Responsibility, Crude oil washing, Gas free, Inert gas etc... Since 1996 more than 15,000 seafarers are trained at the center, 700 of whom were non Turkish.

Prof.Dr. Osman K. SAĞ is the project coordinator of MSTC.

2. SEAFARERS EXAMINATION CENTER OF TURKEY –

Prime Ministry, Undersecretariat for Maritime Affairs (the Administration in Turkey) authorized ITUMF to carry out examinations of certificate of competency at all levels on behalf of Turkish Administration in the form of a National Examination Center in 1997.

Thus, ITUMF organizes exams four times per year at TUZLA Campus, and several times per year in other districts of Turkey when required by the Administration.

Prof.Dr. Osman K. SAĞ served as the Founding President of the Examination Center (1997-2000); Vice Dean Prof.Dr. SÜREYYA ÖNEY newly elected as President will be serving for the next three years (2000-2003)

3. THE SIMULATOR CENTER OF TURKEY –

ITUMF recently initiated a Japanese – Turkish Governments 5 year JICA Project (2000-2004) named "The Improvement and the Promotion of the Merchant Maritime Education in Turkey" to seek technical transfer from Japanese Scientists and Maritime Experts together with the procurement of the necessary equipment in the form of Full Mission Shiphandling and Engine Room Simulators. 5 Japanese Experts already initiated consultancy work at ITUMF in April, 2000.

Prof.Dr. Osman K. SAĞ is the Project Manager of the JICA project.

4. INTERNATIONAL CAREER OFFICE OF ITUMF –

The Faculty has assisted those cadets who are expressly interested in performing their on board training on the International Fleet in finding several opportunities with a number of the largest and the most reputable international shipping fleets of the world. The Faculty believes that such orientation of the young positive cadets should be encouraged as much as possible so that the Faculty can meet the crucial task of educational institutions, namely, "motivating the students". The result so far has turned out to be very much valuable to have opened ITUMF Cadets much more to the International Maritime Society.

5. BILATERAL IN TERNATIONAL ACADEMİCAL COOPERATION –

ITUMF has excellent academic relations with the following Overseas Sister Maritime Higher Education Institutes –

COUNTRY	UNIVERSITY	YEAR OF PROTOCOL SIGNING
USA	Maine Maritime Academy	1993
EGYPT	Arab Academy for Science and Technology and Maritime Transport	1994
ROMANIA	Constantza Maritime University	1994
POLAND	Gdynia Maritime Academy	1998
JAPAN	Kobe University of Merchantile Marine	1998

6. MISCELLANEOUS ACTIVITIES –

Consultancy work to the Turkish Administration is provided regarding the preparation of the National Legistration for STCW '95 which commenced on February 1997.

Representation of Turkey at IMO for MSC, STW Committee / Subcommittee Meetings is frequently carried out by the Dean, Prof.Dr. Osman K. SAĞ.

Prof.Dr. Osman K. SAĞ is also serving as the IMO Competent person of TURKEY to assess the Administrations of Parties to IMO regarding STCW '95 requirements.

IAMU 2000
INAUGURAL GENERAL ASSEMBLY
HOST UNIVERSITY ITUMF ORGANIZING COMMITTEE

IAMU 2000 INAUGURAL GENERAL ASSEMBLY - HOST UNIVERSITY ITUMF ORGANIZING COMMITTEE

Prof.Dr. Osman Kâmil SAĞ	PRESIDENT
Prof.Dr. Süreyya ÖNEY	VICE PRESIDENT
Prof.Dr. Ahmet BAYÜLKEN	VICE PRESIDENT
Senior Lecturer Hisashi YAMAMOTO	VICE PRESIDENT
Assoc. Prof. Dr. C/E İsmail ÇİÇEK	SECRETARIAT
Senior Lecturer Nejat KOÇAR	SECRETARIAT
Ms. Nejla TUNALI	SECRETARIAT

I. <u>Deck Department</u>

Department Head - *Prof.Dr. Süreyya ÖNEY*
Vice Dept. Head - *Dr. Ayşe YILMAZ*

Senior Lecturer Dr. Semra ERTÜRE
Senior Lecturer Dr. Tayfun ACARER
Senior Lecturer Ercüment ŞAHİN
Senior Lecturer Nejat KOÇAR
Senior Lecturer Ali KANDEMİR
Senior Lecturer Capt. Güven TUNCER
Senior Lecturer Capt. Ali CÖMERT
Senior Lecturer Capt. Mustafa ULUSOY
Senior Lecturer Zuhal ER
Senior Lecturer Capt. İlhan UÇANSU
Senior Lecturer Capt. Nusret BELİRDİ
Senior Lecturer Capt. Süha BAYTURA
Senior Lecturer Kemal GÜRELİ
Senior Lecturer Gürol AKSU
Senior Lecturer M. Şükrü TURGUT
Senior Lecturer Cahit ÖZDAMAR
Senior Lecturer Atilla TOK
Research Assistant Dr. Capt. Özkan POYRAZ
Research Assistant Dr. Capt. Münip BAŞ
Research Assistant Capt. Cemil YURTÖREN
Research Assistant Capt. Tanzer SATIR
Research Assistant Capt. Sıtkı USTAOĞLU
Research Assistant Capt. Barış TOZAR
Research Assistant Sevilay CAN
Lecturer Mahmut SERT

II. <u>Marine Engineering Department</u>

Department Head - *Prof.Dr. Ahmet BAYÜLKEN*
Vice Dept. Head - *Dr. Sinan ÇAKIR*

Assoc.Prof.Dr. Selahattin GÖKTUN
Assoc.Prof.Dr. Oğuz Salim SÖĞÜT
Assoc. Prof. Dr. C/E İsmail ÇİÇEK
Senior Lecturer Dr. Kemal Yaşar DÖNMEZ
Senior Lecturer Fügen TÜRKAY
Senior Lecturer Gülsevin Ç. GÜRANİ
Senior Lecturer A. Samet EMİR
Senior Lecturer C/E Fahrettin KÜÇÜKŞAHİN
Senior Lecturer C/E Müftah KILINÇ
Senior Lecturer Şükrü YÜCEKAYA
Senior Lecturer Tevfik DEVELİ
Senior Lecturer Ümit ÜLGEN
Research Assistant Dr. C/E Cengiz DENİZ
Research Assistant Dr. C/E İsmail Deha ER
Research Assistant C/E Ali KUŞOĞLU
Research Assistant C/E Aydın ERCAN
Lecturer Erol KAPLAN

III. <u>Marine Transportation – Administration Department</u>

Department Head - *Assoc.Prof.Dr. N. GÜLER*
Vice Dept. Head - *Assoc.Prof.Dr. S. ILGIN*

Senior Lecturer Dr. Özhan GÜRKAN
Senior Lecturer Dr. Serap GÜNER
Senior Lecturer Ayşe DAĞCI
Senior Lecturer Tarcan ÜSTEK
Research Assistant Dr. Muhsin KADIOĞLU
Research Assistant Sunay SABUNCU
Lecturer Koray KUZAY

IV.<u>Basic Sciences Department</u>

Department Head - *Prof.Dr. Osman K. SAĞ*
Vice Dept. Head - *Dr. Mustafa YILMAZ*

Prof.Dr. Mükerrem İLKIŞIK
Senior Lecturer Dr. Kudret RODOPMAN
Senior Lecturer Dr. Sabire CÖMERT
Senior Lecturer Yıldız DARYAL
Senior Lecturer İbrahim ABBASOĞLU
Senior Lecturer Günay BİLİCAN
Senior Lecturer Süleyman KARADENİZ
Senior Lecturer Çetin EVİRGEN
Senior Lecturer Cem GÜZEL
Reader Nedret ÖĞÜTOĞLU
Reader Dilistan SHIPMAN
Reader Şükriye AKKUŞ
Reader Nesrin GÜLSARAN
Lecturer Güler BAŞARAN
Lecturer Hüsnü MIRIK

IAMU 2000

INAUGURAL GENERAL ASSEMBLY

PROGRAM

IAMU INAUGURAL GENERAL ASSEMBLY PROGRAM

	Sunday June 25		Monday June 26		Tuesday June 27	Wednesday June 28	
08.00 - 09.30			Free Transport to the Campus	Late Registration	Free Transport to ITU Maslak Campus	Free Transport to ITU Maslak Campus	
09.30 – 11.00	Arrivals / Free Morning		IAMU Opening Ceremony		Sessions III For WG1, WG2, WG3	Sessions V For WG1, WG2, WG3	II. MARITIME GENERAL ASSEMBLY OF TURKEY (DAY1)
11.00 - 11.20					Coffee Break	Coffee Break	
11.20 - 12.40					Sessions IV For WG1, WG2, WG3	Sessions VI For WG1, WG2, WG3	
12.40 - 14.00	IAMU Executive Committee Visit To ITUMF		Lunch At ITU Maslak Campus		Lunch At ITU Maslak Campus	Lunch At ITU Maslak Campus	
14.00 – 15.00	IAMU Inaugural General Assembly Desk Open For Registration at Princess Hotel	IAMU Executive Committee NF Meeting	IAMU Press Conference + M/S AIDA IV + M/S NEPTUN Visit for Public	Sessions I For WG1, WG2, WG3	Selected Speeches by Invited Guest Speakers	City Tour of Istanbul Topkapı Palace eg. And Shopping At Closed Bazaar	
15.00 - 15.20				Coffee Break			
15.20 - 16.40		Cocktail At M/S Akdeniz Training Vessel		Sessions II For WG1, WG2, WG3			
17.00 - 18.00			Free Transport to M/S SARAYBURNU		Free Transport	Free Transport	
20.00 - 24.00	Princess Hotel IAMU Information / Welcome Desk Available		Welcome Cocktail Prolonge Cruise Along the Bosphorus on M/S SARAYBURNU of Turkish Maritime Lines		Reception at M/S AIDA IV Training Vessel of AASTMT (EGYPT)	IAMU Dinner Party At ITO Istanbul Chamber of Trade Premises	

IAMU INAUGURAL GENERAL ASSEMBLY PROGRAM

<table>
<tr><th></th><th colspan="3">Thursday
June 29</th><th>Friday
June 30</th><th>* Saturday
July 1</th><th>* Sunday
July 2</th></tr>
<tr><td>08.00 - 09.30</td><td colspan="3">Free Transport to ITU Maslak Campus</td><td></td><td></td><td></td></tr>
<tr><td>09.30 – 11.00</td><td colspan="2">Closing Session I
Reports of Working Groups</td><td rowspan="7">II.
MARITIME GENERAL ASSEMBLY OF TURKEY
(DAY 2)</td><td>IAMU Working Group Meetings</td><td rowspan="7">Post Congress Tours of Istanbul</td><td></td></tr>
<tr><td>11.00 - 11.20</td><td colspan="2">Coffee Break</td><td>Coffee Break</td><td></td></tr>
<tr><td>11.20 - 12.40</td><td colspan="2">Closing Panel
Closing Address</td><td>IAMU Working Group Meetings</td><td></td></tr>
<tr><td>12.40 – 14.00</td><td colspan="2">Lunch At ITU
Maslak Campus</td><td>Lunch</td><td></td></tr>
<tr><td>14.00 – 15.00</td><td>IAMU Executive Committee Meeting</td><td rowspan="3">M/S AIDA IV
+
M/S NEPTUNE

Visit For Universities</td><td>IAMU Editorial Board Meeting</td><td rowspan="3">ITUMF Graduation Ceremony</td></tr>
<tr><td>15.00 - 15.20</td><td>Coffee Break</td><td>Coffee Break</td></tr>
<tr><td>15.20 - 16.40</td><td>IAMU Steering Board Meeting</td><td>IAMU Editorial Board Meeting</td></tr>
<tr><td>17.00 - 18.00</td><td colspan="3">Free Transport</td><td>Free Transport</td><td></td><td></td></tr>
<tr><td>20.00 - 24.00</td><td colspan="3">Farewell
Banquet
At ITUMF
Group “TURKUAZ”</td><td>Free
Evening
At Istanbul</td><td>Cabotage Festival / Ball Of Turkey

* Optional</td><td>ITUMF Graduation Party / Ball

* Optional</td></tr>
</table>

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IAMU 2000

INAUGURAL GENERAL ASSEMBLY

PAPERS PRESENTED

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
PROCEEDINGS OF INAUGURAL GENERAL ASSEMBLY
26-29 JUNE 2000, ISTANBUL, TURKEY

INNOVATION OF EDUCATION SYSTEM TOWARD 21ST CENTURY AT KOBE UNIVERSITY OF MERCHANTILE MARINE

T. Fukuoka

Department of Ocean Electro-Mechanical Department,
Kobe Univeristy of Merchantile Marine, **JAPAN**

Abstract

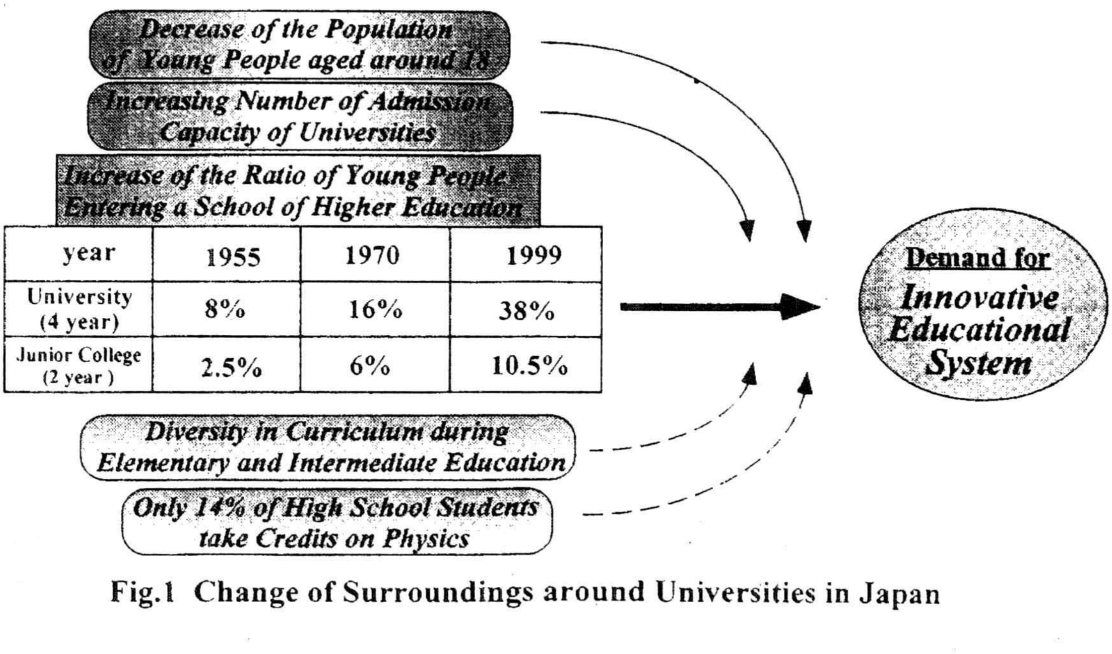
It is the time for Kobe University of Mercantile Marine (KUMM) to promote the projects toward 21st century. KUMM strongly hopes to be *the center of excellence* of maritime science and related areas, both domestically and internationally. The final goal of KUMM is not only to be the *core* of education and research, but also to play an important role as an information processor and distributor on maritime science.

In Japan, the total number of applicants for admission to universities is gradually decreasing. Thus, the universities are forced to alter the concepts of educational activities. To overcome such serious problems, KUMM decided to form five task-oriented working groups in 1998 under the slogan called *VISION 21*.

In this paper, the outline of KUMM's strategy is briefly explained with emphasis being placed on the innovation of curriculum and educational system for undergraduate student.

1. Introduction

In Japan, most universities are facing a great difficulty, which has never been experienced before. As a whole, the number of applicants for admission to each university tends to decrease, because the total number of young people aged 18 is continuously decreasing since around 1990. Additionally, only 14% of the high school students in Japan study physics according to the recent statistics, which means that some universities based on science and technology are forced to accept such students with various educational background. Figure 1



year	1955	1970	1999
University (4 year)	8%	16%	38%
Junior College (2 year)	2.5%	6%	10.5%

Fig.1 Change of Surroundings around Universities in Japan

explains the phenomena in detail, which causes lots of problems for the universities to solve. Consequently, the conventional educational system, which has been employed for a long time, needs to be reviewed. KUMM is also facing the same problem as in the case of the other universities whose educational background is primarily based on science and technology.

It is therefore strongly desired to establish an innovative educational system to cope with the difficulties mentioned above. Thus, KUMM formed five task-oriented working groups in 1998 under the slogan of *VISION 21*, which deal with such important issues as improvements of curriculum and educational system, MET system in 21st century, the advertisement and applicant acquisition. The basic concepts of *Vision 21* project are given as follows:

1) Conservation and Utilization of dark blue sea for human beings for 21st century

2) Bringing up highly educated international maritime leader

3) To be the core university of the marine transport and the marine science and related areas

In this paper, the emphasis is placed on the innovation of curriculum and educational system for undergraduate students.

2. Outline of Present Educational System at KUMM

2.1 Organization of Undergraduate Course

The undergraduate course of KUMM has four departments as follows.

- *Maritime Science*
  - *Nautical Science* Course (50)
  - *Marine Engineering* Course (40)
- *Transportation & Information Systems Engineering* (40)
- *Ocean Electro-Mechanical Engineering* (40)
- *Power Systems Engineering* (30)

The figures in the parentheses represent the admission capacity of each department or course. Students graduated from Department of Maritime Science receive the degree of B.Sc. in Maritime Science, while the students graduated from the other departments acquire the degree of B.Sc. in Engineering. It should be pointed out that such three groups as Marine Engineering Course, Departments of Ocean Electro-Mechanical Engineering and Power Systems Engineering have a number of common subjects as far as introductory subjects are concerned.

KUMM also has Graduate School of Maritime Science and Technology, four divisions in the master course and two divisions in the doctoral course (Ph.D. course). Detailed discussions on the Graduate School are to be presented by Prof. Inoue.

Master Course:

- *Maritime Science* (8)
- *Transportation & Information System Engineering* (8)
- *Ocean Electro-Mechanical Engineering* (11)
- *Power Systems Engineering* (11)

Doctoral Course:

- *Maritime & Transportation Systems Science* (4)
- *Ocean Mechanical & Energy Engineering* (4)

2.2 Chairs (Faculty Organization)

There are nine faculty chairs at KUMM, as listed below.

- Nautical Studies
- Maritime Studies
- Transportation Systems Engineering
- Information Systems Engineering
- Ocean Mechanical Engineering
- Electro-Mechanical Engineering
- Marine Engineering
- Nuclear Engineering
- Cross-Cultural Studies

Each chair consists of approximately 10 staff members. *Cross-Cultural Studies* chair is mainly in charge of *general arts*. The other eight chairs are mainly teaching the subjects on science and technology. Currently, KUMM has about 100 faculty members, and they belong to one of the nine chairs. To innovate the educational and research systems at KUMM toward 21st century, it was concluded as the results of the working group activities that the present faculty chairs and the department organization should be reconstructed.

3. Concepts of the New Educational System Proposed by *Vision 21* project

Figure 2 illustrates the concepts of the new educational system proposed by *Vision 21* project. Detailed descriptions of the present situations and environments surrounding KUMM are presented in the figure. Our goals consist of the drastic improvements of the educational system for undergraduate students and MET. It is considered that those purposes can be attained with help of *Education Supporting System* to be established. *The Education Supporting System* has two tasks, i.e., the inspection and estimation of education

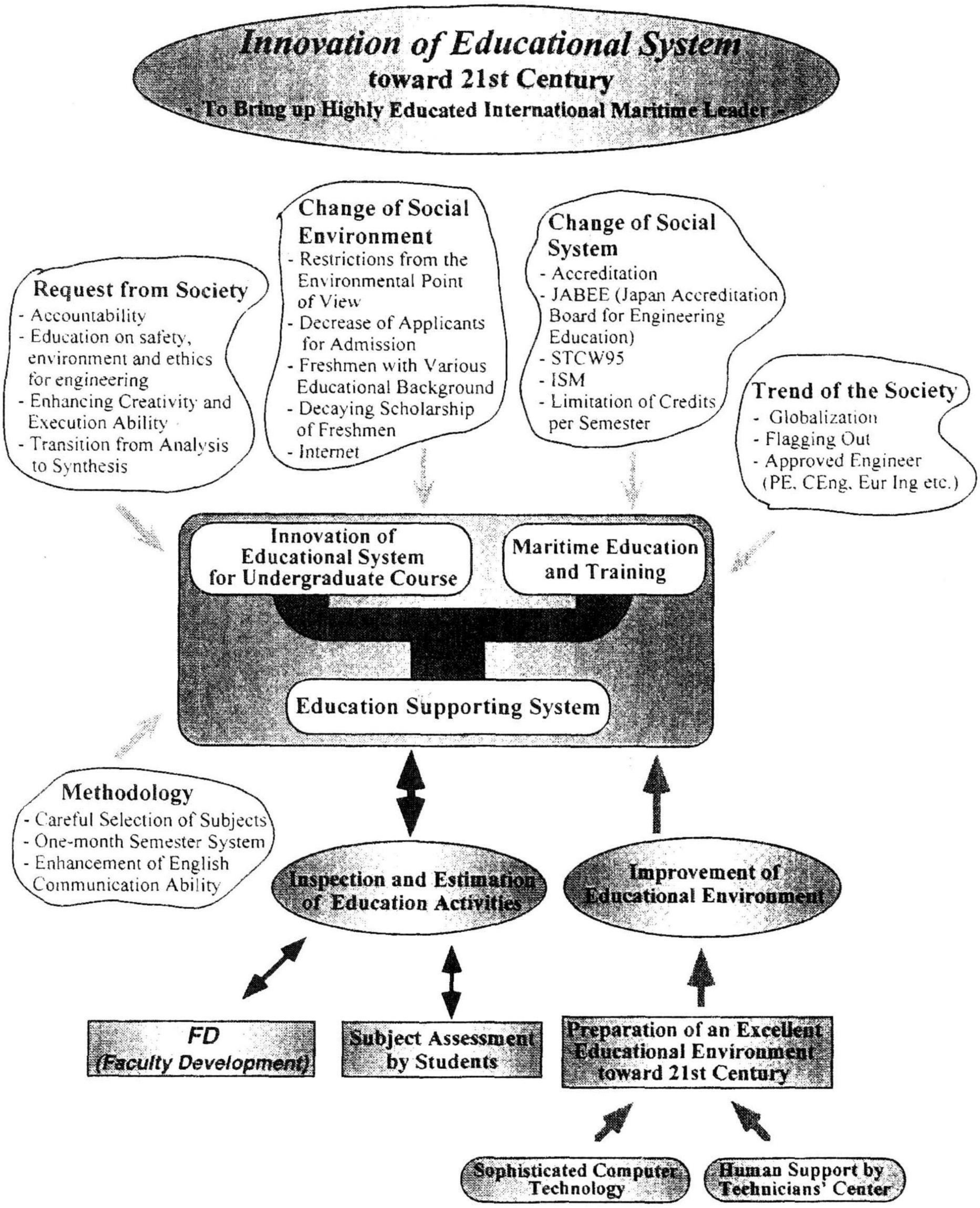


Fig.2 Concepts of the Innovation of Educational System

activities and the improvement of educational environment.

1) Inspection and estimation of education activities

So-called faculty development (FD) and the subject assessment by students are planned. *FD* and the *subject assessment* have not been adopted positively in Japan, especially at national universities. It is considered that the simultaneous promotion of *FD* and the *subject assessment* could be a great help to accomplish *Vision 21* project. Incidentally, *an accreditation* has been accepted mainly by private universities in Japan. Recently, The Japanese Government has decided to accredit all the national universities by a newly established organization. Prior to such compulsory accreditation, it is the intention of KUMM that all the activities of KUMM are to be approved by Japanese University Accreditation Association (JUAA) in 2001. JUAA has accredited many universities since 1947.

2) Preparation of a ideal educational environment

An innovative educational environment must be prepared to cope with the education in the 21^{st} century. It is expectantly realized with help of the sophisticated computer technology now available and human supports. Continuous introduction of the rapid progress in multimedia technologies and Internet can be useful means to improve the present educational system drastically. On the other hand, it is commonly recognized that education is essentially and desirably supported by humân labors. Fourteen technicians are now working for KUMM except for the crew of the training ship *FUKAE MARU*. Each technician has belonged to a specific laboratory so far, which has been usually headed by a professor. According to the concepts of *Vision 21* project, all the technicians belong to a newly organized *Technicians' Center*. They are counted on to be powerful supporters for various activities of KUMM especially for the undergraduate education program.

4 . Strategies to Attain the Goals of *Vision 21* project

To improve the quality of undergraduate education, *Vision 21* project has proposed a number of strategies. Representative six strategies are tabulated in Table 1, and each strategy is explained in detail in the following.

1) Improvement of lecture systems with *Compact Class*

To enhance and improve the educational quality, each class should be as small as possible. It makes possible such important issues as interactive lecture, imposing a number of exercises and homework, which may be disliked by the recent students in Japan, because they have scarcely experienced such an educational system. Judging from the present student organization of KUMM, each class is desired to consist of about forty students. The *Compact Class* system is particularly effective for the fundamental subjects of science and technology. Most of those subjects are provided for freshman and sophomore.

2) Introduction of *One-month Semester System*

KUMM adopts two-semester system in the similar manner to the most universities in Japan. Students studying in the Department of *Maritime Science* must experience a one-month ship-training annually in the first three years. The training system is sometimes detrimental to make up a flexible and effective

Table 1 Strategies to Attain the Goals of *Vision 21* project

1. Improvement of lecture systems with *Compact Class*
2. Introduction of *One-month Semester System*
3. Limiting the number of credits for one semester
4. Enhancement of communication English ability
5. Careful selection of the subjects requiredto be maritime officers
6. Taking a new look at the subjects on general arts

curriculum, particularly for the other three departments, because each department is closely related from the curriculum point of view. *One-month Semester System* has high promise to solve this problem. It could be a useful means for constructing the curriculum with high flexibility.

3) Limiting the number of credits for one semester

Recently, The Ministry of Education in Japan strongly demanded every university to limit the number of credits which a student can register for one semester. It is the intention of the authority that credits should be given under the substantial achievement. According to the Japan standard, one credit needs 45 hours study including the lecture in the classroom. The rule means that corresponding to one-hour lecture, students must study at least for two hours. To accomplish the substantial credit system, the number of credits, which a student can resister for one semester, must be limited to some extent. It is predicted that this system works well when being introduced together with *proposal* 1).

4) Enhancement of *communication English* ability

In Japan, every freshman has learned English at least six years before entering universities. However, their ability in English is not necessarily sufficient as far as oral communication is concerned. This problem is fatal for Japan to continuously develop in the fields of science and technology under the present circumstance of *globalization*. KUMM has two strategies. First, the score of the qualified test on *communication English* is regarded as the credits in KUMM. Secondly, it is strongly recommended that introducing English into an ordinary lecture in various ways as much as possible. The rating may be given to each subject according to how much English is introduced. However, there are still serious problems to be solved. KUMM has only one faculty of native English speaker for teaching communication English. That is to say, who teaches *communication English*, and how is it taught?

5) Careful selection of the subjects required to be maritime officers

The present curriculum for *Maritime Science Course* demands the students to take a number of credits for graduation, say, more than 140 credits. In addition, lots of credits are required to be a candidate of maritime officer. The graduation requirement is to be reduced as small as 130 credits in the new curriculum. As far as the maritime certification is concerned, *Vision 21* project proposed that the number of credits should be reduced as small as possible, hopefully to the minimum value of 35 credits, which exactly coincides with the minimum requirement specified in Japan law.

6) Taking a new look at the subjects on *general arts*

It is now strongly demanded that every university should have its own uniqueness in the educational system. On the other hand, the importance of general arts cannot be ignored. It is sometimes said that the subjects on *general arts* be a great help in the future. Consequently, it is a vital matter for KUMM to discuss how the subjects on *general arts* are taught.

5. Future Plans and Prospects

A new curriculum system is to start from April 1, 2001. Reconstruction of the faculty organization is now being discussed intensively. In addition, the department organization is also being re-examined.

As for a student level, every student is possibly asked to take the examination of TOEIC (Test of English for International Communication) in the very near future, which can estimate the ability of *communication English*. In these days, many companies in Japan tend to impose *TOEIC* and its score is sometimes used as the index for the promotion of personnel. Thus, it is expected that the introduction of *TOEIC* may stimulate the students' motivations toward polishing up the ability in *communication English*.

KUMM believes that only the *synthetic innovation in education, research and management* leads to the success of *Vision 21* project.

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INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
PROCEEDINGS OF INAUGURAL GENERAL ASSEMBLY
26-29 JUNE 2000, ISTANBUL, TURKEY

INNOVATIONS AND NEW TENDENCY IN POLISH SYSTEM OF MARITIME EDUCATION

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Gdynia Maritime Academy, Gdynia, **POLAND**

ABSTRACT: This papers describes the maritime education, training and research in Poland based on an example of Faculty of Navigation in Gdynia Maritime Academy. The purpose of paper is to present of the integrated educational and training system of professional staff capable to meet the current demands for maritime specialists of any description from the part of the shipowners and shore-based companies of the sea economy in line with the requirements. The integration involves: curricula, research projects and the development of scientific staff on one hand a course of the sea going service as well as shore-based industrial experience of the marine professionals on the other hand. The paper contains the goals and aims of the system, the profile of a graduate of a Maritime Academy and the educational process effected trough a multilevel structure of the system. The concluding part refers to the issues connected with the improvement of the current system, establishment of new lines of study, quality of the training process with regard to both the safety at the sea and the effectiveness of shipboard apprenticeship as each year, the world market demands more and better qualified professionals for ship operations, repairs and service.

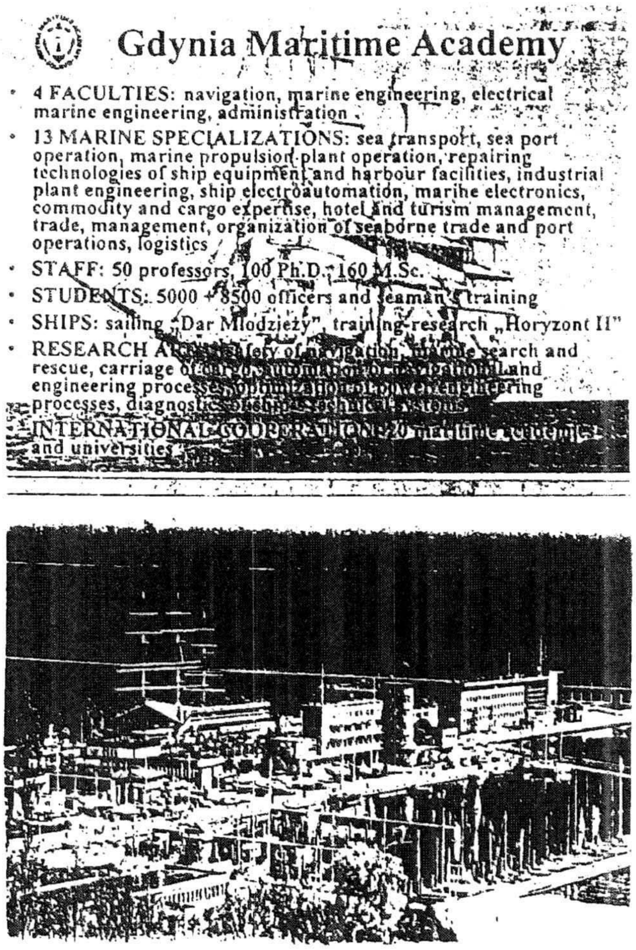
INTRODUCTION

The State Maritime College was established basing on the Goverment's. edict of 17th of June 1920. A few days ago our Academy celebrated 80 anniversary. From 1968 having a status of Higher Maritime School is using official name Gdynia Maritime Academy (GMA). In our presentation we will touch briefly upon the present situation with regards to the maritime education and training in Poland specifically on Faculty of Navigation in Gdynia Maritime Academy.
Due to career developments and requirements in maritime industry, an integrated system meeting international standards has been established in Poland. This system may be considered as a **Maritime Education and Training (MET)** and it consists of three different levels:

- **post secondary level,** i.e. a maritime college, educating future ratings; from 2000 Polish Maritime Administration gave permission to educate also officers on post secondary level;
- **university level,** corresponding to academic level and educating future **officers** with the degrees of B.Sc. and M.Sc.;
- **post university level,** fulfilling the vital role of vocational training for **all ranks of marine officers, including masters and chief officers,** carried out by the Officer Training Centre or other similar maritime institutions.

GENERAL

Gdynia Maritime Academy is a state-owned school. It is a legal person and is supervised by the Minister of Transport and Maritime Economy within the provisions of a Parliamentary Act in this respect.
The aims and goals of the Academy are education and upbringing of highly qualified professionals and development of sciences for the purpose of maritime economy.
It offers a high quality education which will qualify students to become officers in the merchant fleet or take their places in respected positions in related industries or professions at an Engineer and M.Sc. degree levels.
The process of education at particular fields within the full-time, evening or part-time system is conducted in accordance with the plans and programmes of studies established by a respective council of faculty. The plans and programmes of studies follow the requirements of international conventions which merchant marine officers should satisfy, especially STCW, SOLAS, MARPOL and COLREGS conventions.



STRUCTURE

Gdynia Maritime Academy is the National Centre for training and education for the marine transport. It currently conducts studies at certificate, diploma and degree levels in the following sciences:
- Navigation and Marine Transport, Ship's and Port Operations,
- Marine Engineering (Power Plant Operation, Radio-electronics and Electroautomation),
- Marine Technology (Repair of Ship and Harbour Equipment),
- Management (Business, Sea Harbour Turnover, Hotel-Tourist Service),
- Commodities and cargo.

THE GRADUATED PROPERTIES

A graduate from Gdynia Maritime Academy is a highly educated and well prepared for work on board sea-going vessels, for companies of the maritime economy and also for maritime economy related companies located all over the sea side regions.

Gdynia Maritime Academy graduates:
- hold Diplomas with a title of B.Sc. and M.Sc.,
- acquired sea-going and land workshop experience and professional qualifications which jointly authorise them to obtain a Certificate of a Merchant Marine Officer issued by the Polish Maritime Administration,
- acquired professional experience and qualifications to undertake in the future employments at managerial positions in

the marine industry and sea side regional companies,
- hold a rank of a reserve midshipman after having completed military training within the frames of their studies.

RESEARCH ACTIVITY

The Academy's staff is also involved in research projects within basic and applied areas of sciences. The main objects of research are:

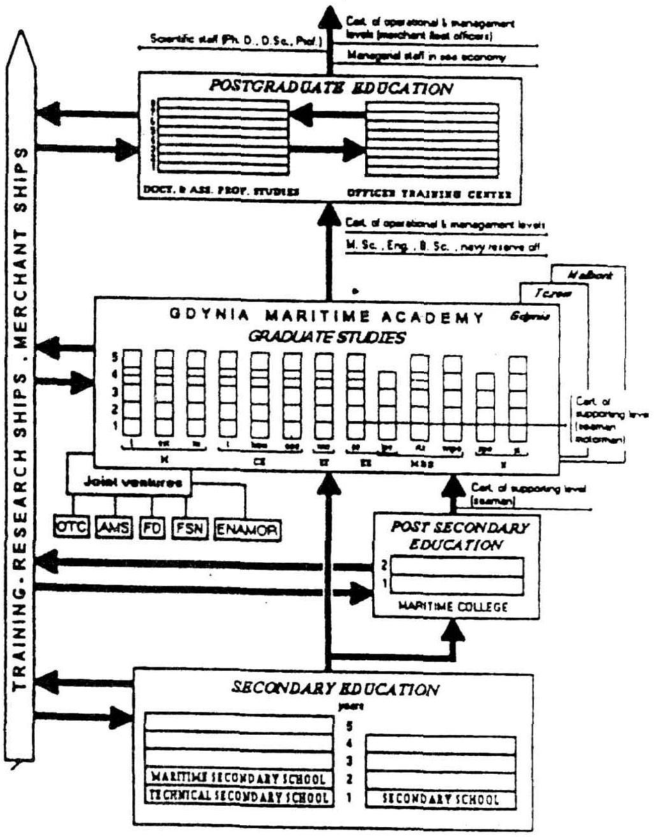
- Safety of Navigation
- Search and Rescue
- Carriage of Cargoes
- Ship and Port Operations
- Automation of Navigational and Power Engineering Processes
- Optimisation of Power Engineering Processes
- Diagnosing Ship's Technical Systems
- Foodstaff Technology.

Members of the Academy's staff are highly appreciated specialists who participate in the development of practical projects, which then are implemented in maritime economy.
Some of them are also employed in the Polish Academy of Sciences, and an essential group are experts working for IMO – International Maritime Organisation.

MARITIME EDUCATION SYSTEM

Maritime academies in Poland, apart from conducting their own curricula, have also assumed the role of co-ordinators in charge of the development and effectiveness of the integrated system of staff education for the sea economy under the authority of the Ministry of Transport and Sea Economy (MTSE) at the following four levels:

- Secondary Maritime Education, supervised by MTSE, covering:
  - basic maritime education;
  - apprenticeship on board training ships, and supply of candidates to maritime academies which educate the teaching staff for these schools. Moreover, the Maritime Post Secondary Schools are established in response to the needs of the labour market. These schools are both private and state run and offer two-years education courses.
- Graduate Studies:
  - one-level or two-level, full-time, free of charge studies in Gdynia;
  - two-levels, part-time, payable studies in Gdynia, Tczew and Malbork.
- Postgraduate studies:
  - shipboard officers, operational and management levels;
  - managerial staff for shore;
  - based operations.
- Doctorate and Assistant Professor Studies which lead to the degree of a doctor (PhD), an assistant professor (DSc) and a professor.



TRAINING SHIPS

The Academy owns two training vessels: the tall ship "Dar Młodzieży', and "Horyzont II" which replaced on the 28th of April 2000 the two smaller vessels "Horyzont" and "Zenit". Having sufficient ice class and as a modern, cruising training-research laboratory she will serve in both the North and the South Pole regions.

Technical data of "Dar Młodzieży" :

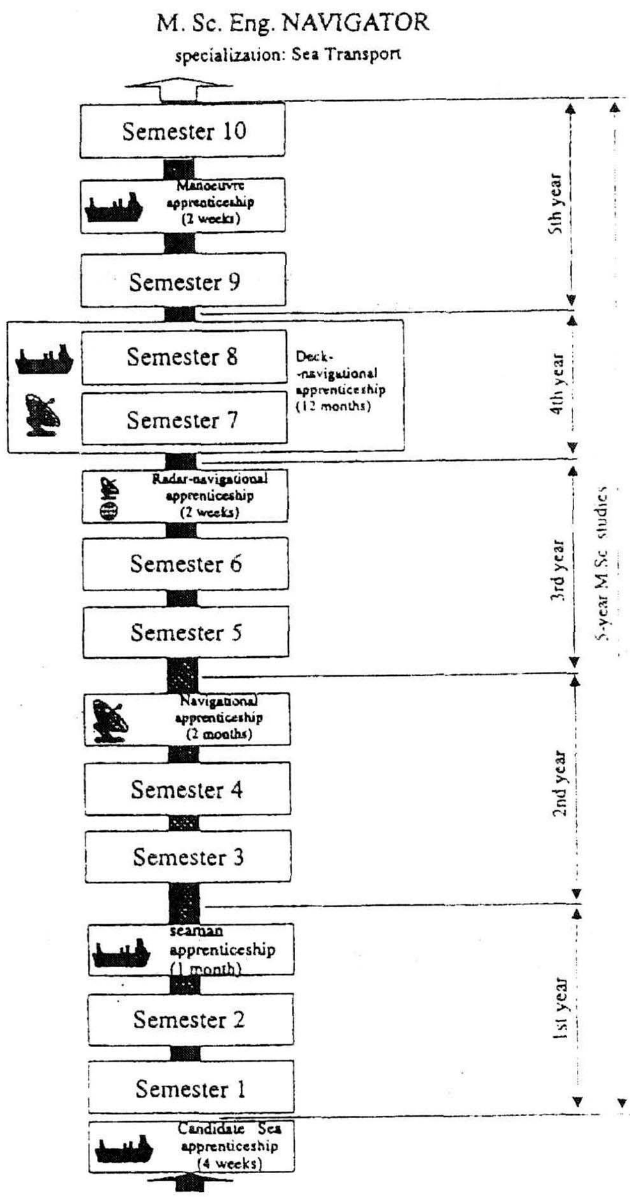
length overall together with the bowsprit : **108,60 m.**
length between perpendiculars : **79,40 m.**
width at frames : **14,00 m.**
draught : **6,60 m.**
height up to the main deck : **7,80 m.**
height up to the upper deck : **10,05 metres**
surface of basic rigging : **3000 m^2**
power of main engine : **2 x 750 KM**
speed under mechanical propulsion : **11 knots**
GRT : **2384,85**
NRT : **335,37**
displacement : **2946**
Polish Register of Shipping Class : **KM and F**
height of masts : **49,50 m.**
49,50 m.
46,50 m.
accommodation potential :
for crew members **40 + 4**
or apprentices **120 + 30**

Technical data of "Horyzont II" :

DWT :	**288,00 t.**
GRT :	**1321,00 t.**
L.o.a :	**56,00 m.**
Breadth :	**11,40 m.**
Depth :	**5,20 m.**
Tonnage :	**288,00 t.**
Propeller :	**1variable pitch**
Main Engine :	**1280 kW**
Speed :	**11 knots**
Bow thruster :	**125 BHP**
Accommodation :	**45 students**
	12 crew

STUDIES OF THE FACULTY OF NAVIGATION

The entire theoretical and practical knowledge and general upbringing principles transferred to students at the Academy should form personality of a graduate which will enable him to discharge very demanding duties of an officer navigator on a self-dependence basis.
A graduate from the Faculty of Navigation obtains a Diploma with a specialisation in sea transport and a title of an M.Sc. in Navigation.



QUALITY OF EDUCATION

Both : Faculty of Navigation and Faculty of Marine Engineering of Gdynia Maritime Academy being the very first faculties in Polish Academic Education System have achieve the ISO 9001 Quality Standards in Education in July 1998 after two years of preparation. GMA was granted ISO 9001 by Polish Register of Shipping member of IACS.

Polski Rejestr Statków

POLSKI REJESTR STATKÓW 1936

CERTYFIKAT SYSTEMU JAKOŚCI

CERTIFICATE OF QUALITY SYSTEM

PCBC
Akredytacja PCBC
Accredited by PCBC

Nr NC-087/98

Wydany dla: **WYŻSZA SZKOŁA MORSKA W GDYNI**
Issued for: **WYDZIAŁ NAWIGACYJNY**
Al. Zjednoczenia 3
81-345 Gdynia

Zakres certyfikacji: KSZTAŁCENIE NA POZIOMIE AKADEMICKIM, PROWADZENIE PRAC NAUKOWO- BADAWCZYCH ORAZ SZKOLENIE ZAWODOWE SPECJALISTÓW DLA GOSPODARKI MORSKIEJ WG WYMAGAŃ POLSKICH I MIĘDZYNARODOWYCH.

Scope of certification: EDUCATION ON ACADEMIC LEVEL, RESEARCH WORK, AS WELL AS PROFESSIONAL TRAINING OF SPECIALISTS FOR THE MARITIME ECONOMY ACCORDING TO THE POLISH AND INTERNATIONAL REQUIREMENTS.

Audit przeprowadzony przez Polski Rejestr Statków dostarczył dowodu, że stosowany w przedsiębiorstwie system zarządzania jakością jest zgodny z normą:
The audit carried out by Polski Rejestr Statków has afforded the evidence that this quality management system is in accordance with the standard:

ISO 9001:1994

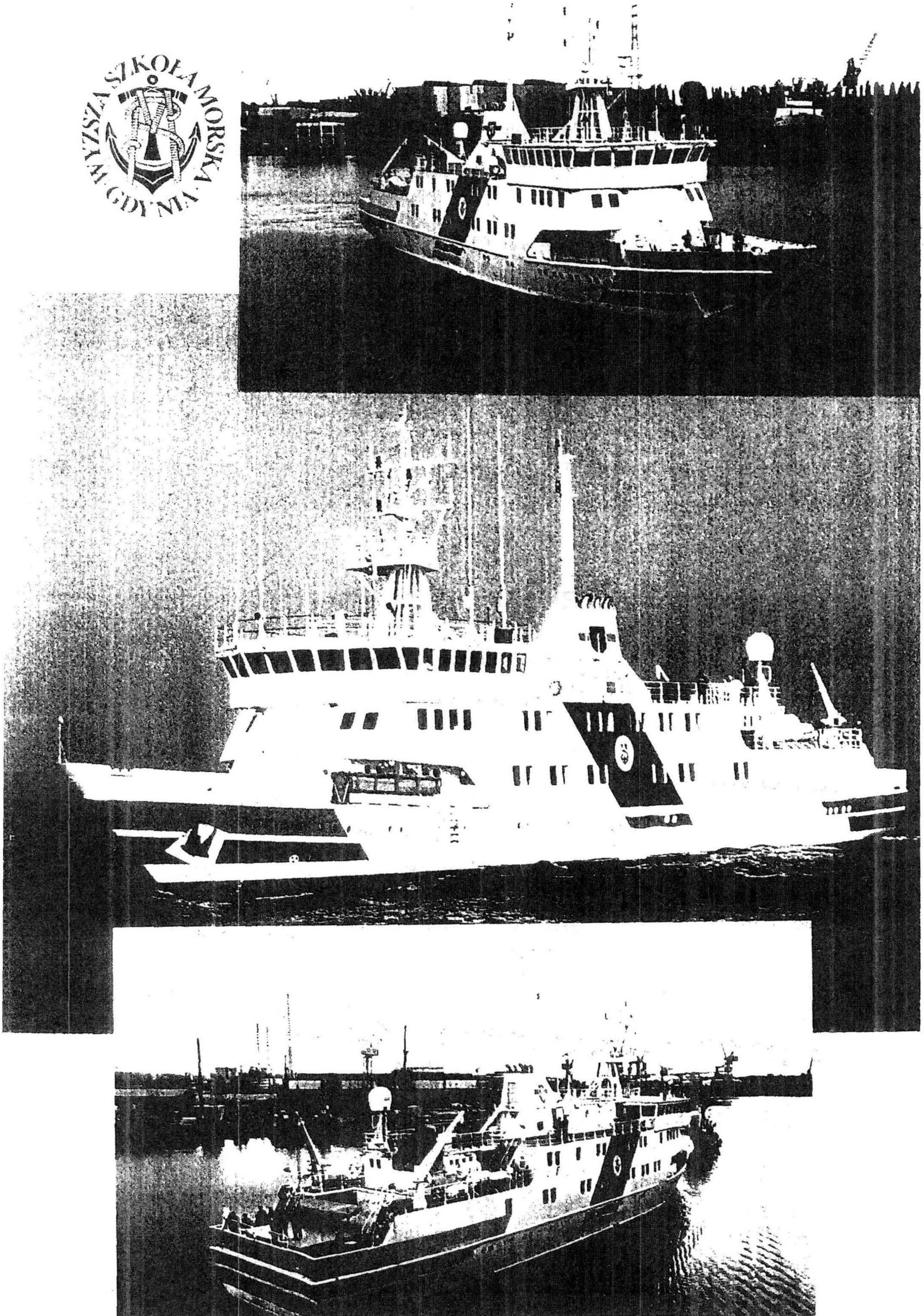
Certyfikat pozostaje w mocy przy zachowaniu warunków zawartych w umowie Nr NC-087/98
The certificate stands on compliance with conditions of contract No. NC-087/98.

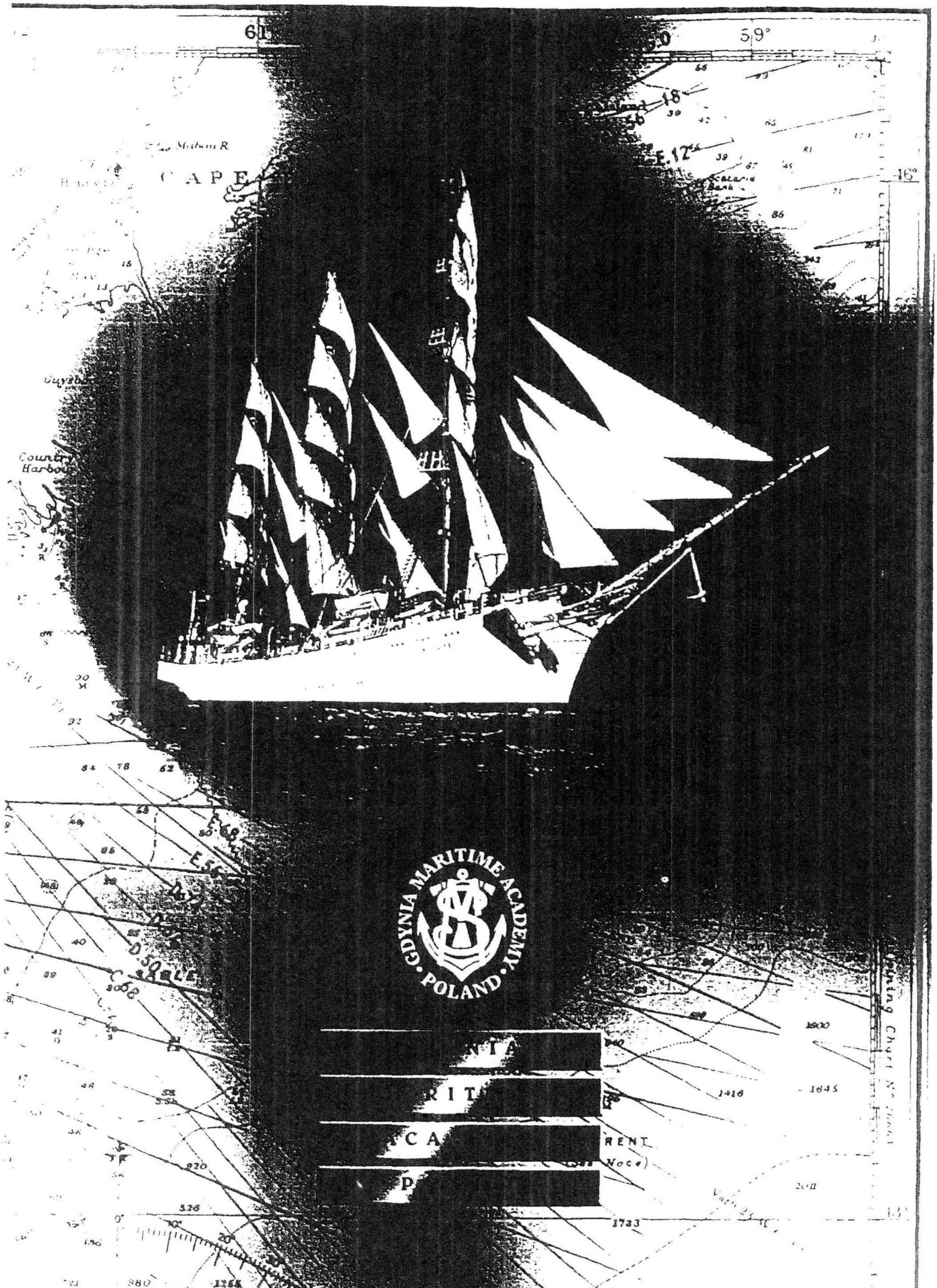
Certyfikat jest ważny do:
The certificate is valid up to: **07.07.2001**

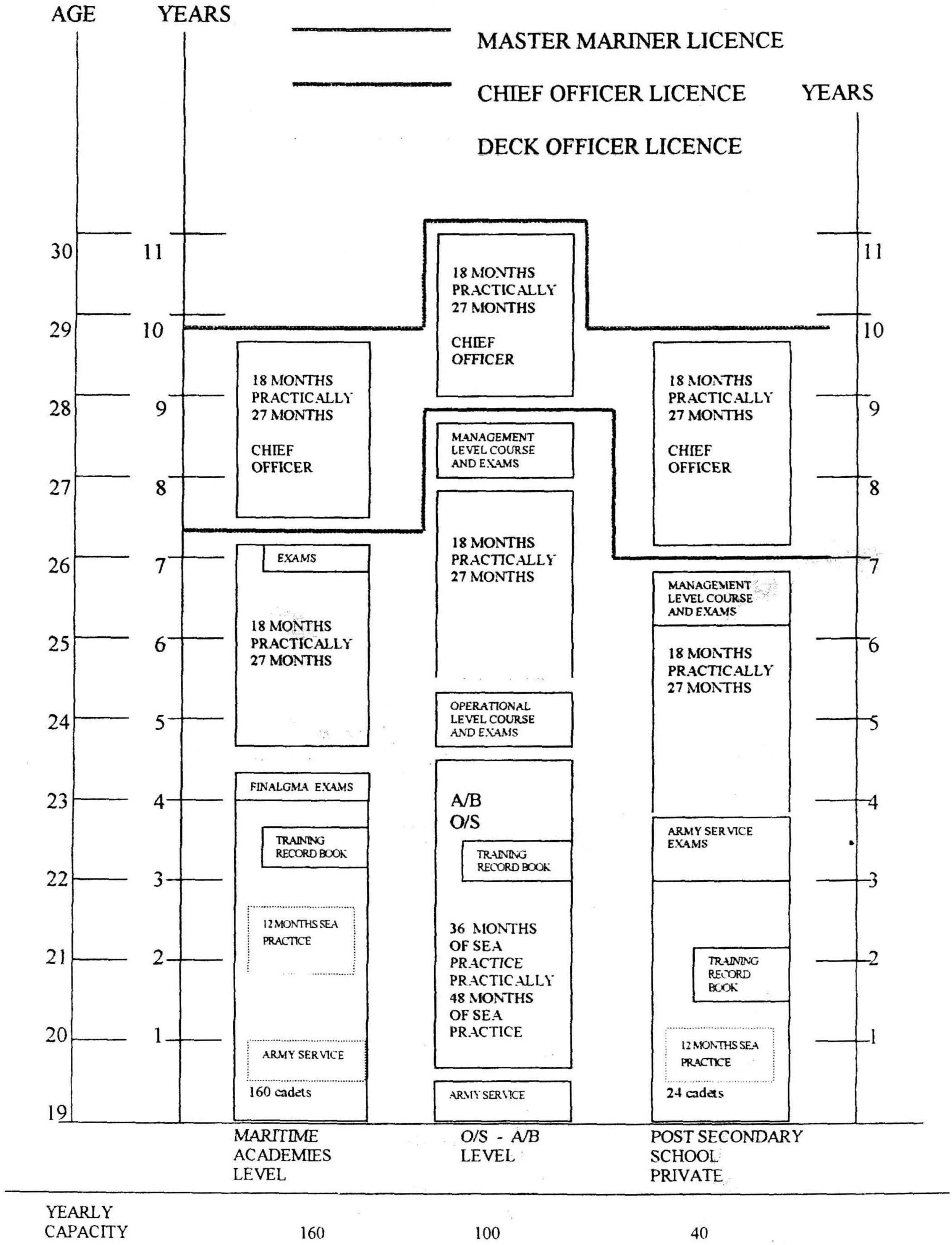
Bogdan Przybylski .... Jan Jankowski

Gdańsk, 08.07.1998

WYŻSZA SZKOŁA MORSKA GDYNIA




GDYNIA MARITIME ACADEMY
POLAND



AGE
YEARS
MASTER MARINER LICENCE
CHIEF OFFICER LICENCE
DECK OFFICER LICENCE
YEARS
30
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28
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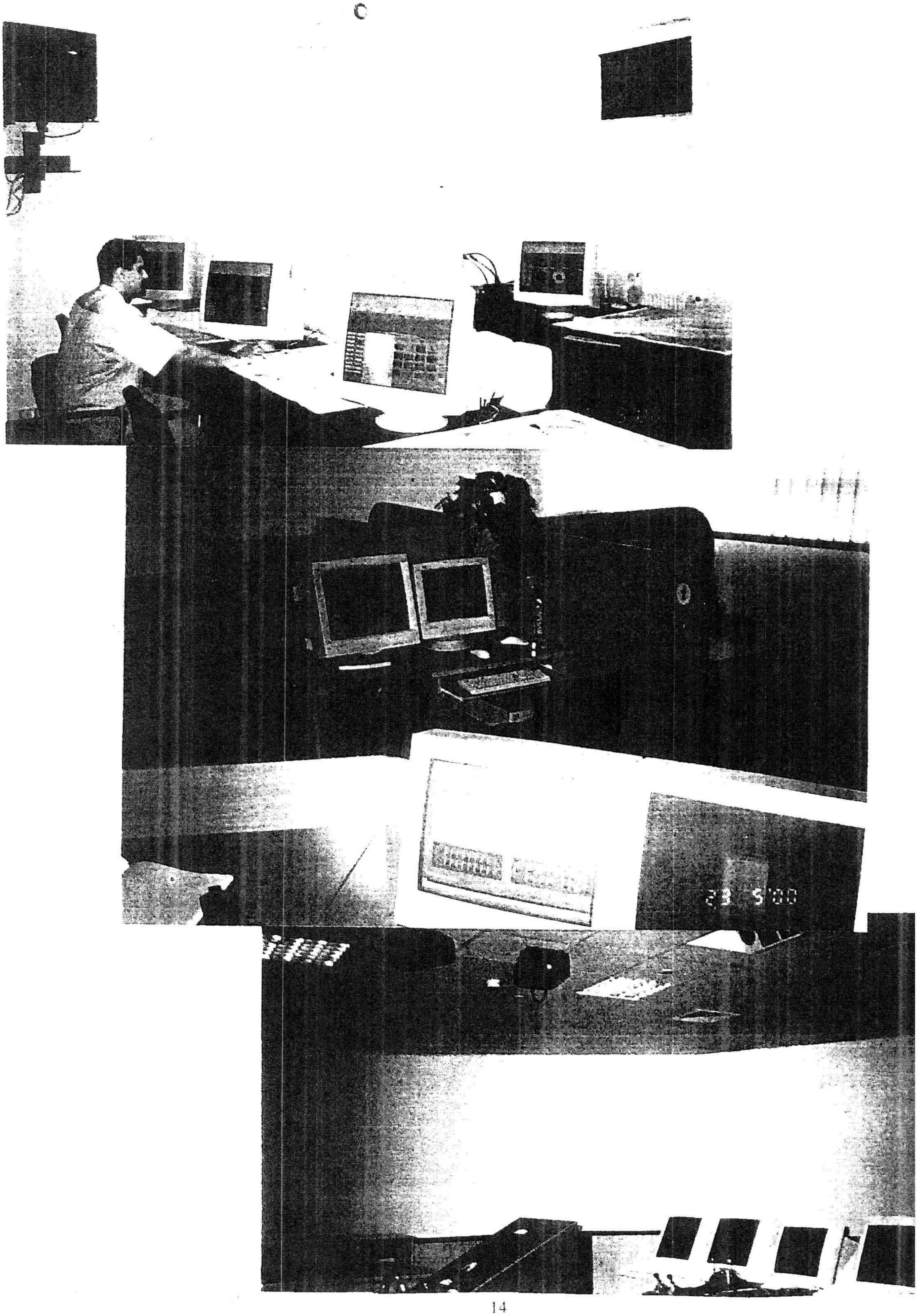
1
18 MONTHS PRACTICALLY 27 MONTHS CHIEF OFFICER
MANAGEMENT LEVEL COURSE AND EXAMS
EXAMS
18 MONTHS PRACTICALLY 27 MONTHS
OPERATIONAL LEVEL COURSE AND EXAMS
FINALGMA EXAMS
TRAINING RECORD BOOK
12 MONTHS SEA PRACTICE
ARMY SERVICE
160 cadets
A/B O/S
36 MONTHS OF SEA PRACTICE PRACTICALLY 48 MONTHS OF SEA PRACTICE
ARMY SERVICE EXAMS
24 cadets
MARITIME ACADEMIES LEVEL
O/S - A/B LEVEL
POST SECONDARY SCHOOL PRIVATE
YEARLY CAPACITY
160
100
40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TEACHING FACILITIES

The teaching facilities at Gdynia Maritime Academy including :

- Radar Simulator
- ARPA Simulator
- 240^0 scope Ship handling Simulator
- Cargo handling Simulator
- 2 GMDSS Simulators
- Electronic Chat ECDIS Simulator
- Survival Training Facilities
- Fire Fighting Training Facilities
- Marine Pollution Prevention Training Facilities
- Marine Power Plant Simulator
- LPG / LNG loading control Simulator
- Refrigerated Container Laboratory
- Engineering Workshop
- Diesel Power Plant / Workshop

and more than 60 well equipped laboratories. Three presented transparent foils shows :

- 240^0 scope Ship handling Simulator
- Cargo handling Simulator
- Electronic Chat ECDIS Simulator

According to requirements specified in the International Convention on STCW concerning examination methods, GMA having all above mentioned simulators is intending to establish special examination centre for Maritime Administrations.

FINAL CONCLUSION

The high technical complexity of ship equipment demands well-educated officers. and it is foreseen that the qualification requirements for ship crewmembers will continue to increase in the coming years. At the same time, the world shipping market experts are forecasting a lack of well-educated merchant marine officers in terms of the requirements agreed upon in the conventions and protocols developed by the IMO.

Due to different level of knowledge of young officers is necessary to establish the uniform system for the certification of competency applicable internationally to the graduates of the IAMU Member Maritime Universities / Faculties trough academic approach.

Gdynia Maritime Academy is very interested in promoting Global Maritime excellence and in eliminating of insufficient ways of educating and simplified training.

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GLOBALIZATION OF MARINE PEOPLE RESORCES

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ABSTRACT

The issues of improvement of quality of maritime training under the conditions of increasing sea traffic become more and more urgent. STCW has to a certain degree ordered requirements to the level of training and allows to develop criteria for the assessment of the level. However, national peculiarities in considering these requirements and subsequent special features of service on board vessels requires agreed program of training marine specialists at maritime universities. The present paper is devoted to certain aspects of the above problem, regarding training navigators. The ways of cooperation between maritime universities are suggested herein.

NOMENCLATURE

Hereinafter otherwise other stipulated we use terms common to the international maritime practice.

1. TASKS AND SPECIAL FEATURES OF NAVIGATIONAL TRAINING

Globalization of marine people resources presents the task of adaptation during the training process to maritime educational establishments, namely:

- to navigational and technological devices and systems which may occur on the employee's vessel;
- to professional training of crew of the vessel;
- to national content of the crew, especially among chief officers.

Currently vessels are equipped by different producers and sailors have to get used to their special features. The whole process of marine specialists training should be based on minimization of adaptation time. This is provided first of all by organization of training process and by development of corresponding simulation equipment.

On the stage of theoretical training the material for special training is formed with due regard to fundamental principles of marine devices' structure and functioning. Discussion and exchange of the curricula on this stage should help to develop basic criteria of assessment of theoretical knowledge level if marine specialists. In order to assess the qualification level of specialists various tests are being used. Development and implementation of the programs is potential field of cooperation between maritime universities.

Guideline on organization of navigational service on board vessel prescribes main operations of navigators under different conditions of sailing. But it does not exclude and limit any measures and actions which may be effective under these sailing conditions.

Obviously, graduates of maritime institutions can not immediately become high qualified specialists ready to act effectively on the bridge while keeping watch. As experience shows, the graduates have sound knowledge and skills for solving simple navigational tasks, for example:

- dead reckoning under simple sailing conditions;
- taking readings of navigational devices and mapping observations during coastal sailing;
- taking readings of indicators of satellite radar navigational systems (SRNS) and their mapping, etc.

However while solving such navigational tasks as taking into account corrections to calculations of radar navigational systems (RNS), analyses of accuracy of ship's position determination, dead reckoning with regard to influence of external factors etc., sometimes difficulties arise which can lead to errors endangering safety of vessel, cargo and crew. In order to avoid these errors it is necessary to develop methods of control over watch officers actions by captain. We can give here one of variants of recommendations for control over navigational safety of vessel with regard to different qualification of navigators. We mean not only control over wrong operations or errors, but also assistance to navigators in improvement of their professional skills provided by captain.

2. CONTROL OVER QUALITY OF NAVIGATOR'S WORK

The most important element of control over navigator's work is regular personal determination of ship's position by captain. This would allow to be aware of navigational conditions, to effectively control navigators' work creating the atmosphere of requirements, to find rough errors in plotting, and to reduce and exclude probability of emergency.

Currently vessels widely use indicators of SRNS of GPS Navstar type. This led to the fact that navigators determine ship's position using this system only both at coastal sailing and in the open sea. This is first of all caused by simplicity of exploitation, high accuracy of determination of ship's position and non-continuous observation. Such practice leads to loss of practical skill of using other methods of determination of ship's position. However, alternative method of control, especially at coastal sailing, is occasional use of radar station (RS) and observation by visible shore reference points.

Therefore in order to control navigational plotting at coastal sailing captain can choose any other method of observation, suitable for given sailing conditions, especially if watch officer used the same method of observation for several times. This can be for example the following observation:

- by RS;
- by visible shore reference points;
- by Navstar etc.

The usage of observation methods differing from the ones used by watch officer, excludes the possibility of rough errors (system and occasional). Errors may appear as a result of wrong operations of navigators, break down of technical and radio devices, as well as result of incorrect interpretation of RNS readings, technical navigational devices (TND) or errors in recognition of navigational reference points.

Probability of rough errors in interpretation and processing of impulse phase RNS is quite high: P=0.1 to 0.2 and in some cases even more, if the main source of errors in influence of space radio waves. Therefore we can conclude, that in average every tenth or fifth observation made with the help of these devices contains rough error. We should also take into consideration that probability of error at manual calculation is high due to psychological features of a person. If for example solving the task suppose 10-12 elementary operations, probability of error is P=0.1 to 0.083. That is why using information from shore RNS can not be main but only additional one.

Thus, rough abnormal errors are quite often in the practice of navigational calculations, which reflects the influence of obvious factors. Undoubtedly, not every error may lead to emergency, but the task of modern determination and exception of rough errors requires from captain usage of methods and ways of observation which differ from ones currently used by watch officer.

After mapping captain can analyze divergence between observation of watch officer and his own one. The easiest method of analysis is comparison of divergence (C) to double radial average square errors of the compared points.

If $C>2\ (M_1+M_2)$, one of the points contains rough error with probability of $P=0.95$. In case a rough error is found the measures are taken to evaluate the conditions especially at sailing close to navigational dangers.

To quickly calculate values of radial average square error the following simplified calculation method can be used:

1. at determination of positions by two visual bearings: $M=0.03\ D_{av}$

$$D_{av}=\frac{D_1+D_2}{2}$$ - average distance to ref. points

D_1, D_2 - distance to reference points.

2. at determination by bearing and distance:

$M=0.014D_{sc}$, where D_{sc} is value of distance scale

3. at determination by bearing and distance: $M=0.025\ D_{sc}$
where D_{sc} - value of distance scale.

To calculate radial average square error of reckoned point we use the following formula:

$$M_0=\sqrt{M_0^2+M_{sc}^2}$$

where M_0 is radial average square error of the recent observation, M_{sc} = 0.7 K_{ct} at dead reckoning after observation till 24; $M_{sc}=K_c\sqrt{t}$ at $t>24$; K_c - coefficient of accuracy of dead reckoning. Coefficient of accuracy of dead reckoning can be found through statistical processing if observed divergences in dead reckoning in a given area at different duration of sailing. $K_c \approx 0.7 - 1.0$, if observations are taken by Navstar RNS, ≈ 1.5 in other cases.

The suggested method of control confirmed its effectiveness and can be recommended to implementation on fleet vessels. Development and examination of the methods might become a subject to joint investigation of maritime institutions.

Adaptation to devices and systems should be carried out on the final stage of training specialists. In order to enlighten this process it is necessary to give the material regarding main theoretical statements and notions of possible variants of their technical realization in up-dated devices. Lacking possibility to accumulate necessary simulation facilities in the university, which would contain all the possible devices makes us to limit practical studies to typical devices. The main core of training should be carried out using up-dated electronic simulators. The task of IAMU is to formulate main requirements to certification of graduates of maritime institutions; the ways of their achievement are the task for national schools. Development of common standards for equipment, unification of managering bodies and their functions would certainly improve quality of training. It should be mentioned that level of training influences effectiveness of transporting and fishing. What is more important, correct work of navigators results is safety both for crew and environment. That is why strong attention should be given to improvement of professional and environmental training of navigators.

Currently navigators fulfil duties of GMDSS operators. Correspondent training is carried out on special simulators. However, range of GMDSS operator's duties is not determined. The things are still worse with training navigators for ECDIS operation which is obligatory on board vessels since 2002. Various types of ECDIS and charts do not contribute much to increasing marine safety. Development of common criteria for evaluation of system quality and development of simulation training programs for ECDIS operators should be held through joint efforts of maritime institutions world-wide. Far Eastern State Technical Fisheries University trains specialists for fishing fleet vessels and puts its best efforts to improve quality of training. We believe that one of the potential fields is training specialists with higher qualification in two and more specialties. For instance beginning this year the University trains fishing navigators, the first graduates will leave university in 2001. Development of new branches of training of officers seems urgent under the conditions of increasing level of automation in operation all the processes and reduction of crew number.

Improvement of distant training system can be enhanced by inter-university computer net or Internet. Dalrybvtuz is greatly interested in development of such net.

Training officers for work in multinational and multitrained crew can be promoted by collaboration between maritime institutions, specialists and students exchange, a well as curricula and teaching programs exchange.

Activity in this field will certainly contribute to better understanding among crew members trained at different institutions and having national peculiaritie

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
PROCEEDINGS OF INAUGURAL GENERAL ASSEMBLY
26-29 JUNE 2000, ISTANBUL, TURKEY

ACADEMIC EDUCATION FOR MARINE ENGINEERING AT ADVANCED MARITIME UNIVERSITIES

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Abstract

A basic concept of marine engineers is that "marine engineers have to be able to make judgements at the time of incidents in the engine room with providing logical explanations to justify their choices". By using the basic concept, the relationship between the level of education for marine engineering at advanced maritime universities/faculties and the level of minimum requirements accredited with the revised STCW95 is discussed. Consideration to improve education and research for marine engineering in the near future is introduced in this paper. The author would also like to propose, from this comparative study, what the education and research for marine engineering at advanced maritime universities should be.

1. Introduction

According to the Webster's English Dictionary[1], "marine engineering is defined as a branch of engineering that deals with the construction and operation of the power plant and other mechanical equipment of seagoing craft, docks, and harbor installations". Thus, marine engineering is not a simple discipline and its structure is an integrated engineering associated with mechanical, civil, electrical, chemical engineering, etc.

On the other hand, the main objective of engineering is, generally speaking, to find the optimum solution of practical problems by applying scientific knowledge and mathematical analysis. The major functions of engineering consist of Research, Development, Design, Construction, Production, Operation and Management. In addition, engineering has to show the reason why the solution is the best. From the standpoint that marine engineering is a branch of engineering, it is reasonable to support that these engineering functions can also be applied to marine engineering.

Marine engineers on board ship, who are defined as "Engineer Officers" in Regulation I/1 of STCW convention, are basically responsible for safe and efficient operation as well as operation complying with environmental protection. Their tasks, therefore, are in a wide range varying from watchkeeping to management of both machinery and crews of the engine department on the ship. Additionally, the important nature of marine engineers is that marine engineers make judgements at the time of accidents or incidents in the engine room and to provide the logical explanations to justify their choices. These definitions will be useful to consider the optimum solution of marine engineering education at advanced maritime universities/faculties.

2. Level of Engineering Education

2.1 Engineering knowledge and academic programs

Before considering the level of marine engineering education at advanced maritime universities/faculties, it will be useful to discuss the level of engineering knowledge using a certain example. Let us suppose that there is an engineering law or principle which students of the marine engineering course will be taught, such as the first law of thermodynamics or the Kirchhoff's current law. The level of engineering knowledge can be classified into four categories as follows;

E1: To know the principle
E2: To understand the principle
E3: To apply the principle
E4: To find a new principle

The knowledge on E1 means that the students know only the name of the engineering principle. In contrast, the students on E2 and E3 can explain the principle to their juniors since they understand the principle, and some of them can apply the principle to solve their problems. Consequently, the boundary between E2 and E3 is not so clear. The students on E4 may be able to find a new principle by using their advanced engineering knowledge. Therefore, a man on E4 may be called as a researcher rather than a student since the man can seek an engineering problem that he has to solve.

On the other hand, academic programs of engineering schools can also be classified into four categories as follows;

A1: High school
A2: BSc
A3: MSc
A4: PhD

It is difficult to define the locations of these boundaries between the above categories because the level of the academic programs basically depends on the policy of a school. The boundaries between these categories will be illustrated in a figure after combining the level of engineer officers.

2.2 Operational and Management Levels

Maritime universities and technical institutions related to maritime affairs normally have a marine engineering course, which one of the purposes is to obtain the engineer officers' license for oceangoing vessels. Therefore, their academic programs have to be reflected in the revised STCW'95. To grasp what kind of engineer officers the STCW'95 really requires, words used in the standard of competence tables, A-III/1 and A-III/2[2], are checked in details. This quite easy analytic work will give us appropriate suggestions.

First, verbs used with high frequency in the Column 1(Competence) are picked up and listed in Table 1 for both A-III/1 and A-III/2. Secondly, words used with high frequency in the Column 2(Knowledge, understanding and proficiency) are shown in Figures 1 and 2 as bar charts with frequency in the percentage of total number of the words.

Table 1 Top three-ranking verbs in Column 1 of tables A-III/1 and A-III/2

Ranking	Operational level (A-III/1)	Management level (A-III/2)
1	Use	Monitor
2	Operate	Control
3	Maintain	Maintain

As the results from this work, the following facts are obtained, namely, competence for the operational level is to Use, to Operate and to Maintain something, moreover, the knowledge of ensuring the competence are concerned with System, Equipment, Operation, Safe, etc. In contrast, competence for the management level is to Monitor, to Control and to Maintain something, while the knowledge of ensuring the competence are concerned with Operation, Law/Convention, Maintenance, System, Theory, etc. What needs to be emphasized from the results is that the knowledge with theoretical background may not always be needed for the engineer officers on the operational level.

Apart from the minimum standard of competence in STCW'95, let us consider the knowledge required for the marine engineers who can make judgements with logical explanation. It may be acceptable that the knowledge of giving logical explanation for a certain engineering incident is not so easy and the level should be over the level of "to know the principle".

There is an opinion that a marine engineer does not always need theoretical knowledge if he has adequate experience. But if he meets an incident, which he has not experienced so far, and he has no theoretical knowledge regarding the incident, then he will be in a panic. This may be an acceptable story regarding the way to Human Error. The author, therefore, would like to point out that the education for engineer officers at maritime universities has to be higher than the minimum standard of competence in STCW'95. The relationship among engineering knowledge, academic programs and engineer officers' level is conceptually illustrated in Fig. 3.

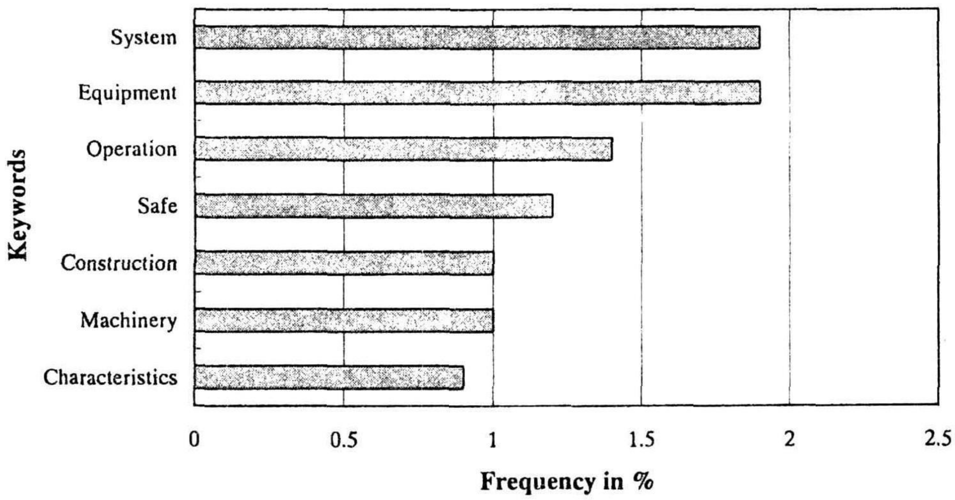

Fig.1 Keywords selected from Column 2 of table A-III/1 (Operational level)

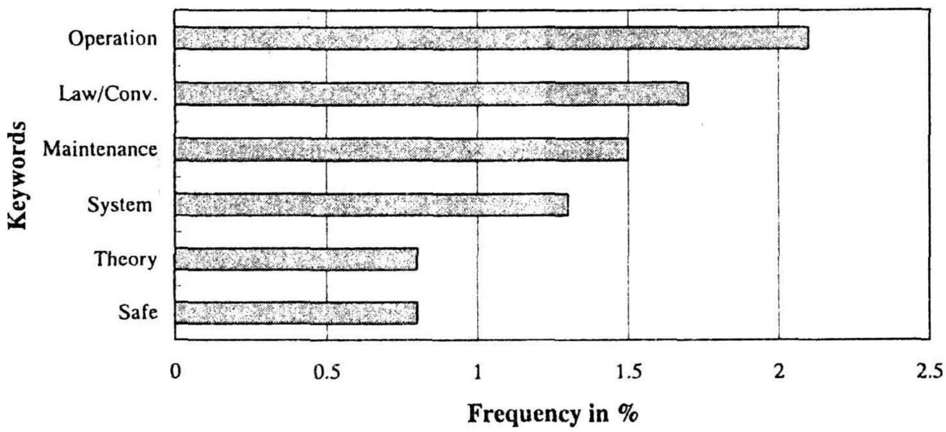

Fig.2 Keywords selected from Column 2 of table A-III/2 (Management level)

3. Dilemmas

From the discussion in the previous chapter, a dilemma is coming up as another subject. The dilemma results from the difference between the level of academic programs at maritime universities and the level for engineer officers. It is quite obvious that the graduate courses at maritime universities are not always needed if the target of the academic programs is only for obtaining the engineer officers' certificates. Because engineer officers accredited with STCW'95, in particular on the operational level, need the experience to operate machinery on board ship rather than the knowledge with the theoretical background. Moreover, shipowners' demand for a young engineer officer is to be just an operator accredited with STCW'95 of which requirements are for the operational level. Therefore, the dilemma is, in other words, for maritime universities having the marine engineering course. The selection that the maritime universities have to determine is whether to be an advanced maritime university having the master and doctoral courses or to be a traditional maritime training school. Needless to say, the decision for this selection must be the way to be an advanced maritime university. However, this decision will lead to the second dilemma.

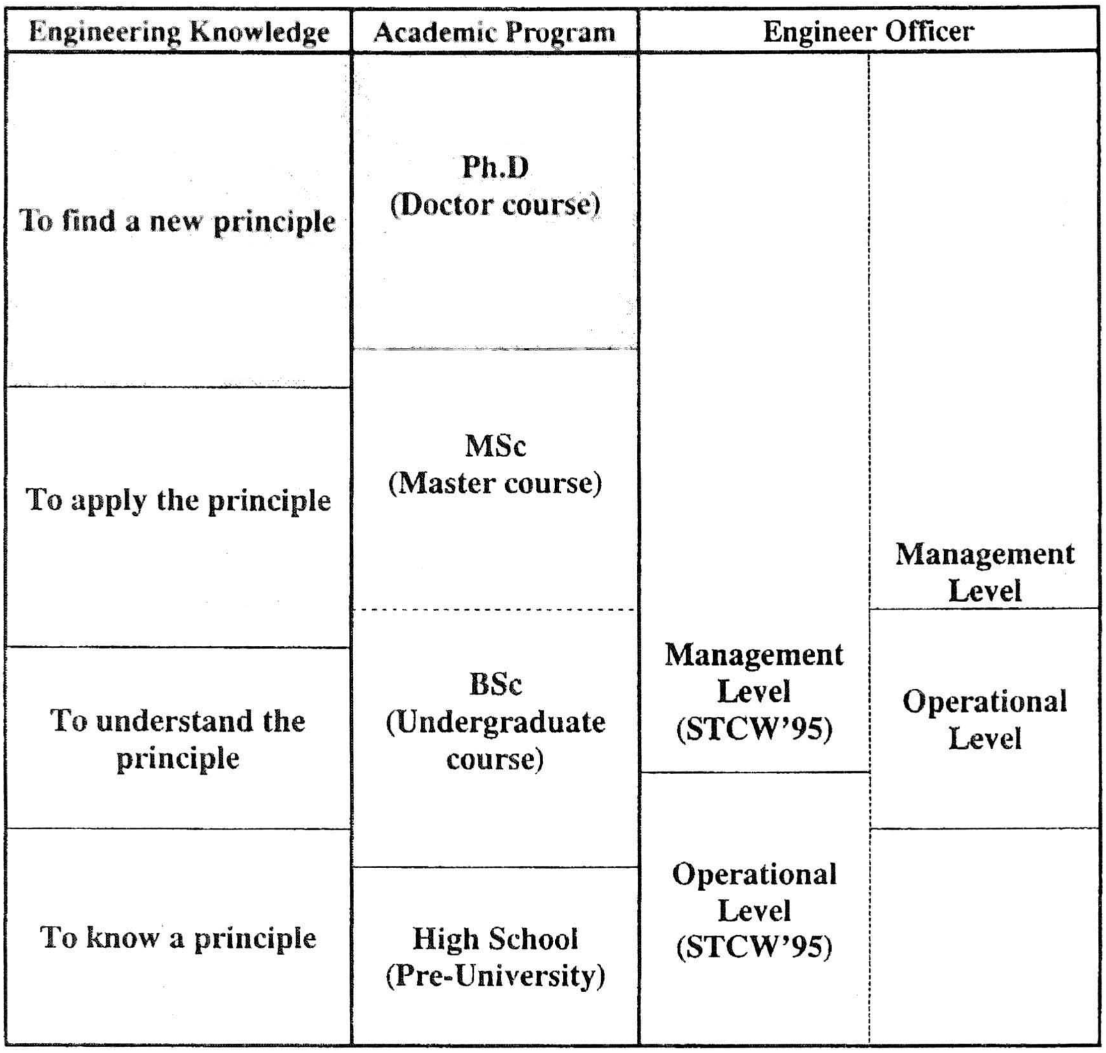

Fig.3 Relation among Engineering Knowledge, Academic Programs and Engineer officers

The second dilemma is for academic staff of the marine engineering course at a maritime university. As academic staff at an advanced maritime university having the graduate course, the ability to undertake research activities and the outcomes has strongly been needed for the staff in charge of the department of marine engineering. As shown in Fig. 4, marine engineering is an integrated engineering associated with mechanical, civil, electrical, chemical engineering, etc. In other words, marine engineering can be expressed as interdisciplinary study. Consequently, once young academic staff in the department of marine engineering starts studying marine engineering with great effort, the direction of his or her research activity is going to the cores of other engineering as shown by the arrows in Fig. 4 because of the nature of research activities. Therefore, after several years, he or she will be no longer an expert of marine engineering but an expert of other engineering. This is difficulty for academic staff at advanced maritime universities to be an expert of marine engineering.

4. The solutions

The major functions of marine engineering are Research, Development, Design, Construction, Production, Operation and Management, as discussed in the introduction of this paper. However, the roles of engine officers on board ship are mainly Operation and Management, which are actually only two of the major functions of marine engineering. The important point which academic staff in charge of marine engineering at advanced maritime universities have to notice is that the functions of marine engineering as a discipline and the roles of engineer officers are not the same, namely the former is much greater than the latter.

According to the ability as a qualified engineer officer, which is to make judgement with logical explanation, the level of engineering knowledge should be on the undergraduate level or beyond, even for the operational level. It is obvious that academic programs for undergraduates at advanced maritime universities should be kept on high standard without being deluded by minimum requirements.

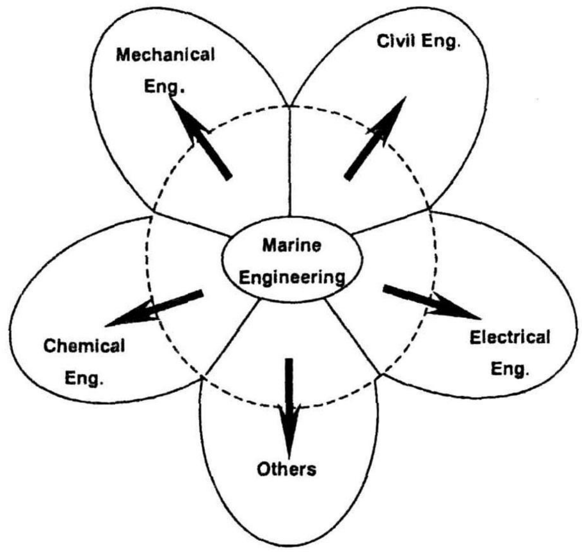

Fig. 4 The concept of marine engineering as an interdisciplinary study

Without doubt, the main target of the marine engineering programs at advanced maritime universities will be to educate the students for the marine engineer who can contribute the development of maritime industry. Thus, the department of marine engineering at advanced maritime universities should provide the superintendent engineers[(3)] to maritime industry, who have adequate experience and theoretical knowledge of both engineering and management.

As far as the research activities for marine engineering are concerned, the marine engineering staff at advanced maritime universities should have at least two types of research projects. The first one is of dealing with somewhat specialized topics, so that the staff can go to the cores of other engineering. The second one is the joint research of which the members are not only from engineering, but also from other disciplines such as law, economics and sociology. The aspect of this sort of joint research really shows the same structure of marine engineering as an interdisciplinary study.

5. Conclusion

As academic staff for marine engineering education at advanced maritime universities/faculties, we should note that education for marine engineers is only a part of marine engineering. Therefore, the academic program for the department of marine engineering should contain not only the education for operation, but also the education for research, development, design, construction and production related to marine engineering. The education programs for the superintendent engineers, which recent maritime industry really needs, may be the most appropriate program for the master course at advanced maritime universities/faculties.

The research activities for marine engineering should be interdisciplinary study according to the structure of marine engineering. Joint study together with researchers from several disciplines may be the most appropriate research topics for marine engineering.

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IM MODEL FOR SHIP SAFETY

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1. ABSTRACT

When thinking about the framework for ship safety, the element of this framework is an important viewpoint. The author would like to propose the "IM model" for ship safety as the elements that composed this framework to make the ships operate safely.
This basic idea of the framework is based on the technique by the National Transportation Safety Board (NTSB [1]). The elements, which compose the frame idea, are shown by these keywords such as 4M factors, ①Man, ② Machine, ③Media, ④Management.
The author propose to add "I" element to these 4M, because the human beings have the tendency to think about things centering on oneself.
There are three kinds of concept of this model as follows:
(1) Internal concept as a frame idea
(2) Intermediate concept for safety navigation
(3) External concept for maritime safety

2. OBJECTIVES

The marine accident is quite pitiless. How should we understand the accident for the safety technology? Is not the accident avoided in this age when the science and technology developed? What should we think so as not to repeat and to avoid the marine disasters?
The accident cannot be foreseen at all, and occurs suddenly even if the safety measures are done enough. It is necessary to analyze the system flow and the human activity in detail with the marine accident.
As for the human errors, there are three asking questions to the commonsense theory of accident in return. [2]
(1) There is no distinction of rudimentary mistake or special mistake in the human errors.
(2) Even the proper person has the mistake unexpectedly.
(3) When the machine and the system become convenient, man becomes those who idle.

In general, there are two important purposes to mechanize.
The first purpose of mechanization is to enable mass production with low-cost of the commodity which cannot be manually done of, the standardization.
The second purpose of mechanization is to make difficult work to process done faultlessly in man's judgment and power.

3. ACCIDENT INVESTIGATION PHILOSOPHIES AND TECHNIQUE BY NTSB

The fault responsibility gives priority in Japan, and the pursuit of responsibility is confused with the investigation of the technical accident. It is difficult to investigate the accident reasonably. Table 1 shows the technique of the accident investigation, which NTSB adopts. This technique of accident investigation by NTSB is scientific and reasonable.

Table1: Accident investigation technique by NTSB

(1) Sequence of Events
○Time series to clarify the accident cause
○Safety－critical situation
(2) 4 M Factors
① Man ② Machine
③ Media ④ Management
(3) Probable Causes
○Squeezing the main causes
(4) Recommendations
--- "Who", "What", "When" ---
○Immediate action
○Long-term action

(1) Sequence of Events

It is necessary to dig up all the factors with an important effect safely with each other, according to the time series to clarify the accident cause and to clarify the chain relation of those factors.

For this reason, it is necessary to fix the fact by collecting the site investigation, the hearing, the material evidence and the experimental researches, etc.

(2) 4 M Factors

The "4M" factors are explained as follows;

① Man :

This term means the individual error of a person such as a master, an officer, a pilot, a VTIS's officer, and crew on board. This error has relation of "Human factors" including the mind stress or the mistake without the problem of responsibility.

② Machine :

This term means defect and breakdowns such as damages of hull and failures of engines and ship's other facilities.

③ Media :

This term has a considerably wide meaning, and indicates an environmental condition that affects the information on the communication and the service, the weather condition, the harbor facilities, and the navigational aids for sailing.

④ Management :

What do the company, the group, and the administration do for safety, or what did not they do? There is a phenomenon concerning with not only one-M but also an event which has affected two-M or more. The problem and measures of the system can be clarified for the first time by classifying the phenomenon into "4 M".

(3) Probable Causes :

The most immediate and main cause of the accident is described as a probable cause in various factors. Because the work to clarify the main cause as a probable cause is unavoidable as the report by the administration, it is not too important.

(4) Recommendations :

It is important to describe clearly, "Who executes?" "What is the item executed?" and "When will it execute by?" Especially, as for describing the time limit clearly, the execution of procedures has two kinds of action program. One is needed to require the emergency action. The other one is big scale action to require time and money. Therefore, it is necessary to describe the time limit clearly divided into "Immediate action" and "Long-term action".

There are two important procedures according to the above-mentioned procedures.

The first procedure is the work to clarify the (1) "Sequence of Events".

The second procedure is the work to classify (1) "Sequence of Events" into (2) "4 M Factors". If these two works are completely done, (3)"Probable causes" and (4) "Recommendations" are shown inevitably.

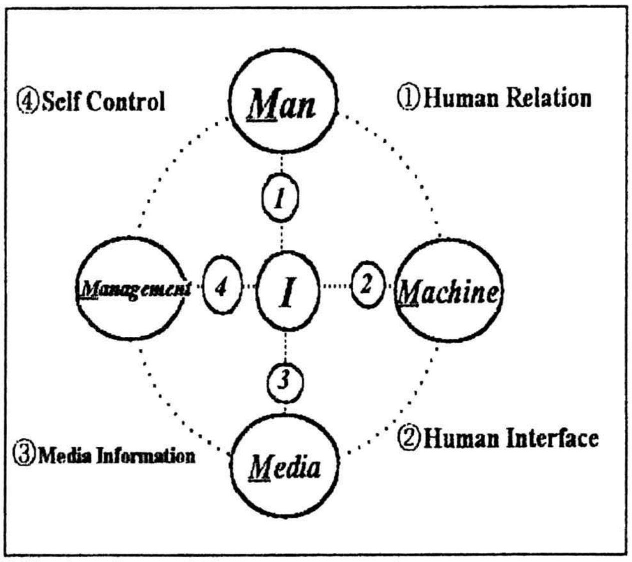
As mentioned above, the technique of accident investigation by NTSB does not intend only procedure. The technique of accident investigation by NTSB includes the philosophical proof where the essential meaning and the suggestion of the accident are pointed out.

4. INTERNAL CONCEPT OF IM MODEL AS A FRAME IDEA

The author proposes the IM model for maritime safety. The frame idea of this model is composed by the combination of 4M factors that are adding by "*I*" factor, shown as Fig.1, because man always put oneself in the center of the earth.

In the Fig.1, ①～④ shows the relation between "4M" and "*I*". The relation between "Man" and "*I*" means ①"**Human Relation**" or "**Human Communication**". The relation between "Machine" and "*I*" means ②"**Human Interface**". The relation between "Media" and "*I*" means ③"**Media Information**". The relation between "Management" and "*I*" means ④"**Self Control**".

Fig.1 Internal Concept of IM Model as a Frame Idea



① "Human Relation" or "Human Communication" means human factors such as 6P that are as follows; [3]

1. Physiological factors
2. Physical factors
3. Pathological factors
4. Pharmacological factors
5. Psychological factors
6. Psycho-social factors

Above items 1.～4. are described as a physiological factor. On the other hand, items 5. & 6. are described as a psychological factor. "Human Communication" needs not only verbal interface but also nonverbal interface.

② "Human Interface(HI)"means the interaction of man with their mechanical facilities and equipments. The main objective of HI is designed by fitting human characteristics according to the ergonomics and also to the human engineering.

③ "Media Information" has the meaning of the interaction through the environmental problems such as weather, the sea-surface condition, and the information technology (IT).
④ "Self Control" means the management scheme based on the **SRK**-model (Human activity depends on the Skill · **Rule** · Knowledge-base) by Rasmussen-1990-.

5. INTERMEDIATE CONCEPT OF IM MODEL FOR SAFETY NAVIGATION

Author shows the internal concept as a frame idea in the previous chapter 4. On the other hand, with regard to the intermediate concept of IM model for Safety Navigation, Fig.2 indicates the relations among 4M.

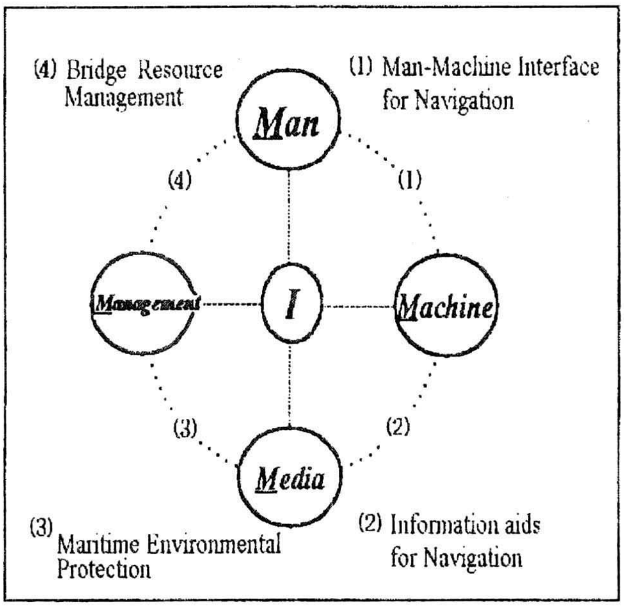


Fig.2 Intermediate Concept of IM Model for Safety Navigation

In the Fig.2, the relation between "Man" and "Machine" means (1) **"Man-Machine Interface for Navigation"**.
The relation between "Machine" and "Media" means (2) **"Information aids for Navigation"**.
The relation between "Media" and "Management" means (3) **"Maritime Environmental Protection"**.
The relation between "Management" and "Man" means (4) **"Bridge Resource Management"**.

(1) "Man-Machine Interface for Navigation" means the basic concept of system design that has comfortable operation without user's special attention.
(2) "Information aids for Navigation" means the measurement devices, so that navigators can obtain the effective and essential information through the environmental situation such as meteorological, geographical, traffic and other navigational information.
(3) "Maritime Environmental Protection" means the problems that is concerned with marine pollution caused by exhaust gas, de-ballast water and garbage etc.
(4) "Bridge Resource Management" means the human relation factors among persons in the navigation bridge. A large number of marine disasters have occurred by these causes of the human relation factors. Master has several kinds of responsibilities on board as you know. For the ship safety, it is important to have only one line order system, and also to confirm each other for the confirmation of the order's content by repeating and by speaking order with a simple body action.

It is easy to consider by setting "*I*" mainly, because each relation among items cannot be separated exactly, and each item has close relation.

7. EXTERNAL CONCEPT OF IM MODEL FOR MARITIME SAFETY -INTERNATIONAL CONVENTION LEVEL-

After a serious and hazardous marine disaster had occurred, the international convention has been often established.
The first and well-known international

convention was the SOLAS that was adopted due to the marine disaster of Titanic. This convention provides for the seaworthiness of the ship and the safety of life at sea.

The STCW convention was provided as international standards concerning the execution of knowledge, the skill, the training and the duty of sesfarers to prevent an accident because of "Torrey Canyon".

The MARPOL convention that came into effect in 1983 takes the abbreviation of MARINE POLLUTION and is called MARPOL73/78 convention.

A basic international rule of the marine traffic system is "the International Regulations for Preventing Collisions at Sea, 1972", and is called COLREG.

Fig.3 shows the external concept of IM model for maritime safety by applying these main international conventions and regulations.

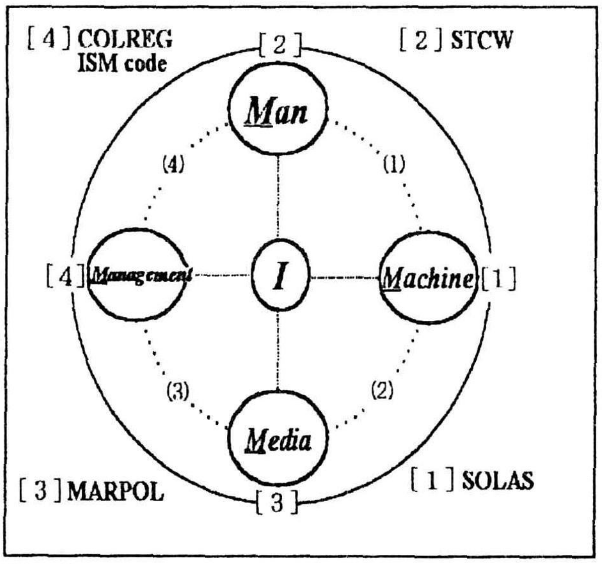


Fig.3 External Concept of IM Model for Maritime Safety -International Convention Level -

The ISM code (5) should be indicated as the Management-factors however this code is described with the new chapter IX of the SOLAS convention. It is the reason why the ISM code for pollution prevention is also described with the same one.

Table2: Main lectures (partly) for students of navigation class at KUMM (4)

4M	Main Lectures for Navigation class
Man	Maritime Labor Boat Seamanship Seafarers Law Marine Sanitation
Machine	Dynamics of Ship Motion Naval Architecture Navigation Systems Marine Engineering Theories of Ship handling Transportation Engineering Navigational Aids Marine Electric Apparatus
Media	Transportation Economics Fix and Sailing Navigation Systems Marine Meteorology Oceanography Signal Communication on board Marine Environmental Science Chemical Oceanography
Management	Seminar on Maritime System Marine Insurance Fleet Operation Port and Harbors Engineering Marine Traffic Engineering Maritime Public Law Maritime Safety and Maintenance Navigation Planning and Routing Logistics Planning Maritime Law Advanced Cargo Handling Safety Assessment for Ship International Law of the Sea Rules of the Maritime Roads Marine Casualties Management of Machinery Radio Regulation for National

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NEW METHODS AND TECHNIQUES OF PROFESSIONAL TRAINING AND THEIR PART IN ACHIEVING SAFE PORTS

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ABSTRACT

With the increase of complexity in port management and operation, a new approach in professional training methods and techniques is required. The development of multi-mode transportation and of new technologies in shipping and ports leads to redefining port operation procedures.

Taking into account the need to update the knowledge level of personnel in accordance with the international standards and regulations regarding the safety of ports and with the current technologies, professional training must be adapted to cover all these aspects. Rapid upgrading of training methods implies the use of information technology.

The main objectives of these new training methods are:
- the development of open systems used to implement knowledge in the form of interactive databases;
- the development of new administration, protection and supervising systems;
- the development of intranet and internet access systems.

The achievement of these goals will insure:
- the increase of training quality;
- the development of secondary skills for trained personnel;
- flexibility in future knowledge updates;
- a decrease in the duration of training;
- an attractive presentation of information using multimedia facilities;
- a new concept of training concerning the individual rather than the group;
- the expansion of training techniques towards long distance training.

Although not a goal in itself, the use of information technology brings us closer to the achievement of well-trained personnel and safe ports.

Motto: *"Give a man a fish and you feed him for a day. Teach a man how to fish and he can feed himself for a lifetime!"*

1. INTRODUCTION

The objective of training is to provide trainees with the necessary competence in terms of knowledge and expertise enabling them to effectively carry out their duties. While any new development in environment may induce needs for specific training, each time major changes are observed, education and training must be revised both in the content and form.

The environment we live in has changed tremendously in the last decade. " We are now in a knowledge – based industry" says Gary Crook in his dissertation at the 15th International Port Training Conference. It is estimated that the amount of knowledge is doubling annually.

The port industry is currently subject to three different but related processes:
- *globalisation* (global ownership and management of port terminals – see P&O and Hutchison ports);
- *privatisation* (transfer of a range of port related activities from mainly publicly owned to mainly privately owned – for portworkers it means exchanging the status of state employee for the conditions of the private sector);
- *modernisation* (includes not only the introduction of new cargo handling technologies and automation of cargo handling and transport but also the replacement of paper based information with digital information <office PC systems, Electronic Data Interchange (EDI), Internet and E-commerce>).

In this context training should be a continuous process. The on-going training could and should contribute to improvements in adaptability and competitiveness.

2. EDUCATIONAL TECHNOLOGY

When I received the offer of developing and presenting a paper on the subject " New Methods and Techniques of Professional Training and their Part in Achieving safe ports", my first impulse was to compile something on the basis of the Information Technology (IT)IT influence on training activities, oriented towards IT specialized information.

Meanwhile, I was requested to provide a course in Dakar-Senegal, for personnel on board port service-vessels, such as tugs, pilot-boats, specialized vessels, etc. This course, which was attended by extremely heterogeneous personnel, from the point of view of their previous education, gave me the opportunity to reconsider the manner of approaching the said-subject, i.e. the adaptability of teaching methods, using modern IT-based methods and techniques in relation to the target-population, in order to ensure the best communication process.

The methods of communication are classified as *verbal, non-verbal and iconic.* It is very important for the trainees to be aware that all three methods are crucial, for a correct understanding of the essential elements in the communication process, i.e.:
- sender;
- receiver;
- modes and methods of information/ instruction transmission;
- barriers to communication and feed-back.

The development and use of educational technologies is based on using digital transmitted information and communication. This has implications for both users and providers. Teaching staff must not be good teachers only but also competent course developers and users of the array of communication technologies available, if the benefits of the flexible delivery approach to education and training are to be maximized.

The advantages of utilizing a flexible delivery approach can be summarized as follows:
- location dependence is reduced;
- disruption to work is reduced;
- cost to users may be reduced;
- learning can occur at the user's pace rather than the provider's pace.

The disadvantages of utilizing a flexible approach can be summarized as follows:
- requires highly skilled teaching staff to be effective;
- costs to providers may be increased;
- interaction between student/teacher and student/student may be reduced;
- access to support material may be reduced.

3. NEW DEVELOPMENTS IN TRAINING METHODS

Once the educational system registered a reform, due to the major impact of the technical revolution during the last twenty years, the teaching methods and techniques had to undergo major changes.

The facilities provided by the latest achievements of the information technology, not only as regards computing speed and storing capacity, but also, and especially through the unprecedented development of software packages, which offer the possibility of commissioning such resources, imposed themselves in the last years as an essential and outstanding support in the educational process.

Without minimizing the achievements and performances of the traditional educational system, we have to underline the major changes brought about by the new techniques.

The new approaches of the training methods include the following :
- *Improved links between on-the-job and off-the-job activities.* The quality of training is enhanced when classroom training compliments training in the workplace;
- *Self-learning and distance learning training packages.* Computer, video and audio teaching aids are being developed to assist people and organizations that are geographically isolated;
- *Trainer training.* With restructuring policies there is a need for more employees to be trained to become skilled instructors.
- *Modular training.* Training programs are divided into modules with both core and optional components to provide a gradual scale of qualification.

4. POSSIBLE IMPLEMENTATION OF NEW EDUCATIONAL METHODS AND TECHNIQUES, USING THE INFORMATION TECHNOLOGY

The main objectives of the new approach for educational methods and techniques are as follows :

a) *To make a knowledge transfer from the traditional support.* In order to achieve this objective it is necessary to develop adaptable software systems which allow the transfer of written, drawn, verbal, animated information in a digital form, as well as its registering in the database.
b) *To organize the inter-active data bases* for storing, updating and transfer of knowledge to the trainees.
c) *To develop some protection, supervising and administration* systems for the access to such databases.
d) *To implement the intranet and internet access information systems* .

Once these main functions are implemented, we can deal with the ways of approaching the teaching methods (appendices 1). For the time being, we have databases including various modes of providing information (written, audio-visual, and so on and so forth).

The new approach of the teaching techniques involves a high expertise on behalf of the teacher, in providing the trainees' access to information on a gradual, modular and performance basis.

If, when using traditional teaching techniques, the trainee has a "whole book" at hand, this time, the teaching technique allows us to provide the information gradually (depending upon the previous training level, which may be checked by means of an initial test) by modules (at a given time, only certain information is available) and according to performance criteria (in order to be able to pass to a new module, the previous module must be successfully completed through an adequate test).

The implementation of such objectives involves the development of some inter-active systems for retrieving the information which shall include testing mechanisms.

The purpose, the objectives and the outline of a specialization training programme conceived by RoMTC are as such as to meet the needs of the maritime industry for a highly specialized "HUMAN FACTOR", with a positive attitude towards safety and environmental protection.

The Romanian Maritime Training Centre (RoMTC) experts have already applied this new approach to teaching techniques, by achieving some sub-systems of the new concept. (The organization of some multi-media information databases, including the mechanisms for a modular, gradual introduction of information <knowledge> and the assessment of the acquired knowledge by testing).

We intend to develop this approach by implementation of the whole concept:

- the extension from intranet to internet access;
- the development and implementation of the administration, access control and supervising systems.

The achievements of these objectives shall ensure certain advantages in the educational process, such as:

- flexibility in future knowledge updates;
- an attractive presentation of information using multimedia facilities;
- a new concept of training concerning individual rather than the group;
- the expansion of training techniques towards long distance training;
- adaptability of the presentation and duration of knowledge acquisition, according to the trainee's previous training and his/her assimilation capacity;
- increase in the quality of the educational process;
- development of additional skills (intranet and internet operation);
- dissemination of information by video-TV systems;

The main difficulties encountered in the achievement of the objectives could be the following:

- high cost of equipment, software and system implementation;
- need for trainers' high specialization;
- large volume of work for the information organization and its transfer in digital form, as well as the approach of a new mode of presentation (significant costs required by specialized labour);
- difficulty of using the system in case of trainee groups lacking adequate knowledge for PC operation (need for individual trainee assistance);
- difficulty in dissemination of information for distance-learning, towards geographical areas (beneficiaries) where there is no access to the latest achievements in the field of information technology (internet);
- break of the direct trainer-trainee and trainee-trainee relationship;
- difficult scheduling of debates. In case of training at the provider site - different assimilation levels of the trainees. In case of distance training - additional difficulties in the access to technology.

5. CONCLUSIONS

A wise saying states that "Being together is the beginning, keeping together is a progress and working together is a success". The important thing is to make trainees aware of this sustainable effort, to ensure they are committed and properly motivated to act accordingly.

Although difficult to implement and apply, the new technology opens unexplored horizons to teaching methods and techniques based on IT.

At this stage, the technology of information has induced major changes in the port equipment, maritime transport and port operation, techniques, management methods and international cargo carriage, commercial relationships in connection with transport (EDI, E-commerce).

The approach to new education technology in this field is self-imposing, not as an aim in itself, but as an instrument in bringing forth the goal of well-trained personnel and a proper commitment.

The achievement of IT objectives shall lead to a safe port operation and valuable management, especially in the context of the general trend of implementing, at an international level, some mandatory safety regulations for all ports and harbours, all over the world.

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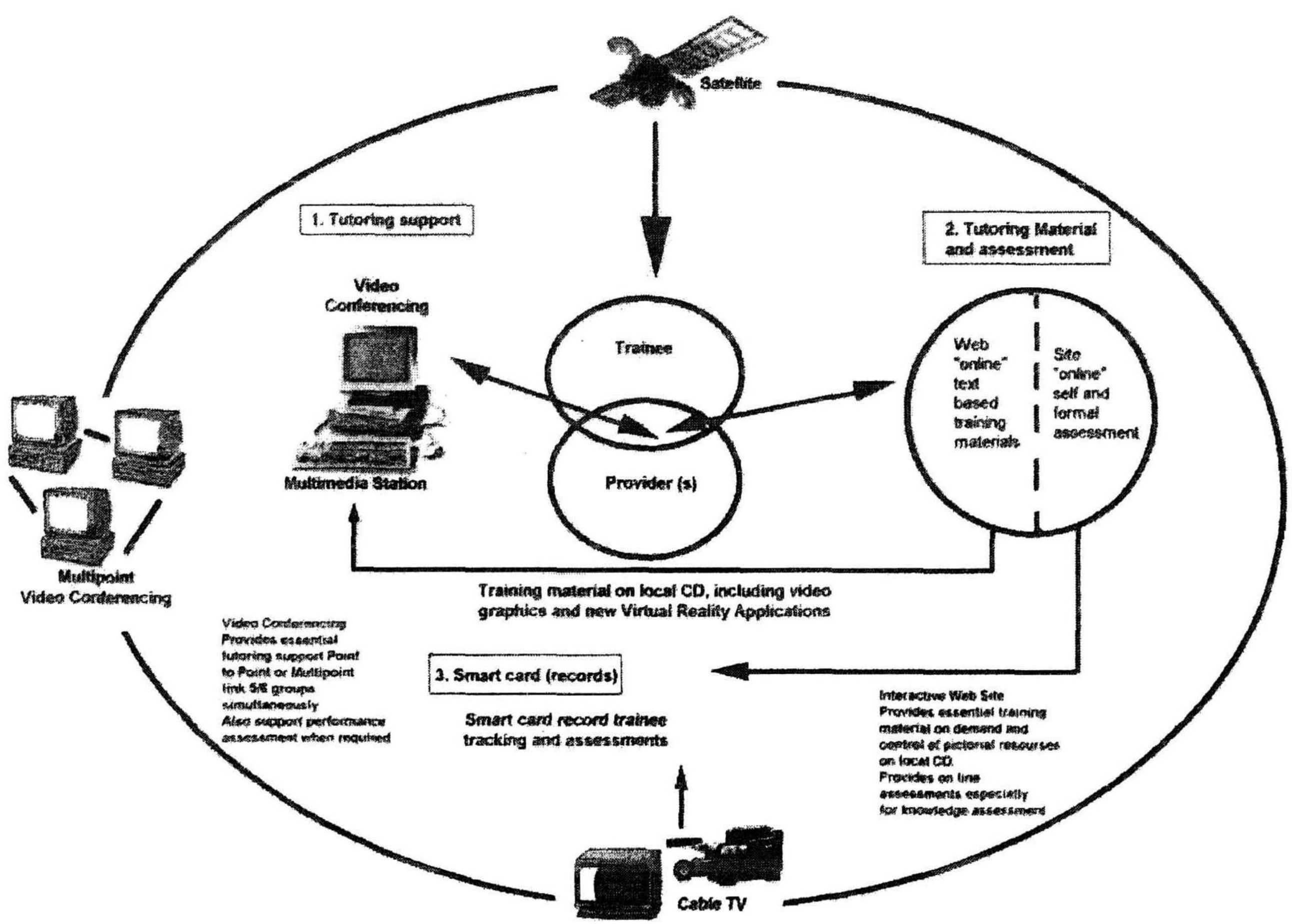
APPENDICES 1



POSSIBLE IMPLEMENTATION OF NEW EDUCATIONAL METHODS AND TECHNIQUES, USING THE INFORMATION TECHNOLOGY

INTEGRATION OF QUALITY BASED MANAGEMENT STANDARDS INTO INTERNATIONAL MARITIME TRAINING AND EDUCATION

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ABSTRACT

Quality Management has been proven successful in many different enterprises around the world. Applications in engineering and business management have also been clearly advantageous in commerce. Although educators are among the first to write about new ideas, they are almost the lasts to apply them to their own activities. Thus it has happened that the quality movement in higher education has been active in United States and European Countries for the last decade.

The maritime education can be defined as a set of interdependent processes such as teaching, learning, researching and resources including human, material and information that function harmoniously to achieve specified educational objectives.

In this study, the quality management system implementation in maritime higher education institutions are observed considering the background of the IMO Conventional requirements. In addition to that, basic principles of maritime training institution accreditation rules are established.

Key words : Quality Management, maritime training, accreditation in education

1. INTRODUCTION

The quality management terminology needs to explained in terms of higher education and training. In this consideration the relationship between the supplier and the customer additionally the product that is provided by the supplier should be indicated.

Actually the student is not a product. The product is the education of the student. In the manufacture of this product, as with any other product, it is essential that the worker (student) be an active participant in the design and creation of the product. The student, who is the person who stays with the learning process longest, should learn to become the comanager of his or her education. This means, according to the tenets of quality management, that the student should be involved, consciously and with skill, in the continuous improvement of the processes that create the product.

The customers for the education of the student are several. They are, in order of importance,

1. The student, who must live with the product for the rest of his or her life. The student must become the comanager of the production of the education and, having such a personal

stake, must be considered first when attempting to define what it means to have quality in education.

2. The student's parents and immediate family who, in many instances, are paying for the product and must also live with the results for the rest of their lives.

3. Potential employers, who will rely on the education of the student after graduation to achieve the purposes of their enterprises.

4. Society at large, which pays a substantial proportion of the cost of the education and requires the future participation of the student as a citizen in the operation of government, as a contributor to the general welfare of society, and as a taxpayer who will support the education of future generations of students.

In shipping business the management of training can be considered as the technical and the commercial management of maritime activities. The new regulations or rules that will be established by IMO have to be taken into account as a research work and the requirements of new rules have to be amended in relevant department curriculums in an efficient manner. As well as the Port State Control parameters and the effects of these parameters in shipping environment cause rapidly positive change improvements of ship management. As a result lecturer's academic research has to point out port state control inspection results and the classification society's survey requirements that complies the statuary certification of vessels [1]. From the commercial side of ship management, the charterers complaints and the condition of clauses in charter party directly affects the claim handling process. The marine casualties or cargo damages that have the direct significant impact in training needs must be considered.

2. EXPECTATION FROM EDUCATION AND TRAINING

The training and education concept can be analysed in four categories for determining the general expectations and reaching to customer statisfaction philosophy.

a. Knowledge, which enables the people to understand what they learn in relation to what they already know [2]. Knowledge is both practical and theoretical. Theoretical knowledge provides the people with the ability to generalise from unique instances. With theoretical knowledge, people can accumulate long years of experience such as twenty years. Otherwise, with only practical knowledge, people will have only one year repeated twenty times.

b. Know-how, which enables people to do. Know-how takes people past merely understanding. Know-how enables people to put knowledge to work [2]. Know-how differs significantly from knowledge. Knowledge can be organised into intellectually tight compartments, and these compartments may be taught as a subject on to themselves. Know-how, on the other hand, requires the purposeful organisation of knowledge from many different areas of learning. As know-how is extended to higher and higher levels of accomplishment, it requires extension to more and more areas of knowledge. When teaching know-how, it is impossible to put bounds on the areas of knowledge which will be encompassed.

c. Wisdom is the ability to distinguish what is important from what is not [2,3]. Wisdom enables people to set priorities on how to use resources of time, energy, and emotion.

d. Character, as Stephen Covey has said, is a combination of knowledge, know-how, and wisdom coupled with motivation [2]. People often recognise the development of character by certain character traits, among which might be listed as: honesty, initiative, curiosity, truthfulness, integrity, cooperativeness, ability to work alone, ability to work in groups, self-esteem. It is up each maritime training institution to identify what to include in each of these four categories. It appears that in maritime education, attention is given only to the first of the four categories, with the last two not even given lip service.

In maritime education the lecturers often believe, that at the university level their sole duty is to develop knowledge and pass it on to the next generation. The development of the student's character is none of their business.

The list of knowledge that students are expected to acquire is usually a composite of what is required for accreditation and what the faculty decides itself. In general, the accrediting authorities should pay attention to the development of either wisdom or character in accordance with the goals for education in the new century.

3. INTERPRETATION OF ISO 9001 STANDARD INTO THE MARITIME EDUCATION

The ISO 9001 (1994) standard: model for quality assurance in design, development, production, installation and servicing was written by engineers and quality professionals from large industries with a manufacturing organisation in mind and thus requires an interpretation for application in a maritime training institution's environment. The need for a systematic approach in interpreting the standard is the existing literature restricts the scope of the quality system to fewer than the full 20 elements [4,5]. As an example, Lewis and Smith consider only twelve elements of ISO 9001 to be directly applicable to education [4], while Willborn and Cheng address seventeen [5].

Although research is an integral part of university process and distinguishing characteristics of academic staff, existing interpretations focus on the learning opportunity and courses as a primary product of educational institutions [6,7]. These interpretations would most certainly become more clear and consistent if underlying production and quality system concepts were to be used.

Although the ISO 9001 standard is generic and it is applicable to manufacturing and service organisations, as well as health care, small business and education, a number of terms and concepts in the standard have manufacturing background. The Maritime Higher Education & Training Institution Production System (MHE&TIPS) can be defined as a set of interdependent processes such as teaching, learning and researching, and resources, including human, material and information, that function harmoniously to achieve specified educational objectives [8]. For example, faculty's objectives can be to create, preserve and disseminate knowledge. Mainly training institutions create three main products:

- student knowledge, abilities competencies
- courses and programs
- research (new knowledge).

ISO 9000 is about quality systems. A quality system is defined as a set of interdependent processes that function harmoniously in an organisation, using various resources, to achieve objectives related to quality. An objective related to quality is to meet and surpass customer needs and requirements. Another objective can be to create zero-defect products (an analysis of zero-defect products) in the faculty environment is presented in [8]. Processes within the quality system transform customer requirements (required output) into the product bearing the ability to satisfy the requirements (actual output). The current version of the ISO 9001 standard, approved in

1994, consists of twenty requirements, each representing one element of the quality system.

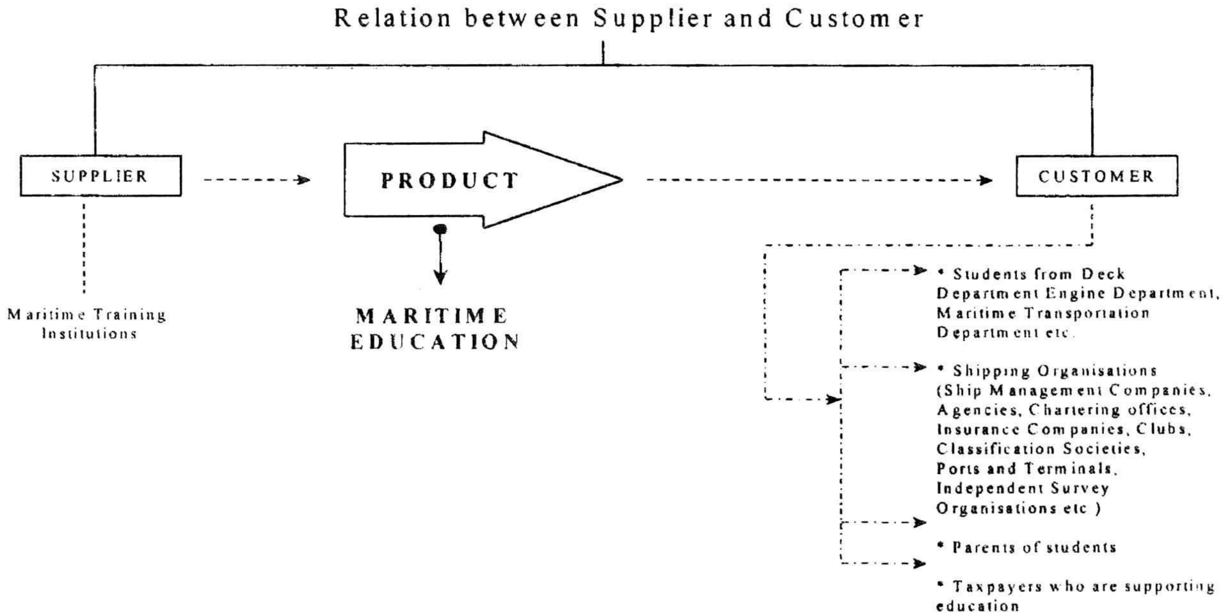

Figure 1. Identification of Quality Management Terminology in Maritime Education

Nevertheless,interrelationships of the twenty elements of ISO 9001 are not clear, and the elements do not seem to follow a logical order. For example, element 4.4 Design control, and 4.6 Purchasing, after which comes 4.7 Control of customer-supplied product. control is followed by 4.5 Document and data.

Some organisations have tried to document and implement these quality system elements in the order in which they appear in the standard, and encountered a treacherous path. The danger in this approach lies in the increased emphasis on documentation and a loss of the focus on the quality system.

In a faculty environment, the development of a quality system and concepts of quality assurance will certainly encounter mixed reviews by academics, which are often weary of structured approaches requiring additional documentation. In order to provide the faculties with a focus on a quality system, ISO 9001 elements have been re-ordered into two categories: (activity elements) quality loop and supporting elements according to. The activity elements are a set of interacting activities and processes that influence the quality of the product through various stages of its life-cycle: from determining customer needs to the evaluation of whether these needs have been met. The first process in the loop is the determination of customer requirements, and the ability of the organisation to meet them. This is the subject of the ISO 9001 requirement 4.3 Contract Review. The product that meets these requirements is then designed (4.4 Design Control), and a quality plan addressing this specific product is prepared (4.2.3). The procurement of necessary resources follows, with sections 4.6, 4.7 and 4.11 of ISO 9001 focusing on these issues. Human resources must be trained to effectively use procured resources (4.18

Training). The product subsequently goes through processing (4.9 Process Control), inspection and testing (requirement 4.10 and 4.12), as well as handling and storage (4.15). Defective products are removed (4.13) and corrective and preventive actions implemented (4.14). Finally, servicing is available, if required (4.19).

The group of seven supporting elements consists first of the requirement 4.1 Management Responsibility, which is implied in all other elements of the quality system. Necessary documentation resources are the subjects of sections 4.2, 4.5 and 4.16 of the standard. Element 4.8 Product Identification and Traceability, is also implied throughout the product's life cycle. Finally, 4.17 Quality Audits and 4.20 Statistical Techniques are designed and implemented to improve the quality system.

This systems approach to ISO 9001, as well as the concept of the MHE&TIPS, will proceed with the interpretation of all twenty elements and the standard for application in maritime higher education. Figure 1 illustrates the MHE&TIPS Quality Management system for the interpretation of ISO 9001.

3.1 QUALITY LOOP ELEMENTS

Firstly the contract review clause can be discussed. Quality can be defined as the ability of the product to satisfy stated and, or implied customer requirements. Therefore, the first step in the development of a quality system in a faculty is to adequately identify these requirements. The objective of the contract review element of ISO 9001 is to provide the faculty with a clear understanding of customers' needs and specifications, to evaluate if these needs can be achieved, and to provide the customers with a clear understanding of the manner in which the faculty shall meet them. The following processes are covered:

◊ Defining and documenting the industrial requirements with respect to undergraduate and graduate programs offered, by means of alumni and surveys, questionnaires, interviews, as well as the analysis of available legislations, international rules and regulations.

◊ Accreditation of programs by regulating bodies such as the Canadian Engineering Accreditation' Board (CEAB) in Canada or the Accreditation Board for Engineering and Technology (ABET) in the United States [9].

◊ Review of contracts with the employers participating in cooperative programs offered by the faculty.

◊ Review of students' understanding of the admission requirements, program content and context, graduation requirements, and their responsibilities and authorities, through interviews and surveys.

◊ Review of industry and sponsored research contracts.

◊ Assessment of the faculty's ability to meet the requirements.

◊ Contract changes, such as when a research sponsor changes the requirements.

As an output of contract review activities, program and research design planning teams should have a clear understanding of the kind of programs, courses, research required, as well as the faculty's ability to offer such programs and research. A document outlining core requirements can be prepared in the form of a program or research project brief, much like product briefs in manufacturing.

Following contract review activities, the faculty must demonstrate the ability to translate customers' specifications into appropriate design of programs, courses offered, individual student curricula and research projects. Design control may consist of several stages, such as: identifying the input into the design process, verification of the program, curriculum, research design against design input, as well as validation of the design output against customers' requirements.

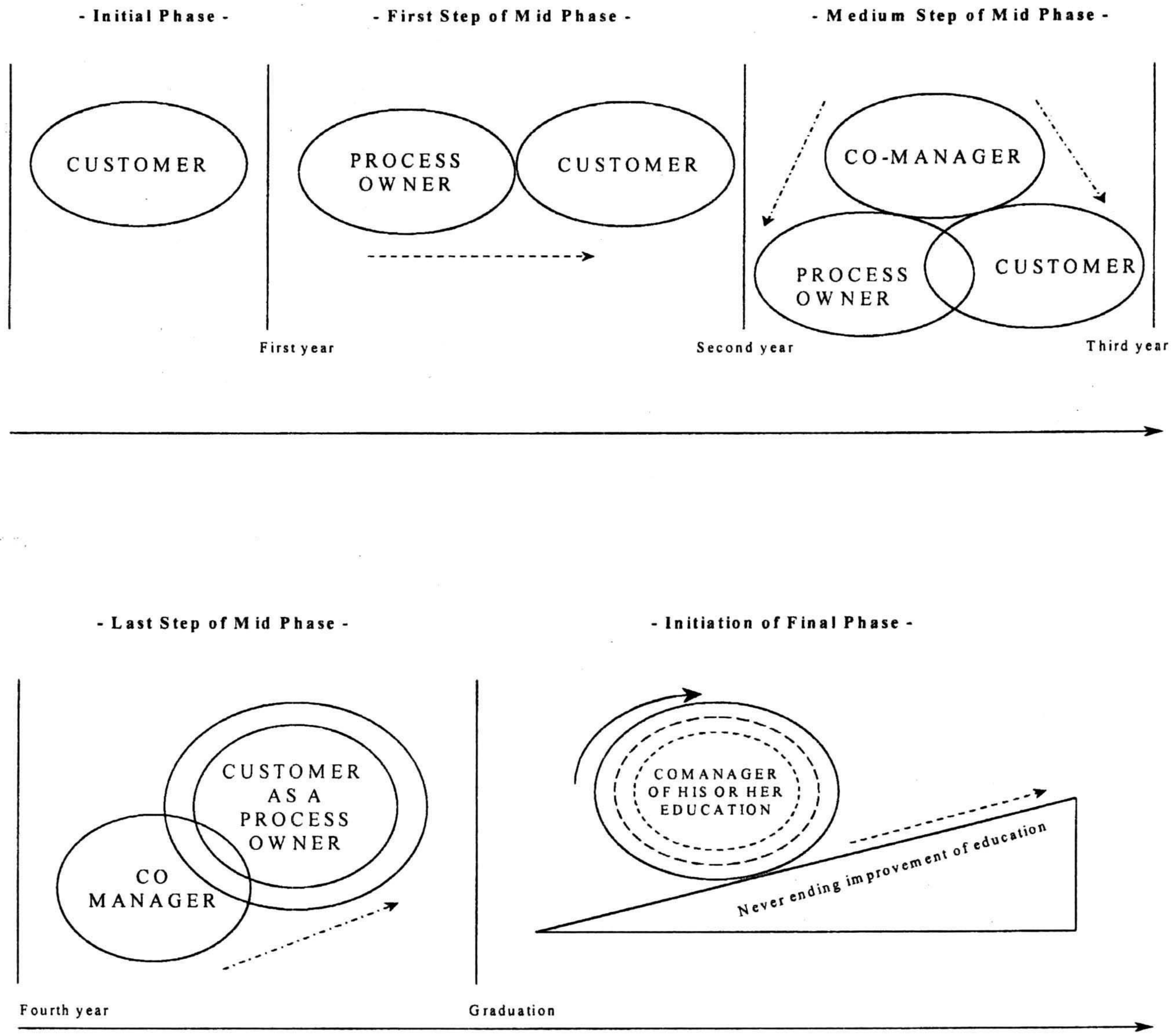

Figure 2. MHE&TIPS loop traceability

Design input may include suggestions for new programs from industry, analysis of customer needs and market position of the faculty, and feasibility studies for new programs or research. Design output should include the statement of factual content and format of programs, skills and competencies to be developed in students or research projects, as well as an illustration of how the course, program, research project content is relevant to its aims and objectives.

The responsibilities and authorities and the vertical and lateral interrelationships between the personnel which are involved in the design process should be defined and documented. Also, the faculty must identify, document, review and approve design changes and modifications. The following processes should be included:

◊ Design planning, review, verification and validation of new undergraduate and graduate programs and courses.

◊ Design control of the individual student curricula, including the statement of minimum paths to graduation, elective and compulsory courses, responsibility and authority of students, and defining the student's input into the design process.

◊ Contractual research with industry and government agencies.

◊ Identification, documentation, review and approval of program design changes, including the addition of new courses and deletion of existing courses and programs.

Quality planning covers the identification, classification and weighing of product quality characteristics, establishing the objectives, requirements and constraints for quality, as well as the preparation of quality plans. Quality plans are documents setting out the specific quality practices, resources and sequence of activities relevant to a particular product, project or contract. This means that each course, program and a contracted research project should have a separate quality plan, standing alone or as a part of the course or research project plan. A typical course quality plan should include:

◊ course requirements from the general calendar; course objectives and specific knowledge, competencies to be developed in students;

◊ course prerequisites and statement of any incoming inspection of student background knowledge;

◊ detailed topic layout and schedule of presentation (can be in a checklist form to provide the record of topics covered in class);

◊ list of required textbooks, software and laboratory notes;

◊ instructions for teaching assistants and laboratory technicians;

◊ detailed inspection plan , including the type of tests (exams) planned, topics covered and weights assigned for each test.

Product design and quality planning is followed by the acquisition of necessary resources, including academic and support staff, information and material resources (hardware, software, equipment and facilities), as well as students. The objective of the purchasing requirement of ISO 9001 is to ensure that these resources conform to the specified requirements. This is necessary because the faculty builds the acquired resources into its products. Defective purchased material, such as a faulty overhead projector or inappropriate software loaded on the network, may negatively affect the quality of the teaching, learning or research processes.

Also, the appropriate verification of a purchased product or an acquired resource must be planned, executed and reviewed. Where specific contracts require the department or faculty and staff members to verify purchased products or acquired resources at subcontractor's premises, this verification should be planned, conducted and recorded according to the particular contract.

Control of inspection, measuring and testing equipment is the another set of resources that has to be allocated before the actual delivery of programs and research includes the inspection, measuring equipment and methods. This ISO 9001 requirement covers the methods and equipment used for measuring and testing of student knowledge, abilities, methods applied to ensure that programs, courses conform to the specified requirements, as well as the measuring and testing equipment used in research activities.

The objective of control of customer supplied product of the quality system is to demonstrate the capability of the faculty to identify, maintain, store, preserve and properly handle all material provided by students in the course of studies, and all products provided by external organisations with which the department has contracts for research projects. The identification, verification and handling of student supplied material, such as exams, tests, assignments, reports, theses, software and books are covered. Also, the examination, storage, maintenance, preservation, handling and proper usage of hardware and software provided by research sponsors, industry and governmental institutions should be documented by appropriate procedures and records.

Process control can be defined as; after the allocation and deployment of adequate resources, the delivery of programs and research is soon to follow. In general, the teaching, learning and researching processes are addressed by this requirement. The objective is to ensure proper identification and planning of these processes, and to ensure that they are carried out under controlled conditions.

Controlled conditions include:

◊ documents defining the manner in which the processes are carried out, such a course research project plans and procedures;

◊ use of a suitable equipment and a suitable working environment;

◊ compliance with reference course and research project quality plans;

◊ monitoring and control of product quality characteristics and suitable process parameters;

◊ preventive and corrective maintenance of equipment used for teaching, teaming and research.

In the inspection and testing procedure, student knowledge, programs, courses and research must be inspected and tested against the requirements set in appropriate procedures and quality plans. Also, records of such activities must be kept. The ISO requirement 4.10 Inspection and Testing applies to the receiving, in-process and final inspection of: undergraduate students' knowledge and skills acquired in a particular course; student's academic status (program level inspection); graduate students, including course-work and thesis-related work; research projects against the requirements set out in the research contract and, or project plan.

After performing inspection and testing of its products, the institution must ensure that the products are properly identified, and that the inspection and test status indicates whether the products are conforming or nonconforming to specified requirements.

A logical path after the occurrence of nonconforming products is to look for and eliminate the causes of these nonconformities, if feasible is called corrective and preventive action. This is done by planning, designing, implementing and reviewing adequate corrective actions to prevent existing nonconformities from occurring again, and adequate actions to prevent the occurrence of potential nonconformities. Corrective and preventive actions taken at all stages of planning, design and delivery of programs, courses and research in the faculty are included in this element. Existing and potential nonconformances are identified, for instance, by means of internal quality audits, statistical techniques, tests or personal observations.

Handling, storage, packaging, preservation and delivery, the material and equipment used in teaching, learning and research should be property handled, stored and preserved in order to prevent damage or deterioration. Also, a safe and healthy environment should be provided. In case of any damage or deterioration of material, equipment or environment occurs, the objective is to ensure detecting and assessing such occurrences, and implementing corrective and preventive actions to eliminate causes of further damage or deterioration.

3.2 SUPPORTING ELEMENTS

Supporting elements of the ISO 9001 quality system address resources necessary for the quality system implementation, as well as resources and processes necessary for the improvement of quality.

Management responsibility is the overall objectives of the quality system are stated in a document called the quality policy. All members of the institution understand and follow this policy. Apart from clearly emphasising quality objectives, management responsibility facilitates that the interrelationships and authorities of all persons whose work influences quality of student knowledge, courses and research is defined. This includes responsibility and authority of the faculty departments administration, professors (instructors), research assistants, technicians and administrative support staff.

Organisational charts or responsibility matrices can serve in this mandate. The executive management must also identify the need for appropriate resources (instructors, assistants, courses, laboratory equipment, library, video and computer equipment), as well as appoint an ISO 9000 Coordinator. The coordinator should be a faculty member with a thorough understanding of the ISO 9001 quality system and the educational and research processes in the faculty. His responsibilities include liaison with external parties, such as other faculties and universities, university administration, student records office and customers, subcontractors of the faculty.

At prescribed intervals, or when required, the executive management conducts management reviews. A management review includes: internal quality audits, overview and analysis of the quality policy and objectives, assessment of quality system effectiveness, analysis of customers requirements needs, interrelationship between customer requirements and policy and objectives.

While quality audits are performed against the departmental goals and objectives, management reviews are performed by the executive management against the quality policy. A management review may include the review of documentation emerging from the audits. Records of management reviews must be kept and evidence of actions arising from them must be available.

The requirement of quality system addresses the scope of the quality system, and the required documentation. If the faculty plans not to include certain products in the quality system, such as research, the range of products and services included in the quality system must be stated. A quality system must be documented with an appropriate quality manual, procedures, instructions and records. This allows proper communication, audits and verification activities. As a result the Quality System traceability related with the customer satisfaction of the MHE&TIPS can be illustrated in Figure 2.

Document and data control ensures that accurate, up-to-date documents are readily available when and where required. All documents and data pertaining to the quality system must be adequately identified, prepared, reviewed, revised, approved and maintained.

Product identification and traceability is a need to properly identify the product and provide means for the traceability of related quality problems to their causes. Therefore, adequate identification of all courses, research projects, students, faculty and staff, as well as the traceability of nonconformancies in student academic progress, courses, programs and research projects are very important.

The objective of Internal Quality Audit element is to verify that the quality system complies with planned arrangements, such as the ISO 9001 International Standard, and to verify whether these arrangements are implemented effectively and are suitable to achieve quality objectives. Internal quality audits serve to improve the quality system from the perspective of individual faculty and staff members, since they raise official attention to shortcomings and problems within the system. An effective internal quality audit system should be established on the basis of ISO 10011-II Guidelines for Quality Audit, with faculty members trained as internal quality auditors.

In order to control and improve the quality of education and research, statistical techniques should be used. This ISO 9001 element requires that the need for statistical techniques in learning, teaching and research is established, and that the identified techniques are implemented and controlled.

4 CONCLUSION

Quality process in maritime training institution provides the framework and systematic approach to examine all management and technical processes, services and teaching activities. It has an accountability component that demands which the establishment of criteria (conforming requirements) be based on customer expectations. The goal is to continue to improve until customer expectations are met and exceeded. Conformity requirements, which provide the criteria for the quality elements, from the basis for self-analyses, reviews, audits, evaluations and other types of measurements.

In this approximation, Maritime Faculty of İstanbul Technical University's Quality and Environmental Management System has been established. Then the faculty was registered both ISO14001 and ISO 9002 by the international accrediation bodies.

This study covers the integration process of ISO 9001 standard, into the Maritime Higher Education and Training Institution taking into account the requirements of STCW 95 Convention. The Maritime Higher Education & Training Institution Production System (MHE&TIPS) has been presented. The relevance and the need of ISO 9000 in maritime education has been discussed, followed by the illustration of the path to ISO 9000 through the accrediatation criterias. It is anticipated that after ISO 9001 registration, a maritime training institution will have effective quality system that will assist to reach never ending process of customer satisfaction.

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ETHICS AND THE MARITIME PROFESSION: AN ARGUMENT FOR TEACHING IN MARITIME TRAINING AND STRATEGIES FOR MAKING ETHICAL DECISIONS

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ABSTRACT

The teaching of ethical decision-making should be included as an integral part of professional mariner training. While traditional training must cover essential areas such as power plants, navigation, personnel management, and communication, it is equally important to teach a basic knowledge of ethical reasoning.

In our competitive, global business world we must subscribe to the maxim that good business is ethical business. To that end, mariner training should include an historical overview of the philosophy of ethics as well as discussions of case studies. Even more important, however, is to articulate and discuss paradigms for making ethical decisions. Training should provide a framework for thinking that will generate insight and provide direction for final decisions. The work of Dr. Rush-worth Kidder at the Institute for Global Ethics in Camden, Maine, provides a language and a methodology for such decision-making.

INTRODUCTION

"and the expensive delicate ship that must
have seen
Something amazing, a boy falling from
the sky,
Had somewhere to get to and sailed
calmly on."

---W.H. Auden, "Musée des Beaux Arts"

A recent edition of the New York Times featured six front-page stories of corruption and ethical lapses: local, state, national, and international examples of leaders swindling the public or otherwise violating the public trust. Both legal and ethical problems abound in modern society, and, if indeed the past held as many examples of corruption as the present, today we seem more willing to address fundamental ethical issues. Ethics is in the air, the Zeitgeist of our times, and as global commerce shrinks our planet, the call for all to act ethically rings louder than ever before.

Good business is ethical business. With that proposition as a starting point, I will present an argument for the teaching of ethics in maritime training schools. I will then offer examples from history and literature that I use teaching ethics at Maine Maritime Academy, and go on to explore a case study of the October 1998 Fantome maritime disaster and the consequent ethical questions. Finally I will present strategies for ethical decision-making drawn from Dr. Rushworth M. Kidder's Ethical Fitness Seminars at the Institute for Global Ethics in Camden, Maine.

The history of ethics and strategies for ethical decision-making should be included as an integral part of professional mariner training. While traditional train-ing includes essential areas such as power plants, navigation, safety of life at sea, international maritime law, personnel management, and communication, it is equally important to teach a basic knowledge of ethics and ethical reasoning. It is not so much that ethics is now avoided as an academic topic--STCW for example, includes a section on Social Responsibility--but rather that the strategies for teaching ethics are not systematized and that practical ways to apply ethical knowledge are unstructured at best.

ETHICAL AWARENESS

Each of us owns an ethical system and the full right to discuss and determine ethical behavior. Ethicist Dr. Michael K. Hooker, who served as president of several American colleges and univer-sities, wrote recently in an essay entitled "How to Think about Ethics" that "[t]here is nothing that I, as a professional philosopher, know that you don't know, the knowing of which would better enable you to engage in tough ethical disputes" Hooker [1]. Whether they choose to acknowledge it or not, students entering colleges and professional schools arrive with a knowledge of ethics, however vague or untested that knowledge may be. What they do not carry with them is a language with which to discuss ethics or a framework for ethical decision-making. Although students, we earnestly hope, have an innate sense of right and wrong pieced together from religious, societal, or parental teaching, ethical codes are harder to locate and more difficult to articulate. Decision-making in ethics is even more arduous, a product of much reading, rigorous discussion, and real-life application.

Conventional wisdom often stymies the teaching of ethics by arguing that ethics cannot be taught, that our value systems and moral beliefs are determined by family and religious influences long before adulthood. Freud would agree. But such is not the case according to Sharon Daloz Parks, a Senior Research Fellow at the Harvard Business School. Drawing on several recent studies, Parks argues in her 1993 essay, "Is it too late? Young Adults and the Formation of Professional Ethics," that "moral develop-ment can continue into adulthood, and . . . particularly dramatic changes can occur in young adulthood in the context of professional school education" Piper [2]. On the basis of my own thirty-five years of teaching in both high school and college classrooms, I strongly concur with Parks. While high school students tend to echo their parents' religious and political views, college students, often living away from home for the first time, will explore and reevaluate ethical positions and codes of behavior. College is a time to test old dicta and try on new ways of thinking. If we can agree that college students are indeed open to reevaluation of core beliefs, that ethics can be taught to young adults and professionals in business, that moral understanding and growth can occur, we must next address the questions of what to teach and how to teach it.

Contrary to what some would argue, I believe that there are fundamental, universal ethical beliefs that cut across all nations and all cultures. If we own property we don't want others to steal it; we want others to respect how we live our lives; we ought not to kill. As Rushworth Kidder, President of The Institute for Global Ethics in Camden, Maine, points out in his book, How Good People Make Tough Choices, every major world religion has a statement that articulates in some way the golden rule of the Christian bible: Do unto others as you would have others do unto you. But Kidder goes further, arguing after extensive research and interviewing that there is a "common ground" and "list of core values" shared by all humans. That list comprises "love, truth, fairness, freedom, unity, tolerance, responsibility, respect for life" Kidder [3].

READINGS IN THE HISTORY OF ETHICS

What are the origins of these values and how do we teach them? Instead of seeking out maritime issues for a discussion of ethics in my Humanities courses at Maine Maritime

Academy, I choose to broaden the base to include early texts from the Western tradition in the belief that a knowledge of the history of ethics will inform--and perhaps reform--the belief systems of the students. We look at Hammurabi's code which delin-eates some of the earliest statutes and ethical codes in such areas as no-fault divorce, women's rights, and builders' liability. We read the Ten Command-ments from the Judeo-Christian bible and selections from the Koran and discuss them in relation to our own times. We read Sophocles' Antigone and discuss the ethical decisions in the play: Antigone's defiance of the law of the state; Creon's arrogant and insecure wielding of power; Haimon's reasoned challenge to his father's authority. The play is rich with ethical questions and with the conse-quences of impetuous and arrogant behavior. Antigone's decision to bury her brother after weighing the law of the gods against the law of the state is a provocative example of right versus right thinking. From Plato's Republic we read the "Allegory of the Cave" and discuss the sources of basic truths, especially the meaning of justice and what comprises a just society. Aristotle's "Nicomachean Ethics" shows the reasonable middle way, the way of moderation between cowardice and recklessness, between arrogance and timidity.

In the Enlightenment era we read excerpts from Bacon, Descartes, Hobbes, and Locke and observe the influences of inductive reasoning, deductive reasoning, natural law, and the social contract on the formation of the democratic governments of the United States and France, especially as articulated in Jefferson's "Declaration of Independence." In the nineteenth century we read John Stuart Mill and Jeremy Bentham and discuss Utili-tarianism, and in the twentieth century we read Martin Luther King's "Letter from Birmingham Jail" with its echoes of Platonic justice. W.H. Auden's poem (quoted above) about the fall of Icarus opens a lively debate about commercial shipping schedules and profit versus human compassion: should "the expensive delicate ship" stop to offer assistance, or having "somewhere to get to," should it sail "calmly on"?

The key ethical issues are the oldest ethical issues. "Musée des Beaux Arts," a twentieth-century poem about a sixteenth-century painting depicts a myth from ancient Greece. This tale of Icarus' flight to escape the Minotaur introduces two timeless ethical issues. First, the ship in the poem has a deadline to keep; customers are waiting. Stopping to aid the drowning boy will put the ship behind schedule and the owners may lose money to speedier competitors. Commercialism and profit override compassion. Second, one could argue that, since the boy has been on a risky, reckless adventure, his fate is his just reward, and thus of even less concern to the mariners. Although Section 2304 of the United States Code navigation rules states that "a vessel shall render assistance to any individual found at sea in danger of being lost," USCG [4] both legal and ethical questions surface: Is the person actually in danger of death? Will the operation endanger the larger vessel? Does the law of the flag country require a vessel to render such assistance?

The list of readings for teaching ethics is arbitrary and will of course differ from instructor to instructor, but the pedagogical objective remains the same: a grounding in the history of ethical philosophy provides the equipment for students to begin to think ethically in a self-conscious way. In a February 2000 article by Captain Mark N. Clemente of the U.S. Naval Academy entitled "Why We Teach Leadership and Ethics at the Naval Academy," Clemente underscores my point about the history of ethics. He writes:

> We want them to graduate with a true understanding of timeless principles, so whenever they encounter situations where the rules have yet to be written, or where conflicts of duty are encountered, they can dig into their conscience and apply the critical

> thinking skills they learned during their four years at the Naval Academy and do the right thing—and for the right reasons. Clemente [5]

Clemente is on the mark: the history of ethics provides us with a general groundwork, the theory for practical decisions, and although Clemente is addressing military engagement, engage-ment in the commercial world draws upon the same ethical precepts. Practicing with the tools for ethical decision-making will give students confidence in those gray areas of global business where equally right solutions must be weighed. Case studies furnish a practical dimension.

THE FANTOME: A CASE STUDY

On October 27, 1998, thirty-one seamen lost their lives when the 282 foot, four-masted schooner Fantome sank in the Caribbean. Second-guessing Captain Guyan March's decisions in the days before Hurricane Mitch struck is not the issue here. He acted as a highly experienced mariner should have acted in accordance with the best information available to him. But several decisions made by the Fantome's owners do call for rigorous examination. After the ninety-three passengers were disembarked in Belize City to avoid the impending hurricane, thirty-one persons remained on board. Only two of them were white, Captain March and Chief Engineer Bucur. Would the decision to save the ship by sending it out to sea to ride out the storm have been different if the crew had been white? And, as Captain Andy Chase, a Professor of Marine Transportation at Maine Maritime Academy, argues in a recent analysis of the disaster, "' going to sea at all costs is an outmoded tactic . . . . Human life is worth more now than it was fifty years ago'" Vaillant [6].

John Vaillant's October 1999 article on the Fantome raises further questions about Windjammer, the company that ran the cruise ship. "Windjammer," Vaillant points out, "has long been held in dubious regard by the East Coast's professional sailing com-munity, members of which describe the fleet as haphazardly renovated and poorly maintained" Vaillant [7]. In order to create "legal fire walls" Windjammer's ships are "registered in Equatorial Guinea" and "owned by an independent corpor-ation based in Panama" Vaillant [8]. The ethical questions pile up: Did pursuit of profit compromise safety? Was risky behavior condoned, even encouraged, by the owners? Did the owners place lesser value on non-white lives? Should the Fantome have put to sea to escape Mitch, a Category 5 hurricane, in response to an outdated, romantic code of maritime valor? Should the Fantome have been operating at all in the Gulf of Honduras where hurricanes can easily box in a slow-moving ship? And the larger question looms of the company's encouraging the current craze for thrill-seeking, rum-inspired behavior on what Vaillant calls "the benignly piratical" cruises where "mock battles ensue, complete with cannon fire" "when Windjammer vessels are encountered" Vaillant [9].

A LANGUAGE FOR ETHICAL DECISION-MAKING

With the history of ethics in mind and a case study before them, students still lack a methodology to think through a situation, to balance right action against right action, to predict consequences, and to determine action. They still lack a language with which to defend their decisions with clarity and confidence. Kidder's Ethical Fitness Seminars offer that methodology and that language.

Kidder proposes a four-step process: "Moral Awareness, Values Definition, Ethical Awareness, and Dilemma Resolution" "Preparation" [10]. In the first section Kidder stresses that "Ethics is not a luxury or an option. It is essential to our survival" "Preparation" [11]. He goes on to argue that if we do not regulate ourselves, we will be regulated soon enough by "externalities." He cites the example of throwing trash out the window of the car, and how we used to self-regulate such behavior. Now, he points out, we "don't throw litter out of the car window because there is $500 fine" "Preparation" [12]. In our age of fragile worldwide eco-systems, this example speaks loudly to the maritime industry in such issues as trash and oil disposal at sea where ethical and legal issues can become confused. The abnegation of self-regulation will produce industry-wide regulation by "externalities." "What used to be regulation by our own good habits," Kidder writes, "has become regulation by the will of the legislators" "Preparation" [13]. It is this thinking that propels Kidder to a definition of ethics in our modern world as "obedience to the unenforceable" "Preparation" [14].

Kidder's second definition of ethics is more useful in decision-making: ethics, he says, is not the battle between right and wrong but "the battle of right versus right" "Preparation" [6]. If something is evil or illegal, for example, there is no ethical dilemma. It is not unethical to cheat on an exam, it is illegal to do so, and there is no ethical dilemma. Kidder ends the first part of his presentation by arguing that there is no "such thing as 'medical ethics,' or 'business ethics,' or 'legal ethics,' or 'journalism ethics.' There is only ethics." He warns against the illusion that we can separate personal ethics from business or political ethics. "The public no longer credits that line of reasoning," he writes. "There is no dividing up ethics into compartments: There's only ethics" "Preparation" [16].

The second section of the seminar focuses on values definition. Here the goal is first, "to create an understanding of the nature of and the purposes for a code of ethics" "Preparation" [17]. In separate groups of five or six the participants create a code of ethics, and it is astonishing that these groups working discretely come up with essentially the same list, with such core values as trust, compassion, and responsibility. Participants from all over the world, Kidder says, come up with the same lists. The groups then measure their codes against other codes such as the Ten Commandments, the West Point Honor Code, and the list of personal values generated by the Institute for Global Ethics.

The third part of the presentation is called Ethical Analysis, and here the goals are "[t]o explore the nature of 'right versus right' dilemmas, [t]o practice identifying the dilemma paradigms" and "[t]o gain experience analyzing a variety of dilemmas" "Preparation" [18]. The four dilemma paradigms in right versus right situations are truth versus loyalty, individual versus community, short term versus long term, and justice versus mercy. "Tough choices," Kidder writes, "don't always involve professional or criminal laws" "Preparation" [19]. "Tough choices, typically, are those that pit one 'right' against another. That's true in every walk of life—corporate, professional, personal, civic, international, educational, religious, and the rest" "Preparation" [20]. As an illustration of the justice versus mercy paradigm, let's say a student has plagiarized a paper and that the punishment is expulsion from school. The professor knows that the student has a lot of potential and probably was unaware of the implications of her action. The situation could be turned into a positive learning experience. Justice dictates dismissal, but mercy suggests she re-write the paper. Both actions are right. Similarly, the truth versus loyalty paradigm might be illustrated by the example of one student seeing another student cheat on an exam. Truth and the school's honor code require the observer to report the incident, but loyalty to the friend counsels silence. The Fantome incident could illustrate the short term versus long term paradigm. A short-term view would argue that it is right for Windjammer to operate its ships, entertain its clientele as they see fit, and make a profit. A long-term view would argue that it is right to be much more cautious when operating an old, slow-moving vessel in the Gulf of Honduras where a hurricane could easily box it in.

The last section of the Ethical Fitness Seminar presents "a systematic framework for seeking resolutions for right versus right dilemmas" "Preparation" [21]. Kidder suggests three principles for guidance: "ends-based thinking," "rule-based-thinking," and "care-based think-ing" "Preparation" [22]. Ends-based thinking is essentially Bentham's Utilitar-ianism, or the greatest good for the greatest number. Making that deter-mination, however, can be a sticky problem. For example, should some humans be sacrificed in medical experiments in order to develop useful medical knowledge for the majority? Simpler to decide is whether a flooded compartment with a seaman trapped inside should be sealed in order to save a ship at sea, a situation graphically illustrated in the recent movie Crimson Tide.

Rule-based thinking would dictate that one follow "the highest sense of principle" in decision-making "Prep-aration" [23]. But impossibly strict and rigid rules can impede and complicate decisions based on universal rules. The right of gun ownership as a response to the Second Amendment to the U.S. Constitution becomes an issue in rule-based thinking. Similarly, rule-based thinking could argue that the Fantome should put to sea in order to save the ship. But here we must evaluate the rules. Is the Second Amendment based on high principle? The current turmoil over gun ownership in the United States challenges this Constitutional "right to bear arms." Is putting to sea to save the ship an out-dated principle when lives are in jeopardy? Care-based thinking invokes the Golden Rule, but things aren't so simple here either. We must ask, for example, who the "other" is in "do unto others." These resolution principles are not infallible, but they do provide a framework and a language for working toward a solution of an ethical dilemma. As Kidder says, they "are the most helpful in confronting the choices we commonly face in today's world" Kidder [24].

CONCLUSION

Based on the two fundamental propositions that ethics is, first, "obedience to the unenforceable," and second, "the battle of right versus right," Kidder's strategies open up the decision-making process and offer a language of resolution for us all: professionals, professors, and students. For mariners already at work in the profession, ethical training courses are available from other sources as well. One such course is described in the Fourth Quarter 1999 edition of the Global Marine News. Tim Hinote, an electrician on the Adriatic VIII drilling rig, describes a course he took with the Randy Smith Training School. Hinote found the sessions provocative and useful. They drew on philosophies, in his words, that "date back to the earliest times" and were focused on a three-step philosophy: "Always do your best. Do the right thing. Treat others as you want to be treated" Hinote [25].

The similarity of this language to Kidder's principles is clear because the basic precepts are the same. Our concern should be less on what we teach than on the thinking process itself, our only saleable commodity. The process of ethical decision-making may not generate a facile solution, but it will generate insight, provide a framework, and suggest a direction. Ethical fitness should be expected of all educated persons and surely should not exclude mariners. If we don't teach principles of ethics and ethical-decision making, who will? If we don't lead them, who--or what--will? We cannot afford that risk.

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THE MINIMUM STANDARD OF COMPETENCE FOR OFFICERS IN CHARGE AS ENGINEERING WATCH IN A MANNED ENGINE - ROOM OR DESIGNATED DUTY ENGINERS IN A PERIODICALLY UNMANNED ENGINE - ROOM

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ABSTRACT

The maritime education and training system at The Maritime University of Constantza, Romania including training in mechanical and electrical workshop and requirements for the teaching staff and trainers, different teaching syllabus, examinations, assessment and evaluation methods, resources and educational techniques, including the use of simulators, are presented in the paper.

For certification as officer in charge of on engineering watch in a manned engine – room, our students shall follow a program of on – board training, at the school-vessel Neptun and on laboratories. After this program, follows examinations and evaluation methods which we present in next tables by functions : marine engineering (the operational level), electrical, electronic and control engineering, maintenance and repair, control of the ship operation and the operational level.

Every student will be required to demonstrate ability to undertake, at the operational level, the tasks, duties and responsibilities which we listed in a table (in column 1). The minimum knowledge, understanding and proficiency required of ratings forming part of on engine of ratings forming part of on engine – room is listed in the same tables, column 2, and the methods for demonstrating competence in column 3.

Next we present the efficiency of STCW 95 in our hyperteaching syllabus and practice.

Educational techniques at the students level including using engine-room simulation equipment, is able to simulate a real main or auxiliary machinery system. They incorporate facilities for simulation of a appropriate main or auxiliary propulsion machinery equipment and control panels, simulate sub – system that include boiler, steering gear, electrical power general and distribution systems, cooling water, refrigeration, bilge and ballast systems.

The evaluation and assessment of students are periodically and consistent in credits.

All of these offer to the new third engineer – officer the capabilities in order to manage any situation which can appear an any kind of merchant vessel.

SPECIFICATION OF MINIMUM STANDARD OF COMPETENCE FOR OFFICERS IN CHARGE OF AN ENGINEERING WATCH IN A MANNED ENGINE – ROOM OR DESIGNATED DUTY ENGINERS IN A PERIODICALLY UNMANNED ENGINE – ROOM

Function : Marine engineering – the operational lever

Competence	Knowledge, understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1	2	3	4
Use appropriate tools for fabrication and repair operations typically performed on ships	Characteristics and limitations of materials used in construction and repair of ships and equipment (at *Naval Materials technology* and *Strength of materials*) Characteristics and limitations of processes used for fabrication and repair (at *Engineering knowledge, hand and power tools* and *Mechanical drawing*) Properties and parameters considered in the fabrication and repair of systems and components (at *Machinery bodies, fabrication processing and assembly* ,*Machinery* and *Maintenance repair and re-assembly*) Application of safe working practices in the workshop environment (at each technical teaching syllabus)	Assessment of evidence obtained from one or more of the following : 1. approved workshop skills training (in the naval practice); the teaching syllabus are finished by exams–trim . I- II and 8 credits 2. approved practices experience and test; the teaching syllabus are finished by exams trim. I-II-III and 12 credits (naval practice at school training vessel Neptun) – in the 4 – 5th year	Identification of important parameters for fabrication of typical ship related components is appropriate Selection of material is appropriate Fabrication is to designated tolerances Use of equipment and machine tools is appropriate and safe

Use hand tools and measuring equipment for dismantling, maintenance, repair and re- assembly of shipboard plant and equipment	Design characteristics and selection of materials in construction of equipment (at *Naval materials technology*) Interpretation of machinery drawings and hand books (*Technical drawing and description geometry, Machinery bodies, Machinery*) Operational characteristics of equipment and systems (at technical teaching syllabus - Table 1 and Table 2)	Assessment of evidence obtained from one or more of the following : 1. approved workshop skills training (general practice and training programs) 2. approved practical experience and tests (in laboratories, by training simulator - Table 3)	Safety procedures followed are appropriate Selection of tools and spare gear is appropriate Dismantling, inspecting, repairing and reassembling equipment is in accordance with manuals and good practice Re – commissioning and performance testing is in accordance with manuals and good practice
Use hand tools, electrical and electronic measuring and test equipment for fault finding, maintenance and repair operations	Safety requirements for working on shipboard electrical systems (*Ship electrical actions and plants*) Construction and operational characteristics of shipboard AC and DC electrical systems equipment (*Ship electrical actions and plants*) Construction and operation of electrical test and measuring equipment (*Electrical measuring and transducers*)	Assessment of evidence obtained form one or more of the following : 1. approved workshop skills training (in laboratories) 2. approved practical experience and tests	Implementation of safety procedures is satisfactory Selection and use of test equipment is appropriate and interpretation of results is accurate Selection of procedures for the conduct of repair and maintenance is in accordance with manuals and good practice (*Ship electrical actions and plants, Electrical measuring and transducers*) Commissioning and performance

			testing of equipment and systems brought back into service after repair is in accordance with manuals and good practice
Maintain a safe engineering watch	Thorough knowledge of Principles to be observed in keeping an engineering watch, including: 1. duties associated with taking over and accepting a watch (*Ship electrical actions and plants, Diesel engines , Main and auxiliary machinery*) 2. routine duties undertaken during a watch (*Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery*) 3. maintenance of the machinery space log – book and the significance of the readings taken (*Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery*) 4. duties associated with handing over a watch (*Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery*) Safety and emergency procedures; change-over of remote/ automatic to local control of	Assessment of evidence obtained from one or more of the following : 1. approved in – service experience 2. approved training ship experience (at school shipboard training vessel Neptun) 3. approved simulator training , where appropriate (at Diesel engines, Machines and Ship power plants Department) 4. approved laboratory equipment training (Ship theory and Construction Laboratory, Hydraulic and hydraulic machines Laboratory, Diesel engines Laboratory, Auxiliary steam boilers and evaporators)	The conduct, handover and relief of the watch conforms with accepted principles and procedures The frequency and extend of monitoring of engineering equipment and systems conforms to manufacturers recommendations and accepted principles and procedures, including Principles to be observed in keeping an engineering watch A proper record is maintained of the movements and activities relating to the ship's engineering systems

	all systems Safety precautions to be observed during a watch and immediate actions to be taken in the event of fire or accident, with particular reference to oil systems		
Use English in written and oral form	Adequate knowledge of the English language to enable the officer to use engineering publications and to perform engineering duties (the students may be able to use technical charts and other nautical publications, to understand technical information and messages concerning ship's safety and operation, to be ability to use and understand the Standard Marine Navigational Vocabulary)	Examination and assessment of evidence obtained from practical instruction (exams and nautical practice) the English language is studied in the first, second and third year and finished by exams and 5 credits	English language publications relevant to engineering duties are correctly interpreted Communications are clear and understood
Operate main and auxiliary machinery and associated control systems	Main and auxiliary machinery (studied at *Auxiliary steam boilers and evaporators, Hydraulics and Hydraulic machines, Marine auxiliary machinery and Installation, principles, performances and supercharging of Marine Diesel Engines, Dynamics components and Auxiliary Systems of Marine Diesel Engines, Naval Mechanical automations, Operation and maintenance of Main and Auxiliary machinery, Ship electrical actions and plants, Electrical measurements and transducers*) :	Examination and assessment of evidence obtained from one or more of the following : 1. approved in – service experience; the teaching syllabus are studied beginning from 3 to 5 year and finished by exams in the trim. V-VI-VII-VIII with credits from min.4 to max. 15 2. approved training ship	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of the marine environment Deviations from the norm are promptly identified The output of plant and engineering systems consistently meets requirements. including

	1. preparation of main machinery and preparation of auxiliary machinery for operation (at school training vessel Neptun) 2. operation of steam boilers (at simulator), including combustion systems 3. methods of checking water level in steam boilers and action necessary if water level is abnormal 4. location of common faults in machinery and plant in engine and boiler rooms and action necessary to prevent damage (at school manned engine - room's vessel Neptun)	experience 3. approved simulator training, where appropriate 4. approved laboratory equipment training (in laboratories of Electromechanical Faculty)	bridge orders relating to changes in sped and direction The causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions
Operate pumping systems and associated control systems	Pumping systems : 1. routine pumping operations (by Laboratory of *Ship electrical actions and plants ,Laboratory of Hydraulics and Hydraulic machines, Laboratory of Ship electrical actions and machines*) 2. operation of bilge, ballast and cargo pumping systems (by *Laboratory of Marine Auxiliary Machinery and Installations*)	Examination and assessment of evidence obtained from one or more of the following : 1. approved in- service experience; the teaching syllabus are studied in the 3 –4 school year and finished by exams with 9 credits; 15 credits 2. approved training ship experience (school vessel Neptun)	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of the marine environment

		3. approved simulator training , where appropriate 4. approved laboratory equipment training (the laboratories of Electromechanical Faculty)	

Function : Electrical, electronic and control engineering – the operational level

Competence	Knowledge, Understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1	2	3	4
Operate alternators, generators and control systems	Generating plant Appropriate basic electrical knowledge and skills (at *Electrotechnics* Preparing , starting, coupling and changing over alternators or generators (at *Ship electrical actions and machines)* Location of common faults and action to prevent damage	Examination and assessment of evidence obtained from one or more of the following : 1. approved in – service experience; the teaching syllabus by exams in trim. IV and V with 9 credits, respective 9 credits and exam in the 3 school year 2. approved training ship experience	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations

	Location of common faults and action to prevent damage (*Electrical Control Systems*)	3. approved simulator training, where appropriate (*Ship Electrical actions and plants Laboratory, Ship Electrical actions and machines*) approved laboratory equipment training (*Ship Electrical actions Electrical actions and machines*)	

Function : Maintenance and repair - the operational level

Competence	Knowledge, Understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1	2	3	4
Maintain marine engineering systems, including control systems	Appropriate basic mechanical knowledge and skills (studied at *Marine Auxiliary Machinery and Installations, Ship Electrical plants, Operation and maintenance of main and auxiliary machinery, Naval Mechanical automations*) Safe isolation of electrical and other types of plant and equipment required before personnel are permitted to work on such plant or equipment (*Safety and Emergency procedures by school vessel Neptun*) Undertake maintenance and repair to plant	Examination and assessment of evidence obtained from one or more of the following: 1. approved in – service experience 2. approved training ship experience 3. approved laboratory equipment training	Isolation, dismantling and re- assembly of plant and equipment is in accordance with accepted practices and procedures. Action taken leads to the restoration of plant by the method must suitable and appropriate to the prevailing circumstances and conditions

	and equipment		

Functions : Controlling the operation of the ship and the operational level

Competence	Knowledge, Understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1	2	3	4
Ensure compliance with pollution – prevention requirements	Knowledge of the precautions to be taken to prevent pollution of the marine environment (studied at *Prevention of pollution of the Marine environment and anti – pollution procedures*) Anti – pollution procedures and all associated equipment (at *Prevention of pollution, Marine Auxiliary Machinery and Installations*)	Examination and assessment of evidence obtained from one or more of the following: 1. approved in – service experience; exam in the trim. VII 2. approved training ship experience (Course of Prevention of pollution)	Procedures for monitoring shipboard operations and ensuring compliance with MARPOL requirements are fully observed
Maintain seaworthiness of the ship	Ship stability (studied by *Ship construction, stability and damage control*)	Examination and assessment of evidence obtained from one or more of the following:	The stability conditions comply with the IMO intact stability criteria

	Working knowledge and application of stability, trim and stress tables, diagrams and stress – calculating equipment Understanding of the fundamentals of watertight integrity Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy *Ship construction* General knowledge of the principal structural members of a ship and the proper names for the various parts	1. approved in – service experience 2. approved training ship experience 3. approved simulator training (Laboratory of *Ship construction and stability)* 4. approved laboratory equipment training (may models of ships made by students at Exam of Diploma); 5. the teaching syllabus are finished by exams and 6 credits in the trim. V- VII	under all conditions of loading Actions to ensure and maintain the watertight integrity of the ship are in accordance with accepted practice
Prevent , control and fight fire on board	*Fire prevention and fire – fighting appliances* (Course and Laboratory) Knowledge of fire prevention Ability to organize fire drills Knowledge of classes and chemistry of fire (*Industrial chemistry, Fire fighting, Ship Electrical actions and plants)* Knowledge of fire – fighting systems (*Fire fighting,, Marine Auxiliary*	Assessment of evidence obtained from approved instruction or during attendance at an approved course, including practical demonstration in spaces which provide truly realistic training conditions (e.g. simulated ship board conditions) and, whenever possible and practical, in darkness, of the ability to : 1. use various types of portable fire extinguishers 2. use self – contained breathing apparatus	The type and scale of the problem is promptly identified and initial actions conform with the emergency procedure and contingency plans for the ship Evacuation, emergency shutdown and isolation procedures are appropriate to the nature of the emergency and are

	Machinery and Installations) Action to be taken in the event of fire, including fires involving oil systems (*Ship board training* at Neptun)	3. extinguish smaller fires, e.g. electrical fires, oil fires, propane fires 6. extinguish extensive fires with water, using jet and spray nozzles 7. extinguish fires with foam, powder or any other suitable chemical agent 8. enter and pass through, with life – line but without breathing apparatus, a compartment into which high – expansion foam has been injected 9. fight fire in smoke – filled enclosed spaces wearing self – contained breathing apparatus 10. extinguish fire with water fog or any other suitable fire – fighting agent in an accommodation room or simulated engine – room with fire and heavy smoke 11. extinguish oil fire with fog applicator and spray nozzles dry chemical powder or foam applicators 12. effect a rescue in a smoke – filled space wearing breathing apparatus	implemented promptly The order of priority and the levels and time – scales of making reports and informing personnel on board, are relevant to the nature of the emergency and reflect the urgency of the problem
Operate life – saving	*Life saving*	Assessment of evidence obtained from	Actions in responding to

appliances	Ability to organize abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching appliances and arrangements, and their equipment, including radio life – saving appliances, satellite EPIRBs, SARTs, immersion suits and thermal protective aids Knowledge at sea techniques (at *Survival at sea and life saving. Marine Auxiliary Machinery and Installation, Ship Electrical actions and plants*)	approved instruction or during attendance at an approved course or approved in – service experience and examination, including practical demonstration of competence to : 1. don a lifejacket 2. don and use an immersion suit 3. safely jump from a height into the water 4. right an inverted wearing a lifejacket 5. interpret the markings on survival craft as to the number of persons they are intended to carry 6. prepare and safely launch survival craft and clear the ship's side quickly 7. safely recover survival craft and rescue boats using: inflatable liferaft and open or enclosed lifeboat with inboard engine 8. the teaching syllabus are finished by exams in the 4 school year with 2 credits and Course of Fire Prevention and Fire Fighting and Course of Survival at sea in life saving	abandon ship and survival situations are appropriate to the prevailing circumstances and conditions and comply with accepted safety practices and standards

Apply medical first aid on board ship	*Medical aid* : Practical application of medical guides and advice by radio, including the ability to take effective action based on such knowledge in the case of accidents or illnesses that are likely to occur on board ship (studied by *First aid* Course in the 3 school year in the trim. VI , finished by exam with 2 credits)	Assessment of evidence obtained from approved training Where practicable, approved practical experience at a hospital or similar establishment s	Identification of probable cause, nature and extent of injuries or conditions is prompt and treatment minimizes immediate threat to life
Monitor compliance with legislative requirements	Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment (studied by *Legislation, Organization and ship management*)	Assessment of evidence obtained from examination or approved training	Legislative requirements relating to safety of life at sea and protection of the marine environment are correctly identified .

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*** - **STCW 95** - STCW Convention. STCW Code, International Maritime Organization, London, 1996.

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STCW COMPLIANCE AND MARITIME ACADEMIES

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ABSTRACT

The six state maritime academies in the United States and the federal U.S. Merchant Marine Academy are degree granting institutions as well as training institutions for the maritime industry. As such they are under the scrutiny of various agencies that evaluate, accredit, or otherwise "audit" their work. These accreditations are very important for the recruitment of faculty and students, for the employability of graduates, and for qualifying for public and private funding.

Accordingly, the requirements of these agencies shape educational philosophy, compete for scarce institutional resources, and profoundly impact the delivery of educational services to students. The adoption of STCW95 Amendments to the International Maritime Organization (IMO) by the United States has added the United States Coast Guard (USCG) as another oversight organization. Compliance guidelines so far promulgated by the USCG and the United States Maritime Administration (MARAD) have the potential for significantly adding to the cost of training mariners in the United States and compromising education for training.

1. BACKGROUND

It is not the intent of this paper to review the STCW95 Amendments to the IMO convention. Rather, it is to trace the general evolution of STCW95 compliance efforts at US maritime academies as it relates to quality education and increased costs. Accordingly, it is assumed that the reader is somewhat familiar with the IMO Convention and the various requirements contained within the latest STCW95 amendments. The following is, however, a summary of STCW95 implementation efforts at the maritime academies relative to costs and impact on the educative mission of those maritime institutions.

General awareness of the new amendments by the state and federal maritime academies began in early November, 1995 at the annual MARAD/Maritime Academies meeting held that year at the California Maritime Academy. At that meeting Chris Young, the USCG representative to the IMO, indicated to the representatives of MARAD, the federal academy and the state academies that the IMO had made significant changes to the regulations covering the certification of watch standers. He indicated that the amendments were designed to promote international standardization in mariner training and to improve the quality of that training through a required quality systems approach to implementation. Mr. Young also indicated that the United States Coast Guard (USCG) would be the final authority for deciding whether a program in the U.S. complied with the STCW95 amendments. However, he indicated that the USCG had not yet addressed how it would implement compliance in the U.S.

At the next annual MARAD/Academies meeting held in the fall of 1996 at the Great Lakes Maritime Academy in Michigan, there was no representative from the USCG to discuss STCW95 compliance as requested by the academies. Accordingly, To further understand the amendments, most U.S. academies agreed to send representatives to a weeklong course [1] at the World Maritime University (WMU) in Malmo, Sweden.

At that course it was apparent that institutions would be expected to adopt a Total Quality Systems (TQM) type approach to training that emphasized compliance with time regulated modeled courses with task competency "check offs." At the time TQM was under severe criticism in the U.S. as inappropriate for higher education. TQM is thought to emphasize the quantification of expected educational outcomes. However, not all such outcomes are believed to be easily measurable. For example, in many educational institutions' mission statements a student mastering "critical thinking" and developing "lifelong learning" are mentioned as desirable educational outcomes. However, they are examples of outcomes not easily measured quantifiably and therefore difficult to mold into a TQM system.

In addition, there was much reference to IMO model courses that indicated both course content and the hours required of a student to study them. The theory that quality education is measured by how long a student is required to be exposed to material (called "seat time" in U.S. education) had long been abandoned by U.S. accreditation agencies as not recognizing the differences in student abilities and instructor skills. Accordingly, required "seat time" is considered by them to be an impediment to a quality educational experience and inefficient for institutions. These were but two examples of concerns the U.S. academies had regarding how STCW95 might be implemented in the U.S.

Given that there was no USCG guidance yet given on STCW95, and given what seemed to be somewhat alarming information from the WMU course, the academies asked for a meeting with the USCG and MARAD to discuss these issues. In December of 1996 the federal Maritime Administrator, Admiral Herberger, and the USCG Chief of Marine Safety, Admiral Card, met with the representatives of the U.S. maritime academies to discuss U.S. STCW95 compliance. At that meeting, both Admiral Card and Admiral Herberger expressly indicated that no significant changes to academy maritime education would be needed to comply with the new amendments. [2] The academies were much relieved to think that they would not have to significantly modify their currently accredited programs to comply with STCW95, nor had to anticipate any additional financial burden in doing so. However, in November of 1999, the USCG publicly admitted that they "perhaps underestimated the total demands that STCW95 would place on U.S. maritime training and education institutions."[3] What caused this new assessment of the impact of STCW95 on maritime academy education?

The author believes that the USCG and MARAD did not: 1. Understand the mission of maritime education at the academies as stated by the United States Government which demands that mariners be *educated* as well as trained; 2. Understand the nature of higher education in the U.S. as regulated by the various accrediting agencies or; 3. Realize the impact and costs of standardizing all mariner training beyond the common competencies stated in the STCW 95 tables as desired by the USCG.

2. MARITIME EDUCATION AUTHORIZATION IN THE U.S.

In 1936 the United States Congress established Title 46 in the U.S. Code of Federal Regulations to cover merchant shipping. In that Title Congress [4] stated that the Secretary of Transportation was authorized to take the steps necessary to provide the "education and training" of citizens for the safe and efficient operation of merchant marine vessels. Subsequent amendments to the Title 46, Section 310 then delineates the authority to establish a federal maritime academy at Kings Point, New York, and state academies located in the states of California, Maine, Massachusetts, New York, Texas, and Michigan.

Organizationally, the federal academy is overseen by the United States Maritime Administration (MARAD), which itself is a part of the United States Department of Transportation (DOT) in Washington, DC. That department is managed by the Secretary of Transportation who is appointed by the President of the United States. Faculty and staff there are federal employees.

State Maritime Academies, however, are responsible to MARAD only for policy concerning the management of the "any ocean" (over 500T) deck and engineer third-officer watch stander programs. (an example is the MARAD policy that such mariner training be no less than three years in duration) The right to confer an academic degree, ownership of physical plant facilities (other than the training ship), the operating budget, other academic programs and all personnel policies, however, are managed by the state governments of the particular state where the academy may be located.

ACADEMY MISSIONS

What is very important to note in the language of Title 46 is the United States policy intent to *educate* as well as train. Accordingly each academy has developed programmatically beyond a pure training school to a degree granting institution in the higher education system of the United States. (the state academies in Maine and New York also offer advanced degrees beyond the usual bachelor are as well).

While the mission of the federal academy is contained in and controlled by federal legislation such as Title 46 mentioned above, the mission of the state academies are set by their state governments. Accordingly, state academies not only have the federal regulations regarding maritime license policies to adhere to and for mission guidance, but also that of their individual states. In these mission statements there are references to a broader scope of education than just training for shipboard competencies. For example, Massachusetts Maritime Academy[5] includes "fully rounded academic background" and "high quality education" as part of their mission. Maine Maritime Academy[6] includes terms such as "intellectual curiosity" and "public service" as part of their educational program, and California Maritime Academy[7] includes the concept of "intellectual learning" in their mission statement.

These are all statements of intended educational outcomes that go beyond pure training. They involve more than repetitive drilling of actions and rote memorization, or a simple check-off system to determine whether one is prepared to serve as a trained mariner. Accordingly, each of these institutions has an obligation to its students to provide an experience that educates as well as trains. However, Captain William Bennett, Commanding Officer of the National Maritime Center, (the USCG office assigned STCW95 compliance responsibility), has stated that STCW95 "says nothing about education". His remarks at a 1998 meeting between maritime academies and the USCG at USCG headquarters implied that as far as the USCG was concerned, education of mariners had little to do with their ability to perform safely. As one might imagine, remarks such as that made to institutions which believe that an educated mariner is a better trained mariner, and who believe that they are charged by their government (and accrediting agencies described below) to educate as well as train, were very disturbing.

3. ACCREDITATION AGENCIES INSTITUTIONAL

To be a successful degree granting institution of Higher Education in the United States a college or university must be formally evaluated and approved ("accredited") by one of the eight regional accrediting agencies. Students normally will not attend an institution that is not accredited, nor will most faculties teach at a non-accredited institution. Accordingly, accreditation impacts both the numbers of students who want to study at an institution, and the quality of teaching. In addition, accreditation allows an institution access to a number of funding sources not usually available to non-accredited institutions.

Maine Maritime Academy and Massachusetts Maritime Academy are both in the New England Association of Schools and Colleges (NEASC) region for institutional accreditation. Accordingly, I will describe the NEASC accreditation process for illustrative purposes. Most other regional accreditation associations are very similar.

NEASC [8] publishes a set of eleven Standards, each of which has sub-sections. The eleven Standards are 1. Institutional Mission and Purposes, 2. Planning and Evaluation activities, 3. Institutional Organization and Governance, 4. Academic Programs and Instruction, 5. Faculty, 6. Student Services, 7. Library and Information Services, 8. Physical Plant Resources, 9. Financial Resources, 10. Public Disclosure (accurate advertising of programs), and 11. Institutional Integrity (ethics). As the list indicates, the evaluation includes most all areas of an academy and sub-sections of the standards include substance and quality measures as well as process measures. As part of any accreditation the academies are required to prepare a comprehensive institutional self-study that addresses the eleven standards. Such a self-study usually takes one to two full years to complete and is then sent to the accrediting agency for their review.

After evaluating the self-study the agency will send a visitation team of eight to ten persons who visits the academy for three or four days to explore the eleven Standards in fuller detail. After the visitation team studies the academy a report is sent to the academy detailing findings of institutional strengths and/or concerns. The academy is given some time in which to respond to any errors in the report or correct weaknesses identified by the team. After that time NEASC will meet and determine whether accreditation is to be offered, delayed until certain corrections are made, or not awarded. As mentioned above, the consequences of not receiving accreditation are very significant and may even result in persons losing their positions or even cause the closing of an institution. Regional accreditation visits are normally scheduled every five or ten years. The institutional cost of an accreditation is usually in excess of $45,000USD.

ACCREDITATION IN DISCIPLINES

In addition to regional *institutional* accreditation, a number of specific disciplines or majors have accrediting associations. At the maritime academies, marine engineering and international business/intermodal transportation majors have associations that can accredit those specific programs.

<u>ENGINEERING</u>. For engineers, the Accreditation Board for Engineering and Technology (ABET) evaluates programs in

marine engineering at two levels. The Engineering Accreditation Commission (EAC of ABET) evaluates engineering programs in which design and mathematical analysis (at least calculus based) and upper levels of engineering science are involved. The Technology Accreditation Commission (TAC of ABET) evaluates marine engineering programs that uses calculus for analysis, but have limited design components in the curriculum and do not require upper level engineering science courses.

These two branches of ABET make a strong distinction between engineering and engineering technology, and within the United States, claim that only graduates of EAC of ABET programs can formally call themselves "engineers". Graduates of TAC of ABET accredited programs may only call themselves "technicians". Most shore-side companies and governmental agencies require engineering persons to have a degree from an ABET accredited program. In addition, many businesses and governmental agencies also closely adhere to the ABET definitions of "engineer" or "technician". Accordingly, in most places, only EAC of ABET accredited program graduates are allowed to be formally hired as "engineers" when employed ashore. Others can only be "technicians" thus earning lower salaries. Accordingly, such accreditation can be translated to increased earning power of graduates who wish to work in the maritime industry ashore.

More importantly, ABET accreditation is viewed as an indication of quality. Such a reputation is due to the rigorous program standards or criteria, and the demanding scrutiny of fellow engineers when they come to evaluate the program. Both EAC and TAC of ABET require that an engineering program self-study (similar to that of the regional institutional accrediting agencies) be done at the institution. Such a study must addresses all the published ABET program criteria [9, 10]. Such criteria cover areas from the required credentials of the faculty, the demonstrated existence of specific student analysis and/or design skills, student communication skills, ethical training, program lab equipment, the professional development activity of faculty, the appropriateness of faculty salary levels, clerical support for the program, the employment history of graduates, satisfaction surveys from employers of graduates to name just a few. After reading the self-study a three or four person team of engineers assigned by ABET from other institutions will visit the academies and explore areas they perceive were weak in the self-study. The visit usually lasts about three days.

If weaknesses or concerns were discovered the institution must correct them within a certain time or risk losing accreditation. Accreditation visits are scheduled every three to six years for ABET programs. The usual cost of an ABET accreditation is around \$10,000USD per program with an annual membership fee of \$1,200USD per program.

<u>BUSINESS OR MANAGEMENT</u>. The best programs in business and management in the United States are accredited by AACSB, The International Association for Management Education. Similar to NEASC and ABET, this organization establishes a set of quality criteria that must be met by member institutions. AACSB criteria [11] covers most areas of a program including the credentials of faculty, areas of study required for a degree, resources available for faculty development, resources available for the acquisition and maintenance of facilities, and entry standards for students. Those criteria also prescribe areas of study required beyond the specific business topics. For example, "ethical and global issues", "demographic diversity", and the "influence" of social, political, and environmental differences in people are required parts of an AACSB program.

This accreditation process includes a five-year candidacy term before accreditation would be considered. There is an annual fee of $1300USD during candidacy that does not include travel costs for faculty and AACSB officials to attend a number of pre-accreditation meetings and visitations. Total costs for initial accreditation usually exceeds $20,000USD. Subsequent accreditation costs are in the range of $11,000USD, and reaccredidation visits usually occur every five years.

OVERALL ACCREDITATION COSTS

Accreditation costs include annual fees to the organization, costs of providing all transportation, housing, food, and administrative support for visiting teams, and institutional costs of faculty and staff who must dedicate time to preparing reports, etc. for accreditation. Annualizing costs for these three accreditations results in an annual cost of institutional accreditation of approximately $18,000USD.

However, these calculations do not take into consideration the funds needed to maintain the standards required of the various organizations. Depending on the association, these costs can be considerable and range as high as $150,000USD per year. These represent costs that the institution would not normally incur except to maintain a specific accreditation. That is to say, a degree and license program could still be offered, but at a lower degree of quality and at the cost of loss of prestige, funding, quality faculty and quality students. Accordingly, these costs are usually inevitable for maintaining a quality program that can compete as a higher level maritime academy in the United States.

4. USCG MINIMUM ASSESSMENT CRITERIA

Between the initial notification of STCW 95 compliance by the USCG at the 1996 meeting in California and their 1999 significant impact statement, many meetings between the USCG and the maritime academies occurred. One of the most significant occurred at MARAD in Washington, DC in April of 1998. At this meeting the USCG reaffirmed that it was their intent to require the standardization of minimum assessment criteria for meeting STCW95 competencies that every academy would have to adopt. That is to say that the USCG would determine exactly what was needed to successfully accomplish each competency and each academy had to accept that as a national minimum standard. In effect, individual instructors and examiners would be required to construct curricula that included these specific criteria levels or better before any U.S. training program would be approved as meeting STCW 95 standards.

For example, to find a position using heavenly bodies the USCG would detail methods to be used, minimal accuracy accepted, what steps had to be recorded as observed, and under what conditions done. An individual competent instructor or examiner would have little leeway for professional judgement.

As another example, initial trials of minimum assessment criteria developed by a research firm hired by the USCG (Battelle Center) for the "preparation of main machinery for operation" included 28 recorded observations [12]. Carrying out this level of detail for the entire competency of starting the main engine would result in enormous paperwork and a prohibitive per student assessment time.

Developing national standards for such a wide range of training included in STCW 95 is a large and politically complex task. For example, in another initial standardization attempt the USCG proposed the adoption of a set of minimum standards for basic safety training [13] that was developed for them by a union maritime training center. The water survival standards were tailored to be used in the centers' small swimming pool and low diving platform so that the center could continue to train mariners. Accordingly, the standard for jumping from a height was set by the USCG as "not to exceed one meter". The net result was to render unacceptable all the academy safety programs that more realistically simulated a real vessel height, as they all were more than one meter high.

As the effort to create minimal national standards progressed it became obvious that the task was more difficult than anticipated. Although professional mariners from throughout the nation have met and developed sets of minimum assessment criteria for the USCG, as of this writing the USCG has yet to publish any official version. As the academy students who graduate in 2002 must meet STCW 95 standards and as most academy programs are four years in length, this means that hundreds of academy students have started their training without knowing what the USCG minimal training standards may be. It would be very difficult and expensive to have to go back and apply new criteria to years of past training.

The effort to establish national minimal assessment standards of this detail and in this manner have also threatened to take away from each academy a fundamental right of American higher education. That is the instructor's right to establish a training program that meets STCW95 criteria according to his or her professional judgement as a teacher and mariner. This right is demanded by the criteria [14] of our accrediting agencies as integral to the quality of an institution and is evaluated by each visiting team. Accordingly, the establishment of rigid national performance and assessment criteria could threaten the ability of an academy to be accredited.

Finally, when queried by MARAD [15], the federal and state academies have indicated that compliance with STCW95 has already cost them an average of $90,000USD per year in addition to their previous cost of operation

SUMMARY

In conclusion, past maritime academy STCW95 compliance efforts by the USCG has ignored the need for academies to educate as well as train from both a regulatory and accreditation perspective. In addition, it has more than doubled the cost of complying with outside regulatory agencies.

The failure to attempt to reconcile education with training, however, is the greatest problem. The USCG view that STCW95 compliance is a pure training issue which has little to do with being an educated person can result in a failure to accomplish the missions of the academies and threatens them with a loss of critical accreditation. Loss of accreditation threatens the quality of education of students and their ability to find competitive employment. More importantly, failing to educate in the manner proscribed by the U.S. Congress or in accordance with accepted degree accreditation standards means that new mariners may not have all the intellectual, ethical, and social skills of judgement needed to provide as safe and responsible ship operation as should be desirable in our world.

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BENCHMARKING – ITS APPLICABILITY TO MET

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ABSTRACT

We consider ourselves to be professionals. We get our institutions quality assured. We consider that we produce safe, well trained seafarers. But on a range of objective measures many maritime education and training (MET) institutions have failed. Failed that is to produce safe, well trained seafarers. In short, we have failed to act professionally. STCW 95 bears witness to this failure as it is not just about the competence of seafarers, it is also very much about the competence of those of us who educate and train seafarers as well as the institutions in which we work.

This paper identifies the attributes of MET institutions providing quality education and training, examines some of the issues associated with quality assurance, and considers how a MET institution might engage in benchmarking. Regardless of the innumerable external constraints there are many things a MET institution can, indeed must, do internally within the organisation to ensure core business activities are carried out in a professional manner; benchmarking assists in achieving this.

Benchmarking in MET is a relatively new concept however, if used constructively benchmarking can be used for three distinct purposes, namely:

- to ascertain performance trends so as to initiate continuous self-improvement activities;
- to compare performance between institutions in mutually agreed areas;
- to determine one's competitive position relative to others.

The paper examines a range of measures suitable for the benchmarking of MET institutions and concludes that for a MET institution to be legitimately recognised as a quality provider it needs to do much more than become quality assured.

INTRODUCTION

Teaching is an ancient and generally well respected profession and the education of our future generations brings with it an awesome responsibility. In maritime education and training (MET) it could be argued that many MET institutions have not met their responsibilities, that is they have failed to produce graduates who can become safe, effective and professional seafarers. Without dwelling on a defence of this thesis it is sufficient to point out that STCW 95 is a direct result of this failure to produce competent seafarers. As professional educators and teachers we should be ashamed that it has taken an international convention to drag MET kicking and screaming into the modern world of education. STCW 95 is not just about the competence of seafarers it is also very much about the competence of those of us who educate and train seafarers as well as the quality of institutions in which we work. Just ask yourself why it is that so many countries and their MET institutions have experienced difficulties in adopting the STCW 95 competency based approach to training. Anyone involved in education should recognise that the approach adopted by STCW 95 is a reflection of criterion referenced training (CRT), which was in vogue during the 1970s, and competency based training (CBT), which is currently in vogue. Whilst the approach adopted in STCW 95 may be new to many MET providers it is, in reality, well tried and understood by educationalists. Lewarn [1].

How then does a MET institution know how well it is performing its primary function of educating and training seafarers? What separates the good from the less good, the quality institution from the ordinary institution, or the professional from the less professional institution? To begin to answer these important issues a starting point is to identify the attributes of good quality MET institutions.

THE ATTRIBUTES OF A QUALITY MET INSTITUTION

Empirical observation shows that if you examine MET institutions which are well regarded by graduates, employers and academic staff then they are likely to possess the following attributes:

- educationally valid courses (approved and audited by a competent education authority);
- qualified staff (technically and teaching qualified);
- good facilities and equipment (suitable for the task, maintained, upgraded/replaced regularly);
- quality system comprising standards, procedures etc for anything affecting core business (valid, documented, accessible, used, maintained, audited and improved);
- external audit/accreditation (independent verification of standards of courses, teachers, teaching equipment, facilities, processes/procedures);
- quality graduates (competent, employable, reputable, professional).

Lewarn [2]

If a MET institution genuinely meets these criteria then the implementation of STCW 95 has little real effect on the institution but on the other hand if a MET institution does not meet these criteria it will need to lift its performance or be forced out of the business of MET.

It is acknowledged that MET faces specific challenges as a result of STCW and, in no particular order, these challenges relate to:

- technical and teaching competence of staff;
- quality of equipment and facilities;
- implementing a competency based approach to training;
- gaining approval from the marine administration to provide specific training and retaining that approval through regular auditing.

Considering each of these challenges in turn it is possible to identify some key measures which should assist a MET institution to evaluate the quality of its performance.

TECHNICAL AND TEACHING COMPETENCE OF STAFF

Some key measures of quality include:

- technical competence and qualifications of staff;
- teaching competence and qualifications of staff;
- staff recruitment processes;
- staff development programs;
- quality of graduates.

QUALITY OF EQUIPMENT AND FACILITIES

Some key measures of quality include:

- variety, age and relevance of equipment;
- maintenance of equipment;
- manner in which equipment is used in teaching and testing;
- standard of teaching facilities;
- quality of graduates.

IMPLEMENTING COMPETENCY BASED TRAINING

Some key measures of quality include:

- educationally qualified staff capable of proper curriculum design;
- curriculum documents aligned with STCW 95;
- curriculum documents in CBT format;
- testing methods used to determine competence;
- quality (competence) of graduates.

APPROVAL AND AUDIT

Some key measures of quality include:

- skill level of MET and marine administration staff;
- approval/audit process;
- approval/audit outcomes;
- quality of graduates.

Assuming that attaining the attributes of a quality MET institution is an aim common to all then a critical issue is just how such an aim can be achieved. A multi-pronged approach offers some hope and this should include:

- developing an institutional culture of self evaluation, desire to improve and continuous improvement;
- focusing on upgrading the technical, teaching, testing and course design skills of the staff;
- adherence to STCW 95 but recognising it is a minimum standard;
- being innovative in identifying new business and generating income: being highly focussed on core business in the budgeting process, and competent in managing expenditure;
- being aware of the threats from competitors but also the strength of networks and partnerships.

Whilst it is evident that the extent to which a MET institution can measure the quality of its own performance is limited by resources, management commitment and staff capabilities it is nevertheless important that this occurs if the aspirations of STCW 95 are to be achieved. Regardless of constraints there are many things a MET institution can do within the organisation to ensure the core business activities are carried out in a professional manner; benchmarking assists in achieving this objective.

BENCHMARKING

To paraphrase McKinnon et al [3], no single MET institution can encompass all maritime knowledge. Every MET institution has to make choices. It is demanding to be world class in even a few maritime academic fields. Each MET institution has to prioritise the use of its resources and use them to best effect but knowing whether it is succeeding in its aims is another more demanding level of difficulty. The key consequential question is how do we in MET know where our institution stands in relation to others and how can we improve our performance.

Benchmarking is not a new concept but within and between MET institutions its use is rare. It can be used for three distinct and important purposes, namely:

- to ascertain performance trends so as to initiate continuous self improvement activities;

- to compare performance between institutions in mutually agreed areas;
- to determine one's competitive position relative to others.

Whilst it is true that all MET institutions are, or should be, deeply concerned about their finances, in most aspects of their performance MET institutions should be measured by criteria other than profit or return on assets. This is because the primary functions of a MET institution is to teach, research and provide services to the maritime community - it is performance in these areas that should be treated as priority measures.

How then should the process of benchmarking be approached? Chang and Kelly [4] identify a seven step process to follow, namely:

- identify what to benchmark;
- determine what to measure;
- identify who to benchmark;
- collect the data;
- analyse data and determine gap;
- set goals and develop a plan;
- monitor progress.

As a process this is not particularly difficult to follow but it is evident that there are innumerable possible activities which could be measured. In the context of Australian Universities McKinnon et al [5] identify twenty five benchmarks which are listed in Table 1 and which they consider to be valid for all types of universities. As MET is but one part of the overall education and training system it is not unreasonable to consider that some or all of these twenty five benchmarks have validity in the context of MET.

Table 1: Twenty five core benchmarks

1. Governance and Leadership
2. University-wide Planning
3. Clearly Defined Lines of Responsibility
4. Organisational Climate
5. Reputation
6. Competitiveness
7. Operating Result
8. Commercialisation: Net Return on Equity
9. Strategic Asset Management
10. Space Management
11. IT & T Infrastructure
12. Learning and Teaching Plan
13. Fitness of Courses
14. Student Satisfaction
15. Employability of Australian Graduates
16. Student Administrative Services
17. Research Higher Degree Completions per Academic Staff
18. Weighted Research Publications per Academic Staff
19. Research Impact
20. Library and Information Services: Contribution to Teaching and Learning
21. Library and Information Services: Provision of Support for Research
22. Culture of Internationalisation
23. Balanced Onshore International Student Programme
24. Strategic Human Resources Planning
25. Career Development/Staff Effectiveness

These twenty five benchmarks have been chosen because they focus on the things which are considered to really matter in the context of university education.

In order to illustrate how such benchmarks are used the benchmark related to Fitness of Courses, McKinnon et al [6], is reproduced at Appendix 1 as an example. Here are illustrated the key points of any benchmark namely:

- rationale;
- data sources;
- good practice;
- levels of performance;
- assessment.

Whilst one could debate the detail of any benchmark the real point is that if we as professional educators and teachers do not know how well we and our institutions are performing then how will we really know if we have achieved the broad aims of STCW 95. Approval by a marine administration is surely a minimalist approach.

Benchmarking then should be seriously considered by any MET institution which aims to both understand how well it is performing and what it needs to do to improve its performance.

CONCLUSION

It is not particularly difficult to identify the attributes of good quality MET institutions. However, attributes tend to be subjective and are, thus, open to question. It is not particularly difficult to become a quality assured MET organisation. However, quality assurance is only a way of proving that what you say you do is what you actually do and, as such, does not indicate how well the institution is performing. Benchmarking is all about performance and, as such, is the fundamental base upon which continuous self improvement should be built.

For all of us in MET benchmarking offers the opportunity for improved performance which, surely, is in line with the broad objectives of STCW 95. But where to start? Much has been written on benchmarking in general but as Macneil et al [7] suggest, benchmarking is not hard but it is different. The International Association of Maritime Universities could facilitate a pilot project amongst a few of its members, or a group of like minded MET institutions might agree to benchmark amongst themselves. Whilst the way forward is debatable it is clear that as the turmoil of STCW 95 is overcome we must not become complacent and believe the task is complete. As MET institutions we must understand how well we are performing and this is where benchmarking has its role.

To paraphrase Evans [8], benchmarking is a good starting point for anyone wanting to run a better MET institution. Benchmarking won't show you how to do things better, but it will highlight those areas you need to work on to improve performance.

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Appendix 1

Area : Quality assurance

Element : Fitness of courses

Type : Learning

Benchmark rationale : Benchmarking the quality of courses and their outcomes against the desired characteristics of graduates, as determined by a particular university, tests how well each course is achieving what it has set out to do, that is, the fitness of its courses.

Sources of data : The benchmark relies on data from other benchmarks (eg, 4.2 Competitiveness; 6.7 Student Progress; and 6.10 Student Satisfaction), plus student assessments of teaching, employer surveys.

Good practice

The fitness of courses to achieve the characteristics desired of graduates of that university depends upon six factors:

- turning each of the desired attributes into operational requirements (mastery of content and professional skills outcomes are easier than attributes such as communication ability, leadership, ethical standards);
- incorporation of operational requirements into courses;
- successful teaching to those criteria;
- the tightness of fit between course requirements and the desired characteristics;
- evidence of continuous improvement, based on specific appraisals of the desired outcomes;
- evidence of value adding, that is, that graduates do acquire and are aware that they have the target; knowledge, skills and attitudes, that they realise how to apply these to best effect, and that they desire to continue increasing them.

Good practice will monitor how much value adding for students is occurring, that is, how well the teaching approach is geared to the preparation of the learners, engages them in learning and achieves high standard outcomes.

Good practice also requires that a feedback cycle, integrating evidence from graduates and employers, ensures that the fit between the course and the desired attributes is constantly getting closer.

Levels

1	2	3	4	5
The attributes desired of graduates are not defined. Course objectives are defined separately for each course and may bear no resemblance to the desired attributes of graduates. There is no feedback cycle. Modification of course proceeds on traditional discipline criteria. Evaluation of outcomes by graduates and employers not undertaken.		The attributes desired of graduates are defined. There are substantial attempts to incorporate the attributes into the courses, but teaching to those outcomes is not specific. There is no feedback cycle. Modification of courses proceeds on more traditional discipline criteria. Some evaluation of outcomes by graduates, and employers.		The attributes desired of graduates are defined. There are universal on-going attempts to incorporate the attributes into the courses in all units and to teach for those outcomes. There is an integrated feedback cycle when the outcomes of courses, evaluated by peers, graduates and employers, are mapped to the desired attributes. Actual outcomes lead to modification of courses, teaching and learning arrangements, or conversely, the attributes are modified.

Self assessment : ....
Check assessment : ....

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PRESENT SITUATION AND PERSPECTIVE ON RESEARCH AND EDUCATION IN THE MARITIME SOCIETY

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ABSTRACT

The tremendous progress of science and technology and the economical conditions in shipping industry have been brought about the innovative changes on the ship operation such as computer-based navigation or mixed crew system. In this paper, author discusses the system of research and education in maritime society focusing on future ship operation technology. At first, author defines what is the maritime technical society and what activities are indispensable for the society, then proposes the imaged of future ship operation technology as a goal. There is a significant technological trend in the present and future ship operation, that is, to reinforce supporting function on shore in addition to self-contained function on board as indicated with ISM codes. This means there should be established another new professional field in the maritime education and research system concerned with ship operation such as fleet operation and maintenance, not the ship operation itself.

1. PREFACE

It is well known that the technology and management of ship operation have been rapidly changed along with the progress and innovation of science and technology and with economy growth over the world. Recently, the ship operation has standardized world-widely. The revision of STCW Treaty and the setting of ISM Code by IMO are taken for example. On the other hand, new tasks of giving technological support and of assessing are often required relating to the emergence of ship operation not complying with such criteria or standards and to the method of determining the standard.

In every society of any field, it is its culture and scientific technology that creates society and innovates on it. Education gives training to human resources in each culture. Research is aiming at the development of society through scientific technology. Figure 1 indicates an image of the activities of maritime technical society.

Education and research should be done

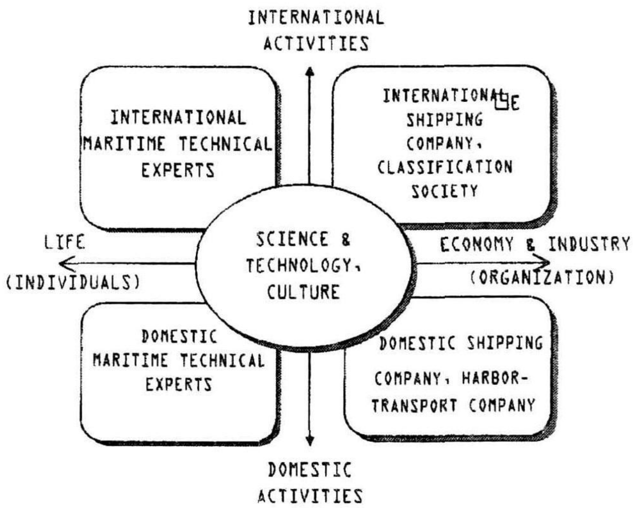

FIG.1 ACTIVITY FIELDS OF MARITIME SOCIETY

in accordance with evaluating what the next generation society would require, not just meeting the present society requires. Therefore, it is very important to set the goal as specific as possible for the development of society in the first half of the coming century, since an approach to the goal is what education and research mean, which is the theme of this paper.

The author defines the goal of future maritime technical society as " the society where we transform ship operation technology of the global transportation system into the technology integrating both land and marine transportation from the technology of ship centered, self-completed function". There are such keywords as safety, resource saving and environmental conservation, where people working can feel satisfied at work.

To approach the goal, we have to improve the quality of human resources engaged in ship operation, present and future. We also have to build mutual support relationship beyond traditional framework and develop the new technology in maritime field. Maritime education institutes should play the central role of such development.

The goal and the way to approach it are inseparable, however, the author will first describe the goal and then discuss the way to approach.

2. IN THE FUTURE SHIP'S OPERATION TECHNOLOGY

2.1 TECHNOLOGICAL FIELDS IN MARITIME SOCIETY

Technological fields required for maritime transportation system are as follows: operation method (transportation method, maintenance of vessels), operation management (vessel management, navigational support), vessels (maneuverability, propulsion), services environment (artificial environment, natural environment). Figure 2 shows the above technological fields classified into 4 categories; system technology, factor technology, software technology, and hardware technology. In each frame of technological fields, the technologies are further divided to show an image of each field.

The field required for seamen as ship operation technology would have been the software technology and factor technology

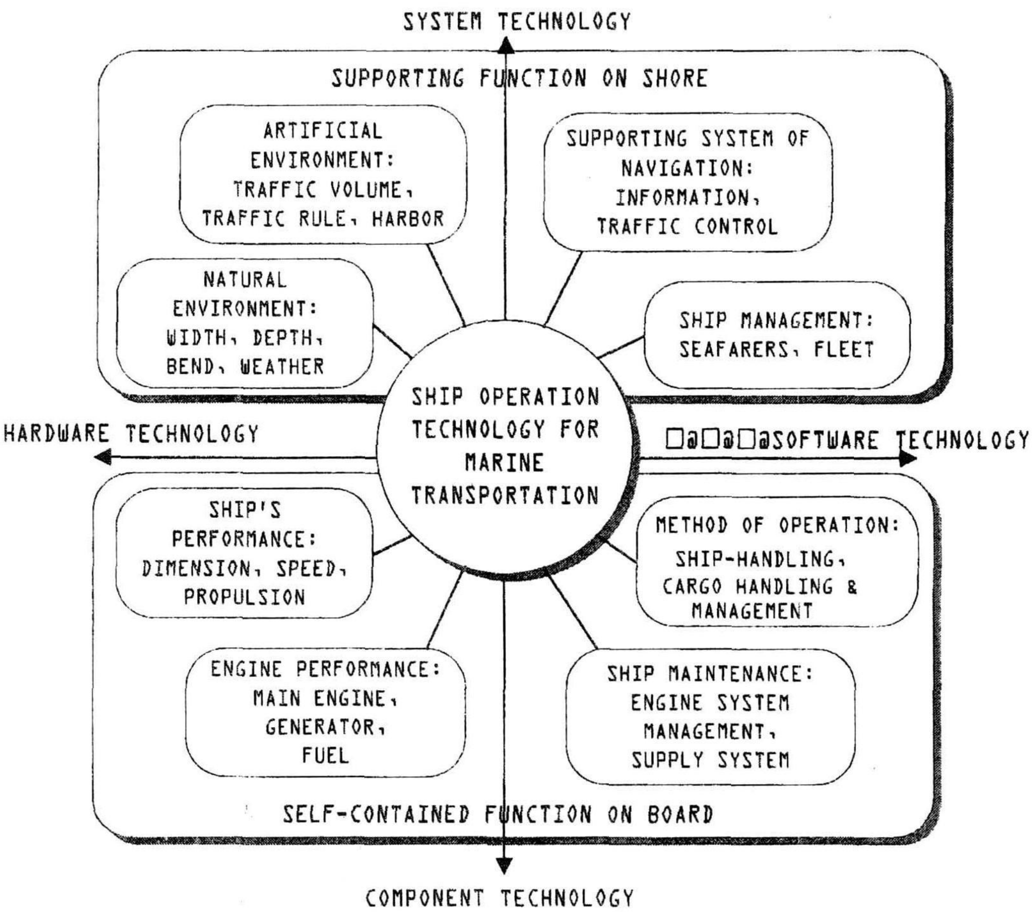

FIG.2 FIELDS OF SHIP OPERATION TECHNOLOGY

mainly consisted of operation method in the fourth quadrant. Vessels in the third quadrant are belonging to the shipbuilding and marine engineering field. Service environment in the second quadrant is the field managed by public administration as social infrastructure, such as port's facilities, maritime security and weather forecast etc.. On the other hand, operation management in the first quadrant is the field, which is managed by ship operation experts at shore of shipping companies. In this figure, the third and fourth quadrants come under the self-completed function and the first and second quadrants come under the support function. Seen from the above, maritime technical society is mainly concerned with the right half of Figure2, which is software technology in the fourth and first quadrants.

2.2 THE ROLE OF EXPERTS FOR SHIP'S OPERATION WOULD BE SAFETY MANAGEMENT

To examine what kind of technology and standard in these fields are required for the future ship operation experts would be the first step to set the specific goal for education and research. So far, the technology required for seafarers was the operation method in the first quadrant. As the systematization of the supporting function at shore in the first quadrant in Fig. 2 was ambiguous, however, the discussion on the desired field of technology became also ambiguous. And that cause the different views on how to train human resources required for such operations.

It is our important aim to embody the specific knowledge, which is required for these fields, in the maritime safety management technology. IMO asks for reinforcement and perfection of operation management system by transferring the safety responsibility under ISM Code from the captain to corporate responsibility of shipping companies.

As ship operation system on board could be discussed on the same line with the traditional technology, author will discuss the technology necessary for operation management system at shore.

2.3 SHIP OPERATION TECHNLOGY AT SHORE FOR ESTABLISHMENT OF TQC

When the navigational function of a ship is mainly intensified at her ocean service, the managing and supporting system will be more required for shipping companies as a result. This means we need management technology, which enables us to recognize by what indicator we could detect the safety of ships at sea and by what indices we could forecast the danger. In other words, it is important to establish TQC (Total Quality Management) technology of the company's fleet. Though we can think of various kinds of TQC according to its coverage and time duration, we will finally be required to employ real time operation monitoring system based on the information technology using satellites.

After the establishment of ISM Code, the systematization of shipping management technology at shore is under the way in shipping companies and maritime research institutes. For example, the research of fleet operation system by Maritime Problems Investigation Committee in Japan (Incorporated Association) pointed out 6 operational functions as ship operations at shore including general management, ship management, treaty management, personnel management, etc. In order to perform these operations smoothly and efficiently, we need knowledge of management technology, including operations research and reliability engineering as well as basic knowledge of conventional ship operation.

3. WHAT KIND OF HUMAN RESOURCES ARE REQUIRED?

3.2 VARIETY OF TASK PERFORMING ABILITY

In maritime technical society, technical level has been classified based on the seafarers' qualification system. This is a certification of capabilities as a seaman on board according to his task. With this system, it is clear that the knowledge and experience has been a big help for the above-mentioned "ship operations at shore". But we have to examine whether the technology required on board is sufficient for operations at shore as it is. We would rather need another qualification and education system according to the role assumed in the system of operational technology integrating both sea and shore. At the same time, it is important to train human resources according to their ability to perform their tasks in the field of technology, either at shore or at sea.

The following three types of training are necessary for human resources development.

(1) Goal-achieving type:
Human resources that is able to achieve the given goal steadily.

(2) Problem-solving type:
Human resources that is able to solve the given problems by utilizing the acquired knowledge and experience in theory and practice.

(3) Problem-setting type:
Human resources that is able to discover problems and seek to solve them on their own.

Not only in maritime technical society but also other fields, goal-achieving type human resources have been mostly sought. But in the field where technical innovations are much required, more human resources of type (2) and (3) are much more required. Industrial divisions where many of these types of human resources are employed will be able to survive in the future.

3.3 CONTENTS OF FUTURE EDUCATION

It is said that what should be taught at present education institutes are thinking ability (logical thinking and broadness of views), knowledge (basic knowledge and practical knowledge), attitude (presentation ability and positive attitude) and skills (language and computer skills).

Maritime education in history shows that importance given to these subjects has been changed along with the progress of technology. Attached importance has been changed (1) from skill (working ability) to knowledge and (2) from knowledge to thinking, and on top of that, to the sphere where attitude to study is considered important, making a spiral elevation. Figure 3 shows such changes as an image.

When universities become accessible to the young generation due to getting less in the number, education to develop basic academic ability to pursue one's own theme will be necessary instead of giving only knowledge at the undergraduate level.

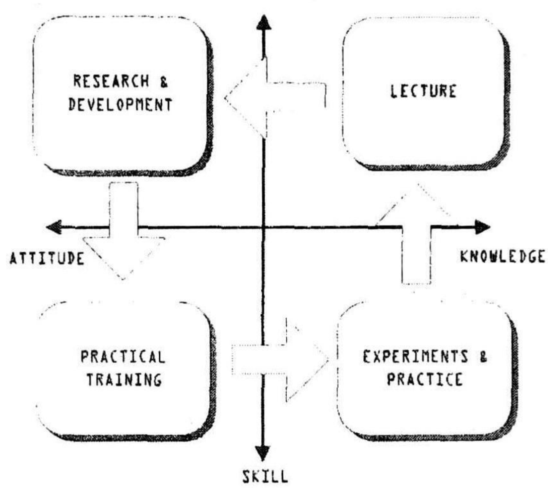

FIG.3 CIRCULATION OF EDUCATIONAL METHOD

3.3 HOW TO EDUCATE STUDENTS

Under the Japanese education system, higher education to freshman is given at universities and technical colleges. After entering private enterprises, education is given through company training system mainly based on OJT. Maritime education is given in the similar system. For seafarer education, there are many educational institutions; universities, technical colleges and seamen's school for freshmen, maritime college for mostly reeducation purpose, and the institute of sea training as a joint facility.

Three types of training of human resources described above correspond to the Japanese higher education system as: (1) goal-achieving type to undergraduate and college level, (2) problem-solving type to master course of graduate school and (3) problem-setting type to doctorate course of graduate school. We have an on-board training system by institute of sea training as a joint system. That functions as a bridge between school education and business at the basic education level. But reeducation system for seamen, which bridges between education institutes and enterprises in order to give problem-solving education, is not sufficient. Training at enterprises should be introduced under an internship program for undergraduate students in addition to sea training on training vessels.

It is essential to give refreshing education of graduate level for people now working in maritime technical society to continue their jobs and create new jobs. It is an urgent task for maritime technical society to establish a system inside and outside of universities in which maritime experts can study while working or receiving financial support.

Figure 4 indicates the image of the educational system of maritime technical experts.

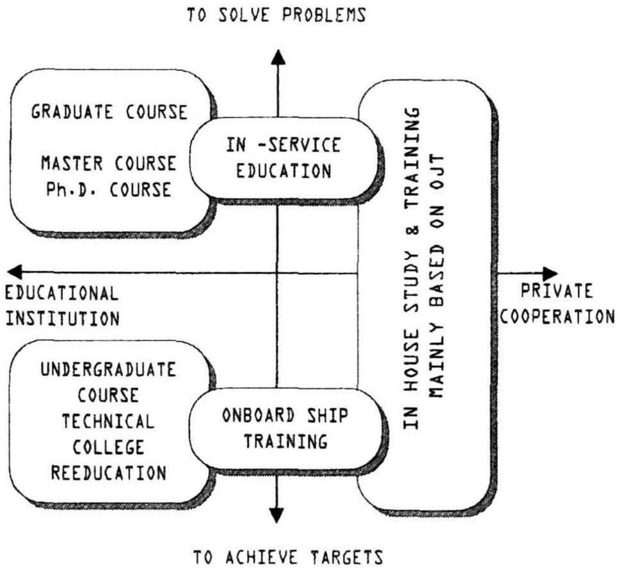

FIG.4 EDUCATIONAL SYSTEM OF MARITIME ENGINEER

3.4 THE ROLE OF INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES

The globalization of maritime companies is more rapidly progressing than another industries as we can see from the development of consolidated boarding and the global alliance of shipping companies. Maritime education institutes are also in the age of international cooperation and competition. One of the remarkable attempts is the foundation of this International Association of Maritime Universities, (IAMU). IAMU is trying to promote research and study with the following common goals among Maritime Universities with graduate schools in the world:

(1) What the maritime education and training for next generation should be

(2) What the future education for safety management at sea should be

(4) What the worldwide excellence of maritime education should be.

These three main issues are important and common to all maritime universities.

We believe that human resources training in the 21st century will be developed through such a global alliance of maritime universities.

4. CONCLUSION

Author has imaged the future ship operation technology, placed on education and research as an approach to that goal, and then described what maritime education should be. He believes that we have to think of the role of education and research institutes in maritime society from the viewpoint of innovation of maritime technical society. Though this discussion, we could find the starting point for the vitalization of education.

In Japan where the number of younger generation is decreasing, we cannot sustain maritime technical society that is rapidly changing merely by passing on to them the same thing we have learned. The number of people engaging in maritime affairs is decreasing. This fact is indicating that the quality improvement of these people is imperative. We must not reproduce copies of ourselves, and we have to put up an ambitious goal at which younger generation could set a high aim.

Under these considerations, Kobe University of Mercantile Marine has just started the reform of whole education and research system of the university toward 21cetuary under above considerations.

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GLOBALIZATION OF INCREASING OF MARITIME EDUCATION LEVEL

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ABSTRACT

Scientific research which has been carried out in Far Eastern State Technical Fisheries University for recent two decades shows the urgency of regular correction of training marine specialists. The conditions that point to the necessity of the correction are fast development of modern navigational methods and requirements of IMO convention.

Theoretical statements used in structural analyses of training of officers for providing marine safety allowed to determine the main ways of improvement of the existing training system. The ways are: automation of production processes, application of computer techniques, special training. As a result of detailed structural analyses of marine educational systems we drew to certain conclusions on the negative aspects of the systems. The negative aspects are as follows:

- lack of unification in training, regular retraining and certification of marine specialists (this can be improved through the activity of marine education centers)
- lack of unification of simulators for certification of marine specialists.

Conclusions and suggestions including the problem of intensification of training process due to application of new techniques and implementation of tariffs for teaching staff are of great interest for the authors.

NOMENCLATURE

Hereinafter we use terms common for international maritime practice, otherwise specified.

In order to avoid misunderstanding we offer the following terms and abbreviations:

1. IMO - International Maritime Organization
2. System graphical research - analysis of structure of certain system with the help of a body of mathematics of graph theory.
3. Top graph - representation of real system in form of blocks (vertexes and elements) and connections (transmission and interactivity) between them.
4. Rib graph - representation of certain scheme as a result of modification of graph. Connections, information, interactivity or functions become vertexes and real and quasi-elements become edges.
5. Navigation - process providing safe sea faring and aiming at achievement of set purposes.
6. Fishing navigation - process providing safe sea faring and influence on parameters of production process carried out on board fishing vessel (motion of vessel, search and harvesting of fishing objects)

7. FSAD - fish searching acoustical devices
8. DSP - determination of ship's position.

SYSTEM APPROACH TO IMPROVEMENT OF QUALITY OF MARITIME TRAINING OF FISHING FLEET NAVIGATORS

Introduction

Eagerness of maritime teaching staff to improve quality of maritime education through its globalization is natural. The quality level is predetermined by requirements of corresponding International IMO Conventions and state standards, curricula, training programs etc. Thus, maritime education goes behind practical needs.

That is why leading scientists and seafarers develop certain potential aspects of development of navigational devices and methods for the subsequent improvement of quality of maritime training. In Russia a great contribution to investigation and increasing effectiveness of navigation was made by Y.K. Baranov, R.B. Brandt, V.V. Veykhman and others. A.I. Rodinov, A.E. Sazonov, Y.N. Fimilov and other authors devoted their studies to automation of navigation and increasing accuracy of navigational information processing. V.V. Konovalov, K.N. Zuyev, M.I. Kogon and other scientists contributed much to development of simulators and imitation devices intended to train navigators. Of certain interest are engineering and psychological studies of navigator's activity and marine safety conducted by E.M. Lushnikov, V.O. Ramm. Technical ideas of A.A. Andreev, L.P. Gostomyslov, A.I. Karapuzov and some other experts aim at solution of navigational tasks at fishing. Fundamental background of complex automated decision making system was laid by M.I. Gabryuk, L.A. Zemnukhov, V.M. Lobastov and O.V. Nemtsev.

Chair of navigation at Dalrybvtuz has carried out system analysis of professional activity, training and its improvement for more than 20 years. A new approach has been developed which allows to formulate requirements to corresponding maritime training programs based on real working conditions at sea. This approach allows to correct educational process with regard to practical needs before they are confirmed by IMO regulations. Distribution of the approach will allow to realize global structure of qualified maritime specialists for fleet vessels.

The present paper contains the task, theoretical studies, ways of practical solution and problems of global approach to fishing fleet navigators.

Theoretical subjects

System approach to investigation of fishing navigation system (FNS) was first applied by the author in 1989 [E.M. Zhidkov, E.N. Malyavin, 1]. The main point of the approach is that every system presents an integrated unity even if it comprises various functional systems and subsystems. Each system has several indicators and relationship between them can vary. System approach methods let us solve two main tasks: determination of system elements value and relationship between them; evaluation of quality of structural scheme of the system and recommendations on its improvement. Thus, solution of these problems would allow to find common approach to improvement of maritime education quality.

The main condition of successful system analyses is usage of adequate system model. For FNS we developed a system model which takes into consideration both functional and probable relations and their interaction in system.

The model can be represented in form of oriented top graph, vertexes of which are formed by FNS elements, and edges are represented by interaction and informational relations in system [V.I. Nechiporenko, 2]. Analysis of such model allows to give recommendations for achievement of the following tasks: 1) functional unloading of some system elements; 2) strengthening of weak units through functional redundancy; 3) redistribution of efforts in order to achieve the desired quality of system functioning.

For a detailed analysis we have to change from the adopted representation of FNS in form of top graph to rib graph. This shift makes it possible to represent physical parameters of system elements to graph links and to accumulate all the logical conditions in vertexes.

Such method applied to a certain system model is given below in details.

<u>Structural analysis of system of professional activity of navigators.</u>

Professional activity of navigator is carried out in FNS. The model represented herein is based on system analysis conducted by Chair of navigation at Dalrybvtuz in late 60s, observations and experimental data from fishing vessels taken in 70s-80s as well as on theoretical statements and evaluation made by experts.

Top graph of FSN model is given on Fig. 1.

In order to built rib graph equivalent to given top graph we present matrix of influences in the following form:

$$\left\| l_{ij} \right\|_1^{11} = \left\| \begin{array}{cccccccccc} 1 & & & & & & 1 & & & \\ & 1 & 1 & 1 & & 1 & & & & \\ & & & & & & 1 & & & \\ & & & & & & 1 & & & \\ & & & & 1 & & & & 1 & \\ & & & & & & 1 & & & \\ & & & & & & 1 & & & \\ & & & & & & & 1 & & 1 \\ & & & & & 1 & & & 1 & 1 \\ & & & & 1 & & & 1 & & \end{array} \right\| \qquad (1)$$

Based on matrix $\| l_{ij} \|$ (1) and using the quasiconical matrix theorem we build matrixes $\| S_{ij} \|$ and $\| C_{ij} \|$. Elements of matrix $\| S_{ij} \|$ are defined according to formula

$$S_{ij} = l_{ij} \left(\sum_{i=1}^{11} l_{ij} + \sum_{j=1}^{11} l_{ij} \right) \qquad (2)$$

Where $\sum_{i=1}^{11} l_{ij}$, $\sum_{j=1}^{11} l_{ij}$ are sums of units in lines and columns of matrix $\| l_{ij} \|$.

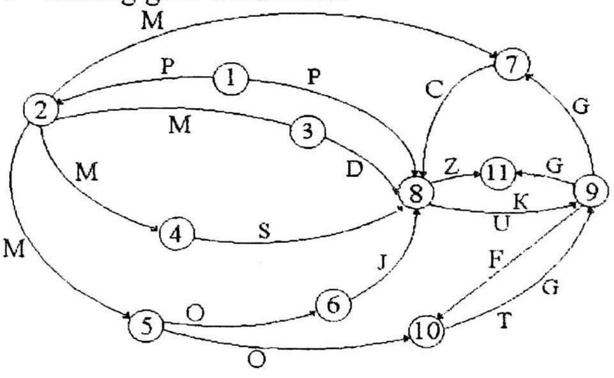
Computing according (2) we obtain matrix as follows:

$$\left\| S_{ij} \right\|_1^{11} = \left\| \begin{array}{cccccccccc} 3 & & & & & & 7 & & & \\ & 5 & 5 & 5 & & 6 & & & & \\ & & & & & & 6 & & & \\ & & & & & & 6 & & & \\ & & & & 4 & & & & 4 & \\ & & & & & & 6 & & & \\ & & & & & & 6 & & & \\ & & & & & & & 4 & & 4 \\ & & & & & 5 & & & 5 & 5 \\ & & & & 4 & & & 4 & & \end{array} \right\| \qquad (3)$$

Fig. 1. FNS top graph

System blocks: 1.- task block; 2.- transit and fishing grounds; 3.- ship's location definition block; 4.- safety block; 5.- fishing object; 6.- fish searching instruments; 7.- other vessels; 8.- navigator; 9.- vessel; 10.- fishing gear; 11.- estimation block

Influences in system: P - voyages task, M - area characteristics, D - current coordinates data, S - current safety estimation, O - influence of fishing object and gear, J - fishing object information, C - information from other ships, Z - given criterion, U - governing influences, K - course, G - cargo amount information (made product), F - influence of vessel on fishing gear, T - fishing gear influences.



Elements of matrix $\|C_{ij}\|$ are calculated based on formula

$$C_{ij} = l_{ij}\left(\Delta_{j/i}S_{ij} + \Delta_{i/j}S_{ij}\right), \qquad (4)$$

where $\Delta_{j/i}S_{ij} = \left(S_{ij} - \min_{j} S_{ij}\right)_{i}$ is sum's excess of data-in and data-out half extents for element l_{ij} in i-line in comparison with element having minimal value $S_{ij} \neq 0$ in this line;

min S_{ij} is minimal data-in and data out half extents sum value for elements $l_{ij}=1$ in i-line;

$\Delta_{j/i}S_{ij} = \left(S_{ij} - \min_{j} S_{ij}\right)_{i}$ is sum's exceed of data-in and data out half-extents for element $l_{ij}=1$ in j-column in comparison with element having minimal value $S_{ij} \neq 0$ in this column;

min S_{ij} is minimal value of data-in and data-out half-extents sum for elements $l_{ij}=1$.

If to continue calculations we shall define the final matrix as follows:

$$\|C_{ij}\|_{1}^{11} = \left\| \begin{array}{cccccccccc} 0 & & & & & & 5 & & & \\ & 0 & 0 & 0 & & 2 & & & & \\ & & & & & & 0 & & & \\ & & & & & & 0 & & & \\ & & & & 0 & & & & 0 & \\ & & & & & & 0 & & & \\ & & & & & & 0 & & & \\ & & & & & & & 0 & & 0 \\ & & & & & 0 & & & 1 & 1 \\ & & & & 0 & & & 0 & & \end{array} \right\| \qquad (5)$$

Method of rib graph tops numeration according to [O.Ore, V.I. Nicheporenko, 3] allows to shift to a new rib graph shown in Fig. 2.

Additional symbols for Fig. 2: 12. - fishery strategy choosing block, 13. - FSD information interpretation block, 14. - fishery strategy implementing block, 15. - navigation and ship monitoring block, 16. - fishing object recognition block, 17. - monitoring criterion working-out block, 18.- ship monitoring control block, 19.- influencing factors analyzing block, 20.- optimization block; a - start of system activation, b=P, c=M, d=T, e=G, f=(P,D,S,J,C) - information for ship's navigator, i = information on target function, k - influences of vessel, l - end of activity.

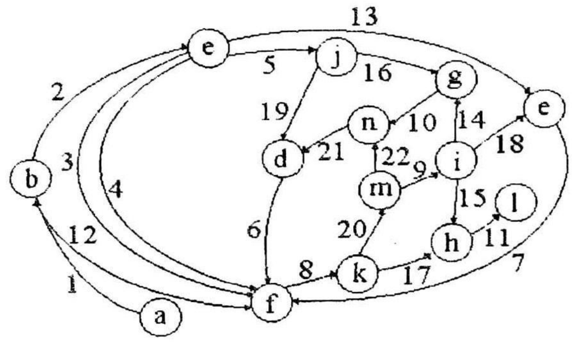


Fig. 2 is equivalent to Fig. 1 as it preserves the same system of binar oppositions. If we connect middle points of ribs of the graph in Fig. 2 we shall get original tops of the graph.

Thus, in accordance with Fig. 2 we have determined group of quasielements which are necessary for improvement of effectiveness of the whole FNS. These groups contain elements represented in Tab. 1

Elements and links of equivalent rib graph Table 1

Tops of the graph (influences, links, FNS signals)		Data-out signals of tops of rib graph (ribs of equivalent graph)	
Mark on the graph	Corresponding data-out signals or their functions	Rib No.	Name of the corresponding element
1	2	3	4
a	Start of system activation	1	Task block

1	2	3	4
b	b=P - voyage task	2 12	Transit and fishing grounds Influencing factors analysis
c	c=M - area characteristics	3 4 5 13	Ship's location definition block Safety block Fishing object Fishery strategy choosing block (FNS quasielements)
d	d=T - fishing gear influences	6	FCD
e	e=G - cargo amount (made product)	7	Other vessels
f	Information for navigator	8	Navigator
g	g=0 - influence of fishing object on fishing gear	10	Fishing gear
h	Influence of navigator	11	Estimation block
i	Information for navigator on target function	14 15 18	Fishing strategy implementing block F_{14} (G,D,O) (FNS quasielement) Navigation and ship monitoring block F_{15} (G,KZ,U) (FNS quasielement) Ship monitoring block at fishing time F_{18} (G,D) (FNS quasielement)
j	j=0 - influence of fishing object on fishing gear	16 19	Estimation block F_{19} (O,T) (FNS quasielement) O interpretation block (FNS quasielement)
k	Governing decision of navigator (U,Z)	17 20	Monitoring criterion working-out block F_{17} (U,Z) (FNS quasielement) Optimization block F_{20} (U,K,T) (FNS quasielement)

1	2	3	4
m	m=T - fishing gear influences	9	Vessel
n		21 22	Optimization block F_{21} (U,Z) (FNS quasielement) Optimization block F_{22} (O,T,U,G,F) (FNS quasielement)
1	End of activity		

Shortcomings and methods of improvement

From the above analysis of system of professional activity of navigator we can draw to a conclusion about necessity of its improvement (FNS quasielements) and methods of implementation. The results are included into Tab. 2.

Contents of quasielements and new links in FNS structure — Table 2

Quasielements, new links	Symbols (Fig. 2)	Tasks being solved	Ways of improvement	
			main	Secondary
1	2	3	4	5
1. Regulating factors analysis block	12	Computing ones	Automated system of decision making (ASDM)	Automation of navigation
2. Fishing strategy choosing block	13	Computing ones	ASDM	Training
3. Realization block	14	Technical and computing ones	ASDM	
4. Navigational and ship monitoring block	15	Technical ones	Automation of navigation	ASDM, Automation of ship's control when fishing, training
5. Recognition block	16	Technical and computing ones	Automation of ship's control when fishing	Training
6. Block of monitoring criteria choosing	17	Computing ones	ASDM	Automation of ship's control when fishing
7. Ship's control block when fishing	18	Technical and computing ones	Automation of ship's control when fishing	Training
8. Fishing object and gear interinfluences estimation block	19	Technical and computing ones	Automation of ship's control when fishing	Training
9. Monitoring optimization block	20	Technical and computing ones	ASDM	Automation of ship's control when fishing
10. Optimization of FCD mode	21	Computing ones	Training	ASDM
11. Optimization of vessel and fishing gear interinfluences	22	Computing ones	Automation of ship's control when fishing	Training, ASDM

Tab. 2 analysis shows that FNS improvement which provides required quality of education can be systemized through analysis of FNS subsystem according to the above method.

CONCLUSIONS

Thus in order to drawing criterion of maritime education to the required level we need system approach principles of which are stated above for one of maritime specialties and can be applied to another educational programs.

One of the main results of the analysis in coincidence of investigation research with the requirements of IMO in force at present or being adopted. Besides our approach allows to forecast global requirements to maritime education before they are considered by IMO.

As a result, globalization of improvement of maritime education can be achieved through constant research on the suggested theoretical basis. Moreover, a separate problem in maritime education improvement is lack of world-wide level of maritime teaching staff salaries

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ON THE REASON AND SIGNIFICANCE OF THE CORE CONCEPT OF IAMU

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ABSTRACT

The international shipping has been undergoing significant changes in the past three decades. The latest one is described as globalization. It is generally considered that the wave of globalization is big enough to change the present system of international shipping to something fundamentally different.

At the time of change, it is useful to look into what is changing and what is not, and to find out whether the very basic principle of the exiting system is also changing or not.

To have a clear understanding and perspective on the future of the international maritime sector including maritime education the existing basic principle. The author argues that the basic principle of the international shipping is *intact*, and that it will continue to be so toward the foreseeable future.

The system which is intact is the legitimate institution which generously permits FOC(Flag of Convenience) to exuberate. The key issues in the international maritime society today, namely safety and protection of environment, are the logical yet unwelcome results of this legitimate institution.

To cope with the untolerable degree of maritime casualties, in other words, deterioration of the quality of international ocean shipping, STCW95 and ISM Codes are introduced to take full effect in 2002. Whether these countervailing measures to remedy the ill effects of FOC were the truly effective cure, or only a symptomatic treatments are yet to be seen.

The author intends to clarify the basic principle of the existing international maritime system, and the mechanism of deterioration of quality of shipping services inherent to flagging out, thence to consider the logical direction to cope with the vicous dynamism built-in to the existing international shipping system.

[I] THE REALITY OF INTERNATIONAL SHIPPING MARKET

The international shipping market has been dominated by the traditional developed shipping countries(TDSC) throughout the post World War II era till today. Although the national flag fleets of the TDSC have been declining in terms of size, and the number of vessels registered thereto, in terms of actually *controlled* fleet, the share of TDSC is soundly maintained and still keep the dominant position in the world shipping marketplace. For example, "[T]here has been no reduction in the EC share in global ownership since 1990."<1>

One of the most comprehensive study on the current international shipping reality is the EC Commission Report, which, for example, states "[T]the main reason for flagging out is overall cost savings, with crew costs, tax and fiscal costs being cited most often."<2> The similar situation can be seen in other country like Japan. The implied reality is that flagging out develops irrespective of the national shipping policy of her mother country because of the economic rationale inherent to FOC.

It is often pointed out that the international shipping market is one of the most open markets of all the industries. In other words, the theoretical principles of economics work in the purest form in this real market. Hence it is one of the most competitive market of all. With the near collapse of the freight conference system, the competitive environment in the international shipping markets not only of tramp, but also of liner has been getting severer and severer, thus the inevitable pressures for shipowners to minimize their costs in producing their commodities(i.e. *the service of carriage of goods by sea*) to be supplied to the market.

As we see closer in the later section, in most cases, the biggest cost item for shipowners is crew cost, then followed by maintenance and repair costs(including docking expenses) and insurance costs. It is worthy to note that all those are cost items of so called operating expenses. Owners do not consider capital cost as the item suitable for cost reduction because of the terms and conditions of ship finance agreement with banks and other financiers. Therefore they concentrates their cost saving effort in operating(running) expense items.

TDSC have always been dominating the international shipping market because of the high credibility of the shipowners of TDSC in the international ship finance market, which has facilitated TDSC owners to obtain far better finance terms than those of developing coountries at the time of their acquiring ships, hence TDSC owners have been enjoying far more competitive capital cost. By flagging out, they can achieve the best competitive wage cost level equivalent to or less than those of the owners of developing countries, thus they have realized the cheapest operating cost as well. The combination of the two realizes the best cost competitive vessels in the international shipping market. The logical conclusion is that FOC is the system that realizes the best cost competitive ships to the shipowners of TDSC.

As there is so far no sign of questioning the concept of FOC per se in the international maritime society, and as the institution of FOC has the best possible economic rationale to owners of TDSC, it is reasonable to conclude that FOC system will continue to be the fundamental feature of the international shipping system also towards the new millennium. The old principle still prevails.

[II] THE LEGITIMACY OF FOC AS AN INSTITUTION

A. FREED FROM CONTROLS

The tanker who was built in country A, registered in country B, owned by a company in country C, chartered by a company in country D, carrying a cargo shipped by a shipper in country E to a consignee in country F who had resold the cargo to a company in country G, was under the command of a Master of country H, with a chief engineer of country I, and junior officers from countries J and K, and ratings from country L, ran aground off the coast of country M, which had caused an extensive oil pollution affecting the coasts of countries of not only M, but also N, O, P.....

This is nothing out of ordinary in the international shipping today. This is the symbolic illustration of the reality of the international shipping today.

It is well recognized that a off-shore shipowning company is a paper company without substance. The laws of off-shore country permit that the actual shipping business of the actual parent company domiciled in the foreign country in its entirety can be carried out anywhere. There are no restrictions on where the company account is to be kept, where the shore staff are to be deployed. The nationalities of seafarers serving on board the vessel registered to the off-shore country are not necessarily be the nationals of that FOC country. This means that seafarers on board the FOC vessel do not have any substantial relationship with the national economy including the domestic labor market of that FOC country. As far as their labor relationship is concerned, the seafarers on board FOC vessels do not have any practical ties with off-shore country, nor with his mother country.

The link is barely maintained by a thin string of ship registration.

B. THE PRODUCT WITHOUT COUNTRY OF ORIGIN

The concept of "country of origin" is not questioned at all in the international shipping. Look at the case such as described in the preceding paragraph. The point here is not that it seems difficult to specify where the country of origin is, but to confirm the fact that nobody takes up the question the "country of origin" of the service transacted in the international shipping market.

The reality is FOC merchandise does not have country of origin, in other worlds it belongs to no country, let alone the registration of ship itself.

It can be said that FOC is the system of reproduction of stateless shipping services. Thus the responsibility of guaranteeing the service quality rests nobody.

C. THE PARADIGM OF INTERNATIONAL SHIPPING MARKET

The basic principle of international shipping today is clearly stated by OECD as follows:

"the principle of free circulation of shipping in international trade in free and fair competition forms a guarantee of adequate and economic world shipping services and of maximum economic benefit for shipowners, shippers and consumers"<3>

This principle was first established by OEEC (Organization of European Economic Council, predecessor of OECD), and was succeeded by OECD in 1961 when it was formed by 20 West European Countries including Turkey in the form of Code of Liberalisation of Current Invisible Operations.<4>

The OECD principle is specifically described as follows:

1. The provisions of the Annex C. C/1 are intended to give residents of one Member State the unrestricted opportunity to avail themselves of, and pay for, all services in connection with international maritime transport which are offered by residents of any other Member State.

(in order the freedom of transactions and transfers in connection with maritime transport should not be hampered)

2. by measures in the field of exchange control,
3. by legislative provisions in favor of the national flag,
4. by arrangements made by governmental or semi-governmental organizations giving preferential

treatment to national flag ships,

5. by preferential shipping clauses in trade agreements,
6. by the operation of import and export licensing system so as to influence the flag of the carrying ship,
7. by discriminatory port regulations or taxation measures.
8. the aim always being that liberal and competitive commercial and shipping practices and procedures should be followed in international trade and normal commercial considerations should alone determine the methods and flag of shipments.<5>

In view that OECD membership covers all the EU countries plus big shipping countries like the U.S., Norway, Japan, Australia, Canada, Korea, the sets of the OECD principles forms the paradigm of international shipping today.

Almost simultaneously with the OECD Code took effect, The International Convention on the High Seas was adopted in 1958, and took effect in 1962, which established the principle of "Freedom of High Seas". The Convention stipulates the right to any country the freedom of navigation by ships flying her flag in high seas.

Conclusively and concisely, it can be said that *prohibition of flag discrimination* is the core concept of international shipping of today.

Thus the concept of "country of origin" of the ship becomes of no meaning, and only the "normal commercial considerations" of service quality of the shipping company with whom a shipper books his shipment, and the level of freight rate are the two key factors in his decision making as a player in international shipping market.

It is to be noted that "service quality" of the shipping company does not usually mean the "physical condition of a ship", but the commercial service level of the shipping company on the shore in relation with the shipper.

D. FOC ACCOMMODATED

"The shipping policy of Member countries should be directed to safeguarding and promoting open trades, and a situation of free competition on a fair and commercial basis in international shipping in their mutual relations, as well as in their relations with non-member countries", says OECD.<6> With the prohibition of flag discrimination, the paradigm of international shipping is positively friendly to FOC system to exacerbate. Here the fact that FOC system offers the best competitive economical edge to shipowners should be recalled.

It is also noteworthy that the principle of OECD has been made up on the basic concept of minimizing the interference of the national governments, thus trying to maximize the free and fair competition on commercial basis.

[III] THE BLACKHOLE – QUALITY OF SHIPS

The international shipping market has significantly been one-sided to the commercial values as we have seen so far. And it has been encouraged as norms by the basic principles of the market, i.e. OECD Codes. FOC has flourished in pursuit of cost competitiveness by the owners under such environment.

It is now clear that the system of international shipping has been ill-facilitated with the most important countervailing values to commercial rationale. That is quality safeguard mechanism of the quality of ships and the service they render to the market.

It is very much symbolic that the pursuit for more commercial competitiveness has been made first of all in the form of sacrificing the quality of services, i.e. by down grading the quality of seafaring human resource through flagging out, without paying almost no attention to the quality level of the vessels.

The lack of the countervailing mechanism to assure the quality standard has been the key characteristics of the international shipping.

[IV] COST STRUCTURE OF SHIPOWNERS

The cost items of shipowners are two folds, (1) capital cost which is repayment of principal and interests, (or sometimes depreciation is used), and (2) operating(running) expenses such as crew wages, repair and maintenance/docking expenses, insurances including P & I, and shipboard stores.

As mentioned briefly before, cost item (1) can not be changed once it was fixed at the time of purchase between the shipowners and the financiers. The finance agreement stipulates repayment schedule over the whole period of the finance of the ship purchase which usually covers 5 to 10 or even more years. It is practically very difficult to reschedule for the purpose of cost saving solely for the benefit of owners. The practical truth is that once capital cost is fixed for a vessel, it is valid for the rest of her whole life.

The operation (running) costs are different. These cost items are the objects of the cost saving measures for shipowners. The diagram-1 is the typical model of the operating (running) cost structure of a panamax bulk carrier. This clearly illustrates the economical reason why owners set their priority in their cost saving efforts on crew costs.without almost no exception. It is the biggest single cost item in the operating, and can be easily achieved by flagging out the vessel and by replacing the existing crew with cheaper crew of the different nationality.

It is also noteworthy that the ratio of operating (running) costs versus capital cost of a ship generally increases as the size of a ship comes smaller. As the number of vessels in the smaller size category is significant, so has been the demand for flagging out.

[V] THE CONSEQUENCES ON THE HUMAN ELEMENT

The international maritime system is now presented as a system which permits the principle of commercialism to prevail without effective countervailing power to check its quality standard of human resources. FOC countries permit shipowners registered in their countries to employ seafarers of any nationality at the wage levels of their mother country, which is nothing to do with the domestic labor market conditions of the flag states. Under such circumstances, polarization between the seafarer demanding countries and seafarer supplying countries has developed. The main consideration has always been the level of the crew cost of seafarers.

This process has developed with the gaining momentum up to this day in the global shipping market place where there is no institutional requirement for quality assurance for seafaring human resources. Under the principle of flag state sovereignty over a ship who flies the flag of that state which does not have adequate rules and regulations, nor the ability to secure the maintenance of quality standard of seafarers to be placed on board ships registered thereat, thus the international shipping market place has been left with the fatal blackhole unattended as if it has been assumed with optimism that unlimited availability of quality seafarers has innocently been taken for granted like water or air.

The truly unwelcome consequence of this whole-hearted devotion to the commercial principle in the international shipping system is the deterioration of moral discipline in the market place toward the maintenance and enhancement of quality standard of seafaring human resources at all levels. The frequently quoted remarks that more than 80% of maritime accidents are due to human errors is a most eloquent statement of proof that the seafaring human resource is the most crucial element of all for safety, and reliable quality service in ocean shipping. Today's cries for safety could be the reflection of the recognition that the delicate system of sound virtuous circle in the reproduction mechanism of the international shipping has reached the extent that its autonomous functioning has been seriously lost.

[VI] REPRODUCTION OF SEAFARING HUMAN RESOURCES – MARITIME EDUCATION AND TRAINING

Another consequence of flagging out is the ubiquity of mixed crewing environment on majority of the world fleet today. The impact of this to the reproduction of seafaring human resources, i.e. maritime education and training, should not be overlooked.

The development of mixed crewing means the increase of employment opportunities for national seafarers at the international seafarers labor market where there are a number of different systems, cultures abundant. The traditional national shipping know-how, communications including languages, are not enough under mixed crewing environment on board.

On the other hands, when we look into the supply side of the maritime human resources, almost all the maritime universities, academies, and faculties are national or public institutions, subject to governmental budget, to the rules and regulations of higher education law of respective countries. All the resources especially academic staffs, teaching materials are national. They are tightly knit in the web of national bureaucracy.
All in all, they are the institutions only capable to adapt themselves to the rapid change of the international maritime environment only very slowly.

The objective observation leads us to the following points, all of which requires the urgent action :

(1) the level of standards of maritime seafaring human resources has been deteriorated, and should be improved as soon as possible,
(2) the total reproduction(education) mechanism of world seafaring human resources needs to be reviewed and reorganized as a whole,
(3) the traditional national framework is not sufficient to satisfy the needs of international maritime environment of today and of the future.

As the producer of the seafaring human resources, the maritime universities, academies, and faculties are the most appropriate parties to meet this requirement, with the full utilization of their academic and scientific capabilities, academic staffs, expertise based on the long time experience, and above all, their solid moral and ethical discipline kept within themselves.

To cope with the difficulties to meet the globalization of international maritime environment at individual institution level, the logical subscription is the introduction of the concept of *alliance* into the relationship among the maritime universities, academies, and faculties so that the optimum utilization of respective resources can best be achieved through the international cooperation and coordination.

Logical consideration even takes us further from alliance to the fully merged single entity beyond the horizon.

[NOTES]

<1>"*Towards a New Maritime Strategy*", pp.5, Annex-A, Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions,COM(96) 81 final, 13.03.1996
<2>pp.cit., pp.6, Annex A
<3> *"RECOMMENDATION OF THE COUNCIL concerning Common Principles of Shipping Policy for Member Countries"* OECD
13th February 1987,C(87) 11(Final)
<4>"OECD Code of Liberalisation of Current Invisible Operations",OECD, 1961
<5>"Operations covered by the OECD Code of Liberalisation of Current Invisible Operations", Annex to the Code, C.Transport, Remark to C/1, Note 1.
<6> op.cit,"RECOMMENDATION"

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[1] EU, "*TOWARDS A NEW MARITIME STRATEGY*", COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, BRUSSESL, 13.03.1996, COM(96) 81 final

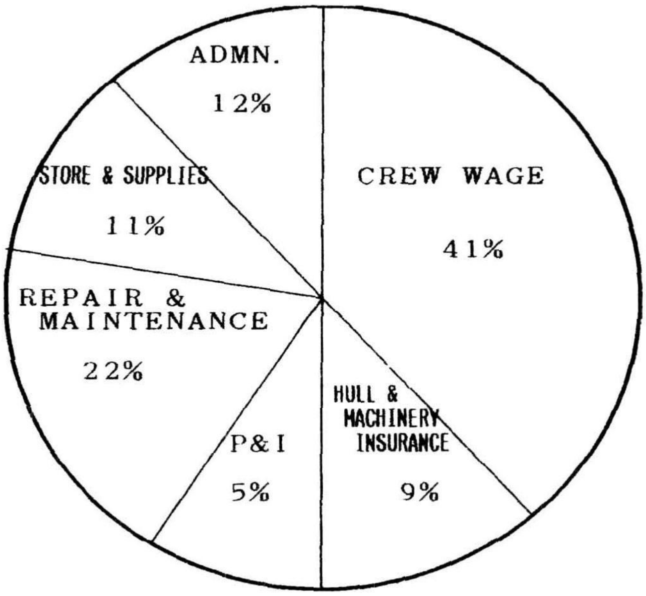
[2] Prof. Masanaga Bujyo, "The Establishment of the Uniform Off-shore Shipping and its Mechanism", Maritime Economic Research No.29, 1995

[3] Prof. Isamu Matsumoto, "EU Common Maritime Policy and Competition Law" Taga Shuppan, 1999

[4] Mr. Ryoichi Sonoda, *Towards the Formationof the OECD Common Maritime Policy"*, Japan Maritime Research Institute Journal No. 405, March, 2000

[5] BIMCO/ISF,"200 MANPOWER UPDATE"
-The Worldwide Demand for and Supply of Seafarers, Summary Report, April, 2000, University of Warwick

[DIAGRAM-1] OPERATING COSTS - PANAMAX BULK CARRIER



[A] OVERALL ANALYSIS:

1.	CREW WAGE	US$1,830/DAY
2.	HULL & MACHINERY INSURANCE	425
3.	P & I	205
4.	REPAIR & MAINTENACE	985
5.	STORE & SUPPLIES	480
6.	ADMINISTRATION EXPENSE	550
	TOTAL OPERATING COSTS	US$4,475/DAY
		→ US$1,633,375/YEAR

[B] CREW WAGE ANALYSIS

MODEL MANNING BUDGET	10 INDIAN OFFICERS 15 FILIPINO RATINGS	10 SLI LANKAN OFFICERS 15 SLI LANKAN RATINGS
WAGES, VACATION, OVERTIME	45,700	32,400
TRAVEL OVERLAP, STAND-BY, AGENCY	6,850	5,350
VICTUALLING	4,550	4,550
TOTAL US$ PER MONTH:	57,100	42,300
TOTAL US$ PER YEAR :	685,200	507,600
YEARLY DIFFERENCE :		▲ 177,600

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
PROCEEDINGS OF INAUGURAL GENERAL ASSEMBLY
26-29 JUNE 2000, ISTANBUL, TURKEY

CURRENT REALITY AND THE FUTURE NEEDS OF MARITIME EDUCATION & TRAINING

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ABSTRACT

The level of education, training and evaluation has an important role in promoting the quality of the seafarer's standard. The international shipping community hopes that the STCW Convention, together with the IMO model courses, will succeed in achieving its objective, i.e. safety at sea. However, studies of maritime accidents statistics show that the human factor is still the main originator of the problem. Hence, there is a need to improve maritime education and training.

This paper discusses the global standard of education, the barriers and challenges to be addressed, the current reality and the proposed features of the needs of the coming generation.

The paper also investigates the use of the system theory for establishing maritime learning objectives, and the application of technology- based learning in implementing and evaluating the training program.

Training institutions are required to evaluate thoroughly the application of modern technologies, and of how this might result in greater competitiveness, higher quality and lower costs.

This paper recommends focusing on the availability of a data- base about maritime institutions, human resources, institute classification, and a global accreditation body. This data- base is vital for establishing a global network

Maritime institutes have to work in close co-operation with the three international bodies interested in maritime training IMO, WMU, and IAMU.

NOMENCLATURE

AAMTI	: Association of African Maritime Training Institutes
AASTMT	: Arab Academy for Science, Technology & Maritime Transport.
CAI	: Computer Assisted Instruction
CBT	: Computer Based Training
EoD	: Education on Demand
GMDSS	: Global Maritime Distress and Safety System
IAMU	: International Association of Maritime Universities
IMO	:International Maritime Organization
ISD	: Instruction System Design
ISM	:International Safety Management
LAN	:Local Area Network
NAOE	:Naval Architecture and Offshore Engineering
PC	: Personal Computers
TBL	:Technology Based Learning
STCW	:Standard of Training, Certification & Watch-keeping
WAN	: Wide Area Network
WMU	: World Maritime University

MOTIVATION

The maritime education process conducts seafarers through specific procedures in order to provide them with the required standards of qualification and skills. The level of education, training and evaluation has an important role in promoting the quality of the seafarer's standard, and this is a significantly major factor in marine casualties. The maritime field can be influenced by many factors: international conventions and regulations, flag state parties (the authority), companies (executing the authority's regulations), maritime training institutes (educating and training seafarers with respect to international conventions and national regulations).

Focuses on the human element when disasters occur make it necessary to have new approaches to the avoidance of risks and the control of losses. The relation between the human factor and the hardware brings new aspects and challenges into safety work, and optimum maritime safety demands a focus on people, hence increased attention to the fact that more than 80% of all undesired events can be referred back to human error.

The International Shipping Community hopes that the International Safety STCW Convention, together with the IMO model courses and Management (ISM) Code, will succeed in achieving its objectives: safety at sea, prevention of maritime accidents and avoidance of damage to the environment. But as to what extent they have succeeded in achieving these objectives, studies of marine causality statistics show no obvious improvement and the human element is still the main factor contributing to this problem. The problem can be traced and summarized in the following points:

- Time lag between convention implementation and technology development.
- Developed countries introduce advanced technology and modern ships, whereas developing countries produce the seafarers; hence, the problem of incompatibility arises and ships are not safely operated.
- The openness of the shipping industry to technology, with a consequent changing context of the seafarer's functions associated with changing work force, will set additional training requirements.
- The existing education and practical training pattern suffers from the shortcomings of person-focused objectives.

Before discussing the future needs to tackle these problems, it is worth- while to review the global standards, the barriers to be addressed and the current reality.

1- GLOBAL STANDARDS OF MARITIME HUMAN RESOURCES

The International Convention on Standards of Training, Certification and Watch- keeping for Seafarers (STCW), 1978, was adopted by the International Conference on Training and Certification of Seafarers on July 7, 1978. The 1978 STCW Convention entered into force on April 28, 1984. Since then, three amendments thereto were adopted in 1991, 1994 and 1995. The 1991 amendments relating to the Global Maritime Distress and Safety System (GMDSS) entered into force in December 1992. The 1994 amendments to special training requirements for personnel on tankers entered into force in January 1996. The 1995 amendments consist of three resolutions (Attachment 1 to the Final Act of the STCW Conference, Amended Annex to 1978 STCW Convention, and STCW Code) entered into force in August 1997 and will be completely implemented in 2002.

Through the IMO procedures the approved international conventions have to be followed by the flag state parties (countries) through companies, maritime training institutes and seafarers. **The STCW 78 needed approximately 17 years to be revised and 7 more years for complete implementation.** So, the IMO mechanism, as the apex of international legislation in the maritime field, needs to be accelerated in order to take the proper action at the proper time, since any deficiency which might arise in the internal processing system of the IMO will have its serious impact on the maritime field world-wide.

The STCW 95 was adopted in order to establish minimum global professional standards for seafarers. These professional standards include skills, knowledge, understanding and the abilities needed to ensure that individuals are capable of fulfilling the role expected from them at sea. Around 3 years have passed now since the Convention entered into force (1st August 1997), and it is obvious that the revised STCW may need more revision - for example in the area of lack of standardization, as in the case of referring in general to simulators without specifying the procedures and how each institute will implement the utilization of simulators. The IMO model courses, too, need to be revised with respect to changing the objectives of education from theory to competence (produced and published late in 99). The revised STCW only encourages countries to help each other to co-operate in the field of examinations, but as education and examination are both sides of the same coin, there is a need to establish a global standard assessment system.

2- CURRENT REALITY

The approach to the analysis of current reality will highlight the non-availability of maritime databases. This gives a clear picture of the maritime field current reality situation. The needed worldwide maritime database has to cover the main elements of maritime transport, (authorities, companies and institutes). Hence, the world-wide maritime database could be classified into:

- Ports and maritime authorities
- Shipping companies and seafarers
- Maritime training institutes supported by an educational and assessment databank.

Ports, maritime authorities and shipping companies' Databases are available through several bodies, but the most important databases needed for harmonizing education and training are not available. Databases needed in maritime education and training fields are:

1. The Maritime Training Institutes Database, supported with:
   - the Educational and Training Databank,
   - the Assessment and Evaluation Databank, and
2. The Maritime Human Resources Database.

Due to the fact that IMO has recently received data communicated from 82 maritime authorities throughout the world in response to regulation I/7 (STCW 95), it is suggested that the database of the world-wide maritime training institutes should develop in close co-operation with the IMO.

Classification criteria for maritime training institutes are needed. This classification of maritime institutes can be international, inter-regional, regional and national. Hence, a global accreditation body can be configured basing on the criteria of classification and the quality of education and training. The training institutes database will help in harmonizing the system of education and training worldwide by establishing a global maritime training institutes network.

The writer of this paper has performed several activities in this area which can be summarized in the following :

1. Suggesting the establishing of a desk in IMO for the maritime training institutes responsible for developing and maintaining the related database. Positive progress was made and the IMO compendium for Maritime Training Institutes was published. Unfortunately, the Maritime Training Institutes Desk in IMO was lately closed.
2. A paper with a presentation was lately demonstrated to the Technical Co-operation Committee in July 1994 entitled "How Inter-Regional Institutes can play a more active role in promoting IMO development role within a proposed network of IMO Maritime Training Institutes". The

main elements of the presentation highlight that :

"There is a large disparity existing in the field of education and training between developing and developed countries. To tackle this problem, the IMO has introduced the Standards of Training and Watch-keeping Convention .It has also established the World Maritime University, IMO International Academy in Trieste, and the IMO Law Institute in Malta. In order to harmonize education and training, the paper proposes a network for maritime training institutes; consequently, it necessitates the classification of an institute into global, inter-regional, regional and national. The Association of African Maritime Training Institutes (AAMTI) is taken as an example of Classified Regional Co-operation Network.

Due to lack of information and data of maritime training institutes, the writer and his working group have accessed the Internet and retrieved the available information from selected institutes:

- Arab Academy for Science, Technology & Maritime Transport
- Cardiff University;
- Denmark NAOE;
- Hong Kong Polytechnic;
- Kobe University;
- Korea Maritime University;
- Newcastle University, UK;
- Norwegian Shipping Academy;
- Singapore Maritime Academy;
- Singapore Polytechnic;
- Tokyo University;
- U.S. Merchant Maritime Academy;
- U.S. Naval Academy (King's Point);
- University of Plymouth; and
- Warsash Maritime Centre.

Although, US Naval Academy (King's Point) shows full information about its curricula and training courses, unfortunately, the information and data retrieved as a whole from all the selected institutions do not provide a consistent focus on the current reality situation.

The maritime institutes have to work in close co-operation with the three international bodies interested in maritime training performance IMO, WMU, and IAMU in developing the world-wide maritime database and databank as an important step towards the harmonisation of maritime education and training system globally.

3- BARRIERS AND CHALLENGES TO BE ADDRESSED

Maritime institutions involved in development of maritime education face a number of barriers and challenges that limit the effectiveness of their efforts. The most salient are:

3-1 Lack of self-development. Choice and opportunities for self-development are constrained by circumstances. The lifestyle and working conditions of seafarers are not conductive to the realization of potential in terms of self-development and, to be successful, the seafarer has to surmount many obstacles not experienced by his shore-side counterparts. Such barriers to development can be described as structured in that they are inherent in the occupation of seafaring. Among the most obvious are unremitting noise and perpetual motion, intense and often unsocial work schedules, limited privacy, restricted access to learning materials, and lack of motivation compounded by feelings of isolation.

3-2 Lack of adequate training. Regarding the regional and country levels, there is a lack of personnel trained in the broad spectrum of disciplines and perspectives needed to successfully implement maritime training requirements. In addition, there is a lack of accurate and effective data on manpower requirements and training needs to meet anticipated developments and to respond to new and emerging training areas.

The STCW 95 was adopted in order to establish minimum global professional standards for seafarers. These professional standards include skills, knowledge, understanding and the abilities needed to ensure that individuals are capable of fulfilling the role expected from them at sea. Around 3 years have passed now since the Convention entered into force (1st August 1997), and it is obvious that the revised STCW may need more revision - for example in the area of lack of standardization, as in the case of referring in general to simulators without specifying the procedures and how each institute will implement the utilization of simulators. The IMO model courses, too, need to be revised with respect to changing the objectives of education from theory to competence (produced and published late in 99). The revised STCW only encourages countries to help each other to co-operate in the field of examinations, but as education and examination are both sides of the same coin, there is a need to establish a global standard assessment system.

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2- A paper with a presentation was lately demonstrated to the Technical Co-operation Committee in July 1994 entitled "How Inter-Regional Institutes can play a more active role in promoting IMO development role within a proposed network of IMO Maritime Training Institutes". The

main elements of the presentation highlight that :

"There is a large disparity existing in the field of education and training between developing and developed countries. To tackle this problem, the IMO has introduced the Standards of Training and Watch-keeping Convention .It has also established the World Maritime University, IMO International Academy in Trieste, and the IMO Law Institute in Malta. In order to harmonize education and training, the paper proposes a network for maritime training institutes; consequently, it necessitates the classification of an institute into global, inter-regional, regional and national. The Association of African Maritime Training Institutes (AAMTI) is taken as an example of Classified Regional Co-operation Network.

Due to lack of information and data of maritime training institutes, the writer and his working group have accessed the Internet and retrieved the available information from selected institutes:

- Arab Academy for Science, Technology & Maritime Transport
- Cardiff University;
- Denmark NAOE;
- Hong Kong Polytechnic;
- Kobe University;
- Korea Maritime University;
- Newcastle University, UK;
- Norwegian Shipping Academy;
- Singapore Maritime Academy;
- Singapore Polytechnic;
- Tokyo University;
- U.S. Merchant Maritime Academy;
- U.S. Naval Academy (King's Point);
- University of Plymouth; and
- Warsash Maritime Centre.

Although, US Naval Academy (King's Point) shows full information about its curricula and training courses, unfortunately, the information and data retrieved as a whole from all the selected institutions do not provide a consistent focus on the current reality situation.

The maritime institutes have to work in close co-operation with the three international bodies interested in maritime training performance IMO, WMU, and IAMU in developing the world-wide maritime database and databank as an important step towards the harmonisation of maritime education and training system globally.

3- BARRIERS AND CHALLENGES TO BE ADDRESSED

Maritime institutions involved in development of maritime education face a number of barriers and challenges that limit the effectiveness of their efforts. The most salient are:

3-1 Lack of self-development. Choice and opportunities for self-development are constrained by circumstances. The lifestyle and working conditions of seafarers are not conductive to the realization of potential in terms of self-development and, to be successful, the seafarer has to surmount many obstacles not experienced by his shore-side counterparts. Such barriers to development can be described as structured in that they are inherent in the occupation of seafaring. Among the most obvious are unremitting noise and perpetual motion, intense and often unsocial work schedules, limited privacy, restricted access to learning materials, and lack of motivation compounded by feelings of isolation.

3-2 Lack of adequate training. Regarding the regional and country levels, there is a lack of personnel trained in the broad spectrum of disciplines and perspectives needed to successfully implement maritime training requirements. In addition, there is a lack of accurate and effective data on manpower requirements and training needs to meet anticipated developments and to respond to new and emerging training areas.

3-3 Limited sharing of training materials. There is rarely any sharing of training materials and experience even though many training institutions and individuals are attempting to address similar issues. At the regional level, training courses may not be accessible to all target groups in need of acquiring skills and knowledge. This is due, among other things, to the fact that in most cases training courses are instructor-dependent and are not adequately documented, a fact that inhibits their adaptation to other institutions or countries .

3-4 Lack of coordination between training institutes. Despite major advances in the maritime practice and the valuable capacities that have been built as a result of long experience in maritime training and education, up to now there have been limited opportunities for cross-exchange of experience among the training institutes. This is due to the isolated approach to training that has prevailed and the lack of a mechanism to steer the training efforts in order to optimize human resources development and provide sustainability to any capacity-building effort.

3-5 Lack of job-focused objective. In most countries, training has been undertaken solely by educational/training institutions that supply mandatory courses not necessarily oriented to the operational needs of the job (***job-focused objectives***). Unfortunately; training is rarely designed and delivered in such a way that trainees can apply the knowledge and skills acquired when they return to the workplace.

3-6 Lack of fund for new training Technology. High quality training is a costly effort involving considerable investments in course preparation as well as the training time itself. In future, training courses, based on high quality materials, geared to specific training needs and coupled with flexible schedules outside working hours, are likely to be in high demand. The introduction of new technologies for training, which allows, for example, the organization of distance learning, or computer assisted teaching, may be considered as an alternative to traditional classroom courses at a scheduled time.

4- PROPOSED FEATURES OF THE NEEDS OF THE COMING GENERATION

The infusion of technology into the maritime field and the changing structure of modern maritime transport are facts of life for a growing number of today's maritime professionals. Neither shows any sign of being a passing trend. Rather, it is the maritime institutes that cannot adapt to changing demands that seem to be fated for non-existence. Adaptation is required at all levels of the system. Seafarers at every stage of their career are being required to expand their skills and knowledge, to develop computer literacy, and to deal with a multitude of tasks that do not fall within the scope of traditional job descriptions.

It follows that, with all the changes occurring in the workplace, training must also change if it is to remain a relevant and contributing activity of the business. In this context, the traditional paradigm of training-program development must be reassessed to determine whether it is still truly relevant. The following will review the systematic approach to training development in order to identify its strengths and limitations within the modern maritime training systems.

4-1 ISD Model. The traditional IMO model courses are based upon the system theory. In its training manifestation, the system theory provides a methodology for defining, developing, applying and evaluating instructional programs. In this approach, as illustrated in Fig. (1), training systems development begins with a system analysis phase , basically, an assessment of training requirements and an *analysis of job data.*

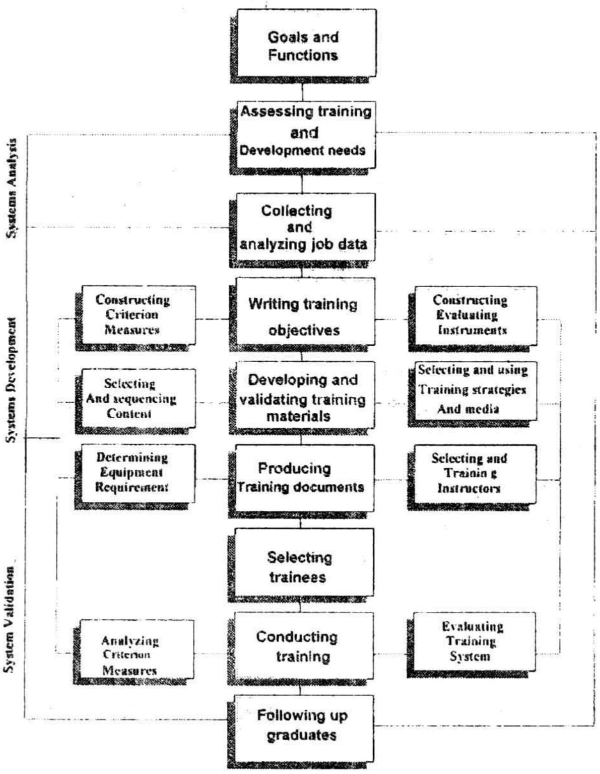

Fig. (1) Instructional System Design (ISD) Flowchart

The purposes of system analysis are to identify where training is needed, what skills and knowledge must be taught, and how work is currently being performed. At its best, the system analysis phase is undertaken proactively: focusing on training in skill and knowledge areas that will support future needs derived from job goals, objectives, and direction. The relevant job data has been collected; ***job-focused training objectives*** are developed. Objectives are stated in terms of performance, defining exactly what the trainee will be able to do by the conclusion of training. Together with this statement of a task, the training objective typically sets forth conditions for performing the task and criteria for measuring task completion.

Objectives stated in this manner may be readily converted into test items, called criteria-referenced-test-item specifications, which are used to evaluate the trainees' knowledge and skills before and after the introduction of the training course. Test items are commonly developed and included in a pre-test, which is introduced prior to training. Then, for consistency, the same question in a different order or with randomised multiple-choice answers – are placed in a post-test, introduced after training. These pre-tests and post-tests are among the evaluative instruments that may be developed at the start of the system development phase.

The remainder of the system *development phase* is concerned with the practical stuff of training development; content is identified and teaching points are organized for presentation. Subject-matter experts are called upon to validate that the material is complete, accurate, and aimed at the appropriate knowledge and learning level of the trainee. A senior trainer or training manager may also review the lesson design for its adherence to the general concepts and standards of training endorsed by the training organization.

A *feedback loop* is illustrated In Figure (1), that provides stimulus for the acceptance or modification of the training system based on trainee pre-test and post-test results The whole instruction system design methodology flows from training objectives, which are derived from careful analysis of job tasks. Fig. (2) shows a view of the structure of work as it is directed by ISD methods. Occupational fields are subdivided into jobs, which are subdivided into duties, which are subdivided into tasks, which are subdivided into elements.

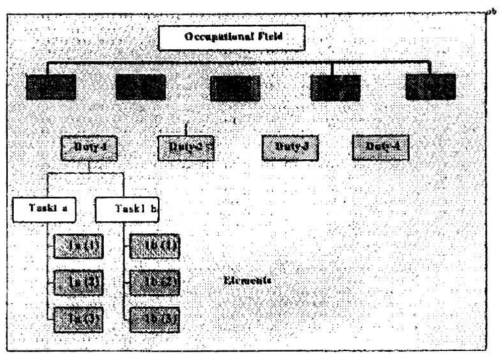

Fig (2) Task Analysis

Hence, from every ***job description***, a complicated taxonomy of subtasks is defined. The analyst then seeks to define the prerequisite skills and knowledge associated with each subtask and developed training objectives designed to provide instruction in the skills and knowledge areas required for task performance. In the absence of strict job descriptions, the insights into maritime training requirements yielded by system analysis are no more objective or scientific than the vague feelings. In the light of this fact, trainers and training managers in maritime universities have every reason to be concerned about the solvency of their formal education in Instructional Systems Design (ISD). The final step is *the evaluation* that generates the feedback that supports the dynamics of adaptability, which ISD advocates regard as its chief advantage over other methodologies. Feedback, in the form of observable improvements provides both an important input for adapting the training-systems development effort to make it more effective and a basis for justifying training.

4.2 Technology-Based Learning. It is the use of technology to help people learn. The technology involved is a computer of some kind. But the computer is undergoing considerable transformation in its function. That is why word technology is in preference to computer. Already the advanced communications technology and technology-based learning (TBL) enable the maritime field to develop interactive learning programs. Trainees will be able to log into web sites and learn anywhere at any time (a global open university). This will become common within maritime industry. Maritime professionals and trainers will have to learn new skills both in developing and performance monitoring. It is even possible to see technology-based learning courseware supplementing the role of the lecturer. Technology-delivered applications could be considered for the following reasons:

1-to reduce training costs,
2-to shorten training programs,
3-to improve staff to student ratios,
4-to make training timelier,
5-to eliminate over- and under-training,
6-to provide more and better training,
7-to increase the total delivery of training in the same time period,
8-to manage training better, and
9-to interact with the student in a meaningful way.

Today, however, there is a changing view of adult education and of motivation. "To motivate" is no longer regarded as a verb. Trainees cannot be motivated to learn. They learn because they want to, and fail to learn when they do not want to. Of course, there are incentives for learning that may help to sustain motivation when it is already present. These incentives are *self-interest* , *need for respect* , *trainee segregation* , *varied media,* and *organisation of training content* .

4.3 Person-focus Training These incentives are by no means exhaustive, but they do point out that training effectiveness is a product of more than the relevance of specific training objectives to the immediate day-to-day work of the trainee. Most adults have innate curiosity and are motivated to learn. These features are automatic products of *person-focus objectives,* which are achieved when adapting the TBL system. What is a ***person-focused objective***? Person-focused objectives focus on self-understanding and self-management. They are not job-task-focused in the strictest sense, though they may be used in conjunction with job and subject-focused objectives.

The maritime training professional with person- focus training would analyse not jobs, but specific individuals so as to tailor training to their specific needs. Individualised training represents an enormous development effort, particularly in institutions with numerous personnel of different cultures. How can separate training programs be developed economically to accommodate the needs of each individual in the institution? In a sense, this has always been done. Good trainers in the classroom individualise their approach to presenting lesson subject-matter by observing trainee feedback and restating material in another way when confronted by a blank, no understanding from trainees. The same is true in a well-written Technology-Based Learning (TBL) Program. If quizzes placed in the program result in below-acceptable performance, content may be presented in another way in the hope of better accommodating the learning style of the trainee.

Of course, there is a world of difference between individualised presentation and using the individual as the basis for training-system development.

Training success is reflected in the seafarers' improved self-awareness, which can make them better seafarers or, at least, more contributing participants in the work of the shipping company. Thus, the evaluation of the success of a training system may need to be an intuitive one where person-focused objectives are considered in training. It can be argued that this has always been the case, even in job-specific training. The ultimate productivity of trained individuals can be diminished by a host of factors unrelated to how trainees perform their assigned tasks. Intuition – or vague feelings – is almost always used to separate seafarer performance improvements from the environment that translates performance into productivity. Still, the concept of making training-systems development a mixture of job-focused objectives and subject- and person-focused objectives may be a necessity.

4-4 Automated Training. Designing an automated training development capability is quite similar to the procedure for designing an instructional course. Most computer systems development methodologies are based on the same basic principles as in ISD methodology. The procedure begins with an analysis phase, then proceeds to an implementation phase, and concludes with an evaluative phase.

Automation needs are identified in the analysis phase of systems development. Based on these needs, functional requirements are defined and the analysis of system requirements is based on a close examination of current manual methods. From this standpoint, excellent trainers should make excellent system analysts! To perform automation needs analysis, many of the same techniques used in ISD job analysis may be applied. To understand how manual methods of training development produce training programs, training department personnel need to be interviewed, their work observed, and procedural steps carefully documented. Few training departments adhere to the standardization training development methods. Fewer still document these standards and procedures where they do exist.

In fact many of the current efforts to integrate artificial intelligence into TBL products- called Intelligent Tutoring Systems (ITS)- are aimed at making TBL courseware more adaptable to trainee or student status in order to better diagnose his misconceptions and buggy behaviours and to provide the appropriate feedback and remedy. ITS can tailor their contents, knowledge and methods to meet the needs of individual student without being limited to predefined responses. Researchers reported that students and trainees working with ITS could learn the presented materials four times faster than students in classical classroom. Typical ITS should contains domain model, teaching strategy model, student model, and intelligent student interface.

The goals of automated systems development are stated in terms of performance: the system will be able to perform certain functions when it is finally implemented. These functional requirements are manifested as outputs generated by the system. The outputs of an automated training development system are the materials used in the conduct of training. Thus, training managers who are planning to automate training program development functions must begin by exploring the learning objectives previously produced by the updated IMO model courses to identify common outputs.

4.5 Forms of Delivery Systems. Remember that the Problem Solving Mode of Computer Assisted Instruction (CAI) comes into play when a person uses computer as a tool to learn something. Any of the computers could be used in that way. IBM has long offered CAI on their mainframe systems. The PCs are the mainstay of today's TBL. Historically, computer-based instruction has been delivered on Large Local, Area networks (LAN), and on desktop PCs. Today the big main frame-based central systems have all but disappeared. However, the increasing availability of Wide Area Networks (WAN) and growth of the Internet are replacing them in concept. Today, despite the brand or model, instructional computer systems can be classified into two general group: Network System, and Stand-alone System.

a) Network System: Recently the entire network-computing paradigm has shifted from local-area, or campus-wide, networks to the Internet. The exponential growth of the Internet has provided a large and growing number of people with Internet access to information and services.

This convergence on the Internet as a standard vehicle for delivering information and the global nature of the Internet makes it a very attractive medium for publishing. Instant access to globally distributed information has popularised hypermedia for online publishing, and it is likely that various forms of Internet-mediated hypermedia will become a dominant form of publishing. Although transmission over the Internet is slow, it offers tremendous possibilities for distributing training. Taking advantage of these trends to deliver distance education remains one of the most exciting challenges for existing educational institutions, Education-on-Demand (EoD). Many people have limited access to traditional classroom settings due to various constraints, such as time, distance, physical disabilities, transportation limitations and expenses, or non-school commitments. Based on a network system, Education-on-demand (EoD) provides distance-learning opportunities for continuing education. Even for traditional full-time students, distance learning can provide attractive options with great flexibility.

Producing and integrating course materials prove a core problem in providing distance-learning services. This process is very time-consuming. Even if publishers do the routine work, such as creating Web pages or encoding video, instructors still need to make decisions regarding the arrangement and integration of course content. Moreover, instructors usually do not have time to, nor are they interested in, learning complicated authoring tools to design and arrange lectures. To motivate the instructors, publishers need easy-to-use authoring tools that help them produce digital courseware quickly. A simple tool to help instructors combine their class lectures and Internet resources has to be developed so that these materials can be delivered to distance learners through an EoD service.

b) Stand-alone System: This hardly needs a description. Almost any PC can serve as a stand-alone learning station. It is a self-contained unit. Each unit is totally independent from others, providing maximum flexibility of curriculum. The training software may be conveniently packaged and introduced on media of various types. The most common general use media for current microcomputers are CD-ROMs. They are optical disks that offer speed, downsizing, accuracy, lower costs and are easy to use. Normally, Stand-alone Systems are the least expensive systems to buy. Since there is no network, a breakdown of one PC will not affect all the students, and one student's PC cannot affect others. Response time may be faster than with network systems. Network versions of software and courseware are not needed. The AASTMT is in the process of developing TBL courseware on maritime training and one of the completed models is going to be presented in CAORF/JSACC 2000, **INTERNATIONAL MULTI-CONFERENCE on INSTRUCTIONAL TECHNOLOGY** at the United States Merchant Marine Academy, Kings Point, New York (July 3-7,2000)

5- CONCLUSION

The Technology-Based Learning (TBL) system will enable maritime institutions and lecturers to enhance the quality of maritime education. TBL System will also be the cornerstone feature of open learning. Open learning seeks systematically to remove barriers to learning and co-ordination between institutions, whether they are related to time, place, or pace.

Computer assisted instruction is not just a fashionable issue but presents a unique opportunity to take a fresh look at knowledge and learning issues and to redefine the roles of all concerned. New technology leads us to examine conventional practices in a different light. It is believed that chalk, transparencies, and paper documents will not disappear at once, but now **all teaching tools in the light of computing technology development have to be considered.**

With more basic research in human-machine cognition and discipline-applied experiments, for training mariners it is hoped that the prior discussion will provide deep insights into practical applications of technology in one of the most significant fields of human endeavour: adult education. The system described in this paper is not hypothetical. The US largest airlines and largest manufacturers of commercials aircraft have successfully used it.

6- RECOMMENDATIONS:

1- Training institutions are required to evaluate thoroughly the application of modern technologies, and how this might result in greater competitiveness, higher quality and lower costs.

2- Training managers who are planning to automate training program development functions must begin by exploring the learning objectives previously produced by the ***updated IMO model courses*** to identify common outputs.

3- To bring the trainee's performance up to par, the application of quality assurance to the instruction has to be consistent all the way.

4- Building up the permanent international capabilities for training, where the following points should be considered:
   a) transfer of experience and sharing of training resources,
   b) sustainability of efforts, and
   c) responsiveness to specific training priorities of the countries involved.

5- All the needs and constraints detailed in this paper call for a global training strategy that emphasizes the following:
   a) The availability of data about maritime institutions and maritime training is a pre-requisite to the planning stage of the proposed system.
   b) Maritime institutes are required to work in close co-operation with the three international bodies interested in maritime training performance IMO, WMU, and IAMU, in developing the world-wide database and data bank.
   c) There is need for a global accreditation body to boost the creditability of certificates issued world-wide.
   d) Institute classification will be needed for establishing the Global Maritime Training Institute Network.

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INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
PROCEEDINGS OF INAUGURAL GENERAL ASSEMBLY
26-29 JUNE 2000, ISTANBUL, TURKEY

BASELINE STUDY, AND THE PREPARATION TOWARDS THE XXIST CENTURY UNDERGRADUATE DECK AND ENGINE CURRICULA OF ISTANBUL TECHNICAL UNIVERSITY, MARITIME FACULTY

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ABSTRACT

In this paper, it is presented that STCW 95, Chapters II and III, Regulations II/1, II/2, III/1, III/2 define the mandatory minimum training and education requirements for certification of watchkeeping officers, masters, chief mates, and oceangoing engineering officers, second engineer officers, chief engineer officers.

The general state / private education system in Turkey is given in detail with some striking examples. The existing Merchant Maritime Education which has classically been a 4+1 year University Degree Education with the Istanbul Technical University, Maritime Faculty is presented in comparison with other newly founded Turkish Institutions after STCW 95, emphasizing on the problems experienced.

A model of a baseline study, and preparations towards the XXI. Century Merchant Maritime Undergraduate Education curricula's of Turkey towards finding solutions for the existing problems of the education system is clearly defined.

A. INTRODUCTION – STCW '95 REQUIREMENTS

1. STCW 95 – Chapter II – Master and Deck Department Regulation II/1

Mandatory minimum requirement for certification of officers in charge of a navigational watch on ships of 500 gross tonnage or more

Paragraph 2 in regulation II/1 of the STCW 95 (Ref. 1) convention states

Every candidate for certification shall:

.1 be not less than 18 years of age

.2 have approved seagoing service of not less than one year as part of an approved training programme which includes on-board training which meets the requirements of section A-II/1 of the STCW Code and is documented in an approved training record book, or otherwise have approved seagoing service of not less than three years;

.3 have performed, during the required seagoing service, bridge watchkeeping duties under the supervision of the master or a

.4 qualified officer for a period of not less than six months

.5 meet the applicable requirements of the regulations in chapter IV, as appropriate, for performing designated radio duties in accordance with the Radio Regulations; and

.6 have completed approved education (IMO Model Course 7.03 – Officer in Charge of a Navigational Watch – Ref. 5) and training and meet the standard of competence specified in Section A-II/1 of the STCW Code which can be simplified as

Every candidate for certification shall

(a) be not less than 18 years of age

(b) satisfy the Administration as to Medical fitness, particularly regarding eyesight and hearing;

(c) have approved seagoing service in the deck department of not less than three years which shall include at least six months of bridge watchkeeping duties under the supervision of a qualified officer; however an Administration may allow the substitution of a period of special training for not more than two years of this approved sea-going service (IMO Model Course 7.03), provided the Administration is satisfied that such training is at least equivalent in value to the period of seagoing service it replaces;

(d) satisfy the Administration by passing an appropriate examination that he possesses adequate theoretical and practical knowledge appropriate to this duties.

In preparing IMO Model Course 7.03 it has been assumed that the entrants will have successfully completed a minimum period of full-time general education of about 10 or 11 years. For example in U.K. full-time general education starts at the age of 4, and is mandatory for 11 years which means one can satisfy the entry standards to the profession at the age of 15.

2. STCW 95 – Chapter II – Master and Deck Department – Regulation II/2

Mandatory minimum requirements for certification of masters and chief mates on ships of 3,000 gross tonnage or more.

Paragraph 2 in Regulation II/2 of the STCW 95 (Ref.1) convention states

Every candidate for certification shall;

.1 meet the requirements for certification as an officer in charge of a navigational watch on ships of 500 gross tonnage or more and have approved seagoing service in that capacity

.1.1. for certification as chief mate, not less than 12 months, and

.1.2. for certification as master, not less than 36 months; however, this period may be reduced to not less than 24 months if not less than 12 months of such seagoing service has been served as chief mate, and

.2 have completed approved education (IMO Model Course 7.01 – Master and Chief Mate – Ref.3) and training and meet the standard of competence specified in section I-II/2 of the STCW Code for masters and chief mates on ships of 3,000 gross tonnage or more

SUMMARY – This implies that a 14/15 year old candidate who started 10/11 years full time general education at the age of 4, can be a W/O at the age 18 attending to a two years of IMO Model Course 7.03 Education, and 1 year of on board training (6 months bridge watchkeeping) after an exam. Then, after 1 year of IMO Model Course 7.01 Education, with another one year on board a vessel as W/O, he can sit for an exam of C/M, at the age of 20. Or with another two years on board a vessel as 1 year W/O, and 1 year C/M, he can sit for an exam of a Master at the age of 21.

This is enabling a 14 years old candidate with 10/11 years of full time general basic education to be a Master in 7 years time at the age of 21 attending to some private courses without any High School Education, never mind University Education.

3. STCW 95 – Chapter III – Engine Department – Regulation III/1

Mandatory minimum requirements for certification of officers in charge of an engineering watch in a manned engine-room or designated duty engineers in a periodically unmanned engine room.

Paragraph 2 in Regulation III/1 of the STCW 95 (Ref.1) convention states

Every candidate for certification shall:

.1 be not less than 18 years of age

.2 have completed not less than six months seagoing service in the engine department in accordance with section A-III/1 of the STCW Code, and

.3 have completed approved education (IMO Model Course 7.04 – Engineer Officer in Charge of a Watch – Ref.6) and training of at least 30 months which includes on-board training documented in an approved training record book and meet the standards of competence specified in Section A-III/1 of the STCW Code.

which can be restated more clearly as

Every candidate for certification shall:

(a) be not less than 18 years of age

(b) satisfy the Administration as to medical fitness, including eyesight and hearing;

(c) have not less than a total of three years approved education (IMO Model Course 7.04) or training, relevant to the duties of a marine engineer;

(d) have completed an adequate period of seagoing service (6 months) which may have been included within the period of three years in sub-paragraph (c)

(e) satisfy the Administration that he has the theoretical and practical knowledge of the operation and maintenance of marine machinery appropriate to the duties of an engineer officer;

(f) have attended an approved practical fire-fighting course;

(g) have knowledge of safe working practices

In preparing IMO Model Course 7.04 to meet the minimum age for certification (18 years) and to obtain the minimum of three years specialized education or training, the age of entry could be 15 years, or less.

4. STCW 95 – Chapter III – Engine Department – Regulation III/2

Mandatory minimum requirements for certification of chief engineer officers and second engineer officers on ships powered by main propulsion machinery of 3000 kw propulsion power or more. Paragraph 2 in Regulation III/2 of the STCW 95 (Ref.1) convention states

Every candidate for certification shall;

.1 meet the requirements for certification as an officer in charge of an engineering watch and;

.1.1. for certification as second engineer officer, shall have not less than 12 months' approved seagoing service as assistant engineer officer or engineer officer, and

.1.2. for certification as chief engineer officer, shall have not less than 36 months' approved seagoing service of which not less than 12 months shall have been served as an engineer officer in a position of responsibility while qualified to serve as second engineer officer; and

.2 have completed approved education (IMO Model Course 7.02 Chief and Second Engineer Officer (Motor Ships) – Ref.4) and training and meet the standard of competence specified in Section A-III/2 of the STCW Code.

SUMMARY – This implies that a 14/15 year old candidate who started the basic full-time general education at the age of 4, can be an E/O at the age of 18 attending to a three years of IMO Model Course 7.04 Education which includes 6 months seagoing service, after an exam. Then after 1 year of IMO Model Course 7.02 Education, with another one year on board a vessel as E/O, he can sit for an exam of second E/O, at the age of 20. Or with another 3 years on board a vessel as 1 year E/O, and 2 years second E/O, he can sit for an exam of a Chief Engineer at the age of 23.

This is enabling a 14/15 years old candidate with 10/11 years of basic full-time general education to be a C/E in 8 years time at the age of 23 attending to some private courses without any High School Education, never mind University Education.

B. EXISTING GENERAL EDUCATION SYSTEM IN TURKEY

Refer to **Figure 1** for the existing general education system in Turkey. Pre-school education starts at the Nursery between the ages 0-2. Kindergarten education is given between the ages 2-6. Classical Primary School is for five years between the ages 6 to 11 which is run by the state, free of charge and is mandatory. Then, pupils attend to a Junior High school for 3 years between 11-14 years old. The very new system is an 8 year education (a combination of Primary + Junior High School) which is compulsory till the age of 14. Pupils attend to High School run by the state, free of charge between 14-17 years old. Sometimes either before Junior High or High School, they attend to a full year of Foreign Language (mainly English) preparatory class which enables them to attend the University at the age of 18.

In Turkey there are 74 state and privately run (approximately 20) Foundation Universities. The quality of education differs enormously from one another. Istanbul Technical University is one of the top 4-5 Universities in Turkey. Every year almost 1.5 Million High School Graduates take a General Entrance Exam for the universities. Depending on their success, they are placed in Universities of one of their 22 choices. As an average only 500,000 High School Graduates can be offered places in Universities, the rest having to take the exam next year. To attend to a top University, one must be placed in the top 10-15% of the 1.5 Million High School Graduates.

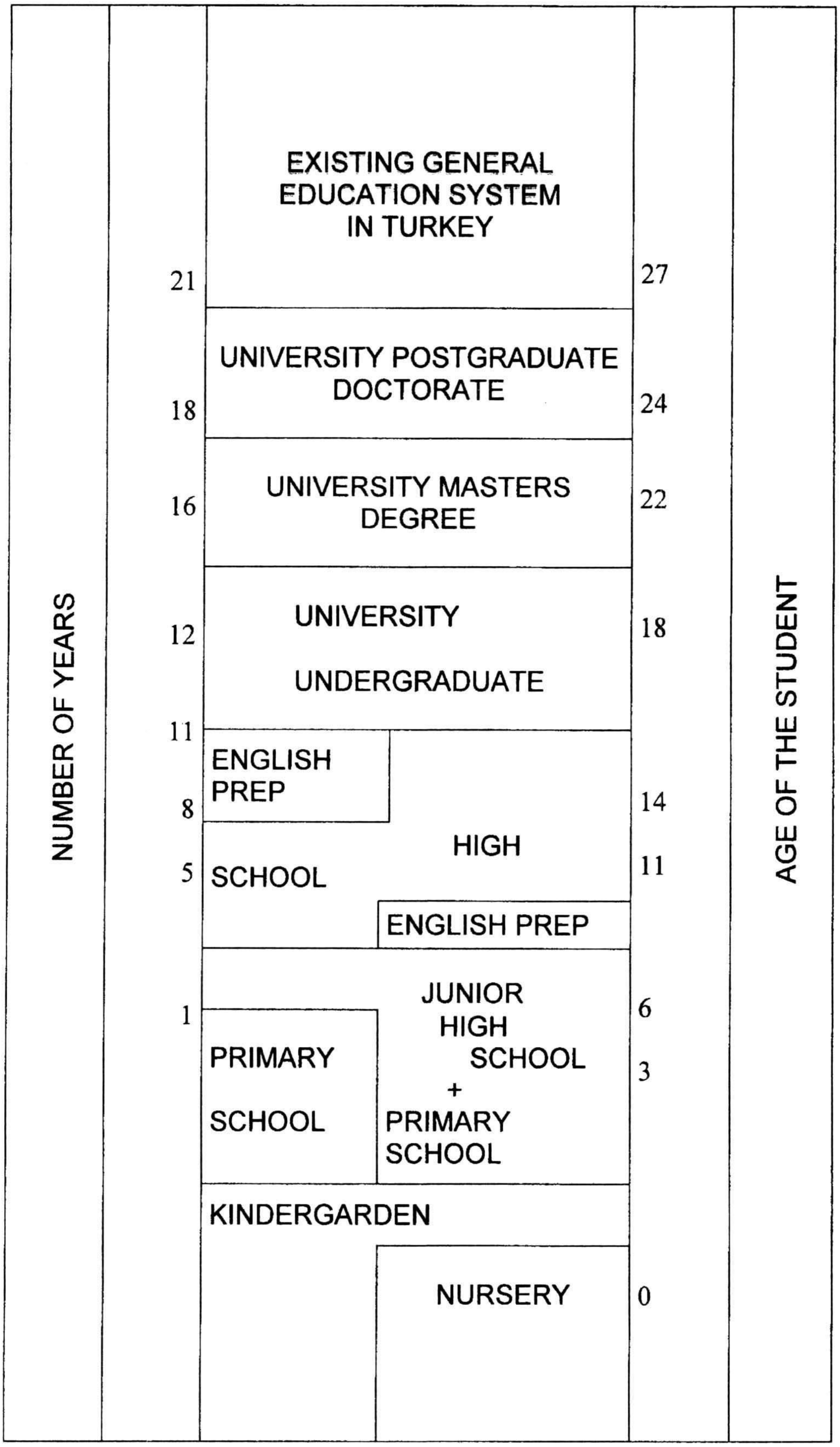

FIGURE 1 Existing General Education System in Turkey.

IX YEAR	HRS/WEEK	X. YEAR	HRS/WEEK	XI. YEAR	HRS/WEEK
Literature	4	Literature	4	Literature	4
Religion	1	Religion	1	Religion	1
History	2	History	2	History	2
Geography	2	Culture	1	Philosophy	2
Maths	5	Composition	3	Literature	3
Biology	2	Psychology	2	Geography	3
Physics	2	Geography	2	Maths	5
Chemistry	2	Maths	5	Geometry	2
Health	2	Geometry	2		
Languages	4	Analytic geometry	2		
Physical Ed.	2				
	28		24		
Electives	5	**Electives**	6	**Electives**	6
		Languages (1)		Logic	2
TOTAL	**33**	Languages (2)		Sociology	2
		Computers		Languages	2
			30		28
		Arts	1	Law	2
		Music	1	Arts	1
		Physical Ed	1	Music	1
				Physical Ed	1
		TOTAL	**33**		
				TOTAL	**33**

Figure 2. State High School Program in Turkey

TABLE 1 (a) MATHS CURRICULUM OF THREE YEARS AT HIGH SCHOOL
FINAL YEAR
FUNCTIONS
LIMITS
CONTINUITY FUNCTIONS
DIFFERENTIALS
INTEGRALS
LINEAR ALGEBRA
SECOND YEAR
TRIGONOMETRY
RANDOM NUMBERS
LOGARITHMS
PERMUTATION, COMBINATION,
PROBABILITY
SERIES
FIRST YEAR
LOGIC
SETS
FUNCTIONS
NUMBERS
POLYNOMIALS
EQUATIONS, INEQUALITIES, FUNCTIONS

TABLE 1 (b)-PHYSICS CURRICULUM OF THREE YEARS AT HIGH SCHOOL
FINAL YEAR
LIGHT
WAVE MOTION
LIGHT THEORY
ATOM THEORY
MOVEMENT OF PARTICLES IN
ELECTRICAL FIELD
SOLAR ENERGY
SECOND YEAR
FORCE
MOTION
NEWTONS LAW
GRAVITATIONAL MOTION
IMPULSE AND MOMENTUM
ENERGY
MAGNETISM
ELECTROSTATICS
ELECTRICAL CURRENT
ELECTROMAGNETIC INDUCTION
FIRST YEAR
PROPERTIES OF A PURE SUBSTANCE
PURE SUBSTANCE AND ELECTRICITY

For Example, Istanbul Technical University has 11 Faculties. To enter to Faculties Like Industrial, Electrical (computer) Engineering; one must be in the top 1-2% where as the Faculty of Mines and Ores accept students from the top 15%, ITUMF students come from the top 8-10%.

Students without proficiency in Languages, attend to a one year Language Preparatory class before they start to their normally 4 year University Undergraduate program. Only disciplines like Medicine, Veterinary science etc.. are for six years. Students graduate from the University at the age of 22-24.

Postgraduate programs of Masters and Doctors degrees are normally for 2 and 3 years, respectively. Students complete a combined MSc + PhD Postgraduate Study at the age of 27-30.

Refer to **Figure 2** for the three year State High School program where the quality of education is very high by all International standards. A typical example of the curriculum of Mathematics, and Physics at three years of a State High School before entering to the University will support this argument, presented in **Table 1 (a), 1(b)**.

C. EXISTING MERCHANT MARITIME EDUCATION SYSTEM IN TURKEY –

The Merchant Maritime Education in Turkey has classically been a 4+1 year University Degree Education with the Istanbul Technical University Maritime Faculty, for both Deck and Engine Departments.

Refer to **Figures 3, and 4** for the Program structure of Deck, and Engine Department Education at ITUMF with 8 semester programs presented in **Tables 2, and 3**. (Ref.2)

In 1995 when STCW 95 was drafted giving major importance to "Training and Assessment – Regulation I/6", "Quality Standards – Regulation I/8", "Use of Simulators – Regulation I/12", all undergraduate programs of ITUMF have been reconsidered to be carefully transformed into the format of Figures 2, and 3 which are mainly "7.01+7.03+PLUS" for Deck Department, and "7.02+7.04+PLUS" for Engine Departments. An Integrated Quality System of ISO 9002 + ISO 14001 acquired separately from Class NKK of Japan, and RINA / IQNET of ITALY achieved for the first time in any Higher Education Institute in Europe accredits the Undergraduate programs system of ITUMF to 35 IQNET member countries.

In 1995 when STCW 95 started to be widely pronounced, the Administration in Turkey which is the Prime Ministry, Undersecretariat for Maritime Affairs gave major importance for the same number of hours of IMO Model Courses to be included in Undergraduate Programs. With other obligatory courses of the Turkish Higher Education Law of No. 2547, the programs presented 35-40 hours of education per week causing a number of inconveniences.

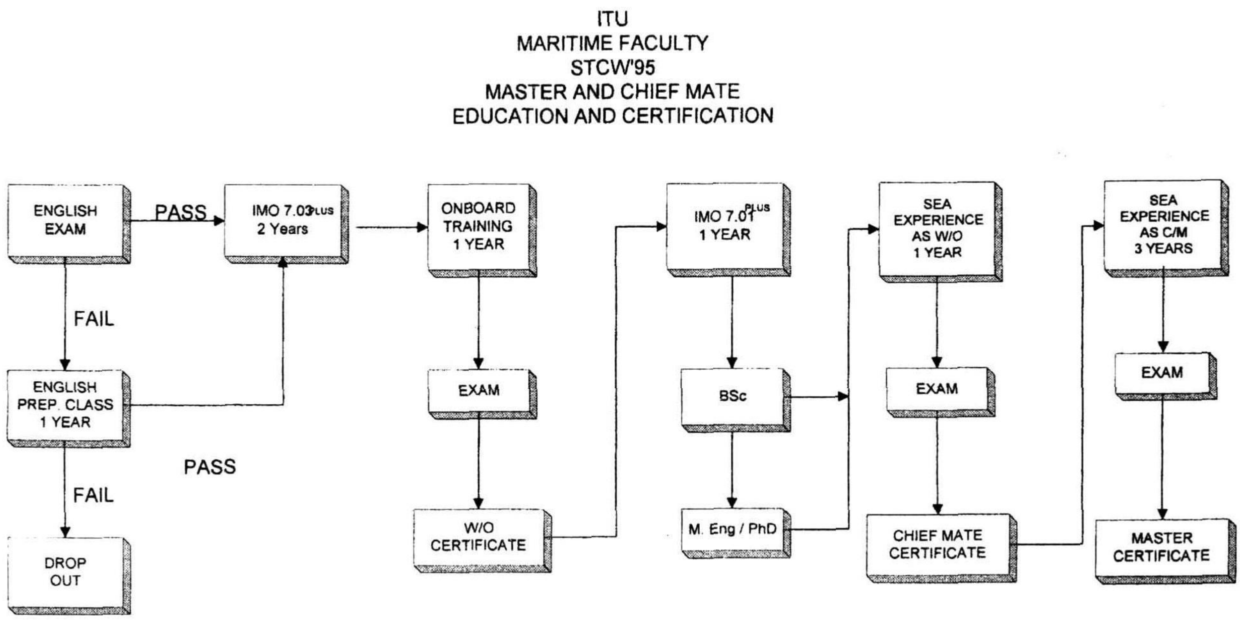

Figure 3

ITU
MARITIME FACULTY
STCW'95
CHIEF AND SECOND ENGINEER OFFICER
EDUCATION AND CERTIFICATION

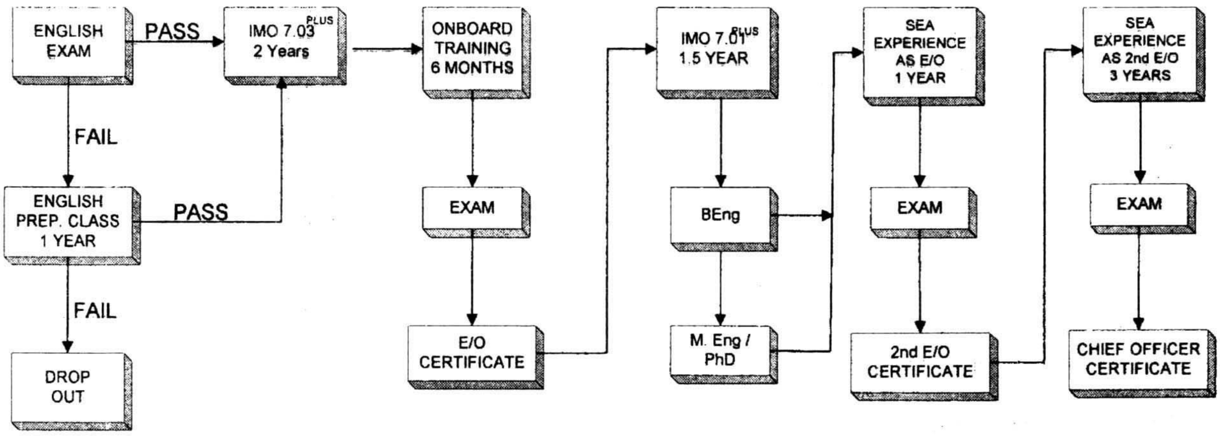

Figure 4

Administration concentrated on the number of hours (quantity) being similar to IMO Model Courses for undergraduate programs, but overlooked at the level and the quality of the contents covered in these number of hours. Due to bureaucratic reasons, institutes had to follow the administration for being eligible at the Certificate of Competency Exams of Seafarers.

There are mainly four categories of Merchant Maritime (human resources) Education in Turkey, at present

1. ITUMF - 150 students / year

   Istanbul University, Marine Transportation, Administration Dept. - 50 students / year

   İzmir Dokuz Eylül University, Maritime College - 50 students / year

   KTU, Sürmene Marine Sciences Faculty - 50 students / year

These are 4+1 year state education Institutes after High School leading to Oceangoing Master/ Chief Engineering certificates in the long run with capable academical staff body, International campus facilities, laboratories, and Administration approved undergraduate program (with Graduate Schools as well) emphasis given to English Language. All State Universities are attended with symbolic tution fee. (Ref 7-14)

2. ITU, Maritime Junior College - 150 students / year

   Kocaeli - Karamürsel Maritime Junior College - 600 students / year

   Uludağ - Yalova Maritime Junior College - 50 students / year

These are two year courses after high school only leading to W/O, and E/O certificates with 7.03, and 7.04 IMO Model Courses covered relatively for Deck and Engine Departments. Programs are Administration approved, but all have comparatively limited staff, laboratories. Students with rather lower scores of University Entrance Examination are admitted. All state Universities are attended with symbolic tuition fees.

TABLE 2. MARINE ENGINEERING DEPARTMENT CURRICULUM

First Semester

GMZ 100	Mathematics I	(4-2)
GMZ 101	Physics	(3-1)
GMZ 102	Marine Chemistry	(2-1)
GMZ 105	Computer Programming	(2-1)
GMZ 114	Engineering Drawing I	(2-2)
GMZ 115	Workshop I	(1-3)
GMZ 121	Introduction to Marine Engineering I	(3-0)
GMZ 160	English for Engine Officers I	(3-0)
GMZ 165	Physical Educating I	(1-1)
ESP	Introduction to Computer Programming	(2-0)

Second Semester

GMZ 200	Mathematics II	(4-2)
GMZ 201	Physics II	(3-1)
GMZ 214	Engineering Drawing II	(2-2)
GMZ 215	Workshop II	(2-4)
GMZ 221	Introduction to Marine Engineering II	(3-0)
GMZ 222	Statics	(2-0)
GMZ 260	English for Engine Officers II	(3-0)
GMZ 265	Physical Education II	(1-1)
ESP	General Aspect of Marine Engineering	(2-0)

Third Semester

GMZ 300	Mathematics III	(4-0)
GMZ 310	Dynamics	(3-1)
GMZ 315	Workshop III	(2-4)
GMZ 317	Introduction to Marine Electrotechnology	(4-0)
GMZ 318	Operation and Maintenance of Main and Auxiliary Machinery I	(4-4)
GMZ 319	Thermodynamics I	(3-0)
GMZ 360	English for Engine Officers III	(2-0)
GMZ 361	History of the Turkish Revolution I	(2-0)
ESP	Marine Hydraulics	(2-0)
ESP	Introduction to Naval Architecture	(2-0)

Fourth Semester

GMZ 400	Mathematics IV	(4-0)
GMZ 405	Numerical Analysis	(2-0)
GMZ 409	Material Science	(3-0)
GMZ 411	Strength of Materials	(3-1)
GMZ 415	Workshop IV	(2-4)
GMZ 417	Marine Electrotechnology I	(3-1)
GMZ 418	Operation and Maintenance of Main and Auxiliary Machinery II	(2-2)
GMZ 419	Thermodynamics II	(3-0)
GMZ 460	English for Engine Officers IV	(2-0)
GMZ 461	History of the Turkish Revolution II	(2-0)
ESP	Energy and Energy Sources	(2-0)
ESP	Energy Conversion	(2-0)

Fifth Semester

GMZ 517	Marine Electrotechnology II
GMZ 518	Fluid Mechanics
GMZ 520	Heat Transfer
GMZ 525	Marine Diesel Engines I
GMZ 526	Marine Auxiliary Machinery I
GMZ 527	Naval Architecture
GMZ 532	Machine Design
GMZ 566	Turkish I
ESP	Marine Heat Engines

Sixth Semester

4 Months OnBoard Training
28 Credits

Seventh Semester

GMZ 722	Steam Boilers	(3-0)
GMZ 723	Steam Turbines I	(2-1)
GMZ 725	Marine Diesel Engines II	(4-2)
GMZ 726	Marine Auxiliary Machinery II	(3-1)
GMZ 732	Electronics	(3-0)
GMZ 733	Automatic Control	(3-0)
GMZ 740	Management Economy	(2-0)
GMZ 753	Labor Law	(2-0)
GMZ 766	Turkish II	(2-0)
ESP	Power Plants	(2-0)

Eighth Semester

GMZ 823	Steam Turbines II	(3-0)
GMZ 824	Gas Turbines	(2-0)
GMZ 825	Marine Diesel Engines III	(3-1)
GMZ 828	Survey Procedures	(2-0)
GMZ 829	Refrigeration	(3-0)
GMZ 834	Heating, Ventilation and Conditioning	(3-0)
GMZ 859	Maritime Law	(2-0)
GMZ 844	Simulator	(2-3)
GMZ 880	Project	(2-4)
ESP	Marine Engineering	(3-0)
ESP	Mechanical Vibrations of Ships	(3-0)
ESP	Personnel Management	(2-0)

' Credit hours, (Theory-Practice)
'' English Language Supported Programme

TABLE 3. DECK DEPARTMENT CURRICULUM

First Semester

GVZ 100	Mathematics I	(4-0)
GVZ 101	Physics I	(2-1)
GVZ 102	Marine Chemistry	(2-1)
GVZ 105	Computer Programming	(2-1)
GVZ 121	Ship Power Plants I	(2-0)
GVZ 135	Seamanship I	(1-1)
GVZ 139	Navigation I	(4-2)
GVZ 142	Safety at Sea I	(1-1)
GVZ 160	English for Deck Officers I	(3-0)
GVZ 165	Physical Education I	(1-1)
ESP''	Introduction to Computer Programming	(2-0)

Second Semester

GVZ 200	Mathematics II	(4-0)
GVZ 201	Physics II	(3-1)
GVZ 210	Statics	(2-0)
GVZ 233	Watchkeeping I	(4-0)
GVZ 235	Seamanship II	(2-1)
GVZ 239	Navigation II	(4-2)
GVZ 242	Safety at Sea II	(1-1)
GVZ 260	English for Deck Officers II	(3-0)
GVZ 265	Physical Education II	(1-1)
ESP	Basic Marine Terminology	(2-0)

Third Semester

GVZ 300	Mathematics III	(3-0)
GVZ 303	Spherical Trigonometry	(2-0)
GVZ 312	Dynamics	(2-0)
GVZ 317	Electronics	(2-1)
GVZ 327	Ship Construction	(2-0)
GVZ 333	Watchkeeping II	(4-0)
GVZ 335	Seamanship III	(2-2)
GVZ 339	Navigation III	(4-2)
GVZ 360	English for Deck Officers III	(2-0)
GVZ 361	History of the Turkish Revolution I	(2-0)
ESP	Introduction to Naval Architecture	(2-0)

Fourth Semester

GVZ 400	Mathematics IV	(3-0)
GVZ 418	Fluid Mechanics	(2-0)
GVZ 431	Ship Stability I	(3-1)
GVZ 439	Navigation IV	(4-2)
GVZ 440	Electronic Navigation I	(2-2)
GVZ 442	Safety at Sea III	(2-2)
GVZ 459	Economy	(2-0)
GVZ 460	English for Deck Officers IV	(2-0)
GVZ 461	History of the Turkish Revolution II	(2-0)
ESP	Cargo Handling and Stowage	(3-0)
ESP	Emergency Procedures	(2-0)
ESP	Shipping	(2-0)
ESP	Port Management	(2-0)

Fifth Semester

GVZ 534	Ship Manoeuvring and Handling I	(1-1)
GVZ 537	Meteorology I	(2-1)
GVZ 539	Navigation V	(4-2)
GVZ 540	Electronic Navigation II	(2-2)
GVZ 541	Cargo Handling and Stowage I	(4-0)
GVZ 545	Marine Communication I	(2-2)
GVZ 547	Basic Law	(2-2)
GVZ 566	Turkish I	(2-0)
ESP	Chartering and Broking	(2-0)

Sixth Semester

7 Months OnBoard Training
15 February – 15 September
28 Credits

Seventh Semester

GVZ 721	Ship Power Plants II	(2-0)
GVZ 731	Cargo Ship Stability II	(3-1)
GVZ 734	Ship Maneuvering and Handling II	(2-1)
GVZ 736	Oceanography	(2-0)
GVZ 739	Navigation VI	(4-2)
GVZ 742	Safety at Sea IV	(2-1)
GVZ 748	Maritime Law I	(4-0)
GVZ 749	Chartering	(2-0)
GVZ 766	Turkish II	(2-0)
ESP	Ship Owner Business	(2-0)
ESP	Marine Insurance	(2-0)

Eighth Semester

GVZ 833	Watchkeeping III	(2-0)
GVZ 834	Simulator	(2-3)
GVZ 837	Meteorology II	(1-1)
GVZ 841	Cargo Handling and Stowage II	(3-0)
GVZ 845	Marine Communication II	(2-2)
GVZ 848	Maritime Law II	(4-0)
GVZ 855	Personnel Management	(2-0)
GVZ 880	Project	(2-4)
ESP	Marine Engineering	(3-0)
ESP	Maritime Law	(2-0)
ESP	Navigation	(3-0)
ESP	Personnel Management	(2-0)

' Credit hours, (Theory-Practice)
'' English Language Supported Programme

3. TÜDEV – Chamber of Shipping Maritime Education Foundation Courses - 250 students / year

This is a two year course after high school only leading to W/O, and E/O certificates with again 7.03, and 7.04 IMO Model Courses covered relatively for Deck and Engine Departments. Students do not need University State Entrance Examination to attend the courses. Tuition fee is high with Turkish Standards (3000 USD/year. Building is available with staff / laboratory support from ITUMF.

TÜDEV has pioneered the very first private Merchant Maritime Education in Turkey in 1999. It is different than other profit making privets courses. It's the authors wish to see TÜDEV can a private Foundation University in the most near future, carrying out on Education of 4 years after High School, and vastly contributing to Turkish Merchant Maritime Education at the standards of a University.

4. OTHERS - 250 students / year

Recently one or two private instructors of practical seafaring background and no qualified teaching experience with permission granted from the Administration providing 7.03 Special Courses for Radio Officers and for some other ratings with 8 years of Basic Education and 3 years on board experience to be qualified for restricted W/O certificates with the long distance intention of qualification for W/O Certificates. Education is carried out at the facilities of a Merchant Maritime High School for 2000 USD / course tuition fee. The approach is extremely dangerous, not in line with even minimum standards of STCW '95 regarding the number of years of minimum 11 years of basic education required.

As one can observe, there is a rather variety of Merchant Maritime Education in Turkey ranging from the ITUMF et al.. 5 year very bright University Graduates with good command of English / Computers, educated by top Staff Members at campus atmosphere, with excellent laboratories; training vessel etc.. ready for any international / International employment as W/O; to private education of ratings with 8 years of basic education by individuals aiming for initially restricted, later on full W/O certificates.

D. BASE LINE STUDY, AND THE PREPARATIONS TOWARDS THE XXIST CENTURY MERCHANT MARITIME UNDERGRADUATE EDUCATION CURRICULAS OF TURKEY–

Refer to the Undergraduate Deck program of ITUMF in comparison with IMO Model Course 7.01+7.03 in **Table 4**. (Ref.2)

One does observe that ITUMF covers **3062** hours of courses (7.03+7.01+Turkish Higher Education Mandatory courses) in 4 years plus 840 hours of Maritime English in Prep. Class totalling to 3902 hours.

IMO Model Courses 7.01+7.03 education recommended by IMO (STCW '95) and Turkish Administration totals to **2597** hours.

Similarly, Refer to the Undergraduate Engine program of ITUMF in comparison with IMO Model Course 7.02 + 7.04 in **Table 5**. (Ref.2)

One again does observe that ITUMF covers **3192** hours of courses (7.02+7.04+Turkish Higher Education Mandatory Courses) in four years plus 840 hours of Maritime English in Prep. Class totalling to **4032** hours.

IMO Model Courses 7.01 + 7.03 education recommended by IMO (STCW '95) and Turkish Administration totals to **3008** hours.

When one compares some sample courses from IMO Model Course and ITUMF curriculum such as Mathematics, Physics it will be clearly observed that the IMO Model Course contents are at Junior High School level with Turkish standards, and should not be re lectured at that level in a University. Mandatory minimum Turkish Law contents of Calculus or Physics as practised anyway now, should be lectured. Thus, having already studied them before University, some hours of basic courses should be deducted from the IMO required total number of hours.

Moreover, the number of hours required by IMO for professional Maritime courses should be reconsidered to be vastly decreased at ITUMF taking into account the following boundary conditions of STCW '95 Code, Section B-I/8 (Guidance regarding quality standards).

.1 The mission statement of the institution

.2 Details of academic and training strategies in use;

.3 An organization chart and information on the composition of committees and advisory bodies;

.4 Staff and student information

.5 A description of training facilities equipment, training vessel, simulators etc..

.6 An outline of the policies and procedures on:

.6.1. student admission

.6.2. the development of new courses and review of existing courses

.6.3. the examination system, including appeals and resits

.6.4. staff recruitment training, development, appraisal and promotion

.6.5. feedback from students and from industry, and

.6.6. staff involvement in research and development

Above, independent evaluation can be carried out experimentally to all 3 categories of Merchant Maritime Education Institutes (the 4th one should be banned since approach is not in line with even minimum STCW 95 standards), and number of hours required for each institution's curricula should be redeveloped; ITUMF et al. needing the minimum number of hours covering the same courses, and may be Group 2 and 3 curricula staying in line with IMO requirements of minimum standards.

Again experimental observations for pilot number of courses should be carried out with a number of students (10 each for example) with different academical backgrounds from each category of institution attending to a certain lecture under the same conditions (staff member, laboratory etc...), and then being tested to observe their comparatively success trends. It is expected that ITUMF at al.. students will comparatively score higher points relative to other students, thus again contributing towards the development of an empirical formula of less hours spent on learning a certain topic.

This experimental approach can be extended to the students with various academic backgrounds from a number of pilot countries in the future as an IAMU - Working Group I Project, eventually achieving an international curriculum calibration scale suitable for all parties concerned; having of course the same curriculum for the students of the same quality and background.

This will yield in the High Standard Merchant Maritime Universities / Faculties of the world being involved with more concise number of hours of curriculum to grasp the same amount of knowledge in relation with Institutes in line with STCW '95 minimum requirements who might need that many hours (IMO Model Course Hours) to learn the same topic.

Again utilising less hours, more advanced topics can be introduced to quality students compared to a standard student.

Thus, the 35-40 hour / week programs of ITUMF et al. due to the bureaucracy of the Administration tending to keep in line with IMO Model Course tedious hours designed for 14-15 year old cadets of more modest academic backgrounds; can be vastly and effectively reduced to create space for "Dual Major" education during the same period of time within the Faculty, and "DUAL FACULTY Program" of Turkish Higher Education which permits one bright student to graduate from two Faculties of ITU during 5-6 years instead of one at four years. (For example, Maritime Faculty and Industrial Engineering Faculty.)

Also under this renewed conditions, with less hours during the week Turkish Higher Education permits the bright student to take all required courses at a shorter time to graduate 1 semester earlier.

This approach also permits the student to be involved in research, final year project more specializing on his field of interest, and graduating under more optimum, efficient conditions.

E. CONCLUSION -

The authors recommend that, the outcome / results of their approach to design a mathematical / empirical scale regarding the number of hours of undergraduate programs most efficiently required for students of different academical backgrounds which will be presented as a full paper at the First INAUGURAL CONGRESS of IAMU in Istanbul / Turkey during June / July 2000; should be brought to the attention of IMO – STW subcommittee as a positive approval of which Administrations will widely without hesitation take new liberal measures for each party avoiding very orthodox measures leading to inefficient waste of academical time for some high quality institutes concerned.

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G. APPENDIX – TABLES

TABLE 4 - ITUMF Undergraduate Deck Program in comparison with IMO Model Courses 7.01 + 7.03

TABLE 5 - ITUMF Undergraduate Engine Program in comparison with IMO Model Courses 7.02 + 7.04

H. NOMENCLATURE

STCW	Standards of Training, Certification, and Watchkeeping
IMO	International Maritime Organization
W/O	Watchkeeping Officer
C/M	Chief Mate
E/O	Engineering Officer
C/E	Chief Engineer
ITUMF	Istanbul Technical University, Maritime Faculty
CLASS	
NKK	Nippon Kaiji Kyokai
RINA	Registro Italiano Navale
IQNET	International Quality Network
KTU	Karadeniz (Black Sea) Technical University
TUDEV	Turkish Maritime Education Foundation
IAMU	International Association of Maritime Universities
STW	Standards of Training, Watchkeeping

IMLA	International Maritime Lecturers' Association
MED	Mediterranean
UNDP	United Nations Development Programme
ITU	Istanbul Technical University
IMAM	International Maritime Association of Mediterranean

TABLE 5 – ITUMF UNDERGRADUATE ENGINE PROGRAM IN COMPARISON WITH IMO MODEL COURSES

IMO MODEL COURSE 7.04			IMO MODEL COURSE 7.02			ITUMF		
1. Int. to marine eng. Materials	18		1. Thermodynamics and heat transmission	52	5	1. Mathematics	280	28
2. Basic eng. science	47	3	2. Mechanics and hydromechanics	68	18	2. Physics	112	
3. Mathematics	100		3. Operational principles of diesel Installations	114		3. Marine chemistry	42	
4. Marine eng. drawing & design Part 1/Part 2	60	60	4. Operation and maintenance of machinery 60			4. Computer programming	42	
5. Industrial chemistry	30	15	5. Physical and chemical properties of fuels and lubricants	33	-	5. Engineering drawing	112	
6. Hand and power tools	-	120	6. Technology of materials	94		6. Workshop	308	
7. Machine tools	-	160	7. Chemistry and physics of fire and extinguishing agents	28,5	7,5	7. Int. to marine eng'g	84	
8. Fabrication, welding, joining , cutting	-	120	8. Marine Electrotechnology, electronic and electrical equipment	146	85	8. Statics	28	
9. Marine engineering maintenance – Part 1 / Part 2	-	100	9. Fundamentals of automation, instrumentation and control systems	65	6	9. English	140	
10. Marine plant operation	-	30	10. Naval architecture and ship construction	123	-	10. Physical education	56	
11. Thermodynamics	84	6	11. International maritime law, agreements & conventions	36	-	11. Dynamics	56	
12. Mechanical Science	50	10	12. Personnel management, organization and training	31	-	12. Marine electrotechnology	182	
13. Int. to marine electrotechnology	70	20	13. Medical emergency- first aid	12,25	7,75	13. Operation and maintenance of main and auxiliary machinery	140	
14. Int. to ships & ship routines	24	-				14. Thermodynamics	84	
15. Basic free fighting	13	5				15. History of Turkish Revolutions	56	
16. Medical emergency – basic training	6,5	5,5				16. Material science	42	
17. Personal survival	10	5				17. Strength of materials	56	
18. Seagoing Phase	~	1 year				18. Fluid machines	42	
						19. Heat transfer	42	

19. Marine eng. materials	28	-	14. Life-saving appliances	11,75	18,25	20. Marine diesel engines	224
20. Marine heat engines	30	6				21. Marine auxiliary machinery	98
21. Marine electrotechnology	73	43				22. Naval architecture	42
22. Advanced workshop Practice	-	200				23. Machine design	42
23. Operation & maintenance of	248	-				24. Turkish	56
main and auxiliary machinery						25. On board training	
24. Medical emergency – first aid	12,25	7,75				26. Steam boilers	42
25. Proficiency in survival craft	11,75	18,25				27. Steam turbins	84
26. Advanced training in fire fighting	28,5	7,5				28. Electronics	42
						29. Automatic control	42
	1004	982				30. Management economy	28
	1986					31. Labor law	28
						32. Gas turbines	28
						33. Survey Procedures	28
						34. Refrigeration	42
						35. Heating, ventilation and conditioning	42
						36. Maritime law	28
						37. Simulator	70
						38. Final year project	84
						39. Maritime English	840
						EXTRAS	
						Introduction to Computer Program	28
						General Aspect of marine eng.	28
						Marine hydraulics	28

		Int. to Naval architecture		28
		Energy and energy sources		28
		Energy conversion		28
		Marine heat engines		28
		Power plants		28
		Marine engineering		42
		Machinacal vibrations of ships		42
		Personnel management		28
			210	
			3192+840	

TABLE 4 – ITUMF UNDERGRADUATE DECK PROGRAM IN COMPARISON WITH IMO MODEL COURSES

	ITUMF	IMO MODEL COURSE 7.03	IMO MODEL COURSE 7.01	TOTAL
1. Mathematics + Spherical Trigonometry	224	144	-	144
2. Physics + Electronics	140	304	-	304
3. Watchkeeping	140	117	48	165
4. Ship Power Plants	56	-	34	34
5. Navigation + Electronic Navigation	616	576	187	763
6. Safety at Sea	154	116	157	273
7. Ship construction	28	63	31	94
8. Ship Stability	112	68	106	174
9. Ship Manoeuvring Handling	70	15	48	63
10. Meteorology + Oceanography	70 + 28	58	33	91
11. Cargo Handling	98	50	104	154
12. Maritime Communications	112	105	70	175
13. Maritime Law	112	-	87	87
14. Maritime English	PREP 840 + 140			
15. On Board Training	12 MONTHS	-		
16. Personal Management	28			
	+			
1. Chemistry	42			
2. Statics	28			
3. Dynamics	28	EXTRAS		
4. Fluid Mechanics	28			
5. Computers	42			

6. Seamanship	126			
7. Physical Education	56			
8. Turkish History	56			
9. Turkish Language	56			
10. Economy	28			
11. Basic Law	56			
12. Chartering	28			
13. Simulators	70			
14. Final Year Project	84			
15. Int. to Naval Arc.	28			
16. Basic Marine Tech.	28			
17. Int to Camp. Prog.	28			
18. Cargo Handling	42	EXTRAS		
19. Chartering	28			
20. Shipowner Business	28			
21. Marine Eng.	42			
22. Navigation	42			
Shipping	28			
Marine Insurance	28			
Maritime Law	28			
Personnel Management	28			
Port Management	28			
TOTAL	**3062 + 840**			

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COMPUTER TESTS – HARMLESS OR NOT?

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ABSTRACT

Almost everyone knows computer method of control over the knowledge when the monitor shows a question and several answers. A student has to choose the correct answer and push the key. The next question with answers appears. In the end of the test computer puts the corresponding mark.

This type of testing has certain advantages as compared to traditional oral inquest: the test teacher saves much time at the inquest of large groups of students. These advantages have made this type of test wide spread in different knowledge fields.

But is the type of test harmless?

Lets turn to the answers to questions: one of them is correct and the rest are false. It means that false answer should be concealed and looks very much like the correct one. That's where the problem is.

During the test mental activity is intensified and the person is thinking intensively over each answer trying to choose the correct one. Can we assure that he or she will remember the correct answer and will get rid of false ones for good? No, we can't assure it. On the contrary the brain of the tested person will automatically fix all the answers which he or she was thinking over.

In some time under the real working conditions and in case of emergency when urgent solution is required the person may remember false answer.

The present paper suggests solution of the above problem.

COMPUTER TESTS - HARMLESS OR NOT?

Almost everyone knows computer method of control over the knowledge when the monitor shows a question and several answers. A student has to choose the correct answer and push the key. The next question with answers appears. In the end of the test computer puts the corresponding mark.

This type of testing can also be carried out in a written form when the questions and written on the sheet of paper and the task for the student is to mark the numbers of correct answers. Teacher has the table with numbers of questions and numbers of correct answers.

This type of testing has certain advantages as compared to traditional oral inquest:

1. Even in written variant of the test teacher saves much time at the inquest of large groups of students.
2. In computer variant teacher does not spend any time at all, as he or she gets the ready computer made marks.

These advantages have made this type of test wide spread in different knowledge fields.

But is the type of test harmless? Lets turn to the answers to questions: one of them is correct and the rest are false. How must a false answer look like? If false answer is made if obviously wrong form it can be easily recognized by a student who has just finished a course of certain subject or by a specialist who is retrained in this field.

It means that false answer should be concealed and look very much like correct one. That's where the problem is.

One of the university teachers confessed in a private conversation that he spends much time to think of false answers in theory and structure of vessel.

It is known that human brain has certain ability to choose different pieces of information including knowledge and its subsequent reproduction. Some persons can better remember oral information (lectures), other - writen information (textbooks), some people can better remember drawings (posters, illustrations, screen versions).

Emotionally valuable events can be better remembered, for instance the beginning and the end of a story, an object on the background etc.

What can be better understood, preserved and reproduced? Something, which is pondered over, repeated for several times and emotionally experienced. These processes we can find during a test.

What does a person feel when being tested? It is obvious that the mental activity is intensified and the person is thinking intensively over each answer trying to choose the correct one. Can we assure that he or she will remember the correct answer and will get rid of false ones for good?

No, we can't assure it. On the contrary the brain of the tested person will automatically fix all the answers which he or she was thinking over.

In some time under the real working conditions and in case of emergency when urgent solution is required - which answer will the person remember.

In case of emergency surgeons say 'We are loosing a patient'. A surgeon has just come back from retraining. There are thirty variants of reaction in case patient's heart breaks down, twenty of which are false. Would you like to be operated on by the surgeon?

A plane is landing and there is a break down in the system. The pilot has twenty variants of action at his disposal, fifteen of which are false. Would you like to be one of the passengers?

In storm vessel suddenly loses its stability. Captain has recently been tested, and there are fifteen answers in his memory, thirteen of which are false. Would you like to find yourself on board the vessel?

Spot check shows that a percentage of "remembering" false answers is rather high. Some time after testing students often give wrong answers i.e. show the non-existing knowledge which were not given by text book or by a teacher.

For example tests are composed so that student has to choose one concealed incorrect answer from ten correct ones. This answer will be remembered better than all the correct answers as it is accompanied by positive emotion of success. Memory will preserve all this 'informational garbage'. Memorizing of correct answers will be weak.

Usually tests are composed so that a person has to choose one or two correct answers disguised among several incorrect. In this case individual features of memory will prove to be most important.

Much will depend on how a person works over control tests, how intensively he thinks and how many times he repeats the lesson. The memory will preserve both correct and incorrect answers. Incorrect answers are also valuable for brain as they have to be found, recognized and separated from correct ones. This is accompanied by positive emotion.

During a test a person suffers a kind of nervous break down, anxiety and fair of failed exam. Even if a person does not confess in these feelings they still exist. These are negative emotions.

Every case of emergency can also cause such emotions.

Memory should find safe decisions both under the conditions of exam and in case of emergency. In stress situation that is better reproduced what was perceived in the like circumstances. Remembrances will by any means contain false answers.

A person will have to waste his or her time to analyze memory and repeated search of correct answers.

Creating false answers, which look very much like the correct ones we give our students so called knowledge, which do not exist and don't have any right for existence.

Thus, tests as they are present factories, which produce, distribute and implement false knowledge, information which was specially created in order to obscure brains and which manages to do it.

In case of real emergency the stress in multiplied. We can not exclude the possibility of wrong choice at the existing type of testing.

In winter 1983 a rescue vessel was tugging to the shore refrigerating trawler damaged by ice with its two departments filled by water. The sea was rough. At some moment the vessel lost its stability and took about 30 degrees list.

Captain of the tugged trawler on the motion put the helm over and took the full speed trying to correct the heel. As a result of this manoeuvre the vessel took a 45 degree list on another side, the hell was never corrected and the vessel sank.

It is known that such manoeuvre is prohibited for the vessel, which has lost its stability. The rules of seafaring practice can read this. It is also said by teachers during lectures. Nevertheless we are sorry to hear from time to time about captains trying to do it.

If the question on heel correction is included into a test, among false answers we would certainly find this dangerous prohibited manoeuvre. Many navigators will remember it. Then, in emergency we would have higher level of wrong operations.

Seafarers know that a serious danger is offered to a small vessel by sailing in a storm at overtaking sea. If length of a vessel and wave length are approximately equal and their speeds are almost equal this can be very dangerous. The vessel can suddenly loose its stability upset and sink. In order to avoid danger it is necessary to reduce speed and change the track.

Many years ago when I was a captain of fishing vessel my ship was a flagship and headed 15 similar vessels. We were coming back home to Vladivostok port from Nothern part of the sea of Okhotsk though the strait between Sakhalin and the continent. Having passed through narrow fairways we entered the Tatar Strait. I allowed the vessels to follow independently as their speed range permitted. The column extended. There was fair storm wind, but sea was not rough because there was not enough space for the waves' speeding up. As we continued motion the space astern grew, and the height of wave increased.

At one moment the ship appeared on the crest, she was carried on by the wave but in some seconds the wave retrieved. I went up to the bridge. The length of wave was close to the length of the vessel and its speed was higher than that of the vessel. The height of the wave was not very big so I did not notice any danger.

In a quarter of an hour a wave (probably ninth one) raised the vessel up. We were again on the crest, which was located around middle.

The wave carried the vessel forward turning it to the left. Suddenly the vessel fell down on its left side with about 45 degrees list. Helmsman was thrown from the helm, broke the deck house door and stuck in the bridge wing guard. I was staying between the control pillar and telegraph pillar, so I stayed on my feet. I changed into low speed but the speed was not reduced. (It occurred that watch-keeping mechanic who was in the engine room was thrown to aside and could not get to the speed regulator.) Finally the propeller's speed reduced sharply, the wave passed by and the heel was corrected.

I immediately informed the rest vessels of the accident over the radio and asked them for reports. It proved that two more vessels suffered the same situation but to a less degree. None of the captains reduced the speed. I ordered every vessel to change for half-speed and we safely continued the motion.

If we include to a test the question of captains actions at lost stability while sailing on strong fair wind we will certainly find among false answers the order 'Full ahead'. In this case you won't have to listen to my report now.

I know the case when fishing vessel moved in the Barents Sea in a storm its side to the wave which was very bad for about twelve hours. The vessel was rolling but its stability preserved under the normal level.

While entering its native harbour the vessel had to be turned ahead. Almost at once the vessel took the list of 40 degrees but managed to balance. The captain turned the vessel and mover at a low speed for several hours. Relatives of crew-members made fires ashore waiting for the coming back from a voyage.

In the evening the captain took the second attempt to enter the harbour. At first the vessel moved ahead then suddenly upset and sank in sight of the seeing in.

There was no testing at that time. If this question is included into today's tests we should expect increase in the amount of the accidents.

While I was working on my report Vladivostok newspaper informed about two cases of loose of stability by vessels. On may 15^{th} 15 miles off Somali coast a 120 meters long cargo vessel got a strong list. The vessel lost its stability because of the cargo shift and began listing. The crew was saved by Russian container vessel *Alexander Fadeev*, which approached the emergency signal. The list was about 25 degrees.

On the same day 4 mile off the shore transport *Skrypev* began listing starboard and sank. The crew was rescued by fishing vessel.

May be captains of the vessel have passed computer tests and thoroughly studies false answers to the question of operations in case of lost stability of a vessel?

What can we do?

1. I believe that first off all it is necessary to conduct research on 'obstruction of memory by false knowledge' after computer testing on various subjects.
2. It in necessary to mark out operators which are required to quickly react and make decisions, who's incorrect acting can result in serious consequences or accidents. They are pilots, navigators, cosmonauts, surgeons, nuclear power station operators, locomotive drivers and many others.
3. During training and knowledge control of the operators it is essential to prohibit tests with false answers.

4. Simulators used for training the said operators including computer simulators should be prepared not to read texts but to imitate operations and incorrect operations as well under different conditions.

After each incorrect operation there should be a red flashing light with inscription 'Wrong operation! Be aware of emergency!'

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TOWARD A GLOBAL STANDARD MET SYSTEM - AN ANALYSIS OF THE STRENGTHS AND WEAKNESSES OF PRESENT MET SYSTEMS

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ABSTRACT

The primary consequence of the globalisation of international shipping industry is harmonization enforced through the STCW 95 certification systems established in different countries. However, after several years of its application, beside many positive effects the legal and educational framework enforced by the STCW 95 convention also shows a number of drawbacks.

In this paper the consequences of the application of the STCW 95 convention on the organisation of the MET institutions are examined. Particular attention is paid to the effectiveness, strengths and weaknesses of the traditional, more academic MET systems in comparison with the more vocationally oriented system of maritime education and training. Conclusions are based on the recent experience of MET institutions in Croatia where MET institutions were recently forced, by government decision, to abandon academic approach and to apply "pure" vocational system.

Finally, assuming that present trends toward further harmonization and standardization will be maintained, the papers presents an outline of a possible future global standard MET system with particular reference to MET institutions.

1. INTRODUCTION

As a sociological process globalisation has been noticed for the first time in the shipping industry back in early 1970's. At that time a number of well-known shipping companies from traditional maritime countries have gradually changed the flag of their ships to so-called flag of convenience (*foc*) countries. At the beginning, companies registering ships in *foc* countries would retain national crews but after some time, first crew members and later masters and officers were replaced with seafarers, mainly from developing countries, willing to work for much lower salaries. Today, except at routes directly or indirectly controlled by a national authority, a great proportion of trading ships sailing at international routes have multinational crew on board. The number of different nationalities ranges from two or three up to twenty or more on great passenger cruisers. In the situation where the ship's owner, flag of the ship, ship's operator and crew members rarely come from one and the same country, the governmental control of education and training standards can hardly be implemented. Eventually the number of problems arising from such circumstances and severity of their consequences has progressively increased to the extent that an international action became a necessity. In response to this fast-growing problem the International Maritime Organization (*IMO*) organised the first International Conference on

Standards of Training, Certification and Watchkeeping of Seafarers in London in 1978 (*STCW*). Unfortunately, after several years, the minimum standards set up in the original convention proved to be insufficient, forcing IMO to practically rewrite the original text

2. STCW 95 - FRAMEWORK TO BE EXTENDED

Recognizing the importance of the human factor for all levels of maritime safety and environmental protection, IMO assigned highest priority to the work on the new text of the STCW convention, which was eventually accepted in 1995.

If compared with the original version, where only a broad outline of the certification system to be followed by the member states has been defined, the new text contains numerous improvements. Among the most important are clear and concise procedures for issuing certificates of competency and for their recognition, the competencies required are described in much greater detail as well as other duties and responsibilities of the member states, etc. Taken together, the new text of the convention has been generally deemed as a giant step towards standardization and harmonization of the certification systems used in member states.

It has been frequently stated that the most important difference between the 1978 and 1995 versions was the fact that new convention is competency-based. The term "competency" has been indirectly defined as phrase "incorporating prescribed standards or levels of knowledge, understanding and demonstrated skill". The terms "demonstrated skill" and "proficiency" are used interchangeable in the text as synonyms.

However, it has to be emphasized that the new convention did not in any sense define the processes to be followed for obtaining the competency, *i.e.* it did not try to standardize or harmonize any aspect of the maritime education and training (*MET*). In other words, the convention defined the final product of the MET process without defining the process itself. The "honourable" exceptions are numerous recommendations to member states to follow model courses (being recommendation themselves).

It seems that the authors of the convention tried to avoid any direct influence on the national MET systems as much as possible. For example, the convention did not even try to define the duration of education/training, resources and equipment, MET entry requirements, etc. Justification for such an attitude can be found in numerous variations of national MET systems in existence, making the task extremely complex. Another reason can be found in the fact that the basic requirements (to be fulfilled in a limited time as defined by the convention) burden administrations to the such extend that additional pressure could force them to consider or actually reject the convention.

Even with such an approach the influence of the STCW 95 convention on national MET systems cannot be disregarded. The convention clearly defined certificates at different levels as the final "product" of the MET process. Subjects to be taught are defined implicitly in the description of the each competency. Also, very helpful information can be extracted from the methods for demonstrating competencies as well as in the assessment criteria.

It can be stated that STCW convention, one way or another, just started the process of harmonizing various national MET systems toward an internationally agreed MET system. However, it will not be fast as it could be if requirements regarding curricula and institutional framework of the national MET system are articulated more clearly. Probably the most important changes will be imposed by the obligatory application of quality systems (QS) in the MET institutions. In order to obtain QS certificates, MET institutions will be forced to compare their standards with whatever standard exists. In this respect, IMO model courses are of the highest importance since these are still the only existing ones, though unofficial standards concerning the process of MET. However, it could be expected that in following years model courses will be applied more or less uniformly by numerous national MET systems in the world.

In light of the relation between the STCW 95 convention and national MET systems, the STCW convention presents a major step towards an internationally harmonised certification system and, at the same time, a first step towards internationally harmonised maritime education and training system. From the standpoint of MET institutions it can be deemed as an international framework and basis for further development to be expected in the near future.

3. Institutional Changes - Experience from Croatia

Maritime education and training in Croatia has a long-time tradition. The first secondary schools, many of them still existing today, were established in the first half of the 19th century. A higher education programme, lasting two academic years and dedicated to masters and engineers, started in Rijeka in 1949, soon to be followed by higher MET institutions founded in Split and Dubrovnik.

In 1978 the Maritime Training School in Rijeka became the Faculty of Maritime Studies, offering two and four years programmes, and in the latter case, a Bachelor of Science degree. At the same time the institution became a full member of the Rijeka University.

During 1998 the Croatian government's decision to split the academic system in two parts, academic and vocational, became effective and the institution was forced to abandon the four year programme and to split in two institutions: the Rijeka College of Maritime Studies and University Department of Maritime Studies. The College deals with vocational education of seafarers while University department offers a university programme in the field of maritime transportation. Graduates of the University departments are trained to take up positions on shore. At the same time, Croatian maritime authorities have started the process of full implementation of the provisions of the STCW 95 convention. It has to be emphasized that institutional change of the education system did not influence the Croatian MET institutions on the secondary level as those on the level of higher education.

The institutional reform and the application of the STCW convention provisions have considerably changed the position of the higher-education MET institutions in the overall national higher education and technology (ET) system.

The changes regarding institutional organization and work are numerous. Since the higher education MET institutions are no longer a part of the local university, theoretically, the requirements to be met by students for the entry level need not necessarily to follow university standards. Another direct negative consequence is decrease of the requirements for the electing academic staff – they are no more required to obtain appropriate academic degrees (M.Sc. and Ph.D.) as before. As the STCW 95 convention, more or less clearly, prescribed a minimum content of education programmes, there are numerous requests for a stricter application of STCW 95 provisions, thus abandoning additional subjects (such as a higher mathematics). As for the existing higher-education institutions in Croatia are concerned, this means that the requirements to be met by the students in order to graduate (particularly regarding knowledge and understanding), previously in accordance with university standards, could be decreased.

Finally, the number and extent of research projects, previously quite common and important for a long-term development of an institution, almost disappeared from the everyday agenda.

As a direct consequence of the previously mentioned changes there is a number of requests to national ET authorities to establish higher-education MET institutions according to new rules in the smaller local centres where previously applied standards, particularly regarding academic staff and other resources, could not be met.

In addition, with the separation of academic and vocational education, seafarers wishing to obtain an academic degree after a number of years spent at sea have little or no possibilities to do so.

4. MET - What next?

In response to the changes imposed mainly by the mentioned political decision and partly by the application of the STCW 95 convention numerous members of the academic staff in Croatian higher MET institutions have raised a number of issues regarding future development of MET institutions, both in the Croatia and abroad. The most important issues, according to the authors' opinion are the following:

- Who is the real customer of MET institutions at a higher level? Individual seafarers, shipping industry, national administration, or the country as whole? Depending on the possible answer, the development policy of an institution will be completely different!

- Should higher education MET curriculum consist of vocational subjects defined in the STCW convention (educating the so-called "deep-sea drivers") or should they include general subjects such as higher mathematics, chemistry, and physics?

- What is the "depth" of the MET curriculum – only subjects directly associated with professional tasks (relating mainly to maritime safety and pollution prevention) or should some other additional subjects be included helping the student to understand the underlying processes (shipboard technology, law, economy, cargo, ports and their organization)?

- Should MET institutions include in their regular curriculum the subjects supplementary to those defined in STCW convention, thus covering a wider area of maritime transport, making education more expensive, but offering students extended possibilities when applying for positions on shore?

- What approach should be used when designing and conducting the curriculum taught at higher education MET institutions: theory vs. practice, problem solving vs. skills (blind routine)?

- How much effort should be dedicated to develop skills, knowing that skills are based on the presently existing technology that will be abandoned or replaced in due time, no matter whether in a few years or over the next decade? How much attention should be paid to almost abandoned technologies, such as celestial navigation?

- Should MET institutions on higher level dedicate a part of their resources to research projects? If so, what kind of projects?

It is worth noting that many important questions can be answered if answers to previously stated questions are known. An example could be the question of minimum qualifications for the academic staff - as high as possible if an MET institution intends to teach students how to use problem-solving methodology or if it is involved in research projects, and as low as possible if an MET institution's sole concern is to offer the minimum level of competency as required for the target certificate in the shortest possible time and at a price as low as possible (the so-called "deep-sea driver" option).

For the authors of this paper the most viable option for higher education MET institutions is based on the proposal made by the authors of the METHAR project [1,2]. According to this proposal a national MET system should recognize two types of institutions: those, preferably being members of the university, offering degree courses (BSc) and those, whether independent institutions or not, offering non-degree courses.

The degree programme, lasting 3½ - 4 years, should consist of general subjects (such as university-level mathematics, chemistry and physics), core curriculum, extension and enrichment. The core curriculum part should be based on the corresponding IMO model course (without any alterations) and should be harmonized (regarding the subjects, duration and time sequence in relation to general subjects) at least on the national or preferably on the international level. The extension part should consist of several groups of elective subjects to be selected by the student, and corresponding to different modern transport technologies (for example liquid cargoes, transportation of passengers, bulk commodities, etc.). Certain components of the extension part should as much as possible correspond with or include IMO model courses, if existing. Enrichment part should be fully dedicated to various aspects of the shipping industry and related activities – basically for taking positions on the shore (maritime law, economics of shipping and ports, multimodal technologies, environment protection, etc.).

The non-degree programme, lasting two years, should consist of core curriculum (same as for degree programme) and general subjects (including mathematics, chemistry and physics but at lower level than for the degree programme).

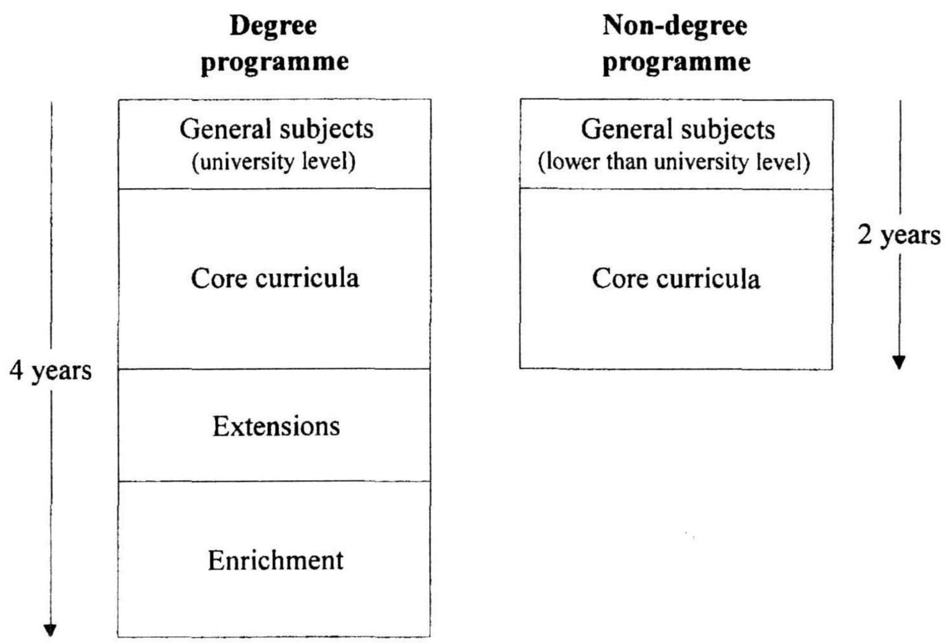

Figure 1 Schematic presentation of the proposed harmonized MET system for higher education [2]

It is the authors' opinion that the proposed system could satisfy the needs for a wide range of different countries and different national ET schemes. Advantages of the proposed system are enclosed basically in the appropriate combination of the standardization, even on the international level (in the core part) and adaptability for specific purposes (in the extension and enrichment part). The system as proposed offers a possibility for an easy continuation of the education of seafarers after a number of years spent at sea. The system also conforms to present developments regarding mobility of students as proposed by the European Rector Conference (CRE), especially if European Credit Transfer System (ECTS) is applied.

5. CONCLUSIONS

It is the authors' opinion that structure of national MET systems at higher education level, presently under the strong influence of the national tradition and ET systems in place, will tend to the similar form. This tendency will be further promoted predominantly through the standardization of certification systems under the umbrella of the STCW convention. Today, at the beginning of the process, the standardization of MET systems will be encouraged through informal recommendations, first and foremost through IMO model courses. Later on, more formal standardization, probably using the STCW convention as a legal framework, can take place. However, the standardization, whether formal or informal, will be limited only to subjects defined by the STCW convention as essentials, while a significant part of the curricula will be left outside, thus allowing each institution or country to tailor its education programmes to their specific needs.

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THE TURKISH PROJECT: A COLLABORATIVE LEARNING MODEL FOR MARITIME INSTITUTIONS

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ABSTRACT

The article analyzes a unique collaborative learning model that was recently introduced in a semester-long course at Maine Maritime Academy. The participants collaborated with their peers from a Turkish maritime university, using the internet as the communication medium to accomplish their project goal. Student expectations and concerns regarding the project and the pedagogy were gathered using pre- and post-project surveys. Data analysis shows that while the project was not perfect and requires significant faculty commitment, there are tangible benefits from pursuing such a learning model. The researcher recommends applying similar models in traditional maritime academic fields.

1. INTRODUCTION

The human race is blessed with many unique characteristics that include the presence of an inquisitive mind, and the desire and willingness to learn. If given the option, human beings develop their own ways and means of learning a body of knowledge. While some individuals learn best in a tranquil environment, there are some that do not learn in the absence of a stereo system playing their favorite music. Davis [1] and others have documented the usefulness and effectiveness of various learning models. Collaborative learning model is one such pedagogy that has been applied and studied extensively in traditional educational discipline [1]. However, there has been no documented work that details the effectiveness or usefulness of such a learning model in maritime education. It is unclear as to why this is the case as there has always been a strong correlation between the success of a maritime venture and the effectiveness of the collaboration between various stake-holders involved in that venture. Despite all the advances in our understanding of the learning process, and the various coordinate-d efforts toward educating an era of "zero-defect" seafarers that constantly seek con-tinuous improvement, it is ironic that there is very little emphasis toward collaborative learning that involves direct inter-university student-to-student contact in the maritime discipline. The only instances that incorporate any level of collaborative maritime academic learning is typically during bridge team exercises or those that prepare seafarers for emergency situations such as life-boat and fire drill or other emergency situations.

The existing models of collaboration between maritime institutions are limited to inter-institutional agreements that typically facilitate faculty, and in some rare cases, student exchanges. There has been virtually no documented effort to promote collaboration between students of maritime universities on a real-time basis. The paper will discuss an ongoing effort between two maritime universities to facilitate collaborative learning without leaving their respective campus and by taking full advantage of the worldwide web and the internet. The model and its outcomes should be of particular interest to the International Association of Maritime Universities (IAMU) given its mission as well as the ongoing globalization of business activities in general.

The paper will provide a brief description of ongoing globalization of goods and services and use that as a background to establish the case of global seafarers, an IAMU mission. It will then examine relevant collaborative learning paradigms. This will be followed by a description of the MMA-DEU collaborative learning model and its outcomes. The data gathered from the study will be analyzed and conclusions made to fine-tune and enhance the effectiveness of similar projects in future years. The author will also recommend some possible collaborative learning topics with a more direct maritime connotation.

2. THE GLOBALIZATION OF MARITIME EDUCATION

The formation of the International Association of Maritime Universities is an ambitious yet essential attempt in light of the broader ongoing changes in global business environment. The world is becoming increasingly smaller from a physical as well as a literal sense. Hill observes that the business strategies of international businesses have progressed gradually from the basic international strategy of the post WW-II years to those of multi-domestic, global and transnational strategies during the last few decades [2]. Businesses seek sustainable competitive advantage in the marketplace taking into account the various cost pressures and product differentiation pressures unique to their product and market. The maritime industry has kept up with ongoing broader strategic changes by adapting its business practices. There have been numerous mergers and acquisitions in the various shipping markets that parallel the global trend toward horizontal and vertical integration that is often reported in business periodicals. The liner sector has witnessed the evolution of global players such as the Maersk-SeaLand, the APL-NOL and the P&O-Nedlloyd mergers [3]. There have been similar trends that involve independent ship-owners in the dry and liquid-bulk markets as well as involving independent ship owners and other third party service providers in the industry such as ship management companies [4]. The dramatic growth of ships registered in nations that do not have a genuine link with the beneficial owner is an excellent illustration of the contemporary ship-owners adapting their operational strategy to establish "least cost" business systems [5].

The market for seafarers has also undergone dramatic changes in the past few decades. Recent studies have documented the ongoing decline of seafarers from the well-developed, traditional maritime nations [6]. The economic and social benefits of pursuing a seafaring career are readily observable in major supplier nations such as the Philippines and India. The role of non-traditional seafarer supply sources will continue to increase because of the worsening supply shortage of navigating officers and marine engineers. As a result, the industry's dependence on the global seafarer will enhance in future years.

The formation of the International Association of Maritime Universities provides a unique but essential opportunity to facilitate a global learning process in maritime education. The concept of global learning is well understood in business lexicon as it helps the migration of the best practices from all source regions. The IAMU Working Group I aims to improve the methods and contents of maritime education training at member universities in light of the globalization of the world maritime labor force. IAMU Working Group III has the express goal of promoting global maritime excellence. Hence, it is imperative that the IAMU and its working groups examine and analyze various learning models that would enhance student learning and lead to a regular and dependable supply of globally competent workforce in future years. One such learning model that has been studied extensively but used very little presently in maritime universities is the collaborative learning model.

3. THE COLLABORATIVE LEARNING PEDAGOGY

Collaborative learning is a pedagogical mechanism. It is known under different names such as cooperative learning, collective learning, learning communities, peer teaching, peer learning, reciprocal learning, team learning, study circles, study groups, and work groups [1]. Beckman [7], Chickering and Gamson [8], Collier [9], Cooper and Associates [10], Goodsell, Maher, Tinto and Associates [11], Johnson and Johnson [12], Johnson, Johnson and Smith [13], and Whitman [14] have researched the effectiveness of students working in small groups. Johnson, Johnson and Smith [13] suggest three broad categories of such learning and they include informal learning groups, formal learning groups and study teams. While the informal learning groups are typically of an *ad hoc* nature, the other two groups are of longer duration and may typically last throughout the entire course of a semester. An element of commonality among all the studies listed earlier is that they evaluate the effectiveness of intra-institutional collaboration between students taking a particular course in a subject area and working in small groups of varying numbers, whether or not under the direct supervision of an instructor.

4. THE TURKISH PROJECT

The Turkish Project collaborative learning model experimented during the spring semester 2000 at Maine Maritime Academy (MMA) is a variant of the earlier studies. The author developed the model based on experiences gained from incorporating the more traditional peer-learning exercises in various business and economics courses taught in previous years. The maritime business faculty members at the Dokuz Eylul University (DEU) were invited to participate in the pilot project prior to the start of the semester to which they readily consented. The author decided to introduce the model in an International Logistics Management course taught by him.

<u>PROJECT DESCRIPTION</u>. The MMA student sample consisted of fifteen third year students pursuing a BS degree in International Business and Logistics. The Turkish Project was one of the course requirements and the student performance in the project counted for 35 percent of their course grade. The students were required to find a Maine-based product that could be exported and sold in the Turkish market. The students grouped themselves into six teams, three groups of three students each, and another three groups of two students each.

The project was divided into three distinct phases. During phase one, the MMA students conducted a country analysis of Turkey that helped them to learn the Turkish history, culture, and other salient socioeconomic aspects. The students identified their product and its Turkish market potential during the second phase. During the third phase, the student worked out a logistics and marketing plan inclusive of landed cost of their product in Turkey, import and export documentation, customs formalities, a sales and distribution strategy to be pursued in Turkey as well as estimated sale prices and revenues from the operation.

The author assigned students deadlines for each phase, with approximately a month gap between each of the deadlines. A detailed written report was due at the end of each of the phases, with 30 percent of the project grade being assigned for each phase. The remaining 10 percent of the project grade were set aside to evaluate a final oral report made by each MMA student team.

THE ROLE OF DEU STUDENTS. Two DEU faculty members provided a listing of DEU students that would participate in the project as Turkish counterparts for the MMA students. The DEU students were to provide guidance and help the MMA students in understanding the Turkish culture and its socioeconomic and business features. Thus, the role of DEU students was limited to only serving as quasi-consultants rather than as direct stakeholders in the project.

COMMUNICATION AND COORDINATION. A project of this nature would be impractical in the absence of advances in communication technology. Both MMA and DEU have excellent internet capability that made the project possible. The project and its details were included in the author's personal web page maintained on the MMA server. The web page also hyper-linked to the team pairings as well as commonly used Turkish phrases and expressions to help the MMA students. All communications between the paired teams were to be done through e-mails with a copy of each e-mail transaction going to the author as well as each of the two DEU faculty members that assigned students for the project.

5. STUDY METHODOLOGY

The author drafted qualitative surveys to gather student perceptions prior to the project and also on completion of the project. The surveys were administered to MMA students as well as DEU students through their faculty members, using the internet as the communication medium. A description of the pre- and post-project questionnaires follows.

PRE-PROJECT SURVEY. The researcher designed a pre-project questionnaire that consisted of two segments. The first segment sought to query the student expectations from the project while the second segment aimed at understanding their concerns (see Tables 1 and 2). The survey included statements related to each segment that were to be answered using the Likert scale with 1 being complete disagreement, 3 being indifferent and 5 being complete agreement. Further-more, students were also given the option to add statements of their own to capture any omissions and exclusions on the author's part.

Table 1. Student Expectations

NO.	STATEMENTS
1.	Make new friends
2.	Gain cultural knowledge
3.	Learn to do business in Turkey
4.	Become a better manager

POST-PROJECT SURVEYS. The re-searcher used two survey instruments to gather student perceptions on completion of the project and help evaluate its pedagogical outcomes. One instrument consisted of the same questions as those used in the pre-project survey (Tables 1 and 2). The other instrument consisted of seven statements that were to be answered using the Likert scale with the same notations as given earlier. Table 3 contains a listing of these statements.

Table 2. Student Concerns

NO.	STATEMENTS
1.	May take a lot of time
2.	Dislike for strangers/foreign culture
3.	Language problems
4.	Cultural problems
5.	Other team unhelpful

Table 3. Post-Project Outcomes

NO.	STATEMENTS
1.	The project was a useful exercise
2.	Our team worked well
3.	Our team shared tasks well
4.	Foreign team was helpful
5.	Foreign could be more helpful
6.	Collaborative learning is good
7.	Continue collaborative learning

Table 4. MMA Student Expectations: Pre- and Post-Project

	Pre-Project							**Post-Project**						
Stmt. No.	**1**	**2**	**3**	**4**	**5**	**Mean**	**SD**	**1**	**2**	**3**	**4**	**5**	**Mean**	**SD**
Expectations														
1.	4	5	5	0	1	2.27	2.35	6	5	3		1	2.00	2.22
2.				2	13	4.87	7.78			5	5	5	4.00	0.00
3.				1	14	4.93	9.19		1		5	9	4.47	4.00
4.		1	3	2	9	4.27	3.59		3	2	4	6	3.87	1.71
Concerns														
1.	2	3	5	2	3	3.07	1.22	4	2	1	3	5	3.20	1.58
2.	13	1	1			1.20	6.93	14				1	1.27	9.19
3.	1	2	7	3	1	3.07	2.49	2	7	2	1	3	2.73	2.35
4.	1	5	6	2	1	2.80	2.35	4	5	3	2	1	2.40	1.58
5.	5		6	2	2	2.73	2.06	1	1	4	2	7	3.87	2.55

6. EMPIRICAL ANALYSIS

The empirical analysis consists of three stages. The first stage analyses the identical pre- and post-project surveys, the second stage compares the mean values of the responses received from both MMA and DEU students, and the last stage interprets the results received from a revised post-project survey distributed to MMA students.

STAGE ONE (MMA STUDENTS). All fifteen MMA students answered the three survey instruments listed above. Eight DEU students responded to the pre-project survey. The post-project surveys were sent to the DEU students through their faculty members and their responses as well as responses from the DEU faculty are expected in the near future. All responses are tabulated in the following pages. Table 4 compares the pre- and post-project responses received from MMA students, the weighted-averages of those responses and their standard deviations.

The responses indicate that MMA students did not begin the project anticipating major social gains such as making new friends. The post-project responses give further credence to this. The students agreed strongly with the second statement that they expected to enhance their cultural knowledge from the project. The post-project responses however tempered this observation although they still expect similar projects as an effective learning tool in understanding foreign culture. A similar pattern can be observed in the student responses to the statements three and four. There was relatively strong agreement with the expectation that the learning model would help in gaining professional knowledge and competence essential to function effectively in the global market. The lowering of student expectations in the post-project survey is a reflection of the need for fine-tuning of the project rather than their rejection of this pedagogy. The analysis of pre-project student concerns indicates that they were indifferent to the time factor becoming a major issue. The students strongly disagreed about cultural incompatibilities affecting their performance. They were also relatively neutral about language problems as well as other teams not providing sufficient help. The only noticeable trend from the post-project survey was the MMA students' concern about the Turkish teams not providing sufficient help. Answers to all the other statements remained relatively neutral with the only exception being statement number two that was rejected strongly once again.

Table 5. DEU Student Perceptions

NO.	1	2	3	4	5	MEAN	SD
Expectations							
1.	1	2		2	3	3.50	0.82
2.		2	2	2	2	3.50	0.00
3.			1	2	5	4.50	2.08
4.	2		1	1	4	2.73	2.06
Concerns							
1.	2	1	1	2	2	3.13	0.55
2.	6	2				1.25	2.83
3.	4	1	2	1		2.00	1.41
4.	5		2	1		1.88	2.08
5.	3		1	1	2	2.86	0.96

STAGE ONE (DEU STUDENTS). Table 5 shows the responses received from DEU students. The responses to the first segment tend to be in agreement with all given statements including the expectation to make new friends. They were indifferent to two of the concerns, viz., the time commitments and the other team not being helpful. Their responses to the other three statements ranged from mild to strong disagreement.

STAGE TWO. This stage shows a comparison of the mean values of the MMA and DEU student responses. As the author has not yet received DEU student responses to the post-project survey, a composite weighted-average value was developed for the MMA students. Table 6 shows the comparisons.

Table 6. Comparison of Mean Responses

	MMA		DEU	
NO.	**MEAN**	**SD**	**MEAN**	**SD**
Expectations				
1.	2.13	4.69	3.50	0.82
2.	4.43	7.38	3.50	0.00
3.	4.70	9.82	4.50	2.08
4.	4.07	5.52	3.63	1.41
Concerns				
1.	3.13	1.22	3.13	0.55
2.	1.23	11.75	1.25	2.83
3.	2.90	2.95	2.00	1.41
4.	2.60	3.39	1.88	2.08
5.	3.30	3.67	2.86	0.96

Analyzing Table 6, the MMA student expectations are generally more in agreement with the given statements with the sole exception of the statement that pertains to making new friends. The answers to concern-related statements also show many similarities. One could conjure a number of explanations for the minor differences especially in the responses to the sociological benefits of the project, a major one being the cultural differences between the Turkish and the U.S. students.

STAGE THREE. The statements tested in this survey are shown in Table 3 and the responses are anlysed in Table 7. The students agreed that the project was a useful learning exercise. In general, the MMA teams worked well and shared their tasks well internally among the respective teams. They disagreed that the DEU teams were as helpful as they would have liked. This was con-firmed with a similar question (statement number 5) to eliminate questionnaire bias. The most promising outcomes of this study are found in the answers to statements 6 and 7. The students agreed moderately or more that collaborative learning is a good pedagogical model and such efforts should be continued.

Table 7. MMA Students Post-Project Perceptions

NO.	1	2	3	4	5	MEAN	SD
1.		1	4	3	7	4.07	2.50
2.		3	2	5	5	3.80	1.50
3.	1	2	1	7	4	3.73	2.55
4.	8	3	2	1	1	1.93	2.92
5.		1	4	2	8	4.13	3.10
6.		1	3	4	7	4.13	2.50
7.		1	3	2	9	4.27	3.59

7. OUTCOMES ANALYSIS

The responses received have reaffirmed the usefulness of the collaborative learning model used in this study. It is the author's intention to fine-tune the model to enhance the effectiveness of similar academic projects. However, the numerous hurdles that exist in such ventures must also be acknowledged.

One major difficulty is in finding a foreign university whose academic year is at least somewhat similar to the own university's academic calendar. In the case of MMA and DEU, the MMA spring semester began approximately a month before the DEU's semester. Such difficulties can be overcome through careful planning of the activities and the class agenda.

Once partnering universities are identified, there is the important issue of finding a faculty member teaching a related course in the foreign campus and who is willing to get involved in such an exercise. Most faculty members do not have the spare time to coordinate the activities of their students as well as that of their counterparts elsewhere. Only an extra-ordinary faculty member is willing to go over and beyond what is normally done in a classroom to accomplish a task of this nature. Furthermore, there has to be adequate incentives for the students from the foreign university to get involved in the project. One mechanism to accomplish this is by having a reciprocal project for the foreign students who would also receive academic grade for their efforts that would depend on the cooperation received from the people that they were originally expected to help. One should expect student complaints about the lack of cooperation from the other team given the human propensity to blame someone else for their own failures. So, the faculty members must be adept in handling such charges and countercharges. All these hurdles are over and above the difficulties typically associated with coordinating and grading an intra-campus group project.

8. APPLICATION IN THE MARITIME FIELD

Although the Turkish project was conducted as part of a business course, the collaborative learning model can be applied in teaching traditional maritime courses as well. Examples could be collaborative projects in Coastal Navigation (Passage Plan-ning), Meteorology and Engineering that necessitate students with expertise in the subject matter explaining that to other students. This would help reinforce the knowledge base of the students teaching others. As an example, a student group from a U.S. maritime university could be tasked to make a passage plan for transiting the Bosphorus Strait, or the Japanese Inland Sea, or the English Channel which could be critiqued by their peers in the counterpart maritime universities. The local students could disseminate their under-standing of the local navigational challenges to their peers from foreign maritime universities who in their professional career would be better prepared to navigate their ships safely in those constrained waters. The work done in other fields have shown that collaborative teamwork and projects under-taken by heterogeneous groups encourage higher order thinking and problem solving [15] [16]. Furthermore, this would also prepare the future seafarers for understanding and appreciating foreign nationals, cultures and value systems. These are highly desirable skill-sets for future seafarers and will promote excellence in their profession.

9. CONCLUSION

Collaborative learning models and their effectiveness in higher education is well recognized. It is well worth the time and effort to apply such models in maritime education because of the significant benefits they offer. The learning process is enhanced in these situations through social interaction that by itself is a highly desirable trait among future seafarers.

There is very little current use of such learning models in maritime education in general. Collaborative learning of the inter-institutional type is rarely attempted even in the more traditional disciplines. The recently concluded Turkish Project showed that it can be done effectively between students in maritime universities. The availability of internet communications obviates the traditional communication difficulties that would have precluded pursuing such projects in the past.

The Turkish Project is far from perfect and has several areas that need improvement. Both groups of students must be carefully chosen and there should be adequate incentives for them to participate and contribute effectively in the learning process. As a learning model, it requires significant commitment and planning on the part of faculty members. The institutional faculty reward system should take such initiatives into account and due recognition must be given to faculty members who undertake such efforts. Philanthropic organizations should also promote such initiatives as it would be another step toward promoting safer seas and cleaner environment, so dear to one and all of us. It is concluded that the inter-institutional collaborative learning model has significant pedagogical potential in advanced maritime education and that it would contribute positively to the evolution of an era of excellence in maritime education and training.

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INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
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IMPACT OF STCW ON US MARITIME ACADEMIES HISTORY OF STCW AND IMO

SEAFARER'S TRAINING, CERTIFICATION AND WATCHKEEPING CODE

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Shipping is perhaps the most international of all the world's industries, and one of the most dangerous. In 1948 an international conference in Geneva adopted a convention establishing International Maritime Organization (IMO). The first task of IMO was to adopt a new version of the International convention for the Safety of Life at Sea (SOLAS). This was achieved in 1960 and then IMO turned its attention to such matters as the facilitation of international maritime traffic, load lines and the carriage of dangerous goods.

While safety was and remains IMO's most important responsibility, a new problem of pollution emerged. During the next few years IMO introduced a series of measures designed to prevent accidents and to minimize their consequences. IMO tackled the environmental threat by the introduction of a treaty known as MARPOL 73/78. This treaty covers not only accidental and operational oil pollution but also pollution be chemicals, goods in packaged form, sewage and garbage.

In 1969 and 1971 IMO adopted treaties which enabled victims who suffered financially from oil pollution to obtain compensation much more simply than had been possible before.

In 1970 IMO was instrumental in the establishment of the International Mobile Satellite Organization (INMARSAT) which greatly improved the provision of radio and other messages to ships.

IMO is best known for being responsible for the adoption of maritime legislation with special attention crew standards. Approximately 40 conventions and protocols have been adopted by the Organization and most of them have been amended on several occasions to ensure that they are kept up with changes taking place in the world shipping.

IMO is one of the smallest of the United Nations agencies with a staff of approximately 300 people. The objective of IMO is simple, "safer shipping and cleaner oceans". The annual budget for IMO for 2000-2001 is 36,612,200 pounds sterling. The amount paid by each member state depends primarily on the tonnage of its merchant fleet.

IMO consists of an Assembly, a Council with five main Committees: the Maritime Safety Committee; Marine Environment Protection Committee; Legal Committee; Technical Cooperation committee; and the Facilitation Committee. The Assembly is the Governing body of the Organization and consists of all Member States which meets once every two years in regular session. The Assembly is responsible for approving the work program, voting the budget and determining the financial arrangements of the

Organization. The Assemble also elects the Council.

The Council is composed of 32 Member States elected by the Assembly for two-year terms. The Assembly is responsible for supervising the work of the Organization and, coordinating of activities of the organs of the Organizations; consider the draft works and budget estimates; receiving of reports and proposals and forwarding to Assembly with appropriate comments and recommendations; appoint the General Secretary; and enter into agreements or arrangements concerning the relationship of the Organizations with other organizations. The Members of the council for 2000-2001 are as follows: China, Greece, Italy, Norway, Russian Federation, United Kingdom, United States, Argentina, Brazil, Canada, France, Germany, India, Netherlands, Sweden, Australia, Bahamas, Cyprus, Egypt, Finland, Indonesia, Malta, Mexico, Morocco, Panama, Philippines, Republic of Korea, Singapore, South Africa, Spain and Turkey. Mr. William A. O'Neil of Canada is the present Secretariat and has held this position since 1990.

In 1978 an international conference was held in London, England which was hosted by the International Maritime Organization (IMO). The 1978 STCW Convention entered into force on 28 April 1984. Since then three amendments were adopted, 1991, 1994, and 1995. The 1995 amendments were adopted by resolution to the International Convention on Standards of Training, Certification and Watch keeping for Seafarers, which was convened by the International Maritime Organization (IMO) from 26 June to 7 July 1995 at IMO headquarters in London, England. It was the intention of STCW to clarify the standards of competence required, introduce qualification requirements for trainers and assessors, provide effective mechanism for enforcement of its provisions and allow greater flexibility in the assignment of functions on board ship thus broaden the career opportunities of seafarers. Many countries were represented at 1978 conference. Establishing a universal set of standards governing the qualifications of mariners would level the playing field by preventing developing countries from employing poorly qualified officers and crew. A set of uniform minimum standards would improve safety and the competitive position of companies that were obligated to meet their country's higher standards.

Under the STCW Code, mariners are required to perform proficiency demonstrations in addition to passing written exams. The present US system combines sea service along with written examination to determine eligibility for rank and grade. Under the STCW Code the candidate will have to display the ability to do the job prior to being issued a license.

Proficiency demonstrations sounds idealistic but has the potential to become extremely troublesome due to the subjectivity of the demonstrations. Practical demonstration can be extremely labor intensive as well as subjective. Time and money must now be allocated for something that did not previously exist, at least top the degree which the new standards are requiring of an individual. The new concept requires more of the Mariners than were previously required and many would say there was nothing wrong with the system to begin with so why fix it if it is not broke.

Each country that is party to the STCW convention was required to submit a detailed report to IMO detailing the process that each country was going thorough to provide "full and complete" effect of the STCW document. Countries had to build their own assessment system to ensure complete compliance. The US submission has not been responded to as of this date. The US submission is not accessible through the "Freedom of Information Act" due to the fact that the US submission was considered a "draft" document. Draft documents are not accessible through FIA. Reports were due by 1 August 1998 and are subject to review by panels of maritime experts to determine whether a country's national regulations, training schemes, and quality standards are good-faith efforts.

The United States Coast Guard, National Maritime Center, (NMC) is the authorized regulatory body for the United States which is tasked with full mandating compliance to the Code. The United States Maritime Administration (MARAD) is tasked with interpretation of the Code and assists NMC with determining acceptance standards. Both NMC and MARAD fall under the Department of Transportation within the federal government. The United States representative to the convention an is an civilian attorney who is employed by USCG .

Standards varied greatly from country to country as to what level of proficiency must an individual possess in order to serve as an entry level officer and through all the ranks to Master or Chief engineer. Some countries such as the Philippines had as many as 115 maritime schools which had no overseeing body which insured that some degree of consistency was being maintained in training seafarers.

It was determined at the 1978 convention that in order to develop standards where consistency was to be maintained globally, much data would be necessary in order to develop guidelines for all countries to comply. Between 1978 and 1995 international annual meetings continued to take place and discussion and guidelines were adopted to establish an international standard for the training of seafarers. Little dialogue took place between the U.S. representative to the convention and the schools offering training to seafarers. What dialogue took place, included that the STCW code would have little implication as to how the schools in the U.S. presently conduct their training. As a result of all communications regarding implementation of STCW having negligible impact on training, little effort was given nor was there much monitoring of discussion during the convention.

In 1995 a Resolution to the 1978 Code was put forward for full implementation globally as of 1 February 2002. The schools involved in training of seafarers in the U.S. continued to hear from the US Regulators between 1995 and 1997, that the 1995 STCW would have little implication on how the schools conducted their training programs. It was the intention of the Code to bring third world countries up in standards. For any four year college which incorporated training for seafarers such as maritime academies, it meant that the incoming freshman class as of the Fall 1998 was to be taught in accordance with the 1995 Code.

The STCW Code is divided into Deck and Engine as well as licensed and unlicensed. The part of the Code which has greatest impact on the U.S. Maritime Academies is the part which addresses Deck and Engine are "Watch keeping arrangement and principles to be observed, Article VIII".

Until the Fall of 1998, the maritime academies provided training under approved programs of MARAD. At the conclusion of four years of training and 180 days of sea service, the student was require to be examined over three to four days depending on which discipline they were enrolled. Upon successful completion of the U.S. coast Guard examination, the student received a entry level license of unrestricted horsepower and tonnage to sail vessels anywhere in the world very general terms, the STCW Code requires that a Training Record Book (TRB) be kept for each individual which shows what type of training has been administered, who administered the training, on what date the training was conducted. In another document, the school must have detailed description of all training evolution's which description of how the level of proficiency was measured and what system was used to access the proficiency.

While the U.S. representative committed the U.S. to comply with this treaty, no resources have ever been identified for implementation of STCW. The regulatory bodies of the U.S. felt the U.S. should set standards which are second to none with no resources available. There is a large degree of conflict between the regulatory bodies and the maritime academy representatives for STCW.

And while there is conflict between the regulatory bodies and the maritime academies there is also conflict internally with each of the maritime academies as to how to interpret and build a plan of action for implementation of STCW. One department would like to see the U.S. standards lowered to be consistent with global standards while the other department agrees with maintaining nothing but the highest standards globally.

US Maritime Academies

There are presently six state funded and one federally funded maritime academy in the United States. All of the academies offer Bachelor of Science degrees and are accredited by either a regional accreditation board or a national accreditation board such as ABET (Accreditation Board of Engineering and Technology).

The Six state academies are:
California Maritime*
Vallajo, California
Texas Maritime**
Galveston, Texas
Great Lakes Maritime***
Travese City, Michigan
Maine Maritime
Castine, Maine
Massachusetts Maritime
Buzzards Bay, Mass.
New York Maritime
Fort Schyler, New York

The following maritime academy is federally funded and requires congressional appointment similar to U.S. Military, the U.S. Naval, and U.S. Air Force Academies:
U.S. Merchant Marine Academy
Kings Point, N.Y.

* California Maritime is part of the State University system of California.
** Texas Maritime is part of the Texas AM University in Galveston.
*** Great Lakes Maritime is part of the University of Michigan located at Traverse City.

Maine, Massachusetts, and New York Maritime are part of the state college system for that state. All state funded maritime academies receive predominately state funds for offsetting operating costs. All state academies have training vessels funded by the federal government with the exception of Great Lakes Maritime. At Great lakes Maritime, sea service must be obtained by sailing of commercial vessels.

The US. Merchant Marine Academy at Kings Point, New York receives all funding from the US. Government. All cadets are required to procure sea service on commercial vessels. Total sea service, due to the fact that the cadets are not part of a structured at sea educational program, is 300 days. All state schools are required to have 180 days of sea service with the exception of Great Lakes Maritime which must have 270 days of sea service. Kings Point is considered a federal military academy similar to Annapolis and West Point. The graduates from Kings Point do not have active duty commitments upon graduation but do have reserve commitments due to the federal funding support received to operate Kings Point.

When attempting to compare the federal military academies you may take a close look at USCG or Annapolis and find that the graduates upon graduation do not step aboard vessels as officers in charge of a watch. The academies send their graduate to additional schooling and training which may last up to one year. The graduates which now have additional training are sent to vessels where they are placed in watch situation in an "Under Instruction Mode" until the pass a level of proficiency that is acceptable to the standards set forth by that branch of service and the Captain of the vessel. The USCG Academy recently sent representation to Massachusetts Maritime Academy to see if implementation of STCW standards could be included into it's curriculum. After spending one day on campus, the Coast Guard Academy Representative found that what was been required under STCW was covered in post graduation in the practical training aspect of prepare an officer to be "In-Charge" of a watch. There was no probability that time could be found in the existing curriculum to accommodate STCW requirements.

According to Mr. Greg Szczurek who serves as a private advisor to the U.S. delegation STCW subcommittee at IMO for the past two years, a recent graduate of a maritime academy is "not well prepared to stand a watch after receiving their license". He also states that "all would say that the system needs to be improved to make sure that a person can do the job he or she is authorized and paid to do after receiving their license". Mr. Szczurek clarifies his position by saying "as long as it doesn't cost more money or take more time or put the person in a position where he or she might be responsible for training and evaluating the candidates for advancement". This statement is particularly important to the maritime academies due to the fact the guidance and direction from MARAD and USCG on how to implement STCW is requiring all the facets identified above.

There are many similarities in academic programs between all the maritime academies. There is one exception, Great Lakes Maritime who offers an associate degree which can be linked to Ferris State University for an optional Bachelor Degree. The four year maritime academies vary in total number of credits for the degree. The average number of credits awarded is 160. 160 credits can be equated to an equivalent of a five year program wrapped into a four year program.

They all offer accredited four year B.S. degrees. They all require their cadet to take the equivalent of years of academic credits in a four year time frame. All of the maritime academies are accredited. All the maritime academies require the cadets to have no less than 180 days of sea service above their conventional academic program. All cadets must take and pass a three to four day examination administered by the U.S. Coast Guard in order to receive their degrees.

The examination measures a person's proficiency as a sea going entry level officer in the U.S. Merchant Marine. This examination combined with the cadet's academic and character endorsement has been the means of determining whether an individual is proficient to serve as an entry level officer. An individual many not take the examination unless they satisfy graduation requirements and the individual will not receive his or her degree unless the examination has been successfully completed. None of the federal academies require third party testing (U.S. Coast Guard examination) in order to obtain their degree. As a matter of fact, the U.S. Coast Guard Academy does not administer this exam to it's graduates.

It is important to note that there are other methods of procuring an entry level U.S. Coast Guard license. This process in called "License via the Hawspipe". This process allows a person to be eligible for a license by either having at least three years sailing in an unlicensed capacity and taking the exam or having the equivalency sea service and training by way of the Armed Services (Navy or Coast Guard). Both these methods require a detailed assessment of the candidates eligibility requirements and must take the same examination as the cadets from the maritime academies. Presently approximately 90% of the entry level licenses come from the maritime academies while the remaining comes from the "Hawspipe". A recent pole showed that as much as 30% of the officers sailing in one of the national unions were "Hawspipe" officers with only 10% of the original licenses being issued annually were "Hawspipe" licenses. This signifies that the "Hawspipe" individuals have a greater tendency to stay at sea for a longer career than the maritime academy graduates. There is no educational requirements for an individual procuring a license by way of the "Hawspipe" track.

Under STCW (Chapter III, Regulation III/1) it states that all "officers in charge of an engineering watch in a manned engine-room or designated duty engineer officer in a periodically unmanned engine-room on a ship powered by main propulsion machinery of 750 kW propulsion power or more shall hold an appropriate certificate.

Each candidate for certification shall:

1. be not less than 18 years of age;

2. have completed not less than six months seagoing service in the engine department in accordance with section A-III/1 of the STCW code; and

3. have completed approved educational training of at least 30 months which includes on-board training documented in an approved training record book and meet the s tandards of competence specified in section A-III/1 of the STCW Code.

If it is the intention of STCW to be worldwide standard for determining eligibility for entry level officer positions, then there is a large problem with how the U.S. determines eligibility foe entry level licenses. I recently asked a representative from the National Maritime Center how a "Hawspipe" candidate would be reviewed for meeting eligibility for licensing and the response was something close to the effect of, "I believe that I have the ability to interpret prior military educational training and apply the training against STCW requirements". If this is the case there is a great deal of subjectivity to meeting eligibility requirements for the entry level position.

Third party testing has become an accepted means of outcome assessment of what an individual has retained, at that given moment, for a level of proficiency in a given subject area. The state of Massachusetts is incorporating outcome assessments examination for college graduates entering the teaching profession and for students in grade school. Third party and outcome assessment testing is growing in acceptance and recognition in the U.S. The down side of the outcome assessment testing is that there is a tendency to teach towards what is necessary to pass the examination as well as the test only measures what an individual comprehends at that given moment. But, the testing is a consistent measure of what one knows at that given moment and can be used as an excellent resource to help the instructional institutions to alter their academic programs to better prepare the individuals for the future.

STCW Audit Process

The STCW Code requires that each country have a Quality Standards System (QSS) in order to ensure consistency and compliance with the code. On-site audits will be conducted as an important part of the procedures established by the Maritime Administration and the US Coast Guard for meeting the oversight (QSS) requirements of STCW regulation I/8. The purpose of the visit is to verify that the objectives of the professional core maritime training programs which has been approved by the joint Maritime Administration and Coast Guard STCW Review Committee (RC) continues to be achieved, and that a plan is in place for correcting any deficiencies.

The scope of the audit process will be sufficient to ascertain that the competencies identified are being taught and assesses in accordance with the approved program and to assure compliance with STCW-95 and 46 CFR. The Audit Team will attempt to help the academy assess it's strong and it's weak points. Areas of particular importance to the engineering program at the maritime academies include:

<u>Under the STCW Code</u>
III/1 Officers in Charge of an Engineering Watch
V/1 Familiarization and Basic Safety Training
<u>Under 46 CFR</u>
10.205(g) Basic and Advanced Fire Fighting
10.205(p) Practical Demonstration of Skills
10.304(p) Training Record Book

While the items listed above are designated for the engineering curriculums at each of the maritime academies, the list of areas which are subject to review during the audit for the Marine Transportation Departments (Deck) is considerably more in depth and intensive. All the areas identified above have an equivalent designation in the deck programs. Additional areas to be reviewed include; Proficiency in Survival Craft and Rescue Boats, Competence in ARPA, GMDSS Training, and Bridge Teamwork. The Audit team will examine all physical facilities including training vessels, laboratories, and simulators.

Audit team composition will be comprised of one MARAD and One Coast Guard representative with at least one of which will be a member of the Review Committee (RC). There will be two members from other academies, preferably one Deck and one Engine. The maritime academy representatives should be senior instructors who have substantial experience sailing on US Merchant vessels. Experience in accreditation audits or other audits is desirable. All travel costs and arrangements are the responsibilities of the maritime academies. The Audit Team may have one optional representative who may be invited to observe the process. The maritime academies shall provide lists to the Audit Team of potential maritime academy representatives to be part of the Audit Team.

The Audit Team will arrive on a Sunday afternoon and depart he following Wednesday. The Audit Team will employ the use of an "Audit Report Form". This form allows for consistency between visits and academies. The form provides the opportunity to allow the Audit Team member to state whether he/she feels that a given area has been satisfied by a yes/no and provides the opportunity to write comments on each of the areas be evaluated and at the conclusion of the report.

The Audit team will :

A. Review Course Files and Training Record Books

B. Meet with Senior administrative personnel responsible for organizing and administering the sea going training program.

C. Interview of deck and engineering students of all four classes.

D. Interviews of instructors and ascertain teaching loads

E. Tour Facilities, labs, simulators, training ship, Etc.

F. Observe practical demonstration skills

G. Hold daily organizational meeting for Audit Team

H. Notify Academy of any deficiencies for possible "on-the-spot" correction

I. Submit brief evaluation prior to departure

All the Maritime Academies will be subject to the audit process and must provide a three month advance notice to requesting a visit. This audit process has strong similarities to the accreditation process that each of the maritime academies must now be subject to in order to satisfy the degree requirements

Impact on Recruitment due to STCW Implementation

The maritime academies are confronted with problems which are noticed when potential students are considering a maritime academy or a conventional college or university. A student looks at the maritime academy catalog and sees five years worth of academic credits crammed into a four year time frame. The prospective students see a calendar year which averages more than 10 months in duration. This means less time to make the necessary funding to go to school. The average number of credits in any given semester is more than what is found in a conventional program. An example of the problem is when a prospective students looks at the fall freshman semester and observes 19.5 credit hours. This does not include time spent on shipboard maintenance or watch standing over the course of the week. A freshman may have 30 hours accounted for between the hours of 0800-1600 Monday through Friday. Some of the prospective students only see that they have very limited free time but the work that is required of them is considerably more than what may be found in a conventional college or university.

The maritime academies relied heavily on what is know as the "Legacy Factor" for recruitment of students. This meant that students were brought to a school be parents, friends or relatives who were alumni or tied to the school through association. As years have passed and the number of sea going positions have diminished, graduates have found employment in areas other than sea going positions. This has in turn reduced the "Legacy Factor" due to the fact that fewer alumni are seeking career long employment in the sea going positions.

In an incoming freshman class there is considerable credit given to the athletic program in recruitment of students. The athletic department sells a concept to a prospective student that they may be able to start on a varsity team in Division III athletic program due to the size of the school. As much as 40% of the incoming class has an interest in participating varsity athletics. The sales pitch to a moderately good high school athlete that "you may be able to play varsity ball as a freshman" means something to the prospective student. Moderate athletes will not be given the opportunity to make a team at Division II never mind make the starting squad.

A student will not be allowed to enter a maritime academy on athletic prowess by itself. The maritime academies weigh the time management potential of an individual. A student who has time management skills and may not even know it. The prospective student who can participate in athletics, hold down a part time job while keeping a car on the road and doing C+ or B- work in high school has great potential at the maritime academies.

With the implementation of STCW, time management plays a more important role in selecting a prospective student. There are few undergraduate academic programs which require the time management skills which are necessary at the maritime academies. STCW only makes the time management skills more necessary.

Knowing the importance of time management is emphasized at Massachusetts Maritime Academy where student have mandatory study hours Sunday through Thursday evenings. Not all students have the same study habits and due to the rigorous schedule the freshman are faced with and the need to improve their study habits, the mandatory study hours are necessary. The time management skills which are finely honed while attending any of the maritime academies are part of the reason that they are so employable in so many fields. Employers see that they have been christened with time management skills already. The employers can provide the necessary training but do not have to emphasize time management because they have a proven track record of time management.

The schools advertise the challenge of going to sea and the opportunity to sea various parts of the world while being a student. Some schools use the concept of "Learn-Do-Learn" where the "Do" takes place in an at sea environment. The schools promote the growth of an individual and maturity of an 18-19 year old student. The typical profile of a student at any of the maritime academies is an individual who has not left their parents for any lengthy period of time and has done very limited, if any, travel outside of the US.

The schools should not see any results of reduced enrollment due to STCW due to the fact that STCW is not included within the advertising aspect of the schools. The schools state that they are compliant with US and International standards. The schools do not define in detail what is necessary in order to meet the standards. Prospective high school students are more concerned with the immediate work loads and academic requirements and are not likely to pay much attention to something that is abstract in nature.

The recruitment includes the description of the USCG licensing process which is stated nothing more than "An individual must pass the USCG license exam in order to satisfy degree requirements". This simple statement has impact in it's own significance. There are very few academic programs in the country where successful completion of a third party test which last four days in length is a prerequisite for issuance of the degree. None of the US Military academies with the exception of the US Merchant Marine Academy at Kings Point has to satisfy these standards.

The concept of third party testing is consistent with accreditation standard and requirements which look for means of determining "Outcome Assessments". The USCG examinations provide a sound and establish method of determining proficiency of a candidate for USCG license. There is consistency with academic standing and the performance on the USCG license exam. The consistency serves value to the accreditation board as validating the academic system. While there may be some inconsistencies in performance on the USCG License exam and academic standing, they are few and far between.

Each of the schools must submit to the USCG a detailed license application. The process of completing the application includes drug testing, physicals, eye examinations, character references, validation of sea service and satisfaction of all academic requirements. STCW now requires and additional load to the maritime academies that a TRB (Training Record Book) be maintained and completed satisfactorily prior to be eligible for the USCG License. The TRB includes the particulars as described in the STCW Code which must be satisfied in order to have a valid international STCW Certificate Issue. The 1995 STCW Certificate is what an individual must have in their possession effective 1 February 2002 in order to sail a vessel in international waters.

We have a "Catch 22" in that he USCG License is required by US Laws under the CFRs and the STCW Certificate is required under the STCW Code. The USCG will not allow an individual to upgrade or sit for a USCG license unless the STCW Code requirements have been satisfied. Presently the maritime academies have processed a student for USCG licensing without an STCW factor. The check-off list for USCG licensing is intensive and lengthy. Now a candidate for USCG licensing must completely satisfy the TRB as well.

The TRB closely describes the activities that a student participated in during their academic career. Events including Basic Safety Training to Bridge Resource Management are included in the book. The STCW Code now requires the schools to maintain accurate record of the candidates accomplishments while attending the school. A student may satisfy the entire course with an overall passing grade but may have been absent for one lab which is listed in the TRB. That absence now prevents that individual from being eligible for USCG licensing.

Administration of TRB requires close monitoring in inputting of data in order to validate a candidates TRB. The TRB becomes an official document which the graduate will take with them when they go to sea as a licensed officer. This document can be required to be inspected at any port any where in the world.

All maritime academies are competing for a few good men and women to steal a phase from the Marine Corps advertising slogan. With the exception of Kings Point, the US Merchant Marine Academy, a student is expected to pay to attend a maritime academy. All the state maritime academies have tuition, room and board, and a fee structure associated with a traditional state college or university. States which have maritime academies are Maine, Massachusetts, Michigan, New York, Texas and California. In an attempt to increase the residential status the New England states were divided where students applying to Maine Maritime from New Hampshire and Vermont would be allowed in-state tuition status. Massachusetts has a reciprocal agreement with Rhode Island and Connecticut. There are other states which also given residential status based on the fact that the state does not have a sate maritime academy. States such as Florida are given residential status by all the maritime academies. Florida is heavily into the passenger vessel and Gulf Coast trade. Massachusetts Maritime uses port visits to Florida as a means of recruiting students from Florida.

The state maritime academies have a non residential tuition differential which may be as much as $5,000. For those who have residential status the annual cost vary between $8,000 and $10,000. There is no cost associated with attending Kings Point.

Each of the maritime academies provide open houses during the spring and fall to allow prospective students the opportunity to view the surroundings. Spring open houses are for juniors and fall open houses are directed at seniors. My observations at open house is that the prospective students would rather listen to enrolled students than professors or administrators. Massachusetts Maritime Academy separates parents from sons and daughters after friendly welcome. The parents are allowed to attend a forum discussion with faculty and administrators. The questions that the parents ask are typically different than the questions asked by the prospective students. The prospective students may be intimidated to ask questions to faculty or administrators but have no reservations of asking the question to someone they would consider to be a peer. The parents do not have to worry about their son or daughter being embarrassed by the questions they may ask.

The profile of the prospective students at the maritime academies is similar in that they average 1050 on the SATs. They fall between the 30 and 50 percentile high school class standing. All the maritime academies have had to great creative to recruit the higher academic standing high school students. Massachusetts Maritime Academy has developed scholarship programs for incoming freshman where any where from 25-60 percent of the annual costs can be absorbed through annually awarded scholarships. Students must maintain grade point average for each year in order to receive the scholarship for each successive year. This concept has attracted some very good caliber students who shine. The approach of being a "big fish in a little pond" gives them a resume at the end of their academic program which makes them highly attractive to employers. The competition between employers to obtain these students has gotten to a point where job offers are being made early into the fall semester of their senior year. In some cases five or more job offers are had by some of the top of the class.

Even in the worst of economic trends the maritime academies consistently places their graduates with complete placement of a class with three months of graduation. Employers know the value of those who have good motivational and time management skills. The maritime academies use the high placement heavily in recruitment. I have noticed while talking with prospective students that as much as they are concerned about getting a job after graduation they are even more concerned with the academic load while being a full time student. The prospective student has concerns about the immediate responsibilities associated with being a full time student. The prospective student also does not want to set themselves up for failure. The immediate load expected of a full time student is intimidating to the majority of high school students. Add STCW to what is already intimidating to most high school students and the formula that results is even a harder sell to prospective students. The maritime academies to not have much choice but to say as little as possible regarding STCW. Attempting to educate a prospective student on what STCW means may turn away those who have a strong desire to sail the globe.

Whether it may be enchantment with the ocean, the fact that a relative went to a maritime academy or just the challenge of what a student will face in a military environment, it is a unique and not a common thread that is shared among typical high school graduates. With a generation which is becoming known as the "WHY" generation having a computer literacy factor higher than the average worker in the US, there has to be a different thought process in recruitment. Using high technology based simulation as a recruiting tool will be more likely to attract an individual's attention than a glossy brochure.

Marketing 101 says that "you must know who is the ultimate consumer" only then can you develop a marketing strategy to sell your product. If the maritime academies look at the academic program as the product and the prospective students as the ultimate consumer, then a marketing plan can be developed for sales of your product (academic program) to the ultimate consumer (prospective student). STCW becomes a factor which must be addressed in order to be allowed to have an academic program. Without STCW compliance there is no program to sell. So STCW must be satisfied and put forward as a necessary component of the whole product which is the degree and sea going credentials necessary for sailing vessels all over the globe.

A simple analogy may be that toy which is advertised on TV. The toy is marketed to the ultimate consumer which may be a child. The toy is advertised as a complete ready to use product. When you go to buy the toy at the described price you see that assembly is required. If assembly being required was openly known and advertised the toy may have reduce sales potential due to the whole and complete truth. The maritime academies have to take the "assembly required" approach in marketing it's program to prospective students. The ultimate consumers do not have to know that STCW is part of the program but that will find out once they have bought the product.

Management of STCW

All parties who must deal with STCW are going to be challenged in managing STCW. STCW brings with it no financial, human or physical resources to the training of entry level officers. Therefore, STCW must be managed with what is available. This means that the existing faculty and administration must work together to become STCW compliant. A TQM approach would be wise in managing STCW, but does TQM work at college or university where the faculty work under a collective bargaining agreement which is in place only 60% of the time? This chapter will address how to cope with managing STCW given the restraints that a college or university may encounter.

"Becoming a Master Manager" references using models as references and learning experiences. Unfortunately, there are few references where a similar situation has occurred which means there is no ideal model to learn from. But, if we take a close look at STCW we will find small amounts of different models wrapped up in STCW, then we may be able to learn from these experiences. STCW requires a balanced approach between the "rational goal model" , the "human relations model", the "open systems model" and the "internal process model". The rational goal model is based on organization effectiveness on dollars and internal process model references professional bureaucracy. Both of theses models compose the management concerns of STCW. There is one very common denominator in STCW and that is the human factor which applies to the "human relations model". It is the human factor which must interpret, implement and comply with the regulations as set forth under the STCW code.

This chapter will attempt to reference the eight roles necessary for becoming an effective manager and cite how these roles apply to managing STCW. There have been many descriptive words attached to STCW. "Moving Target" has been referenced in how to you take aim on something that is continually moving? How can it be managed if is does no have "true shape"? How can STCW be managed if there is not a high degree of "consistency" world-wide?

The basic concept of STCW is to provide a set of standards which can be implemented and enforced globally even though people outcomes are achieved by different methods. All of these factors will be taken into consideration when discussing the eight roles. The US Maritime academies see STCW as unclear with counteractive values and this places STCW clearly in the Negative Zone. We must remember that no one ever said that the US was improperly training seafarers nor was the US Coast Guard licensing system a poor means of determining proficiency. In order for STCW to be managed it must come out from the Negative zone.

Under the "Open Systems Model" there is the Broker and Innovator. I chose these first because it seems to be where some of greatest concerns exist in dealing with STCW. STCW is factual and not going away. The US Maritime academies may have been mislead in thinking that STCW would not have impact on how they educate men and women for the sea going profession, but the reality is that STCW is here to stay.

While many of the roles could be considered key in managing STCW, I believe that perhaps the greatest role to deal with is that of the innovator. This person must facilitate change and adaptation. The reason that this role is so crucial is that STCW is all about change. Unfortunately, the innovator needs some conceptualization of what needs to be done and it is hard anyone to clearly visualize STCW.

Many people are trying to paint a STCW canvas and some people are using a four inch paint brush while others are using a single human hair. Those who are attempting to paint the STCW canvas are senior experienced marine education professionals who spend much time convincing others that there painting better describes what STCW is all about. In the US, there is no single person who assumes the role of innovator. Many people are attempting to fill that role but no one has clearly been identified as the innovator for this initiative.

The broker role is very evident presently and will become a more significant role as time progresses. Mobilizing people is a task for the broker given restricted resources and be creative is a cumbersome task. Each of the Maritime Academies must have a designee who play this role. The person who plays this role must be able to convince that the position that the administration has taken regarding STCW is the right position and the remainder of the school will march to the beat of this drum. The broker role is a most powerful one, where it may be easy to make mistakes but they will not be mistakes due to omission. The broker role is one of ownership and true commitment. Only by taking ownership of this initiative will others follow. The broker role in STCW can be powerful as long as you have a team to work with you and not against you. The five sources of power; legitimate power, personal power, expert power. opportunity power, and information power all come into STCW. Due to the complexity of this issue, a true broker must display a balance of all these powers in order to have a positive team environment while accomplishing a given goal. "A good broker knows where to find the answers" is a quote from "Becoming a Master Manager" and is ever so true in dealing with STCW. Only those individuals who have answers will be seen as brokers. Who are the brokers in dealing with STCW?

The broker must have a good network and in the case of STCW this means networks between the US Regulators, the maritime academies, the shipping companies, and IMO. The broker role then starts leading towards the role of the facilitator where the role leans towards the Human Relations Model. Teams must be built and decision making plays an all important role. If it takes a team approach for compliance of STCW then a team must be built and lead by someone that the team has true confidence in. The team leaders must allow the team to express their opinions while keeping the team pointed in the right direction. This facilitator must build cohesion and trust while keeping interpersonal conflict to a minimum. This role is particularly hard due to the differences of interpretation found internally as well as externally within a maritime academy. Each maritime academy has individuals internally who have fostered their own opinions on STCW as a result of communications between these individuals and US Regulators and representatives from other maritime academies. Each individual who has willfully taken on a role where self initiative has made them more aware of STCW issues feels that they are the facilitator for their respective school. he facilitator role then leans towards the role of the mentor.

While the mentor role falls under the human relations model, it has less significance in dealing with STCW. If the role of the mentor is to manage with openness and sensitivity, then the monitor role plays less importance in the STCW issue. In order for management to accomplish the given task of compliance with STCW, then an assertive approach must be taken by management. All the maritime academies have faculty who are experienced professionals with a vast amount of sea going experience. These faculty train their peers from the private sector and must have a high degree of confidence in themselves in order to earn the trust and respect of their peers. The trust and respect which they have earned is obtained only through strong personalities and commitment to the profession. These faculty are mentors to undergraduates where need to communicate effectively as part of the educational process. The faculty who play the role of assessor and examiner under STCW become mentors more so than those responsible for managing STCW. A key factor is that the mentors must believe in the position which management has taken regarding STCW is order to have the confidence necessary to be a good mentor.

The faculty become monitors due to the efforts required to instruct and access the students. Management becomes monitors due to the role that they play in preparing for the STCW audit. Management must collect the necessary data which satisfies STCW. A student will graduate and must have in their possession the proper documentation for stepping aboard a vessel. This means all information required under STCW must be closely monitored by management to insure that a graduate can work as a seafarer. Management must monitor the STCW program internally to prepare for audits and ensure compliance under the STCW code. The STCW audit procedure will take place every two years to provide guidance to the maritime academies to ensure that the graduates will be properly documented to step aboard a vessel anywhere in the world.

The monitor role leans towards the coordinator role where individual signatures for tasks required by STCW are properly recorded and maintained. This process requires having the necessary resources to record and maintain this information. An individual who is designated by the administration, must be responsible for the maintaining of STCW records.

Massachusetts Maritime Academy has designated the registrar who must keep all academic record at our school. The registrar has an assistant who becomes clerk-of-the-works for the record keeping aspect of STCW. This same person becomes the liaison between the local US Coast Guard Regional Exam Center (REC) for documentation processing. All information and record keeping is processed through this one individual. This person plays a key role in the effectiveness and record keeping for STCW. The system that we are incorporating includes an electronic record keeping system where a faculty member turns in a grade sheet to the registrar at the end of a course. As long as the student passes this course the record keeper will electronically record the signature in the Training Record Book for each individual who has successfully completed this course. We have been for fortunate for one faculty member to take the necessary initiative to custom build the software to make electronic record keeping possible. He has worked many hours in support of building a program so this maritime academy will be STCW compliant. He has done so, looking for little monetary compensation, and has truly displayed the necessary drive required by a school in order to build a program which will make the school in compliance with STCW.

The Rational Goal Model combines the role of the director and producer. These two roles are linked very closely together and the roles are taken on by management. Management has been attempting to foster a productive work environment while building and designing a system which will make the school compliant with STCW. The academic dean plays both these roles at our maritime academy. The registrar reports to the dean and all academic come under the jurisdiction of the dean. Where STCW compliance is based on training received either in a classroom, laboratory, simulator, small training craft or aboard an ocean going vessel the course structure is the responsibility of the academic dean. We are fortunate that the academic dean understands the issues associated with STCW implementation. The dean has been given full confidence from the president who also has a sound grasp of all issues that deal with STCW. I believe that we are fortunate in that the leaders within the management structure want to be informed as to what is transpiring internally and externally with STCW. My conversations with other maritime academies indicate that leadership does not want to take on the role of producer and director and leaves these roles to the faculty.

In providing a synopsis of the eight roles that a maritime academy must play in support of STCW it is imperative that the following occur. Upper level management must play the roles of producer and director with firm conviction and commitment to this initiative. Only of the true commitment is made by upper level management can an entire institution be expected to support the STCW compliance initiative. The monitor and coordinator roles need to be shared between management and faculty. A good working relation ship needs to be fostered so a confidence and support of each parties effort yields a good Training Record Book. Both faculty and management need to play the roles of facilitator and mentor. Perhaps the word which plays the greatest role is flexibility of management, faculty and the regulators. Without flexibility there can only be conflict. STCW is going to evolve over a five year period. Maritime academies cannot be expected to have all issues cleanly resolved instantaneously. Conflicts will occur but conflict need resolutions so the team can meet the objective in satisfying STCW. No maritime academy should expect to have all the wrinkles worked out prior to 1 February 2002. Through cooperative efforts where information in shared openly and flexibility in any discussion process STCW can be meet, but, this pertains to all parties including the regulators, schools shipping companies and IMO.

Anticipated Outcomes

This chapter will focus on points made in this document and come to a conclusion as to how STCW will impact the US Maritime Academies. First a brief review of the facts:

- STCW is a reality.
- STCW goes into full implementation as 1 February 2002.
- The US Regulators have interpreted the STCW Code and made the decision the US will become a yard stick for other countries to measure their STCW programs against.
- No funding at any level is available for implementation of STCW
- The US seafarer pool is diminishing with little hope to regain the necessary seafarers necessary to staff the US vessels, both in peacetime and in time of national emergency.
- STCW does and will always have a high degree of subjectivity.
- STCW does not have any allowance for a degree granting marine educational process.

It must be clearly stated that each US Maritime Academy recognizes STCW and the US Regulators which govern STCW. Each maritime academy does intend to comply with

STCW given the existing resources the school has to work with. The position and interpretation of STCW by the US Regulators has a high degree of subjectivity and the decisions made by the US Regulators will determine the future well being for the US Maritime Academies.

The national defense of the United States of America is in great jeopardy based on position that US Regulators have taken regarding STCW. The position of the US Regulators regarding STCW must be carefully analyzed. It is only with close dialogue between the US Regulators and those who are impacted by STCW that better understanding of STCW will occur. Failure to maintain this type of dialogue will have grave results for the national defense of the United States.

In looking at the present indicators such as statements and positions being made by those who are impacted by STCW the picture being told is grim. The US Regulators have sent a clear message that there will be little if any recognition for the degree granting aspect presently mandated by MARAD. MARAD has taken a position that funding for replacement school training vessels must be acquired by the school as presently observed in the acquisition of the replacement training vessel for Massachusetts Maritime Academy.

Globally there is a 4% shortage of seagoing officers according to the Bimco-International Shipping Federation manpower update recently released. This shortage will allow for seagoing officers to advance more quickly to a degree where the senior staff onboard a vessel has an average of ten years of sea service. This paper could easily be written as "STCW Impact on World Wide Shipping" and the conclusion would be the same.

In conclusion, this paper has proven to me, as a result of the research required, that there is good probability that STCW will be taken to the congressional level. The present position of the US Regulators on STCW will be the equivalent of noose being slowly tightened around the necks of the US Maritime Academies and the present pool of seafarers.

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USING MULTIMEDIA FOR ELECTRICAL ENGINEERING INTO MARINE EDUCATION

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ABSTRACT

The paper presents some implementing results of the new technologies concerning electrical engineering marine education. Introduction and development of the new methods and modern techniques simultaneously with conventional education systems, represents the first step in implementing of the Open and Distance Learning in the Romanian Marine Education. Our experiment consists in the use of the audiovisual resources and information technology, to improve both theoretical and practical teaching of the electrical and electronics marine curricula. The purpose of this experiment is to create the possibility of an autonomous, independent and interactive instruction constituent, very important for the student's education. In the training process, many software programs for electrical curricula were created, intended for testing knowledge and self-testing of the students.

OBJECTIVES

The main objectives of our experiments consist in:

- The elaboration of some computer software for testing and self-testing for students from Electrical curricula using the radio communication standard vocabulary.
- Using multimedia tools to improve theoretical and practical teaching of the marine curricula for education.
- The learning of the technical English terms of radio communication, to elaborate a catalogue of international abbreviations in this field.

METHODS

The first step in our experiment was to create a computer software for testing and self-testing in evaluation of the level of knowledge assimilated by the students. For this purpose there have been drawn up inventories for several theoretical curricula, containing the main definitions, theorems, concepts that make up the elementary knowledge that should be assimilated in order to pass to the superior level of study. Each item is evaluated specifically.

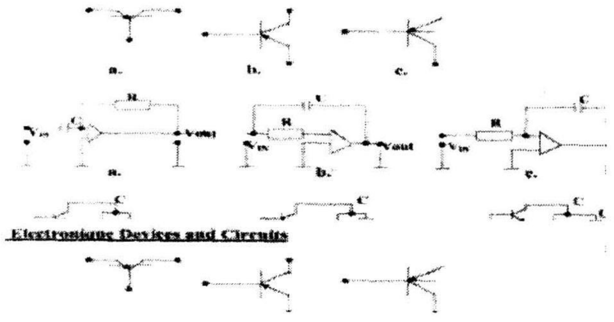
These evaluation qualifiers help students in their self-evaluation and the teachers in testing student's knowledge.

The Science Inventory has been drawn up for the following curricula:

- Electro techniques
- The G.M.D.S.S. equipments, procedures and operations

- The Microwave Techniques

- The abbreviations in English frequently used in maritime radio communication



b.

$$\bar{E}_T = \frac{j\omega\mu}{k^2}(\nabla_T H_z)x\bar{k} \qquad \beta = \beta_0\sqrt{1-\left(\frac{f_c}{f}\right)^2}$$

$$\bar{E}_T = \frac{j\omega\mu}{k^2}(\nabla_T E_z)x\bar{k} \qquad \beta_* = \beta\sqrt{1-\left(\frac{f}{f_c}\right)^2}$$

c.

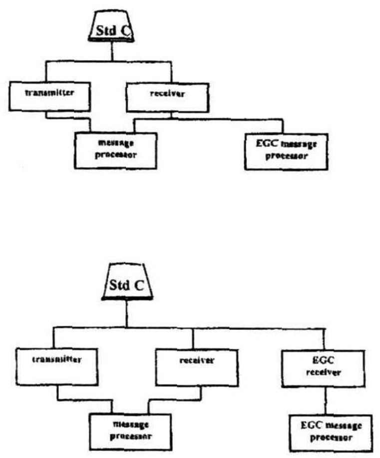


FIGURE 1. PRACTICAL TESTS - EXAMPLE

Another step consists in introduction of multimedia tools and audio-video methods in education. For more complex curricula, like the Microwave Techniques, where a sophisticated mathematical device is used, special recordings of certain lectures were made on videotapes. These videotapes can be played or copied by those interested and can be use in Distance learning also.

Maritime radio communications and their equipment are of an outstanding importance in establishing contact within the ship itself between the ship and other ships, between the ship and shore stations, with Harbour Authorities and also with private persons, but communications at sea are essential in case of danger or distress. That is why our University has the latest simulation equipment available for the students, to supplement their training at sea, electronics navigation laboratory and a Global Maritime Distress and Safety System Simulator. The GMDSS establishes in details all regulations concerning the standards of equipping the ships, the training of the personnel and their responsibilities on board ships, the protocols used in different types of communications.

In the effort to meet this need, greater use has been made, in recent years, of instructional films, video cassettes and tape slide programs, to provide fresher and updating training on a variety of topics for students, master graduate officers and other personnel serving on board of ships.

Though the Maritime University of Constanta owns a training ship, the equipment is limited and the equipping of the ship can not be constantly updated. Further more, the graduate will be employed on ships equipped with a large diversity of navionics belonging to different generation of technologies. The graduates, especially those from the secondary marine education, should master not only the operational ways of the equipment but also their maintenance. They should be able to fix the most important and frequent damages that may occur during operation.

The assembly of the equipment is filmed on tape, as well as the way they are placed on board ship, control room, chart room, and main bridge. Then each equipment is presented in details.

All the explanations of the component's part and their functioning are in Romanian and English language. Once again the maritime terminology being used currently and in order to test their understanding, each description of a certain equipment is followed by a set of questions, along with the correct answers and different practical skills. To sum up, we are trying to make our testing techniques a mirror of students real standard.

The videotapes registered on board NEPTUN - the training ship of the Maritime University Constanta, contain the existing equipment on board of this ship and all the explanations regarding their operation.

It is used for completing both the equipment courses and the training period on board NEPTUN. Besides the videotapes illustrating the functioning of complex marine systems, as the GLOBAL MARITIME SAFETY AND DISTRESS SYSTEM, computer animation was also used. In software production, computer animation must be as suggestive as possible and must present as accurately and simply as possible the functioning of a complex system or of an equipment.

We have developed in our department some of this software with our students, during the completion of their diploma works, based on the previous projects and English documentation.

Another target of our experiment was to develop the modern methods for teaching our students Maritime Terminology.

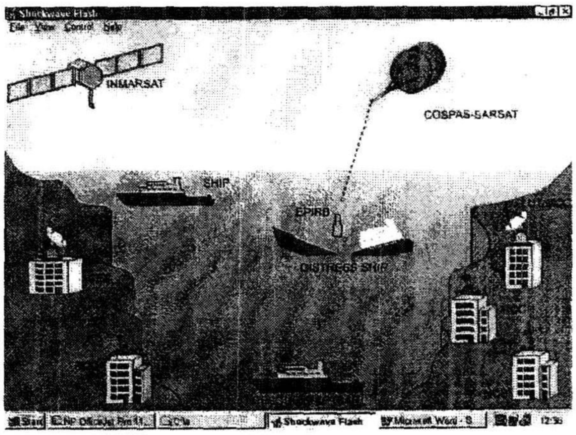


FIGURE 2. GLOBAL MARINE SAFETY AND DISTRESS SIMULATION

Responding to the fact that English is the language of all international maritime activities and a means of communication for seafarers all over the world in order to survive on their travels, the English language, as a subject, is attributed a special importance in the Maritime University of Constanta.

Consequently, as navigation and safety communications must be precise, simple and unambiguous, so as to avoid confusion and error, there is a need of standardization of language and terminology at sea. This would contribute to greater safety and the phrases and terms provided by the vocabulary would be gradually assimilated by those using them.

The endeavours of the two departments of our University, the Electronics and Computer Science Department and Foreign Language Department have as main purpose the acquirement of the technical terminology for radio communication in English by promoting a successful learning for all our students.

The knowledge and skills of a maritime officer need constant improvement. It is justified by many reasons but the most important is the safety of people working at sea. When struggling to understand a thoroughly garbled radio message we realize the importance of a vocabulary of maritime terminology that every maritime student should master.

Starting with the final years of study during the Radio communication, Radar, Radio Electronics Equipment classes and laboratories, the abbreviations, the equipment and their component parts are defined in English.

Rapid advances in radio communication technology have led to an increase in specialist subject areas, each of which has engendered its own set of abbreviations. We have to learn the various abbreviations used in communications at sea. We have difficulties in tracing the abbreviations, as we could find no specialist reference book dealing with abbreviations used in radio communication. In order to bridge the gap we started collecting the abbreviations. We found this to be a fascinating project of unbound proportions.

The areas that we investigated here were mostly Radio Electronics and Communication. Thus for GMDSS system a table has been compiled with the abbreviations in English frequently used, and then currently practiced during the classes, laboratories and practical training.

In conformity with the International Regulations of Radio communications a Seaspeak Vocabulary in English has been made up including the abbreviations used in communications, incident messages for distress, urgency, safety or minor incidents and standard messages, dangerous cargo messages, way point messages, anchoring messages, clearance messages, change of channel messages, first contact messages, arrival messages, ETA messages, Pilot request messages and communications preceded by urgent or the safety signals.

All these are exemplified and then practiced by the students both during the seminar classes and during the practical training period in laboratories or on board ship.

Both the Seaspeak Vocabulary and other notions and texts referring to the systems and Radio communications Equipment form the object of exercises during the English classes.

In this respect the collaboration between the teachers of the above mentioned departments is very important as they have to agree when making up the analytical syllabus for the English classes.

Another way of making the students learn the specific terms concerning radio communications in English is in asking them to accomplish annual projects using English documentation. It is essential for them to master the improved techniques and methods of seamanship so that the ship can be handled more skillfully economically and safely in the future and without a proper knowledge of the maritime terminology this could not be possible. So, by individual studying our students can acquire and learn technical terms of radio communications and at the same time get accustomed with their English meaning.

Some of the projects have been accomplished by our students and our master graduates within the subject Naval Radio electronics Systems by succeeding to do computer programs, simulating radio equipments, radio beacon EPIRB and radar transponder, INMARSAT Communication Systems.

Computer programs for testing and self-testing for our students have also been carried out within our departments mainly for the use of the Seaspeak Vocabulary.

RESULTS

Audio-video methods proved to be extremely attractive for our students with very good results as both their technical and English knowledge could be tested and evaluated. These methods make learning effective and attractive.

Using videotapes to learn about some complex equipment that can not be entirely exhibited in laboratories, is an efficient and economic technical way in education. The use of videotapes and computer animation during classes and laboratories proved to be a very attractive method for the students, a dynamic improvement in education. These combined methods of presentation have increased the student's interest in attending the courses and laboratories. This has been observed in getting better grades in the final evaluation.

CONCLUSIONS

The encouraging results obtained in the final tests by our students give us the right to think that the use of multimedia tools, audio-video methods, computer programs testing and self-testing along with the self studying, regularly checked by the teachers during the electrical classes must be constantly improved, diversified, and extended to other subjects studied in the Maritime University. Also the interactive methods prove to be very efficient and they have to be developed widely in the future. These methods are in fact a first step in implementing Distance learning in our University.

So, the end result is a well-educated graduate of an interdisciplinary curriculum who meets the needs of international maritime activities.

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PROBLEMS OF STCW 95 WHITE LIST UPDATING

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ABSTRACT

The commercial shipping has passed the first significant chart point on the way to comply the STCW 95 provisions, it was the 1st of August 1998, by this day Parties to the Convention submitted their reports to show that they had given full and complete effect to STCW 95 provisions.

The second significant event is the publication of so -called White List. The next one is the recognition of certificates and another date is the 1st of February 2002. By this date all seafarers must be educated and trained in compliance with the new standards and all seafarers must carry STCW 95 certificates.

After that every five years Parties to the Convention must report to IMO on the independent evaluation of training, education, assessment and certification activities to update the White List.

The paper presents the optimization procedure of collecting and evaluating this information based on logical mechanism of checking.

RECOGNITION OF CERTIFICATES

The procedure of recognition of certificates in accordance with STCW 95 provisions is covered by "interlocking network of control mechanisms" , Dearsley [1] , and to review one of these mechanisms we have to go through this procedure step by step [2]:

1.In accordance with Article IV (1) (a,b,c) ,Regulation I/7 and section A-I/7 each Party shall communicate the information to the Secretary- General of IMO.

2.By Article IV (2) the Secretary –General shall notify all the Parties of the receipt of any communication under paragraph (1)(a).

3.Following the section A-I/7 and paragraphs 5-7, the Secretary –General shall maintain the list of competent persons approved by the Maritime Safety Committee.

4.In accordance with provisions of section A-I/7, paragraph 9, when preparing a report to the Maritime Safety Committee ...the Secretary-General shall seek clarifications from the Party and identify any area in which the Party may have requested assistance to implement the Convention.

5.Following the requirements of section A-I/7, paragraph 8 the competent persons shall, on confidential basis, express their views in writing on submitted information.

6.When the complete information has been received and such information confirms that full and complete effect is given to the Provisions of the Convention, the Secretary – General shall submit a report to this effect to

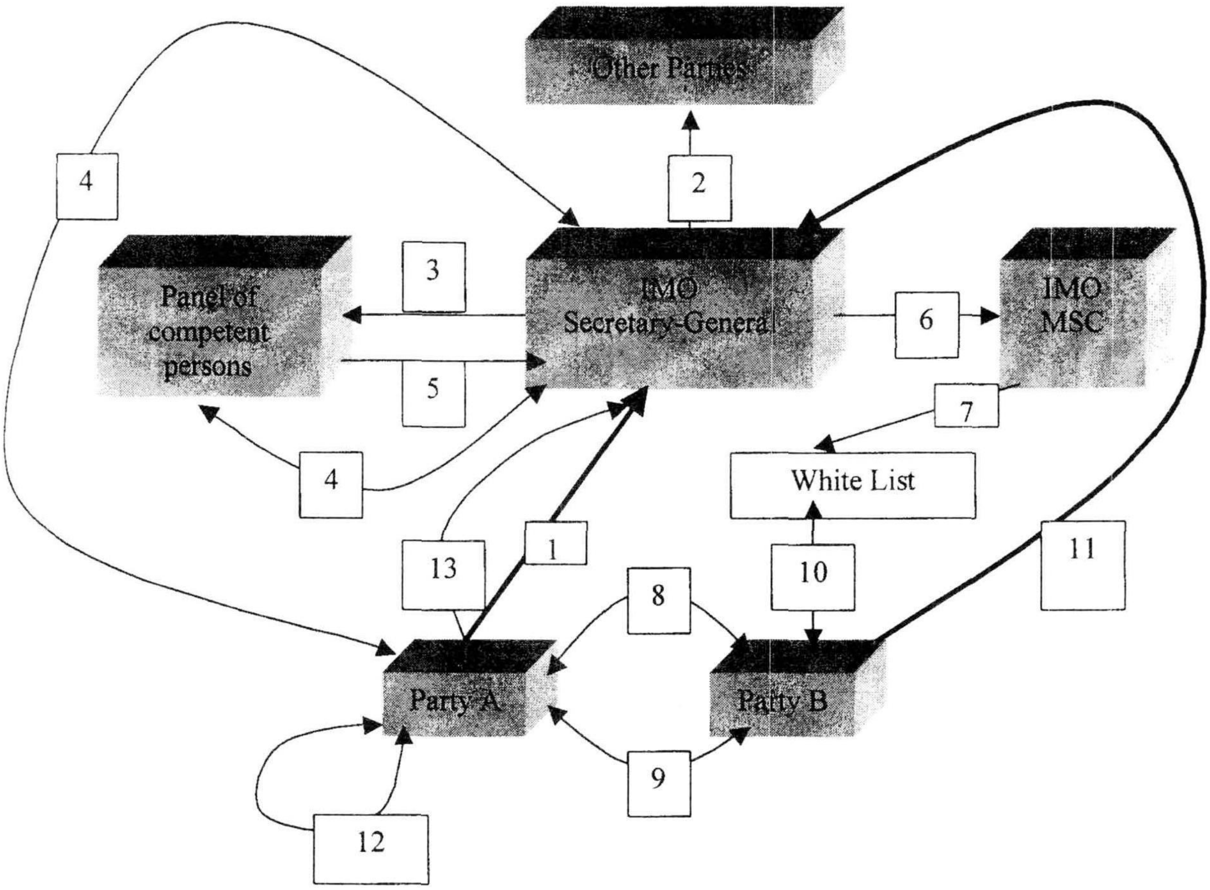

Figure 1.Information links in STCW 95 White List procedure

the Maritime Safety Committee (Regulation I/7,paragraph 2.)

7.Identification of White List at the session of the Maritime Safety Committee, (Regulation I/7, paragraph 3.1).

8.The Party shall arrange the control procedures under Article X in the ports of a Party (Regulation I/4).

9.To recognize the certificates of the other Party the Administration has to confirm, through all necessary measures, which may include inspection of facilities and procedures...that the STCW 95 requirements are fully complied with, (Regulation I/10, Regulation I/4.paragraph 1/1).

10.After the identification of White List in accordance with Regulation I/7, paragraph 3.2. other Parties shall be entitled, subject to the provision I/4 and I/10, to accept, in principle that certificates issued by or on behalf of the Parties identified in paragraph 3.1 are in compliance with the Convention.

11. In accordance with the Regulation I/10, paragraph 3, information provided and measures agreed upon under this regulation shall be communicated to the Secretary – General on conformity with the requirements of regulation I/7. Regulation I/4.

So, the procedure of recognition of certificates, which goes through the White List is rather hard and long. Only the White List part takes in average 21 weeks ,but maximum time is more than 1.5 year. The geometrical interpretation of this way is given by the graph in figure 1.

INDEPENDENT EVALUATION

To show that Party is continuing to give full and complete effect to the applicable provisions of the Convention required by regulation I/8 of STCW 95 and section A-I/7 of the Code it is necessary to arrange the independent evaluation and submit the appropriate report to the Secretary –General.

The following steps are to be made:

12. Paragraph 2 of STCW 95 regulation I/8, together with section A-I/8 of STCW Code, requires each Party to carry out an independent evaluation of its training, assessment and certification system at intervals of not more than five years.

13. Paragraph 3 of regulation I/8, together with paragraph 4 of section A-I/7 of STCW Code, requires that results of the evaluation be reported to the Secretary-General within six months of its completion.

14. Paragraph 4 of section I/7 of STCW Code briefly outlines the information to be included in the report.

15. Paragraph 8.2 of section I/7 of the Code states that the competent persons appointed by the Secretary –General are to express their views in writing on that report.

16. Beginning from step 6.

After that the situation is regulated by paragraph 3 of regulation I/7.

So, we can see, that the White List way is the part of the recognition of certificates procedure and independent evaluation has to repeat the same way trough positions 1-11 in the figure 1.

The results of independent evaluation means the dynamic White List. It is not an easy way to go through such a procedure every five years and we have to use the first White List experience not to waste a lot of time and not to make mistakes. To be effective the procedure of independent evaluation has to be prepared in advance and maximum formalized for inspection of competent persons. Singapore initiated the problem at the 31st session of STW Sub-committee, Singapore [3].

By our opinion the independent evaluation means the following:

- independent evaluation inside the country
- using of independent information sources such as:
  - authorities
  - maritime institutions (academies)
  - training centers
  - shipping and crewing companies
  - regional PSC
  - data bases of other countries, etc.
- independent evaluation of submitted to IMO report by the panel of competent persons.

INFORMATION FOR INDEPENDENT EVALUATION

To follow the above said we propose the set of information tables for independent evaluation (Appendix) and logical mechanism of their work that is on the graph in Fig.2.

By our opinion the items of evaluation may be as follows:

A. List of national documents issued in compliance with STCW 95 provisions .

B. General plan of the independent evaluation in accordance with paragraph 2, regulation I/8 of STCW 95.

C. Extent of compliance of national legislation to STCW 95 provisions.

A,B and C form the national legal base of STCW 95 and self-evaluation will help the

Party and competent persons to review the real situation in this area.

K. Countries recognizing the certificates of the Party.

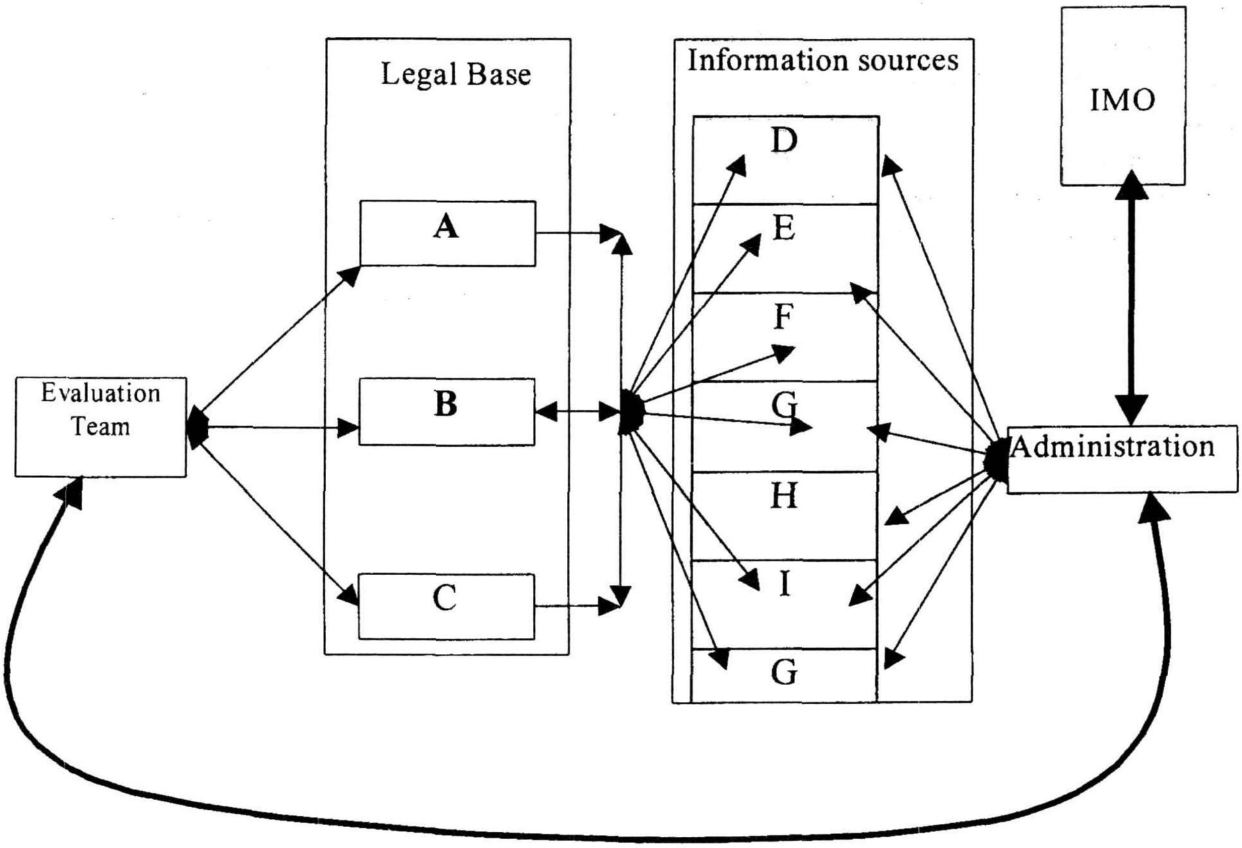

Figure 2.Logical links of an independent evaluation procedure

Independent sources of information will help to make the evaluation more effective firstly for the Party to be evaluated. These sources are:

D. Educational institutions (academies) carried out the education and training of seafarers.

E. Maritime training centers carried out the training of seafarers.

F. Shipping companies carried out the on board training of seafarers.

G. Authorities responsible for issue of certificates.

H. Port State Control

J. Countries which certificates are recognized by the Party.

K. Information sources about accidents related with non-fulfillment of STCW 95 requirements.

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APPENDIX

Information tables

F. List of national documents issued in compliance with STCW 95 provisions

N	Official name of a document	Date of entering into force
...		

B. General plan of the independent evaluation in accordance with paragraph 2, regulation I/8 of STCW 95

	Object of evaluation	The team , carried out the evaluation	Qualification and experience of the evaluation team members	National legal base for evaluation (N from list A)

C. Extent of compliance of national legislation to STCW 95 provisions

STCW 95 regulati ons	Not applicable	Extent of fulfillment of STCW regulation			Document from table A covered the regulation		Deficiencies (if any in)	
		Not comply	Comp lies	Higher than requires	N	Paragrap h(s)	B rief descrip tion	Correc tive measures
...								

D. List of educational institutions (academies) carried out the education and training of seafarers

N	Institutio n	Type of diploma/certificate issued	Compliance to STCW 95 provisions		Actions and terms for improvement (if necessary)
			Compl ies	Not comply	

E. List of maritime training centers carried out the training of seafarers

N	Training center	Type of certificate issued	Compliance to STCW 95 provisions		Actions and terms for improvement (if necessary)
			Compl ies	Not comply	

F. List of shipping companies carried out the on board training of seafarers

N	Shipp ing company	Flag	Compliance to STCW 95 provisions		Actions and terms for improvement (if necessary)
			Compl ies	Not comply	

G. Authorities responsible for issue of certificates

N	Name	Type of certificate issued	Compliance of certification procedure to STCW 95 provisions		Actions and terms for improvement (if necessary)
			Complie s	Not comply	

H. Detentions of ships by PSC during 5 years for non- compliance to STCW 95

N	Regi onal PSC	Number of ships	Shippin g Company	Reasons for detention	Actions and terms for improvement (if necessary)

I. List of countries recognizing the certificates of the Party

N	Country	Date of recognition

J. List of countries which certificates are recognized by the Party:

N	Country	Date of recognition

K. List of accidents related with non-fulfillment of STCW 95 requirements:

N	Ship	Ye ar	Shippi ng company	Type of accident	Which provisions of STCW 95 are infringed	Actions and terms for improvement (if necessary)

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
PROCEEDINGS OF INAUGURAL GENERAL ASSEMBLY
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MODELING IN MARITIME EDUCATION

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ABSTRACT

The modeling method, which has been used in science and engineering for many years, could have a strong impact on maritime education. While the broad technological progress, which has taken place over recent years, has caused a great need for technology education, the existing educational structures have not developed at the same rate. Therefore, the modeling method in maritime education could be a scientific solution to a better understanding and, of course, for best solutions of the problems arise.

We briefly present the reasons for using modeling in maritime transportation. Starting from the classical transportation model, we build multidimensional maritime transportation models and indicate methods to solve these models. Further possibilities of investigation and modeling are also pointed out.

INTRODUCTION

Many applications of engineering and science make use of models. The term "model" is usually used for a structure, which has been used purposely to exhibit features and characteristics of some other objects. Generally only some of these features and characteristics will be retained in the model depending upon the use to which it is to be put.

The modeling method is built upon a mental activity, which allows one, through several logic operations, to process previously obtained information in order to create a theoretical model. This developed model is then reproduced as a practical model with which to experiment. The practical model reflects all theoretical functions and interactions, which can be easily performed, controlled and measured during an experiment.

The experimentally obtained results are essential to assess the practical model and to develop further or improve its status and features. After this process, the improved material is ready for next trial, which in this case is a large-scale experiment. This process can be repeated satisfactorily for several consecutive steps. After a number of iterations the final version of the model is reached.

Some models are concrete, but more often are abstract models, especially in operational research. These models will usually be mathematical in that algebraic symbolism will be used to mirror the internal relationships in the object (often an organization) being modeled.

There are a number of reasons for using modeling:

a) the actual exercise of building a model often reveals relationships, which were not apparent to many people.

b) having built a model it is usually possible to analyse it mathematically to help suggest courses, which might not otherwise be apparent.

c) experimentation is possible with a model whereas it is often not possible or desirable to experiment with the object being modeled. It would clearly be politically difficult, as well as undesirable, to experiment with unconventional economic measures in a country if there was a high probability of disastrous failure. The pursuit of such courageous experiments would be more (though not perhaps totally) acceptable on a mathematical model.

The essential feature of a mathematical model in operational research is that it involves a set of mathematical relationships (such as equations, inequalities, logical dependencies, etc.), which correspond to some more down-to-earth relationships in the real world (such as technological relationships, physical laws, marketing constraints, etc.).

MARITIME TRANSPORTATION MODELING

While the broad technological progress, which has taken place over recent years, has caused a great need for technology education, the existing educational structures have not developed at the same rate. Therefore, the modeling method in maritime transportation could be a scientific solution to a better understanding and, of course, for best solutions of the problems arise.

Firstly, we start from the classical transportation problem and explain why this model is not very good for maritime transportation. Then we improve the model by introducing the third index. Finally, multi-index transportation problems can be considered.

The classical transportation model assumes that the per unit cost for each potential origin destination pair is known a priori. The model doesn't take in consideration the type of ship, the various commodities to be transported, the different characteristics of the vessels and other factors, which also can influence the total cost of transportation. Therefore, we have to consider more indices to build realistic maritime transportation models. By introducing the third index for the types of goods transported, we obtain a three-dimensional maritime transportation model. It is very clear that the multidimensional transportation models could be very good representations of real situations, but the computational problems are really very difficult. More indices we introduce, more realistic the maritime transportation models become; in the same time, the problem becomes more and more difficult to solve.

Also, it cannot be assumed that carriers will be able to serve every origin destination pair for which they are the least-cost carrier because of capacity constraints on the various carriers. Consequently, it is impossible to assign, a priori, the appropriate per unit transportation costs necessary to use classic transportation problem.

Other major differences between classical transportation problems and ship problems could be:

- destination of ships may be changed at sea;
- ships are different from each other in their operating characteristics (capacity, speed), as well as their cost structure. Due to frequent fluctuations in the ship market, even two identical ships may have quite different cost structures;
- ships do not necessarily return to their origin;
- there are more sources of uncertainty and much longer voyages in maritime transportation.

A detailed analysis about the characteristics and the peculiarities of maritime transportation was made by D. Ronen [6].

All these arguments denote that the standard transportation model cannot apply to simulate ship problems.

Depending on the known dates and on the types of the constraints adequate to the problem, there are several three maritime transportation models. Taking into account their main characteristics, we can make a general unit presentation of the three dimensional case.

The objective function become

$$z = \sum_{i\in I}\sum_{j\in J}\sum_{k\in K} c_{ijk}x_{ijk}$$

$I = \{1,..., m\}$, $J = \{1,..., n\}$, $K = \{1,...,p\}$ and where independent on the signification of indexes i, j, k in each model, $\{c_{ijk}\}$ represents the matrix of unit costs of transportation and $\{x_{ijk}\}$ represents the unknown matrix of commodities to be transported.

There are two distinct types of constraints for the variables x_{ijk}:

a. <u>Planar Constraints (PC)</u>

Fixing two indexes of the matrix $\{x_{ijk}\}$, i, j, the summation of x_{ijk}, for all k, should be equal to the elements of a real two indexes sequence a_{ij}:

$$\text{(PC)} \quad \sum_{k\in K} x_{ijk} = a_{ij}\,, \quad i \in I, j \in J$$

The structure of this constraints type imposes the existence of three distinct planar constraints, as maximum, one for each two indexes group $\{i, j\}$, $\{j, k\}$ and $\{i, k\}$, denoted by (PC1), (PC2) and (PC3):

$$\text{(PC1)} \quad \sum_{k\in K} x_{ijk} = a_{ij}\,, \quad i \in I, j \in J$$
$$\text{(PC2)} \quad \sum_{i\in I} x_{ijk} = b_{jk}\,, \quad j \in J, k \in K$$
$$\text{(PC3)} \quad \sum_{j\in J} x_{ijk} = c_{ik}\,, \quad i \in I, k \in K$$

b. <u>Axial Constraints (AC)</u>

Fixing one index of the matrix $\{x_{ijk}\}$, i.e. i, the double sum of x_{ijk}, for all j and k, should be equal to the elements of a real one index sequence a_i:

$$\text{(AC)} \quad \sum_{j\in J}\sum_{k\in K} x_{ijk} = a_i\,, \quad i \in I$$

Similarly to the planar case, the structure of this constraints type imposes the existence of three distinct axial constraints, as maximum, one for each i, j, k index, denoted by (AC1), (AC2) and (AC3):

$$\text{(AC1)} \quad \sum_{j\in J}\sum_{k\in K} x_{ijk} = a_i\,, \quad i \in I$$
$$\text{(AC2)} \quad \sum_{i\in I}\sum_{k\in K} x_{ijk} = b_j\,, \quad j \in J$$
$$\text{(AC3)} \quad \sum_{i\in I}\sum_{j\in J} x_{ijk} = c_k\,, \quad k \in K$$

According to the different types of constraints, the model will be called axial, planar or mixed. For every model, the known dates of the problem are distinct, but there are three compatibility relations (CR) between all these dates, which assure the mathematical equilibrium, as a consequence of the economic equilibrium between demand and supply:

$$\text{(CR1)} \quad \sum_{j\in J} a_{ij} = \sum_{k\in K} c_{ik} = a_i\,, i \in I$$
$$\text{(CR2)} \quad \sum_{i\in I} a_{ij} = \sum_{k\in K} b_{jk} = b_j\,, j \in J$$
$$\text{(CR3)} \quad \sum_{j\in J} b_{jk} = \sum_{i\in I} c_{ik} = c_k\,, k \in K$$

From the above compatibility relations, it follows the well-known equilibrium condition for the transportation problem:

$$\text{(EC)} \quad \sum_{i\in I} a_i = \sum_{j\in J} b_j = \sum_{k\in K} c_k$$

Applying the three dimensional maritime transportation models to carry homogeneous goods (containers, oil, chemicals, ore, etc.), we have to analyse the influence of different types of ships. Therefore, the third index *k* will define the type of vessel used to transport the commodity. We illustrate below the significance of all indexes and dates:

i the origin port (loading port)

j the destination port (unloading port)

k the type of vessel used to transport homogeneous commodity

c_{ijk} the unit cost of transportation from i to j using a k type vessel

x_{ijk} the amount of goods loaded in the origin port i to be transported in the port j with a k type ship, so that the total cost of transportation should be minimum

a_{ij} the amount of commodities transported from i to j

b_{jk} the amount of commodities demanded in the destination port j and transported with a k type vessel

c_{ik} the amount of goods transported from the origin port i with a k type ship

a_i the total amount of commodities stored in the port i

b_j the total amount of commodities demanded in the unloading port j

c_k the total amount of commodities transported with the k type ships.

The most important three dimensional transportation models are the three axial problem (the model which contains all three distinct types of axial constraints) and the three planar problem (contains all three distinct types of planar constraints).

Introducing a fourth index for the commodities transported, we obtain four dimensional maritime transportation models. These problems are more difficult to solve, but the models are more realistic, especially taking into account the ships, which can transport different types of goods.

K.B. Haley [3] is the author of the algorithm for solving the three planar transportation problems. His algorithm is an entirely spreading of “modi method”, a refinement of simplex applied to the classical transportation problem (G.B. Dantzig). We have to point out that some problems remain concerning the computational aspects and also nothing for its solution is described by Haley. W. Junginger [4] made some advances in the above-mentioned problems. Anyhow, starting with the four dimensional transportation models, the application of Haley’s algorithm is only theoretical, due to computational aspects. Therefore, another approach was necessary. A new and modern way of representing the multidimensional transportation problems is obtained by using the hypergraph and its characteristic matrix (Junginger [4]).

The scarcity of published work in this area indicates the low level of penetration of maritime transportation models into real industrial applications. When a ship costs millions of dollars and its daily operating costs are thousands of dollars, large profits may be expected from improving its scheduling process. Therefore, we hope that adoption of the maritime transportation models of this paper will result in significant cost savings in the operations of shipping companies.

MODELING OF MARITIME EDUCATION

To achieve a better standard of maritime education, some important measures have to be undertaken to ensure that more modern curricula are developed. Using modeling, we can improve maritime education. The method appears to be extremely efficient in planning a modern curriculum and, even more importantly, its chain structure provides an opportunity for further system development. It allows for the restructuring and modernization of existing study systems without undesirable disturbances and heavy expenditures.

According to an educational modeling chart Pudlowski [5], the proposed model starts from an existing maritime education structure and design a new system to be analyzed.

The main steps in modeling maritime education could be:

a) description of actual curriculum
b) identification of goals
c) correlation with general educational models
d) recognition of job requirements
e) development of a local curriculum, which individualises maritime education
f) development of aid curriculum (English language and computer science)
f) development of initial and continue training, prepare for life – long learning
g) according between theoretical and practical formation.

Every of the above-mentioned steps could be interpreted as a subsystem with inputs and outputs, but all of them are interdependent processes based on teaching, learning, researching. For this model the process variables are both the human resources (teachers and students) and material / information resources (equipament, computers, others aids). These resources must be harmoniously used to achieve specified educational and/or maritime objectives.

In order to test the efficiency of the model, it's necessary to experiment the practical reproduction of the model. The including activities must be easily controlled, measured and assess. On the other side, a major difficulty regarding experimental results is determining of control groups and experimental groups, taking into account the great importance of maritime work.

It is extremely important to find ways to meet the requirements of the new economy. In a rapidly changing world and a swiftly technology, ideal curricula are practical impossible to achieve. What education can do is to provide the basics and teach a methodology of self-development.

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METHAR

HARMONISATION OF EUROPEAN MARITIME EDUCATION AND TRAINING SCHEMES

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1. Introduction
2. Which main problems are addressed?
3. Why do these problems exist?
4. Which solutions are proposed to solve these problems?
5. Who are the expected users of these proposed solutions?
6. How can the proposed solutions be exploited?
7. Which benefits can be expected from implementing the proposed solutions?
8. Conclusion

1. INTRODUCTION

The METHAR project deals with the maritime education and training of ship officers (MET) in the 13 EU countries with MET, Iceland and Norway (METHAR countries). It began in April 1996 and will end in January 2000.

The METHAR project is carried out by a consortium of 5 institutions, of which 3 are MET institutions and 2 universities involved in higher education and research in maritime transport.

The METHAR consortium is supported by the Concerted Action on MET (CAMET) that will have met 11 times before the end of the project. CAMET serves both as information provider for the research and as discussion forum for findings and proposals from the research. Ideally, the members of CAMET are also expected to act as "change agents" in their own countries and help implement METHAR proposals. In CAMET, MET institutions are represented as well as maritime and educational administrations responsible for national MET and a national shipowner association. Observers in CAMET are the European Community Shipowners Associations (ECSA), the Federation of Transport Workers' Unions in the European Union (FST) and the Confederation of European Ship Master Associations (CESMA).

2. WHICH MAIN PROBLEMS ARE ADDRESSED?

The Right Hon Neil Kinnock, the former Transport Commissioner, answered the theme-question "Is the Seafarer an endangered species?" at an EU Conference in Dublin in December 1996 with "on present trends, yes".

METHAR is aiming at helping halt and revert these present trends by increasing the attraction, quality and competitiveness of MET, enhancing the employability and mobility of MET graduates and their contribution to safer shipping, cleaner oceans and the efficiency of sea transport.

It should be noted in this context that it takes three years from entering a MET institution to obtaining an officer in charge of (a navigational/ an engineering) watch certificate of competency.

The supply of ships officers from the 15 METHAR countries is not meeting the demand for ship officers for METHAR country-flagged ships and for ex-ship officers for the shore-based national maritime industries of METHAR countries.

There exists an overcapacity of study places at the altogether 147 MET institutions at 124 locations in the 15 METHAR countries.

MET in METHAR countries is expensive compared to MET in non-METHAR countries from which ship officers are supplied for ships flying the flag of a METHAR country.

A similiar cost difference applies to ship officers from METHAR countries and non-METHAR supply countries.

The mobility of ship officers between METHAR countries and within the national maritime industry of most METHAR countries is limited.

Taken together, MET in most METHAR countries has an attraction, a competitiveness and a mobility problem. Jobs on board ships as well as in the maritime industry ashore are lost. Jobs on board ships can be filled with ships officers from non-METHAR supply countries, jobs in the shore-based national maritime industry can not be filled with ex-ships officers from non-METHAR supply countries and today also not with national ex-ship officers from EU countries. The service quality of the national maritime industries will suffer.

3 WHY DO THESE PROBLEMS EXIST?

The shortage of applicants for MET is mainly a consequence of a decline of interest in seafaring, a widely spread development in mostly affluent societies. This decline is worsened by the bad image of the industry. The surplus of study places at MET institutions is also a consequence of the globalisation of shipping, the increased use of modern technology in shipping and the availability of ship officers from East European, Asian and other countries who are cheaper and sometimes considerably cheaper than ship officers from METHAR countries.

Repeated efforts have been made in METHAR countries to identify the reasons for the reluctance of young people to chose seafaring as a (temporary) career. Already some 20 years ago it was the "issue for the majority of seafarers (is) not whether to leave the sea but when" (Frank Main, Head, Department of Marine Studies, Liverpool Polytechnic, UK). Since then the development from choosing seafaring as a career until retirement to choosing it as a temporary career has further deteriorated to not choosing seafaring as a career at all. Discussions of expert on, and research into, the reasons for this development have concluded that the decline of seafaring as career objective is most distinct in so-called affluent societies (and that even growing youth unemployment in these societies does not have mush of a counterbalancing effect). The main reason for this development is obviously an increased unwillingness to accept the separation from family and friends and a private life own choice, and this despite today's often fairly generous leave provisions. It seems to add to the staying away from seafaring that the image of the industry is not good, partly because publicity is mainly given to negative events, including the hardships seafarers may have to endure and sometimes difficult and poor working conditions.

The globalisation of shipping has provided ship operators with access to cheap labor from non-EU supply countries. Ship officers from METHAR countries are still employed if they are available although national ship operators' preference for nationals can be expected to weaken if there is not an added advantage from the employment of these of these ship officers. Costs of ship officers from METHAR countries are further increased for ship operators if they are required to subsidize shipboard practice for MET students.

The mobility of ship officers between METHAR countries is rather restricted because of a limited mutual recognition of certificates of competency between national maritime administrations. The mobility of ship officers between deck and engine departments is today only possible for MET graduates in 3 countries. The mobility of ship officers to shore-based positions in the maritime industry is supported by MET in 7 of the 15 METHAR countries.

4. WHICH SOLUTION ARE PROPOSED TO SOLVE THESE PROBLEMS?

Although the meeting of the new international minimum regulatory requirements of STCW 95[1] does not seem to pose any major problem to MET institutions in almost all METHAR countries, the acquisition of new technology in the industry does pose a problem to many MET institutions. This problem could best be solved by a concentration of MET resources at a smaller number of MET institutions in the METHAR countries where many MET institutions and a surplus of study places exist. Such a concentration would also facilitate co-operation between MET institutions in different METHAR countries. The best response to societal developments, which resulted in a decline of interest in seafaring and ship officer MET, is the offer of a syllabus that provides for mobility in the shipping industry from on-board to on-shore positions where shipboard experience is essential or at least desirable. The best response to economic pressures on MET is again the concentration of resources at smaller number of institutions. These institutions could also make an own income from the offer of short intensive professional development courses and the involvement in research and consultancy.

Economic difficulties of ship operators in METHAR countries to employ national ship officers should be alleviated by political decisions to provide indirect financial support or direct financial support from national and EU funds.

The insufficient supply of national ship officers in most METHAR countries could be overcome by the employment of seafarers from cheap labour countries although this would lead to a further loss of jobs in shipping in METHAR countries. The often held belief that ship officers from METHAR countries are better qualified than ship officers from cheap labour countries requires differentiation. Some of the cheap labour countries are producing ship officers of good quality.

Shipboard-confined MET should be maintained also in future for those who do not meet the higher general education entry requirements for ship-shore MET. These students should be given opportunities to obtain, after some time at sea, qualifications similar to their colleagues who graduated from ship-shore MET. Both types of MET should preferably be offered at the same MET institutions.

Provisions for the mutual recognition of certificates of competency among METHAR countries are a necessary prerequisite for the mobility of seafarers within these countries. It would facilitate this recognition of METHAR countries would reduce the number of "foreing-going" certificates to three each in the deck and in the engine department (in accordance with STCW 95). Today, not all of the 15 METHAR countries meet this condition.

MET should receive better national recognition by inclusion of its representatives in national round tables of those concerned with, and involved in, MET. National MET should be appreciated as an equal partner in national efforts for its improvement.

Taken together, the best response to changes in the regulatory environment, to influences from technological and societal developments and economic pressures is the concentration of MET resources, the extension of MET activities and politically decided financial support for the employment of national cadets and ship officers. These measures will improve the qualitı and competitiveness of MET in METHAR countries, will maintain jobs for their nationals and ensure a supply of qualified nationals with shipboard experience to shore-based positions in the maritime industry.

5.WHO ARE THE EXPECTED USERS OF THE PROPOSED SOLUTIONS?

Changes in MET of METHAR countries will have to be made on three levels, the macro, the medium and the micro levels.

Users on the macro level are political decision makers, users on the medium level are national MET-supervising agencies in ministries for transport and education, users on the micro level are MET institutions. National ship operators are users of MET institutions' "products".

Changes on the macro or political level concern the number of study places, the closing of MET institutions or their possible affiliation with other institutions of higher education and the introduction of ship-shore syllabi. Measures in favour of national MET standards and offers should prevail over local and institutional preferences.

Changes on the medium or administrative level concern adaptation of national MET programmes to international requirements (STCW 95) and the national industry's training needs. Decision makers are governmental agencies supervising MET, i.e. maritime or educational administrations. They are also those who have to see to it that political decisions on the macro level are implemented.

Changes on the micro or institutional level concern implementation of decisions on the medium level as well as the extension of institutional activities to short intensive professional development courses, consultancy, research and the making of an own income from these activities.

Adaptation on the medium level and also on the micro level can best be achieved by including MET as equal partner in a national task force of the MET supervising government agency and the industry.

6. HOW CAN THE PROPOSED SOLUTIONS BE EXPLOITED?

There is a multitude of possibilities to exploit the proposed solutions for obtaining benefits from minimizing or overcoming existing problems. Exploitation requires the willingness to pursue changes in national MET with the objectives of increasing attraction of MET, mobility and competitiveness (employability) of MET graduates. Increasing attraction requires both a top-down approach from the macro level and a bottom-up approach from micro level. Increased mobility through national recognition of certificates and ship-shore syllabi is mostly the consequence of a top-down approach and through harmonization of MET programmes a decision on the medium level where top-down and bottom-up approaches meet. Increased competitiveness has to be initiated by top-down measures and implemented through bottom-up measures.

7. WHICH BENEFITS CAN BE EXPECTED FROM IMPLEMENTING THE PROPOSED SOLUTIONS?

Improving and harmonizing MET and making it more widely applicable-as proposed in the METHAR project outcomes-would attract more national applicants and provide increased employment for nationals on national ships and in the national maritime industry ashore. It would also facilitate the mobility of ship officers between METHAR countries and between ship and shore.

Eventually, the trends which make the EU ship officers an endangered species would be halted and even be reverted. A national staff involvement in national shipping would be maintained and would provide for a national supply of ship officers for the national shore-based maritime industry. Present jobs will maintained and new jobs will be created.

It will not be possible to reach major benefits without national political decisions on the concentration of MET resources in all the countries where these resources are scattered over too many MET institutions. The common achievement of STCW 95 minimum standards will facilitate the mobility of ship officers between METHAR countries as well as an increase of mutual recognition of certificates of competency between countries.

The present situation national MET – international industry should be changed into METHAR country MET- international industry

8.CONCLUSIONS

The METHAR project has, in cooperation with CAMET, identified common ground in MET in the 15 participating countries and made proposals for the further development of the existing commonalities. It has also identified problems with which most of the 15 countries are faced and has noted country-specific problems. Although the outcomes of METHAR concentrate on further developing commonalities of MET and on solving frequent and pressing MET problems, CAMET has also given countries with specific problems the opportunity to find out whether these are one-country problems or exist in the same or a similar form also in another country and, if so, which solutions the other country may have tried and whether it has succeeded in solving the problem. The learning-to-know-each-other provision of CAMET has established a network of representatives of MET institutions and of MET-supervising national administrations who now easily communicate with each other, have learnt about the problems with MET in other countries, about failed and successful attempts to solve them and have become more inclined to future cooperation.

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TECHNOLOGY FOR MARITIME SAFETY MANAGEMENT

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1. ABSTRACT

Maritime safety management means the implementation, with the consensus of the maritime society, of tangible measures to improve the safety of navigation and quality of seafarers, to raise awareness of responsibility by shipping companies, and guarantee the sea worthiness of vessels.

The success of activities to achieve these aims depends on the mentality and the willingness of people, organizations and nations involved to cooperate.

In other words, the techniques used to manage maritime safety can be defined as techniques to guarantee the logical necessity of the methodology employed to achieve navigation safety and techniques to achieve a social consensus in order to promote this methodology in the international maritime society.

In the present paper, the definitions of terms used in the framework of maritime safety management are explained. And examples of scientific approaches to management technique needed for various types of maritime safety management are introduced.

2. NECESSITY OF RESEARCH ON MARITIME SAFETY MANAGEMENT

In recent years, the world shipping industry has experienced international cost competitiveness and shipping companies of developed maritime nations have adopted FOC (Flag of Convenience) and Mixed Crewing strategies in order to survive.

As a result, the international maritime society has formed a bipolar structure of seafarer-demand nations and seafarer-supply nations. At the same time, policies to adopt FOC and Mixed Crewing strategies by developed maritime nations have invited such unwelcome consequences for the international maritime society as a deterioration in the quality of seafarers and a lack of awareness of responsibilities by shipping companies.

The international maritime society, however, has been continuing its efforts to assure safe sea transport through global co-ordination by establishing international regulations such as the convention of STCW 1995, the ISM Codes and the Port State Control under the IMO, which are designed to eliminate sub-standard ships, sub-standard seafarers and sub-standard companies.

Within the current framework under the initiative of the IMO, what is universally required to the MET institutions in the world, whether they are in seafarer-demand nations or seafarer-supply nations, is to educate seafarers who will be able to guarantee the safety of navigation aboard their vessels in order to achieve safer shipping and cleaner oceans.

Meanwhile, when we look back over the changes that have taken place in the maritime world and look into the future, it is not difficult to imagine that the current seafarer-supply nations will eventually develop into seafarer-demand nations and employ them from other supply nations. The international maritime society can be likened to a relay race.

Workplaces aboard ships are successively inherited from seafarers of developed maritime nations to those of developing maritime nations just as a baton is passed from one runner to another.

This means the loss of employment opportunities for seafarers of developed maritime nations, and this gives us the motivation to consider what education curriculum we should prepare in the future for seafarers of developed maritime nations, and where and through what types of job seafarers of developed maritime nations should contribute to the international maritime society.

What becomes clear when we consider the historical background of the international maritime society is that the objective of education provided by high-level maritime universities in developed maritime nations is no longer adequate if it only provides an education that satisfies the minimum requirements set down in STCW 1995 by the IMO.

The new mission of education that is assigned to high-level maritime universities of developed maritime nations in the 21st century can be said to encourage personnel of a quality that goes far beyond the minimum requirements set by the IMO and to encourage personnel who have an international perspective to be able to contribute to maritime safety management from the shore side.

As Figure 1 illustrates, high-quality maritime education at high-level maritime universities -where the key words are "practical techniques" to guarantee the safe navigation of vessels, "management techniques" to improve maritime safety and "ability to propose policies" to the international maritime society- must have, in one wing, practical techniques of navigation aboard individual ships and, in the other wing, techniques that are needed for maritime safety management from the shore side. I believe emphasis must be shifted to education and training that is equipped with both wings.

Constructing this kind of new paradigm is a pressing issue for high-level maritime universi-

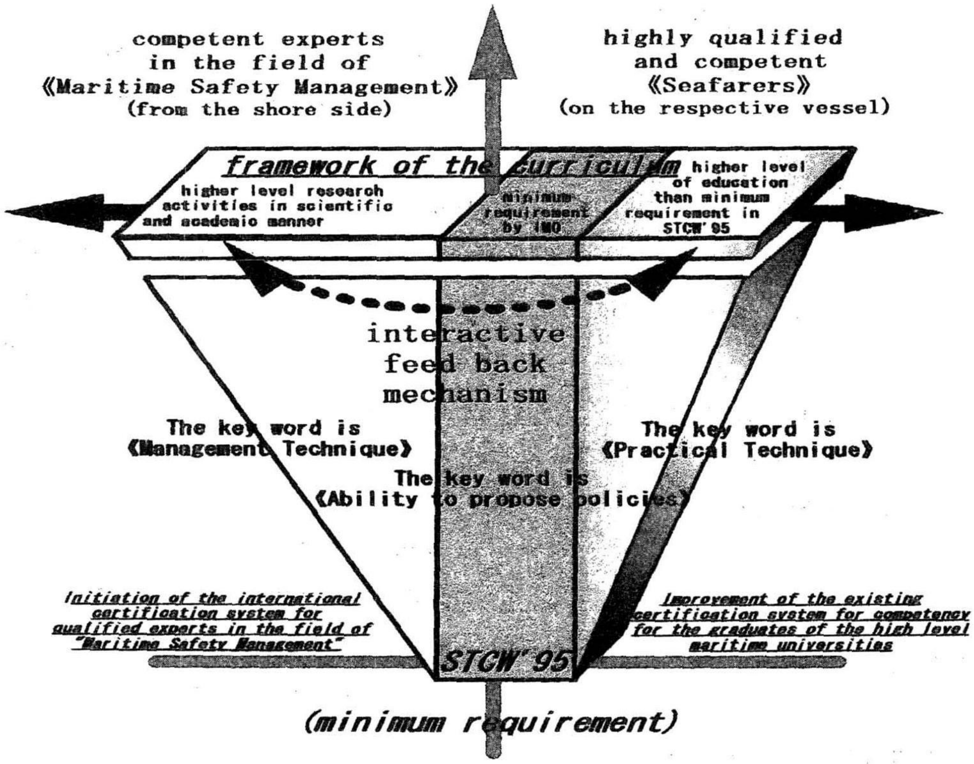

Fig.1 Direction and System of High Level Maritime University toward 21st Century

ties of developed maritime nations and this has an important role to play for both the universities that follow them and the international maritime society of the 21st century.

3. RESEARCH ACTIVITIES RELATING TO MARITIME SAFETY MANAGEMENT AT IAMU

The new responsibilities assigned to high-level maritime universities in the field of maritime safety management in the 21st century may be summarized as follows:

(1) To establish "management techniques" in the international maritime society through a scientific approach in order to improve the safety of navigation,

(2) To establish safety standards and a technical certification system that are common to the whole international maritime society,

(3) To create new types of occupation in the international maritime society, where seafarers of developed maritime nations manage the safety of navigation from the shore side,

(4) To build a safety management system centred on such new types of occupation within the framework of the international maritime society.

WG II and WG III of the IAMU have been set up to conduct research in this area from an academic perspective. Their activities are assumed to include the following work:

From the viewpoint of establishing management techniques;

(1)to define the term "maritime safety management",
(2)to define the term "scientific approach",
(3)to produce tangible research results regarding management techniques to improve maritime safety,

From the viewpoint of education;

(4)to review the existing education curricula for maritime safety management,
(5)to propose a desirable curriculum for maritime safety management,

From the viewpoint of job creation;

(6)to review occupations relating to maritime safety management that currently exist in the maritime society,
(7)to create new types of occupation relating to maritime safety management,

From the viewpoint of constructing social systems;

(8)to propose global standards for safety criteria and global standards for technical certification that are acceptable to the international maritime society,
(9)to systemize a safety management system that is acceptable to the international maritime society,

4 . DEFINITION OF TERMS: "MANAGEMENT" AND "SCIENTIFIC APPROACH"

When an organization is to carry out some activity, it is important that all of the people involved have the motivation to contribute toward the goal. The secret of success is that the relevant people are thoroughly motivated to work towards the same objective.

Similarly, the concept of the term "management" used in this context can be described as a way of achieving the goal of an activity by motivating the members of the organization or relevant people. "Management techniques" are procedures and tools used to motivate them and "management practitioners" are people who lead the activity to its goal using these techniques.

In any type of management activity -in business management, in port management, in fleet management, in quality management of human resources, or even in maritime safety management, what is common to all when achieving the goal of an activity is to build a strong desire for co-operation and contribution amongst the people, organization or nations involved.

Of course, there is a type of management, as seen in the world of business, where arbitrary decisions by the top management are imposed upon the members of the organization to achieve a goal, but this is rare and does not fit well in the international maritime society.

In the international maritime society, any relevant parties are not related in a vertical relationship, but are mutually independent. Therefore, safety management activities in the international maritime society should never be compulsory but generally be voluntary.

There must, therefore, be a tendency that, when carrying out maritime activities such as improving the navigation safety of vessels, improving the quality of crews, raising the awareness of responsibilities among companies, raising the sea worthiness of vessels, the relevant people, organizations and nations constituting the international maritime society should do so on a voluntary basis with a great willingness towards co-operation.

In this type of management process for maritime safety, it is essential to achieve a social consensus for the implementation of maritime safety policies on a voluntary basis. What is important in making more relevant people have a greater understanding is the ability to explain to them the logical necessity of the implementation of the policies.

In the process of convincing the relevant people, we are now required to have techniques that explain the logical necessity of the methodologies that are used to promote tangible measures. We are also required to have techniques to achieve a social consensus to promote the methodologies.

Therefore, the management techniques can be considered, in more precise terms, to be techniques to explain the logical necessity of policies and the techniques to achieve a social consensus in the international maritime society, while the "scientific approach" for maritime safety management can be considered as systemizing these techniques using quantitative analysis methods.

5. SCIENTIFIC APPROACH OF MARITIME SAFETY MANAGEMENT

The international maritime society needs activities for maritime safety management in order to eliminate sea casualties and to conserve the marine environment.

Activities for maritime safety management can be categorized as follows; for example, safety management based on laws and conventions, reliability management of companies and organizations, vessel traffic management in ports and harbours or narrow waterways, quality management of seafarers and marine environment management, etc.

Here, the management techniques that are needed for the implementation of the safety management of each category are explained.

Management of International Maritime Policies

Safety management based on laws and conventions in the international maritime society is characterized by the implementation of measures based on a consensus. For example, a convention under the IMO basically comes into force only after individual nations are satisfied with it and consequently ratify it. This means that active co-operation cannot be obtained from a nation that is not satisfied with it.

The best way to motivate the members of the international maritime society to actively co-operate for a policy objective is to publish the predicted reduction of sea casualties as a consequence of implementation of the policy and the predicted value of the outcomes which can be obtained from a quantitative assessment of cost effectiveness.

The greater the outcome, the more nations will agree with the policy. In the management of international maritime policies, techniques to predict the reduction of sea casualties and analyze cost effectiveness guarantee the logical necessity of the measures.

Management of Quality and Reliability

International maritime society has a long history of inspection systems to guarantee the safety of vessels and cargo storage and, in recent years, certification systems to guarantee the quality and the management ability of organizations have become common.

In this type of quality management or reliability management, it is necessary to establish a standard inspection procedure that is acceptable to everyone. In other words, an internationally standardized, common inspection method and common safety criteria are needed. Standardization of the abilities of those who make judgments is also important.

What level of safety and reliability is the minimum requirement, and what is a sufficient level? In the management of quality and reliability, techniques to show these criteria numerically guarantee the logical necessity of this type of management.

Management of Vessel Traffic

In areas of traffic congestion such as ports and harbours or narrow waterways, traffic separation schemes, restrictions on total traffic volume, restrictions on speeds, traffic control using signals, compulsory pilotage, widening and deepening of channels, installation of navigation aids and many other types of safety management measures are taken. Implementation of these safety management measures involves many people including mariners, pilots, port administrators and coast guards.

In the management of vessel traffic, it is most important to establish assessment models that can predict quantitatively the correlation between the measures to be taken and the improvement of safety and the reduction in the ship handling difficulties imposed on mariners, so as to achieve the mutual understanding of the relevant people. At the same time, it is important to develop techniques to describe clearly the minimum requirement level and the sufficient levels of safety and difficulty.

In the management of vessel traffic, the techniques to demonstrate numerically the correlation between measures and their effects, as well as risk acceptance criteria, guarantee the logical necessity of this type of management.

Management of Human Techniques

Many sea casualties are said to be caused by human factors. To eliminate sea casualties, it is important to clarify in a scientific manner the causal relationships between accidents and human and technical behaviour, and it is also important to investigate how to improve human relationships and how to make technical improvements to eliminate human errors.

In the management of human techniques, solutions will assist the relevant people to understand implementation of this type of management measure.

Management of Marine Environment

Oil pollution is not the only cause of damage to the marine environment; air pollution due to exhaust gases from vessels and ecological destruction due to discharged ballasting water also cause damage. There may be other problems of which we are not yet aware.

In the management of the marine environment, the most important issue at present is to develop techniques to predict the diffusion of pollution and techniques to remove pollution. However, it is more important to develop techniques to make numerical predictions of the impact of pollution to the international maritime society and damage to the marine environment.

Publishing the values of this impact assists the relevant people to increase their awareness and understanding of marine environment conservation. Techniques to demonstrate numerically this impact guarantee the logical necessity of this type of management.

6 . ROLE OF MARITIME SAFETY MANAGEMENT PRACTITIONER

In the absence of any established image of a "Maritime Safety Management Practitioner", an explanation may be required. Maritime safety management practitioners are technical personnel who contribute to enhancing the safety of international maritime activities towards goals.

More specifically, maritime safety management practitioners have the following features:

- Capable of planning and proposing policies to help enhance maritime safety;
- Capable of verifying the logical necessity of the policies proposed;
- Capable of judging activities from a fair viewpoint;
- Capable of coordinating conflicts between positive and negative interests in the international maritime society from a broad viewpoint;
- Capable of playing a role to achieve the goals of activities;

As mentioned above, a maritime safety management practitioner takes a stance as a coordinator in the international maritime society on one hand, and as a fair umpire to judge safety standards on the other. Hence, maritime safety management practitioners are required to be controlled under an internationally unified certification system of qualifications.

Figure 2 shows the flow chart of maritime safety management services to be carried out by a maritime safety management practitioner. The procedures are summarized below.

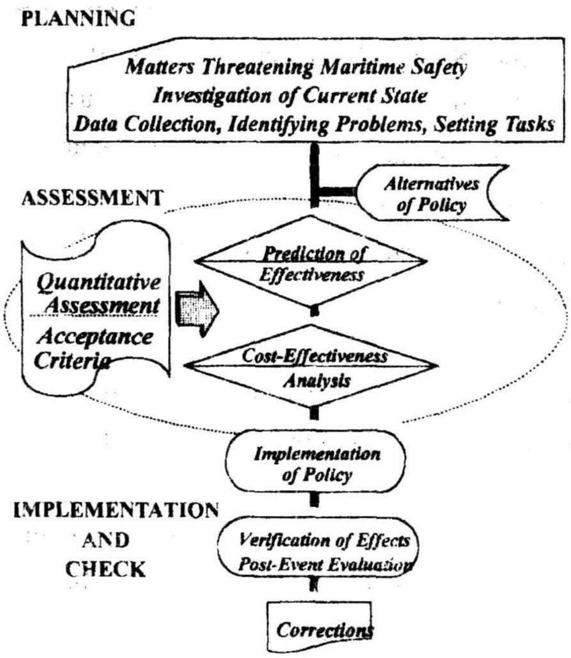

Fig.2 Flow Chart of Service

(1) Planning

The first step to be taken is the process of investigating the current state. Data are to be collected for analyses, issues that endanger or would probably endanger maritime safety are to be identified, and tasks should be established. Policies to solve problems are to be drawn up, while preparing the necessary alternatives.

(2) Assessment

The next step is a process to predict the effects. In this process, the effects of policies are quantitatively predicted and evaluated. Effectiveness and cost effectiveness are to be analyzed for each policy item. In this process of explaining the logical necessity and of achieving social consensus, it is necessary to develop a quantitative evaluation index to predict policy effects, as well as to develop management techniques for establishing acceptance criteria.

(3) Implementation

This step represents an implementation process of the highest effectiveness.

(4) Check

This is a post-event evaluation process, which verifies the effects of the policy implemented. The necessary modifications follow on the basis of the results of the post-event evaluation.

As can be seen from this flow chart of service, the assessment process is most important. The techniques to promote this procedure are conclusive factor in studies on maritime safety management.

7. CONCLUSION

The most important issue in the discussions at the IAMU is the establishment of the next generation of maritime education at high-level maritime universities of developed maritime nations, but equally important is the issue of constructing mechanisms in the international maritime society that will enable skilled maritime safety management practitioners, who are engaged in management of safety navigation from the shore side, to contribute to the international maritime society.

More important is to translate creative proposals into global standards and to transmit information on constructive opinions to establish the next generation of maritime education and a new paradigm of safety management in the international maritime society.

It is also more important to encourage personnel with the ability to propose global safety standards and to put those global standards into practice as policy in the international maritime society.

This paper, as an introduction to the activities of the IAMU, defines the concept of maritime safety management, explains terms such as management techniques, management practitioners and scientific approach. It also explains the management techniques needed for various types of maritime safety management.

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES
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THE NEED FOR QUALITY CONTROL IN MARITIME EDUCATION AND TRAINING

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ABSTRACT

The paper presents the need to implement and maintain a quality management and control in maritime education and training having in the background the International Maritime Organization regulations.

Such a quality system should be build up around the STCW codes section B1/8 'Guidance Concerning Quality Standards' and special national regulations on this subject.

All steps followed by students becoming maritime officers beginning the admission rules to the certification exams should be in accordance with the international standards. In order to achieve such a goal it is necessary to implement and maintain a quality system including: the quality policy, appropriate procedures, quality planning etc.

The work describes the main characteristics of a quality system for maritime education and training and answers to the question 'why we need to implement and maintain' it in all processes developed by the maritime universities.

THE QUALITY AND THE TRAINING PROCESS

We can define the quality management as a trend towards excellence in very process of management, administration and production. And we can not describe an efficient training process without to be guided by a trend towards excellence.

In fact the main goal for each cadet trained in a maritime education institution should be to achieve the highest level of knowledge and the necessary practical skills in order to be able to perform the officer duties on board ships.

To obtain this level of quality you need the joint effort of every single department of the organization, in order to develop, maintain and increase the quality of the training process.

It could be argued that quality normally implies a higher cost. However, and due to the high competitivity generated towards the end of the XXth century, the tendency is towards increase in quality with decreasing costs.

Therefore, quality management starts with practices and examples set by managers, for the continuous improvement of processes and results in every area and operating level of the company. This has to be accompanied by an effort tending to lower costs.

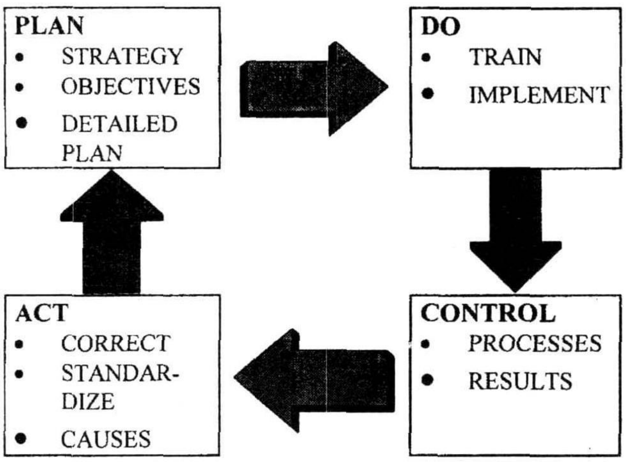
The quality strategy depends of the objective pursued by the organization. A strategy to be used must minimally contain the following elements:

- Excellence in every process of management and administration.
- Culture of continuous improvement.
- Conviction that improved quality lowers costs.
- Participation of all employees.
- Style oriented towards the customer.

The quality of the training process in the maritime field is to be guided both on national and international regulations. The STCW Code includes in Section B-I/8 *Guidance regarding quality standards*. Here we can observe as key elements:

1. an expressed policy regarding quality and the means by which such policy is to be implemented;
2. a quality system incorporating the organizational structure, responsibilities, procedures, processes and resources necessary for quality management;
3. the operational techniques and activities to ensure quality control;
4. systematic monitoring arrangements, including internal quality assurance evaluations, to ensure that all defined objectives are being achieved; and
5. arrangements for periodic external quality evaluations.

Having in view the above the implementation of the quality in the training process can be based on the following scheme:



The activities included in the general process to implement the quality in the education and training should include:

- identify needs that affect the community's support for public schools;
- enable public schools to understand opinions or attitudes of people who express needs;
- identify that result from the activities of organizations that provide input to public school process;
- establish quality requirements for the approved learning process and support services;
- determine the legitimacy of a need;
- record a need and the action the school plans to take;
- document the exact words a person uses to describe a need;
- facilitate an assignment of the need to a qualified person for appropriate action;
- monitor the actions taken on this need;
- maintain a contact with the person who expressed the need;
- identify a source of additional information;
- control variability of processes;
- ensure an appropriate response by a responsible person;
- document the effect of process in addressing needs;
- identify the appropriate people responsible for meeting the requirement;
- identify the appropriate measures so the process and measurement errors can be estimated;
- state a need in measurable terms in order to document the effect of process in addressing the needs;
- interrelate resources and activities which transform inputs into learning and support services outputs;
- establish accountability for resources decisions relating to the process;
- provide a focus and boundaries for the process;
- establish how and then the process begins and what resources are available;

- establish what can be observed and measured at the end of the process;
- establish how mush variability can be tolerated;
- identify the appropriate measures so the process and measurement errors can be estimate;
- focus the process on the purpose stated;
- maintain the relationship of a process to other related processes;
- provide a pictorial representation of all the steps in a process;
- focus attention on the work to be done by people assigned to do it;
- create a ration between the elapsed time and the total time spent on-task;
- test the hypothesis that the learning performance or the support service meets the requirement;
- locate points in the process where the measurement can be used to predict other measurements;
- accumulate systematically agreed upon facts according to a documented process;
- align the reported data with the need that generated the data collection;
- provide a way to track the progress of the need through to its verification and validation;
- demonstrate that all common cause variation has been effectively eliminated;
- identify the variables in the process that are contributing common cause variance for analysis;
- test the plan on a small scale to detect errors.

It is easy to observe the importance of the internal quality assurance evaluations in this process. Such evaluations should involve a comprehensive self-study of the program, at all levels, to monitor achievements of defined objectives though the application of quality standards. These quality assurance reviews should address the planning, design, presentation and evaluation of programs as well as the teaching, learning and communication activities.

MARITIME EDUCATION AND TRAINING QUALITY SYSTEM

A maritime education and training quality system must be build up around the STCW Code provisions covering the following areas:
- admission rules for students;
- equipment with respect to the requirements in the course objectives;
- routines for assessment of students;
- evaluation and appraisal of examinations;
- qualifications of the instructors and external examiners.

The quality system will consist of a large number of quality circuits based upon a common fundamental approach to each individual element, an overall principle. The quality system should specify the systematic rules for an overview of various activities and lecturing goals with the help of timetables, a syllabus, the operational plans and examination rules.

The responsibility to establish the quality policy is on the organization management. Such a policy will define the main organizational goal having in view the shipping companies, shipping authorities and student requirements.

We can observe as a good example the steps followed in quality planning by the Vestfold College (Norway):
- completion of a quality plan, timetable, working plans, operational plans, and examination plans;
- clarification of regulations and requirements of national and international laws, and rules from the maritime and college administrations which relate to maritime education;
- clarification of educational requirements for lecturers, with respect to the STCW convention;
- the procurement of lecturing equipment that is required to meet the lecturing

targets, with respect to the STCW convention;
- clarification of requirements for the procurement of management systems, process, equipment, resources and the experience that is necessary in order to run a quality system;
- clarification that the construction, educational process and control, management and evaluation process, together with the necessary documentation, are in agreement with one another;
- any necessary updating of the quality control, control and evaluation methods that are in addition to existing possibilities, such that equipment with the necessary suitability can be developed in time;
- clarification of acceptable criteria for all possibilities and requirements, together with those which include subjective appraisal, and
- preparation for registration.

CONCLUSION

The process of education and training of the seafarers involve an important responsibility. The actual trend to globalization of the maritime transportation should be based on qualitative and standardized training process.

The future officers should be educated and trained in processes developed under quality control in order to be able to develop safe and efficient activities on board ships. Such a background will be a premise to decrease the risks of the human factor in the maritime accidents with positive consequences in the safe of the life, ships and goods, but also for the protection of the environment from pollution. The implementation of the ISM Code and the quality standards in the maritime education and training institutions are the two important steps to achieve such a goal.

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IMPROVEMENT OF THE EXISTING EXAMINATION AND EVALUATION SYSTEM FOR COMPETENCY FOR GRADUATES OF THE IAMU MEMBER MARITIME UNIVERSITIES/FACULTIES

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ABSTRACT

Assessment and evaluation are basic elements which determine the performance and competency of a given system. The fact that maritime education is an international activity that cannot be validated within national boundaries, initiated the International Maritime Organization (IMO) to engineer and outline an international maritime education system. This is reflected in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW95); and the IMO model courses which are internationally implemented by maritime schools, institutes and colleges worldwide; thus setting the solid minimum grounds for global maritime education.

The **I**nternational **A**ssociation of **M**aritime Universities (IAMU), has clear objectives in setting the International excellence ground for the maritime education system and to design the optimum uniform examination systems for evaluating the level of competency.

This paper highlights and analyses a number of examination procedures followed by some countries, particularly written examinations, in an attempt to set standard parameters for question setting and selection. The paper focuses, as well, on computerizing the whole procedure of question selection from a databank of questions according to proposed rules and constrains.

The implementation of this proposed approach complements the IMO and IAMU global concept in reaching a global assessment tool based on databank. A computer programme determines questions and examinations according to pre-analyzed standard set of procedures, which ensures reliability and validity as well as security.

NOMENCLATURE

IAMU	International Association for Maritime Universities
STCW	Standards of Training, Certification and Watchkeeping for Seafarers
MSC	Maritime Safety Committee
CP	Competent persons
CPP	Competent Persons Panel
CBA	Computer Based Assessment
WE	Written Exams
OE	Oral Exams
AASTMT	Arab Academy for Science, Technology and Maritime Transport

1. INTRODUCTION

In fact the safe operation and handling of ships relies mainly on the standard of knowledge of shipboard crew and their skills rather than the sophistication of the ship's equipment and condition in general. Statistics, derived from marine casualties analysis, indicate that 80% of these casualties are due to human errors resulting from inadequate education and training. More than one hundred vessels of which the deadweight amounts to approximately million tons are lost annually worldwide. The importance and the significance of marine education and training in decreasing marine causalities due to human errors are not questionable.

Since technological developments go hand in hand with efficient training, there is a necessity right now to enhance training that can keep pace with the accelerated high-tech advances. The rising cost of education as a result of using modern equipment as training aids (like simulators, labs and workshops) has led to considerable discrepancies and variations in the levels of performance and career proficiency standards among sea personnel coming from developed and developing countries

So far, examinations are the crucial factor for the assessment of seafarers. However, on the global level, performance and knowledge assessment of seafarers necessitate standardized levels of education and training. In the absence of such parameter any setting of achievement and performance assessment exams would be invalid.

The International Maritime Organization who engineered and outlined an international maritime education system, as was reflected in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW78) and its amendments in 1995, is highly appreciated. STCW Convention considered as the backbone of the system of education and training in the maritime field worldwide.

The problem is to what extent the STCW convention is actually implemented? Are the measures included in the convention adequate to insure that after 1st Feb. 2002 – the final dead line date of the full implementation of the convention – the standards stated in the convention will be implemented globally. To investigate this problem the STCW 95 Convention would be reviewed in the following discussion in regard of the main areas of change in the 1995 Amendments to the STCW Convention.

1.1 Considering the change of Maritime Education & Training Goals from academic objectives to Competency objectives and setting up and clarifying its requirements to enhance the shipboard tasks in a safe and efficient manner.

1.1.1 IMO Model Courses:

According to the new competency objective set by the convention for the maritime education and training system, it was important to modify IMO model courses. Unfortunately, such revision did not coincide –in time- with the issue of the Convention in 1995. The 1st revised edition of IMO model course was published late 1999, which was after the dead line date stipulated in the convention for maritime administrations to communicate information to the SG of IMO – before the 1st of August 1998 – in regard of their implementation and compliance with the convention. These reports-mostly- did not take into consideration the revised IMO model courses, as this was left to each Administration and to their capabilities and resources.

Thus, STCW 1995 may lost its most important Goal which is the standardization of education and training, in which, the IMO model courses are considered its core and base element.

1.1.2 Assessment /Evaluation:

It is well known that education and training, on one hand, and examinations and assessment, on the other hand, are two integrated inseparable aspects in which they could be considered as both sides of the same coin. Since the assessment/evaluation mechanism stated in the Convention is left to the convenience of each individual state, then even with the assumption that IMO model courses were revised in due time, there will be lack of standardization in

assessment and evaluation methods and procedures.
Within this context, assessment method(s) will vary from one administration to another pending on the available facilities and resources in each administration. It is important to set up the minimum requirements and system of evaluation and assessment to be implemented within the STCW 95 convention by all administrations.

1.2 Setting up procedures for making parties to the convention accountable to each other - via IMO- for their proper implementation of the convention and the quality of their training and certification, (known as the White List procedures).

This aspect represents one of the most important points in the revised Convention. However, the mechanism of procedures needed is invalid and lacks credibility, since the Convention called States to modify their national legislation, regulations, syllabi and assessment methods; as well as companies' regulations to be compatible with the Convention requirements; and to communicate reports- in this direction- to the SG of IMO before August 1st, 1998. In fact 82 administrations met the deadline date and forwarded their reports.
In this context, the Convention encouraged administrations to nominate a number of experts – to be approved by the IMO, Maritime Safety Committee (MSC) - as competent persons (CP) assigned to deal with and to assess the administrations communicated information in a panel formulated from 3 to 5 CP's and to report to the SG whether these administrations are 100% complying with the requirements of STCW 95 or not.
In view of the qualified Competent Persons' reports, the SG of IMO has to report the MSC with the list of administrations, which are fully complying with the requirements of the Convention. This list known as: "The White List"

1.2.1 Full and Complete Effect:

Revising the process and work of Competent Persons Panels (CPP's) and in view of the forms issued by the MSC to help the CP's in their work of evaluation and assessment, will yield either full and complete effect to the convention (100% complying), or non-complying at all (0%). In real life the full and complete effect and implementation of the Convention for most countries –if not all- are almost impossible.
The logical question-in this context- is: if the Convention has set broad outlines for education - training and assessment; and if IMO-itself- did not completely revise the IMO model course until late 1999, how-on earth- can any administration be complying fully with the Convention (100%) in August 1998?
In fact, measures and basis of assessment used to evaluate information communicated to the SG have been left to the individual personal discretion and views of the CP's leaving a sizable margin of space for the CPP's tolerance and/or strictness! Surely, the whole assessment will- eventually- lack the required credibility in this respect.

1.2.2 Lack of Remuneration Budget for CP's:

IMO did not consider the allocation of any remuneration budget for CP's. In the absence of any compensation to the work requested by the MSC from the CP's, most CP's treated the assessment process lightly, putting it on a lower scale of their priorities.
In most panels, the process ended up by one individual (out of five) – usually the Head of the Panel- doing the whole job of assessment, while the other members endorse his opinion without going into the actual process of assessment! This scenario has been observed in the work of many panels.
In view of the above, it has been pointed out clearly that although the recognition of certificates through IMO as stipulated in the Convention is extremely important, yet its actual implementation process will lead to its non-credibility.

The previous discussion emphasizes that the revised STCW 95 has introduced a number of positive aspects and could be considered as the most active and effective convention in standardizing the Maritime Education and Training Worldwide. On the other hand the actual implementation process will lead to the Convention non-credibility. In this regard, the problem can be solved partially by harmonizing the Assessment methods used Globally, specially through the International Association of Maritime Universities (IAMU) and its Education and Training Working Group by assigning the task of setting a

Universal mechanism of assessment for the required degree of competence.
As for the issue of recognition of certificates, the expansion of membership and development of the IAMU will enhance the processing of recognition of certification among members and will eventually lead to the implementation of the STCW 95 regarding this matter, which represents one of the most important issues introduced in the revised Convention.

2. REVIEW OF CURRENT ASSESSMENT APPROACHES

The importance of maritime education and training need to be overemphasized. The various forms and types of examinations, i.e., written, oral, computer-self test evaluation, etc., should reflect the validity, reliability and extreme quality-control concepts which entail issuing sea-going personnel certificates worldwide.
Such examinations have to comply with the international standards and measures as stipulated in the STCW and IMO model courses as well as the prescribed requirements stated by individual sovereign States.
Within this overview, the role of examinations in the sea-going profession -by necessity- should aspire towards a global system of harmonization which while accommodating international regulations, should also cater for special requirements of each country. Consequently if the assessment is valid and reliable, then the assessment of educational and training standards is also valid, reliable and true. Assessment can be classified into written, oral and Computer Based Assessment (CBA).

2.1 Written Exams (WE)

The traditional method for knowledge assessment included in the written exam paper can be affected by several factors which can be concluded in the following:

2.1.1 Types of questions

2.1.1.1 Essay

Used to determine the candidate's ability to absorb theoretical components of the course. Questions starting with: **D**escribe, **S**tate, **D**efine...etc. belong to this type of questions. Drawbacks of such questions are the length of time needed to answer them as well as the subjective element in grading.

2.1.1.2 Problem Solving

These are questions which reveal the candidate's capability to undertake the practical and applied components of the course. This -in itself- presupposes that the candidate has already mastered the theoretical part of the course. This type of question begins with phrases like: **F**ind, **S**olve, **C**alculate...etc.
These questions are distinguished by their power to measure the candidate's achievement and absorption of both theoretical and applied portions of the course indirectly and directly.
The same drawback is here, i.e., the length of time needed to respond to these questions.

2.1.1.3 Situational

These are characterized by emphasizing the applied aspects. Responding to such questions requires ample understanding of the course components, where case studies or situations are the focus of questioning. Candidate's answers represent a true-life measure of their capability to absorb the course material and its applications not memorizing it. This question type is an excellent tool for distinguishing candidates who are capable of efficient proficiency applications.

2.1.1.4 Multiple Choice

Where the question format offers to the candidate choices as answers. This type lends itself to any of the other types of questions previously stated.
This type is characterized by ease of correction and grading particularly when the computer is utilized in the grading process for large numbers of applicants. In a country like Philippine, for example, the number of applicants for sea-going certificates of competency is in the range of 20.000 per year.
However, the inherent weaknesses of the multiple-choice format of questions is the fact that it does not accurately measure in-depth

the candidate's absorption of the course. On the other hand, some courses like engineering drawing, chartwork ...etc., cannot be fully covered by using the multiple-choice question format. In addition to that the haphazard correct choice on the part of the candidate is also another weakness which affects the examination reliability and validity.
Any exam paper may contain any or all of the previously mentioned question types.

2.1.2 The Balance of question paper in length, difficulty and importancy

It is pertinent -however- before determining the type of questions used- to point out the necessity of setting a balanced question paper as regards the level of difficulty and the period of time allocated to answers.
This is of crucial importance so that we do not end up by having an extremely difficult exam paper that is unanswerable or a very long exam and cannot be attempted in the time allocated for the set questions. Thus, the factor of the weight of time and difficulty is very important.

2.1.2.1 Weight of time:

This factor can be calculated by applying the following:

$$\text{The question/exam weight of time} = \frac{\text{Actual time for answering question/ exam}}{\text{Allowed time set to the papers' question/ exam}} \times 100$$

Where:

Allowed time:
It is the time allocated to solve a specified question/exam. For example, if the time allocated for the subject exam paper -(allowed exam time)- is two hours, and the exam paper consists of four questions, each of them is assigned an equal allowed time, then 30 minutes will be the allocated time for each question in the examination paper.

Actual time:
In reality each question will not be solved in the same period of time, allocated for it. Of course this depends on the type of question, the question itself, ...etc., So the actual time is the time actually taken to solve a specific question.

Weight of time:
From the previously mentioned simple formula, the weight of time can be calculated. This is very useful because this calculated value can be considered as a measurement of the time taken to solve the exam paper in relation to the time allocated for the exam. In the same previous example if we have a large number of questions - bank of questions- and we are going to choose four questions randomly to be included in the subject exam paper, then we have to look into the average weight of time of the four questions. If it is near to 100%, then the actual time to solve the exam questions will be close to the time allowed/allocated for the exam. This means that the exam will be quite lengthy in time. On the other hand if the average weight of time of the exam questions is near to or less than 50% then most of the students will finish answering the exam paper before half of the exam allowed time elapses. This case also means that the exam is not correctly measured/weighted in time. We can reselect questions randomly until we reach the average time of the four selected questions within adequate range of 60%-80%.

2.1.2.2 Weight of difficulty:

Once we categorize the levels of difficulty into (easy, moderate and difficult or 50%, 70% and 90%), we can assign the difficulty level for each question in the bank of questions. When choosing the exam questions randomly, then the average difficulty of all chosen questions must be within the-agreed upon- range of difficulty (60%-80% as an example). This can be considered as the second constraint used when selecting the exam questions randomly.

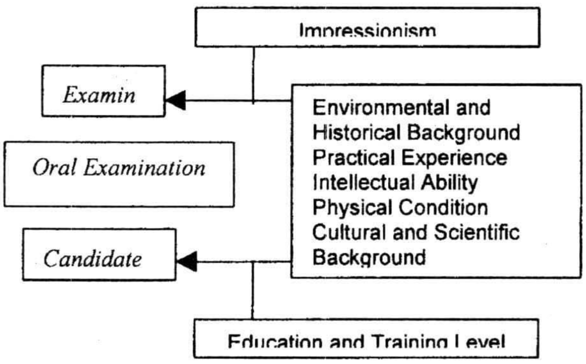
2.1.2.3 The level of questions' significance

This factor is very important in determining the efficiency and relevance of the test and its reliability in measuring accurately the candidate's mastery of the course. Any test or exam cannot be considered significant for a given course if the whole bulk of questions were to test marginal or peripheral or irrelevant issues such as definitions for instance. Definitions are not that important -in some exams- as other issues which are extremely relevant to the ship safety such as questions directly related to collision avoidance if this is the main objective of the subject exam.

In determining the level of questions' significance, the key issue is to measure the understanding of the main objectives of teaching the course; and consequently, the significance or relevance of each course component to the course objectives in general. Definitions are important in a course of Law, but may not be that important in another course. Thus, there should be a high correlation between the level of significance or relevance of the course topics and the objectives of the course; and consequently the questions set for assessing candidates.

2.2 Oral Exams (OE)

Oral examinations, being an important part of the evaluation process, can be affected by many factors that arise due to the dynamic interaction between the examiner and the merchant navy candidates. These factors can be summarized as shown in **figure (1).**



Factors affecting oral exams (Fig. 1)

Therefore, the results of the existing oral examination procedures are -adversely- affected as follows:

- degradation of the comprehensive level;
- impact of impressionism;
- degradation of the education process level;
- randomness of the evaluation process;
- consistency of examination contents;
- degradation of confidential level;
- losing confidence between merchant navy candidates and the examination procedures;
- contradictory levels of merchant navy candidates performance;
- overlapping of written and oral examinations;

2.3 Computer Based Assessment (CBA)

This type has developed tremendously in the last decade and has been implemented in some countries. The experience of Norway in this respect is ***worth mentioning:***

More than 50% of the seafarers working on board Norwegian fleet are Philippines seafarers. For this reason Norwegian ship owners were being aware of the Philippines' seafarers level and standards of knowledge and skills. The Norwegian ship owners developed a Computer Based Assessment program for assessing skills of Philippines seafarers prior to their recruitment process. This type of assessment expected to be used in most areas of Education and Training in maritime field in the near future.

3. PROPOSED METHODOLOGY TO ENHANCE THE DEVELOPMENT OF EXISTING METHODS OF ASSESSMENT

Enhancing the methodology of existing methods of assessments needs first to set up a clear idea regarding the excellence system of education and training stipulated in the STCW Convention and implemented in maritime institutes globally to the level depending on the resources available. Second step is dealing with enhancing the effectiveness of the current methods of assessment.

3.1 Enhanced system of education and training for Watchkeeping Certificate

STCW 95 stipulated in Regulation II/1 the mandatory minimum requirements for Certification of officers in charge of navigational watch on ships of 500 gross tonnage or more as the following:

1 Every officer in charge of a navigational watch serving on a seagoing ship of 500 gross tonnage or more shall hold an appropriate certificate.

2 Every candidate for certification shall:

- Be not less than 18 years of age.
- Have approved seagoing service of not less than one year as part of an approved training programme which includes on-board training which meets the requirements of section A-II/1 of the STCW Code and is documented in an approved training record book, or otherwise have approved seagoing service of not less than three years;
- Have performed, during the required seagoing service, bridge watch-keeping duties under the supervision of the master or a qualified officer for a period of not less than six months.
- Meet the applicable requirements of the regulations in chapter IV, as appropriate, for performing designated radio duties in accordance with the Radio Regulations; and
- Have completed approved education and training and meet the standard of competence specified in section A-II/1 of the STCW Code.

The features of system of Education and Training conducted could be concluded as in Fig. (2), provided that the above mentioned mandatory minimum requirements are taken into consideration.

From the proposed competency educational & training concept, the quality assurance factors can be analyzed and concluded in the following:

A PROPOSAL COMPETENCY EDUCATIONAL &TRAINING CONCEPT

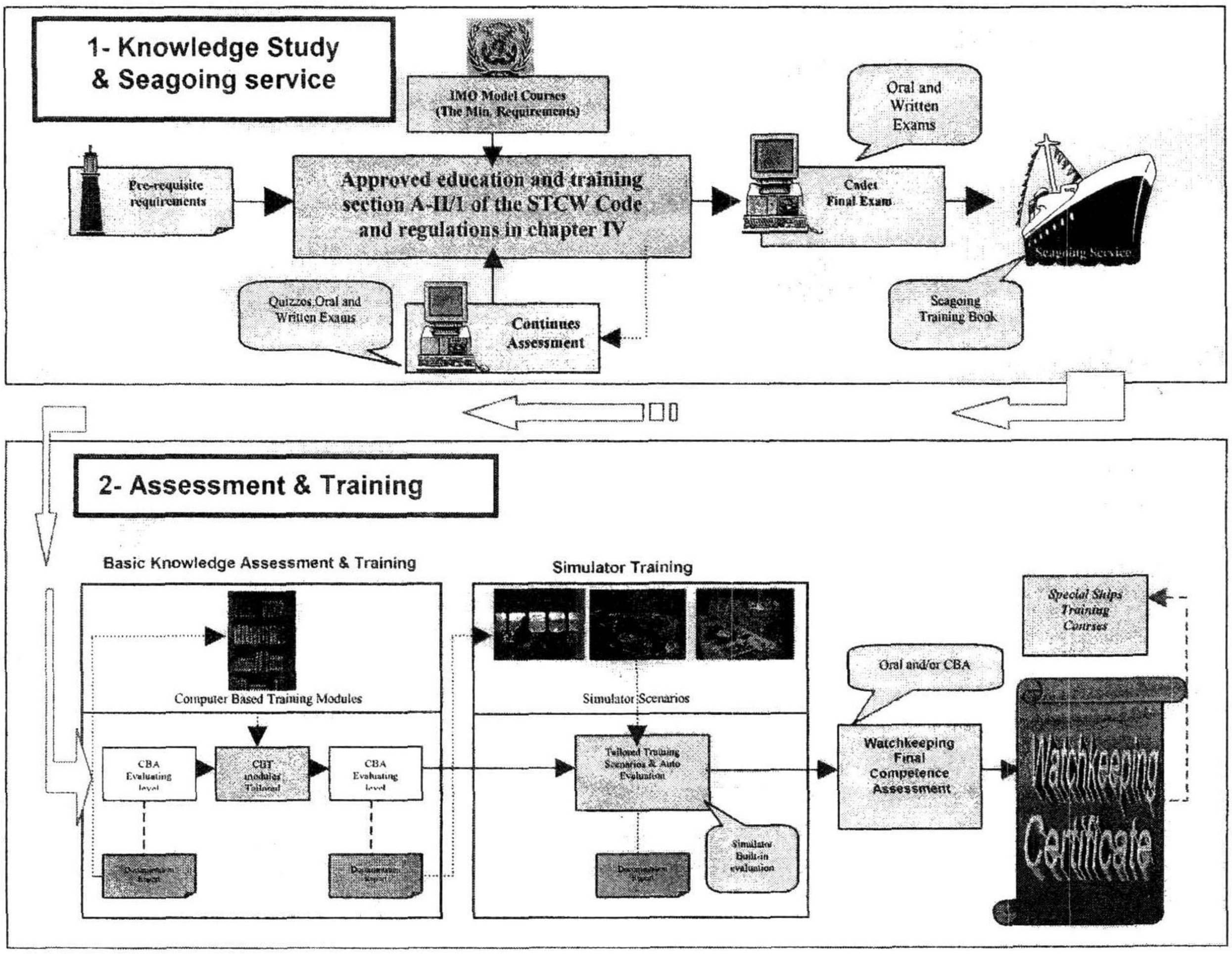


Fig. (2)

1- **Knowledge Study & Seagoing service (Dealing with groups of Students):**
- Pre-requisite requirements (STCW stated only the age as pre-requisite requirements)
- Continues Assessment (Quizzes, Oral and Written Exams)
- Final Exam (Oral and Written Exams)
- Seagoing Training Book

2- **Assessment & Training (Dealing with Competency for each individual Student):**
- ***Computer Based Assessment for Evaluating the level of Competence (tailored Computer Based Training modules)***
- Simulator tailored training scenarios & auto evaluation
- Watchkeeping Final Competence Evaluation (Oral and/or CBA)

3.2 Enhancing the effectiveness of current assessment

Using computer-based systems in evaluation and assessment can extremely help in enhancing and harmonizing methods of examinations worldwide.

Procedures to be followed in order to enhance the effectiveness of current written exams can be as follows:

3.2.1 Studying factors affecting the balance of the subject exam

- Determining the course objectives and pinpointing the orientation objective of the course, then classifying and sorting out the type of questions used relevant to the subject objectives.
- Categorizing the subject-areas of the course content in groups/sections according to their degree of importance and on the basis of the course objectives.
- Determining the number of questions in each group in case of using multiple choice format, while in conventional format types the number of questions will be equivalent to the number of groups.
- Assigning allowed suitable time and marks for each question.

3.2.2 analyzing some of the current examination papers

In order to assess the consistency of current examination papers with the factors as mentioned in item (3.2.1) above; the study and analysis of current examination systems for examination paper in some countries dealt with in an attempt to find out their compatibility and adeptness to meet the requirements of the IMO. This paper focused on three countries:

The Philippines: being the largest supplier of marine employment force in the world.
UK: being, -historically- the oldest country engaged in the maritime field.
USA: being the most high-tech country worldwide.

The subject "Celestial/Ocean Navigation" was considered as the sample of analyzes and evaluation for some of the examinations given during the period 1991-1996. By studying the three samples of examinations in Philippines, UK and USA we could get the following results:

The Philippines: (Multiple Choice Exams)
- The number of questions that consistent with the subject-areas items determined in *IMO model course* represents 21.2% of the exam questions.
- Redundancy and repetition of questions were existing in the exam papers.
- There is no any stress on the degree of importance for some questions; a point that consequently reflected on the examination paper as a whole.
- The actual time to solve the examination paper exceeds by far the time allocated for candidates to attempt all questions. There are some questions that need more than 20 minutes each to solve, like G.C. sailing questions.

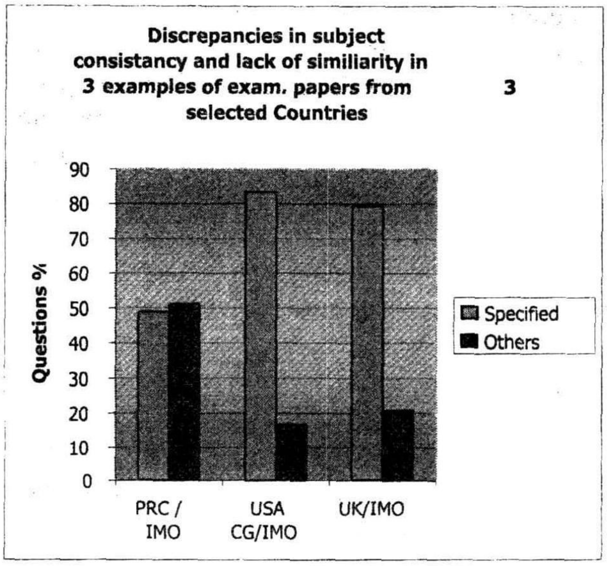
U.K.: (Conventional Exam)

- The number of questions which are consistent, with the subject-areas of 'Principles of Navigation' course for Second Mate Certificate represents 83.4%
- The test is mainly theoretical, however there are some applied questions,
- As the total number of questions is 6 questions only, the exam paper does not properly cover the subject's items.

USA: (Multiple Choice Exams)

- The number of questions consistent with the subject-areas of 'Celestial Navigation' - as stated in the IMO Model Courses- represents 83.4 % of the total exam questions.
- In general, the whole orientation of the set exam paper is towards the applied aspects of the course; consequently the paper does not contain any questions which test the theoretical principles or concepts of the course material.

By studying the three exam papers in Philippines, USA and UK, we generally observe lack of similarity as well as obvious discrepancies in the level of difficulty.



The maritime system of examination needs - more than ever- an international commitment to offer a unified syllabus; and consequently examinations can become -more or less- of the same level.

3.2.3 Revising current available question data banks

In view of the above analysis of the examination systems, there is an urgent need to revise all available questions in the present available data banks for the sake of harmonization, reclassification and updating questions.

Important factors to be considered during the process of revision are the weight of time, difficulty and importance.

4. A PROPOSED GLOBAL EXAMINATION COMPUTER BASED PROGRAM

The global data bank system of examinations will be processed by a package of computer software that will enable concerned authorities to:

4.1 Written Exam

Procuring a well-balanced examination paper in terms of time, consistency and level of difficulty.

The methodology of compiling the global written examination data bank should be based on the following steps:

- Review and investigate the written examination data banks available either on the national and/or regional level.
- Rearranging IMO model courses in such a way that takes into consideration the system of examination implemented in each country.
- Compiling all written examination questions and model answers from different systems in various countries worldwide.
- Reclassifying these questions and model answers according to relevant IMO model courses or rearranged ones.
- Weighting each one of the compiled questions as regards time, level of difficulty, validity, reliability and consistency.

4.2 Oral Examination

As shown in figure (3), improvement of the oral examination procedures can utilize the following tools:

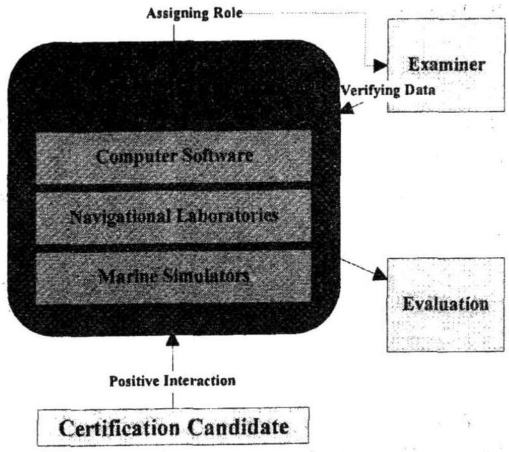


Figure (4) - Improvement of oral examinations' procedures

- **Computers:** Can be utilized either by using ready-made software or preparing special software by professional programmers.
- **Laboratories:** Using different types of laboratories will be effective in evaluating merchant navy candidates, especially in the subjects related to chart work, use of modern equipment, extracting and analyzing navigational data, making navigational calculations, position fixing and cargo handling.
- **Simulators:** Different types of simulators can be utilized in various areas of oral examinations, such as: ship handling, using of radar, interpretation of radar display, using ARPA equipment, extracting and analyzing data from both radar and ARPA equipment and the use of navigational instruments in navigation.

4.3 Computer Based Assessment

This system of assessment and/or evaluation is extremely beneficial and determinant in marginal and critical cases of candidates; particularly in cases where the candidate's performance in either/or WE/OE is not indicative enough; and in cases where the examiner is not positively sure of the candidate's level of performance as regards responses to examination papers or situations.

Within this framework, a computer software package (Computer Based Assessment) is mainly used to evaluate the skills of students, as the first step, as indicated in fig. (2), after finalizing the basic knowledge study and seagoing service. This method of assessment could be used to evaluate tailored knowledge and skills needed for students before attending simulator training and which watchkeeping certificate is utilized now in the Norwegian Embassy in the Philippines to assess seagoing personnel applying permit for work on board Norwegian ships in order to ensure and assess the applicants. The package relies on the multiple-choice format, where a number of questions are randomly processed on the screen for each applicant to choose the correct answer. At the end of the programme, the applicant will get his final assessment on the spot. The package is characterized by keeping a permanent record of all applicants with their score on the test.

The same system -i.e. practical and computer-self tests- is valid for assessment and evaluation for employment and for job promotion for assessing the performance of job or vacancies' applicants in companies, organizations, ports, etc., at any stage of pre-employment and/or employment or promotion.

Depending on the experience of the examination center of AASTMT, Egypt and the experience of others in this field, a global examination system has been developed and can be applied globally after finalizing the needed Questions and the model answer databank.

5. CONCLUSION

This paper is mainly concerned in setting proposed standardized rules, and norms can be internationally applied when selecting examination questions for seafaring candidates worldwide.

The rationales is to narrow gaps and remove obvious discrepancies existing among certified

seafaring personnel having the same marine competency certificate from various marine training institutes worldwide.
The main emphasis -in this study- is focused on written examinations. Different formats, question types, norms for setting questions are thoroughly discussed. Based on the analysis, certain norms and criterion for setting written examination papers are justifiably proposed according to major elements that need to be satisfied.

Three representative samples of examinations are studied and critically analyzed in order to find out their compatibility with the basic elements and norms established for setting a well-balanced examination paper.

The analysis indicated -as well as- the existing discrepancies and pitfalls in the systems of certifying examinations as implemented in various countries of the world. The end result was an urgent need to set standardized norms and criterion for setting, selecting and balancing examination questions.

A proposed set of norms and regulations for processing examinations is suggested, as well as a proto-type model for a computer-aided implementation process for such norms and regulations.

Endorsing the proposed steps of establishing an international unified marine question data bank together with a computer software package for selecting questions/examination paper according to proposed norms and techniques, will form a major step towards a global unification system for setting, conducting and processing marine certification examinations worldwide.

6. RECOMMENDATION

Endorsing the proposed steps of establishing an international unified marine question data bank together with a computer software package for selecting questions/examination paper according to proposed norms will form a major step towards a global unification system for setting, conducting and processing marine certification examinations worldwide.
Such a move will eventually help in narrowing existing discrepancies among marine certificate issuing levels from various marine training institutes. The role of IAMU should be highlighted in this regard. Under the IAMU umbrella, implementation steps are recommended hopefully through IAMU members and Nippon foundation funding facilities. The proposed IAMU/Nippon foundation project is seen to be based on two major components:

- An international marine data bank for questions; and
- A computer software package for question selection and processing.

Along this line, the forming of two work groups is recommended. The first will focus on establishing the question data bank (collecting, organizing, rephrasing and setting questions) through contacts with major question data banks worldwide. The second working group will work on programming and improving a computer software package according to the proposed norms, techniques and criterion discussed in the paper with the objective of implementing an integrated unified marine examination system worldwide.

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THE REFORM AND PRACTICE IN CULTIVATION PATTERN AND COURSE SYSTEM FOR MARITIME EDUCATION AND TRAINING OF THE 21ST CENTURY

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ABSTRACT

Since 1996, the reforming of MET's cultivation pattern and course system, as one of the national projects in higher education, has begun in order to meet the needs of amended international convention and the needs of new century. The paper will introduce the MET's situation of reforming in recent years in China.

The rapid development of world economy and science and technology puts new requirements on the knowledge, ability and quality structure of the cadets. This kind of requirements is more urgent to maritime education with internationalized characteristics. Tens of thousands of high-level seafarers have been trained successfully under the old cadets cultivation pattern of maritime education in the past several decades in China, but the old pattern can not meet the needs of social development any longer under the new situation. The problem that the seafarers trained under the old pattern cannot meet the needs of the shipping industry has become more and more serious. Shipping companies and respective institutions appeal strongly for the navigation education to speed up its reform.

The reform is planned to derive form the broad background of international maritime education with full consideration of shipping enterprise's needs native and abroad, consult the practice of international navigation colleges and universities, and get guidance from STCW95 and native laws and regulations on seafarer's education. It studies the competence requirement and training scheme of seafarers and probes into training aims and training standards for seafarers, and puts forward suggestions on seafarers training program --- recommended teaching plan.

1. THE BASIS AND GUIDING PRINCIPLES

This reform mainly considers the following points:

1) The establishment and development of China's socialist market economy requires higher education to make all-round adaptation and improvement, and maritime education should also meet this need accordingly.

2) Science and technology have highly developed, knowledge economy has just emerged and the competition of national power has become more and more severe, so maritime education must have a good preparation for the new challenge.

3) The eastward moving of international shipping market brings new opportunity for China's maritime education and summons challenge as well. Only when the seafarers accord with the requirements of international standards (STCW78/95) and the regulations for seaman's training and education of the People's Republic of China, can they have the power to compete in the international shipping market.

While studying and formulating cultivating plan for cadets, people should follow the following guiding ideology. (a) Reflect the spirit of the day---"facing the modernization, facing the world and facing the future". (b) Adhere to the principle that knowledge, ability and quality should be developed coordinately and improve comprehensively. (c) Draw achievements from recent maritime education research actively. (d) Use the successful experience of other countries for reference. (e) Train personnel of different level and different standards with distinctive characteristics in accordance with the requirements of certain conventions and regulations home and abroad and the needs of the shipping market.

2 REQUIREMENTS FOR COMPETENT SEAFARERS

2.1 REQUIREMENTS FOR THE SHIPPING INDUSTRY

As maritime education is a part of the engineering education, personnel cultivation should conform to the general requirements of the engineering personnel, but it should also have its own characteristics, which lies mainly in the aspects of applicability, practicality, internationality and priority to management, etc. This characteristic determines that personnel of this kind should possess strong practical working ability, wide range of knowledge, high foreign language level, certain managing administrating and organizing ability. Personnel cultivating plan should be made up on the basis of personnel model requirements.

We have carried out large-scale investigation and research on the quality of personnel cultivation. From the fed-back opinion of the employers, main suggestions on the training of competent seafarers in the maritime education in China are:

1) Widen professional range, strengthen infiltration among disciplines, and set up new optional courses such as economics, law and management.

2) Increase the reform force on teaching contents. Follow closely the tracks of nautical science and technology and introduce new knowledge and new technology into maritime education in time, especially increase the force on teaching material construction.

3) Develop closer relations between the university and the employers. The university should keep abreast of current needs of the enterprise timely and revise syllabus promptly.

2.2 REQUIREMENTS OF STCW 95 FOR SEAFARERS

Compared with the STCW 78, the principle mark of the modification of the STCW 95 is the Functional Approach, Evaluation of Competence and Compliance and Verification Mechanism, which embodies the change of the demands of the seafarers. It emphasizes the practice ability more than the speaking and writing abilities. Therefore, the universities have to make modifications in teaching contents, teaching method and examining method in order to meet the requirements. The following aspects should be considered:

<u>ORIENTATION OF THE EDUCATIONAL SYSTEM AND TRAINING AIMS</u>

The annex of STCW95 provides functions at different level. However, the running educational systems, though provides the 4-year university education and all the knowledge of managements, provides insufficient sea-going service, which results in the failure of the mastery of the actual ability at the management level demanded. This fact should be orientated scientifically. Moreover, will the theoretical management knowledge, which has been instilled into the cadets during the 4 years education, be out of date when they come to the management level? Do they need to reenter the universities to renew their knowledge and be retrained? These questions require clear understanding. A matters stand, the pre-promotion training for the 4-year graduates contains more reviewing than renewing knowledge.

<u>THE MINIMUM REQUIREMENTS AND THE SUGGESTIVE REQUIREMENTS</u>

According to the annex of STCW95, the requirements are divided into two parts. Part A are mandatory standards and requirements. Part B are not mandatory but recommended guidance. Therefore, the course design should at least meet the requirements in Part A, and the teaching content and teaching hours should also follow the model courses. However, should the quality of the seafarers trained be higher than the requirements in part A, and to what extent? This should be fixed. At least, the regular college course should consider the concerned contents of the recommended guidance in Part B on the basis of Part A.

ENGLISH ABILITIES. STCW makes some requirements on the seafarers' English abilities, but the length of teaching hours hasn't been fixed because of the difference between the English-speaking countries and non-English speaking countries. As English ability is one the main obstacles in international competition, English teaching contents and time should be seriously studied.

SPECIAL TRAINING REQUIREMENTS FOR PERSONNEL ON CERTAIN TYPES OF SHIPS Besides container ship, bulk carrier, oil tanker, there are LNG or LPG, ro-ro ships and passenger ships, upon which STCW has its stipulations and special requirements. The resolution of the Convention also deals with the requirement concerning the training of pilots, VTS personnel, and personnel on mobile offshore equipment. Obviously, it is unrealistic and not economical to bring all the requirements into training programs, but these ships and trades exists objectively, and there are always a number of graduates to work in these fields. Therefore, there should be special means to plan training programs.

3. THE ENVISION ON THE KNOWLEDGE, CAPABILITY, QUALITY STRUCTURE AND CULTIVATION PATTERNS OF SEAFARERS IN CHINA

3.1 KNOWLEDGE, CAPABILITY, QUALITY STRUCTURE OF SEAFARERS

Marine navigation is a special one--- the working condition extremely hard and working environment complicated and capricious. During navigation the seamen should have not only the perfect expertise and strong physique, but also the aptitude to adapt to the environment, good psychological quality and the ability to solve various unpredictable problems with promptness, resolution and independence.

3.2 THE CULTIVATION PATTERN

THE BASIC GOAL OF CULTIVATION Morality, intelligence and physique are to be developed together; knowledge, capability and quality are to be improved congruously. According to international and domestic related statutes, the personnel are trained to own comprehensive quality, strong consciousness of safety and environmental protection and international competitive ability.

THE BASIC PATTERN OF CULTIVA-TION For 4-year undergraduates, we practice fundamental knowledge solid, the horizon of knowledge wide and practical ability excellent corresponding with the regulatory basic requests in STCW78/95. For 3-year cadets, we practice strengthen professional knowledge and operational ability corresponding with the operational basic request in STCW 78/95. For part of excellent cadets, we practice undergraduate-master-doctor chain cultivation to strengthen disciplinary construction, teaching faculty construction and training tip-notch nautical experts. For part of cadets we practice the comprehensive general-purpose training (navigation and engineering together) to fit with the needs of future development of shipping industry. And for the cadets with high level of English, we practice strengthening English training to suit the needs of international seafarer's market.

3.3 THE WAYS OF QUALITY TRAINING

(a) Strengthen the cadets' moral education and try to foster cadets with ambition, knowledge, morality and discipline. (b) Strengthen the cadets' self-regulatory ability and improve the cadets' ability to work independently. (c) Deepen the teaching reform, reinforce the teaching work. Revise completely the syllabus, and improve the teaching content. The syllabus should be made on the principle of facing the market, guaranteeing the basis; strengthen the quality education, associating closely with the STCW 95, distinguishing levels, and classified training. After the revision of the syllabus, we should revise carefully the teaching program for specialized course in association with the complication of overall teaching materials. Adopt strong measures in reforming the teaching methods and teaching medium. We should improve the cadets' self-learning ability and give cadets more room to think in the course of teaching. We should put more emphasis on the practice at sea and skill training and make sure that the cadets can get band 4 certificate in English and certificate in computer application. (d) Stress the importance of attitude towards study, develop actively the extracurricular academic and technology activities. On one hand we should reinforce the moral education, on the other hand we should educate the cadets to increase the competitive consciousness, to adapt to the needs of society. (e) Reinforce the campus culture structure and improve the cadets' cultural quality. Improve the cadets' ability in many respects through the activity of speech, discussion, sports meeting etc. Establish all kinds of students' club and carry out activities regularly. Make full use of the weekend to hold all kinds of lectures and subsidiary courses. Make some of the cultural quality course and stipulate clearly that the cadets should choose some cultural quality course. (f) Reinforce the social practice education. Make the cadets understand the society, serve the society and strengthen their responsibility for society and increase their ability by organizing them to participate in the social practice. (g) Reinforce the psychological education. Open the psychological course to the whole students. Cultivate the cadets' spirit of fearlessness and progress forward in face of difficulties through the organization of extracurricular activities and counter-frustration education. (h) Bring into play the role of training persons and try best to form the good training atmosphere.

4. TENTATIVE PLAN ON THE CULTIVATION OBJECTIVE AND COMPETENCE STANDARDS

4.1 PRESENT CULTIVATING OBJECTIVES AND COMPETENCE STANDARDS

The present training objective of maritime education generally focuses on training high-level seafarers who will meet the needs of Chinese modernization construction and develop their morality, intelligence and physique roundly, and accept the basic engineering training. Such seafarers are consonant with STCW competent in international shipping market.

The main difference between training standard of undergraduate cadets and that of students in training schools lies in that education in university aims at training of qualified second officers and third engineers on precondition of satisfying the degree education, and the education in training schools concentrates on practical seafarers who are supposed to be competent as third officers and fourth engineers. On the premises of achieving the requirement for certification by the maritime bureau, some colleges and universities request higher standards for their students. The higher standards are embodied in the systematic course and training and the teaching content. For example, the knowledge necessary for masters and chief officers has been includes in the teaching plan in addition to the basic course and training.

4.2 IDEAS ON THE CULTIVATION AIMS AND QUALIFICATIONS OF PRESENT HIGHER MARITIME EDUCATION IN CHINA

Firstly, the maritime education demands that the graduates have to satisfy the requirements of STCW95 and the standard of national maritime bureau. Secondly, because maritime education is common engineering education, the graduates have to satisfy the requirements degree education. Since the last 40 years, the maritime education has trained many specialized personnel for the shipping industry. With the development of the opening up to the world and reform and the completion of the market economy, the standards for the society to assess the seafarers and the requirements will change. Some theories, which were taken reasonable in the traditional maritime education style, will be reconsidered and redeemed. (a) Traditional technical education will be shifted to comprehensive quality education. Generally speaking, traditional maritime education emphasizes technical education. And this style of intellectual training is not fit for the requirements of modernization construction. With the joining with the international shipping management of national ones, it requires that the quality of ship crews be raised, For the seafarers, they should strictly discipline their deport and show their good career morals, spirit of respect to job and comprehensive qualities. (b) The influence of curriculum and teaching content on cultivation aims. The construction of curriculum system and the determination of teaching content should be orientated to heighten the comprehensive qualities of the cadets. The school should underlie quality education of cadets in four aspects; e.g. moral quality, vocational quality, cultural quality and physical quality. Whether the cadets are trained to meet the requirements of the cultivation aims is greatly concerned with constructing of curriculum and the determination of teaching content, so their importance should be realized.

4.3 THE INFLUENCE OF STCW 95 TO THE CULTIVATION PURPOSE OF MARITIME EDUCATION AND THE PATTERN OF PERSONNEL

At present, the higher education in engineering in China is the start phase of comprehensive reform and the new STCW is beginning to take effect. This is a historic opportunity to the reform in maritime education. The influence of the STCW 95 to the cultivation purpose of maritime education and the pattern of cadets mainly focuses on reconstructing the cultivating mode of specialized cadets in maritime education. Based on the traditional education which concentrate on technology, develop cadets: (a) abilities in many fields and the consciousness including leading ability, recourse ability, ability of using foreign languages, the consciousness of managing and operating and the consciousness of environment; (b) comprehensive quality, including technical quality and non-technical ability.

4.4 SOME PROBLEMS ON ESTABLISHING CULTIVATING PURPOSE IN MARITIME EDUCATION AND THE PATTERN OF PERSONNEL

THE NATURE OF MARITIME EDUCATION We think that maritime education is a organic combination of higher education in engineering field and higher education in occupation, that is, maritime education is based on higher education in engineering, it has an outstanding feature of higher education in occupation, because the main courses in maritime education are among the few courses which are set for work. In the course arranging system, we should be in the frame of higher education in engineering and highlight the features of higher education in occupation which is in the contents of education. To be specially, the syllabus of basic courses in maritime education and main courses in them should meet the requirement of higher education in engineering. The syllabus of professional courses should be consonant and should adapt standards of Chinese seafarers and the requirements of STCW. We should think more from the higher education in occupation.

MODELS ARE DETERMINED WITH THE IDEA OF LIFE-LONG EDUCATION. Higher maritime education should adopt the idea of life-long education, because nautical techniques cover such spheres as economy, commerce, environment, so both STCW and competent authorities require that the seafarers should take compulsory training to refresh their knowledge. These requirements accord both to the scientific training path, namely studying-prctice-restudy-repractce, and to the idea of life-long education. In the practice of maritime education reform, the maritime education field should rationally define the relationship between the quality of nautical special intellectuals and curriculum system and teaching content. What course should be completed for the bachelor's degree in four years? What in higher education, and what in compulsory training should be thoroughly considered at the angle of life-long education so as to allocate teaching hours reasonably. The curriculum content should be scientifically adjusted rather than simply adding to and deleting.

RELATIONSHIP BETWEEN TRAINING AIMS AND QUALITY EDUCATION The main training aims of higher maritime education should show the structure of the modern advance engineering education, including humanities and society quality, major and vocational quality and moral quality. And major and vocation quality is called technical quality while are classified into non-tech quality.

4.5 ADVICE OR SUGGESTIONS

CULTIVATION AIMS OF MARITIME EDUCATION. To train qualified seafarers with good moral, intelligence, health, and with comprehensive knowledge and ability, who has acquired the basic training in engineering, satisfying the international and national requirements for standards of competence.

TYPES OF PERSONNEL The types of maritime personnel should be classified and taught accordingly. For most cadets, they should be trained as qualified personnel in marine transportation. Some top cadets can be offered better chance for self-improvement and then engaged in maritime education or research. Some who are interested in shipping management can be trained as personnel working both ashore and aboard by taking such courses as management, law.

5. A STUDY OF SYLLABUS AND ACADEMIC STRUCTURE FOR MARITIME EDUCATION

5.1 A STUDY OF SYLLABUS AND ACADEMIC STRUCTURE FOR NAVIGATION EDUCATION (students for bachelor degree in four years study)

With a thorough analysis of the navigation education both at home and abroad, considering its past, present and future trend, we carry out reformation in its application. We never cease but adjusting our reformation project for the syllabus and academic system in this field with the purpose that, we may cultivate successors in navigation: those required by the national and international regulations, qualified to our educational policy; those with comprehensive qualities, acute sense of security and environmental protection as well as competency in international competition.

1) As is mentioned above, we set our purpose in fostering navigation specialty on the following criteria: accomplishing the basic training as an engineer; being a skill conductor of modern ships and a manager as well. A part from those criteria, we also set nine extra requirements in morality, intelligence, physical and other specialized functions respectively.

2) General adjustment and improvement. Guided by the national educational regulation, considering the needs of the new century for navigation successors, we redoubled our effort especially in the general improvement for the nautical specialized courses, as is shown in the following table. The reason for this adjustment is to strengthen their basic knowledge commands and widen their scope of knowledge. In their four years of academic study, the average school hour for the required theoretical courses is 20.0 (hours) every week, that figure will increase up to 22.2 when taking optional theoretical courses into account. The purpose is to permit out students more time for their self-study so that they can widen their scope of knowledge which is indispensable to cope with the future need of the society.

Table 1 course arrangement

items course	Number of course	School hours	Percentage in required theoretical courses	Percentage in total school hours
Basic course	12	1150	53.24	47.92
supporting course	6	276	12.78	11.50
Professional course	14	734	33.98	30.58
Optional course	33	240	/	10.00
Total	65	2400	100	100

5.2 COURSE ARRANGEMENT

STRENGTHENING CULTURAL KNOWLEDGE EDUCATION According to the requirement of the Ministry of Education ((MOE) that science students should stress on cultural education, moral education, health education, and other compulsive courses and music, fine arts, literature, history, discourse, eloquence, nautical psychology and other optional as well as some certain social investigations are offered here.

STRENGTHENING ENGLISH LEVEL English level of the cadets would, to some extent, reflect their capacity in international competition. Therefore, the school hours of English course is considerably increased, which is up to 550. And the percentage of English teaching to the total theoretical teaching is also increased to 25.5% (from its original 18.8 %). With the extra 70 hours for English as optional course, the total number can be counted up to 620 hours. So we can guarantee a four-year continuous English instruction. Among those extra hours, we offer listening comprehension and oral class especially, together with advanced reading, and audio-visual class. The satisfactory result is that we've reinforced listening comprehension reading drill. To ensure the realization of desired goal, the cadets are stipulated to take band 4 CET (College English Test), on which basis they are still demanded to pass Band Two oral English Test regulated by the Ministry of Communications.

STRENGTHENING THE COMPUTER APPLICATION LEVEL Considering that navigation, communication, shipping transport and management are progressing moving under the computer operation system, the content and class hours of the computer course undergo a great adjustment to meet the demand of modern shipping. Computer course periods are raised from former 100 to 130 hours, the proportion of which has been added up to 6.0% from 3.6% against all the theoretical teaching periods. The elective computer practice course included, the entire computer course can amount to 190.

INTENSIFY THE PRACTICE LINK Together with the 26-week on board practice, the navigation training course periods is added to 7 weeks from former 5 weeks to guarantee the achievement of STCW 95. What's more, in addition to the radar plotting and ARPA training, bridge simulator training is added, which occupies 2 weeks' class hours.

OPTIMIZE THE STRUCTURE OF PROFESSIONAL COURSES Bases on our country's present level and the international requirement, the course structure and content of the professional courses and the fundamental courses undergo macro adjustment. According to the requirements of the maritime bureau, deck officers must obtain GMDSS operator certificate. Therefore, GMDSS practical training course is added up to 3 weeks (former 1 week). In order to offer the cadets more time of operation practice, GMDSS course is taught in two terms concerning ground station equipment and satellite section respectively. The periods of the traditional navigation courses are generally reduced by about 10%. The former courses such as nautical astronomy, marine navigation and navigational mathematics are combined into one new marine navigation course, which is reduced to 140 from former 210 hours. Two courses, ship-handling and watch-keeping and collision avoidance, are combined into one course, the periods of which is reduced by 10 %. Ship principles and cargo-work are properly combined the teaching hours is increased to 80. Electronic and radio navigation equipment also undergo corresponding adjustment and the periods is reduced from 90 to 60 hours. Ship Operation and Management and the Introduction to International Conventions are two newly set ones to enlarge the cadets' knowledge on ship operation, convention, and law.

THE SET OF OPTIONAL COURSES To widen student's knowledge and foster adaptable personnel, we promote the proportion of optional courses, that is, at least 240 hours of optional courses must be completed, and it is also regulated that the courses restricted to select must be finished no less than 120 hours.

Comparison of teaching hours between the old and the new curriculum. In order to make it easier to illustrate the reformation of our research program, we show the 3 following tables to give a brief demonstration.

Table 2 shows that a higher proportion of optional subjects is made in the new teaching program, and the proportion of the major subjects is appropriately raised, which is mainly caused by broadening the knowledge span of the major subjects.

Table 3 shows that compared to the old teaching program, practical activity, English and computer teaching hours are ensured.

Table 4 shows that in the major subjects, some contents concerned with the rules and management are added, which reflects the practical condition and need of the market.

Table 2 Theoretical teaching statistics

Item subject	93 Teaching program			98 teaching program			This teaching program		
	Numb er Of subjec	Total hours	Pro-Portion (%)	Number Of subjects	Total Hours	Pro-portion	Number Of subject	Total hours	Pro-portion
Public basic subjects	15	1450	51.8%	12	1298	52%	12	1150	47.9%
supporting subjects	6	320	11.4	6	284	11.3%	6	276	11.5%
professional subjects	13	808	28.9%	12	716	28.7%	14	734	30.6%
Optional subjects	/	220	7.9%	/	200	8%	/	240	10%
total	34	2798	100%	30	2498	100%	30	2400	100%

Table 3 Main subjects statistics

item	93 teaching program	98 teaching program	This teaching program
Theoretical teaching hours	2798	2498	2160
Practical teaching hours	56*30	50*30	54*30
Proportion of practical teaching in the total teaching hours	37.5%	37.5%	42.9%
English teaching hours	380+126	514+94	440+10
Proportion of English teaching in the theoretical teaching hours	18.1%	24.3%	25.5%
Computer teaching hours	100	130	130
Proportion of computer teaching in the theoretical teaching hours	3.6%	5.2%	6%
Total teaching hours	4478	3998	3780

Table 4 The corresponding relationship between the subjects in the teaching program and STCW 78/95 function models

Navigational function	Marine navigation (130 hours) + passage plan (1 week)
	Navigational watch, ship maneuvering and collision avoidance (72 hours)
	Navigational aids (50 hours)
	Nautical meteorology and oceanography (54 hours)
	Marine radar and ARPA (44hours)
	Marine signals and VHF communication (20 hours)
Cargo handling and stowage function	Cargo handling (80 hours) + stowage plan (1 week)
	The safety management of the ship (20 hours)
	Ocean shipping practice and maritime law (72 hours)
	Introduction to International conventions (30 hours)

Ship operation Management and personnel management function	Ship's operation and management (40 hours)
	The safety management of the ship (20 hours)
	Ship construction and ship design (40 hours)
	Ocean shipping practice and maritime law (72 hours)
	Ship's operation and management (40 hours)
	Introduction to International conventions (30 hours
Radio communication function	GMDSS Communication equipment (30 hours)
	GMESS communication practice (20 hours)
	Marine signals and VHF communication (20 hours)

5.3 THE STUDY IN THE REFORMATION OF TEACHING PROGRAM AND COURSE STRUCTURE OF MARINE ENGINEERING

We make the guiding ideology about the reformation program of the higher education of 21^{st} century as our starting point. We analyze earnestly about the features of the maritime education and the training objective. And we put forward the teaching program of marine engineering and the program of course structure reformation in the service of the training objective.

1) THE GENERAL IDEA ON TEACHING PROGRAM AND THE REFORMATION OF THE COURSE STRUCTURE.

We consider fully of the specialty structure and feature to optimize the course structure. We take the newest achievements of the advance of science and technology and social development to enrich and renew the teaching contents and teaching method. We establish the idea of life-long education and make cadets get a good theory basis in school to create conditions of continuous education in the future.

2) OPTIMIZATION OF SYLLABUS.

In order to realize the cultivating aims, we make sure the public fundamental courses 1150 hours, and then adjust the proportion of different subjects to optimize former syllabus.

Table 5 The comparison of the course arrangement and hour arrangement

Course classification		Class hour	Percentage in total course (2925)
Required courses	Moral education	60 (90)	2.4 (3.1)
	Military theory	18 (60)	0.7 (2)
	humanities	120 (160)	4.7 (5.5)
	English	440 (365)	17.2 (12.4)
	P.E.	120 (120)	4.7 (4)
	Fundamental courses	1150 (520)	44.9 (38.4)
	supporting courses	634 (720)	25.8 (31)
	professional course	536 (69)	21.8 (23.6)
The total class hours of required courses		2320 (2725)	92 (93)
Limited optional class hours		120	4.8
Free optional class hours		80 (200)	4.7 (7.0)
Total theoretical teaching hours		2460 (2925)	/
The weeks of practice		52 48	/

(a) Reduce the total teaching hours and stress competence education. In the new syllabus, the total teaching hours of the required and optional courses are restricted to 2,560, which are 405 less than it used to be. The required courses total 2,320 hours. The theoretical courses are 20 or so on the average every week, so that the cadets could improve their all-round capability. Meanwhile, the courses, such as humanities, economics and management, law, and anti-pollution laws and regulations, have been selected as optional ones.

(b) Emphasis on the training of the application in English. In order to gain some competitive advantage in the international shipping market, the cadets must be good at listening, speaking, reading and writing in English. The teaching hours for English are increased greatly. Those of required courses are increases from 365 to 440 in addition to 96 of professional English. The total hours cover almost 1/5 of the planned ones 120 optional hours of reading and spoken English are also arranged to ensure the four years of English study.

(c) Stress practice. The specialty of marine engineering is characterized in all-round competences, especially the one in practice. Thus, in the new syllabus, the hours for practice are increased from 48 weeks to 52 weeks. Improvements are also made to meet the practical and gas welding are increases from 2 weeks to 4 weeks. The assembly and disassembly of the auxiliary engine is also added to the practice. In addition, more superior engineer-electrician seafarers are wanted in the international shipping market. Therefore, the new syllabus stresses much training, adding more teaching hours to the course of electricity. During practice, electric technology and the operation of ship power plant are also taught.

(d) Fulfill the STCW 95 completely and comply with the rules about seafarers' training, testing, and certification. It is the first prerequisite that the graduates should be in conformity with the STCW requirements so as to take part in the competition in the international market. From this perspective, the reforms in higher nautical education must be carried out in accordance with the STCW 95. In the new teaching plan, we have set up correspondingly courses and teaching hours to meet the requirements of the test and assessment.

(e) Arrange the teaching scientifically and improve teaching quality completely. There used to be some insufficiencies in arrangement. For instance, the field practice for metal material technology was arranged in the fifth term, when the marine engineering material has no been ended yet. Therefore, this arrangement had a disadvantageous effect on study. Furthermore, it was a long time since the practice started. So it also affect the training of practical operation. The training of simulators and comprehensive experiments should be arranged as an all-round training after the professional courses have been studied. But we used to arrange them in the same term, and it inevitably affect the result of practice. Because of the above-mentioned problems, the syllabus has been modified reasonably.

3) THE OPTIMIZATION OF THE COURSE STRUCTURE

The optimization of course structure is the basic guarantee of realizing the basic aims of teaching program. The course structure is designed with the aim of strengthening the basic knowledge, broadening academic coverage, emphasizing diathesis education and enhancing the competition in the international seafarers' market. The coordination of repetition on content, deletion of backward content and absorbing of up-to-date science and technology achievement and developing trend in the related discipline are required.

<u>THE EMPHASIS OF BASIC THEORIES.</u> Now we have designed 1784 hours on basic course, which is increased 2% and covered 76.9% of the total class hours, though 251 absolute class hours have been reduced. By this way, we took the full consideration of solid fundamental theory and basic knowledge for further education. Simultaneously, we also

took consideration of oral and reading of specialized English. Additionally, the alteration in course design makes cadets' knowledge structure more reasonable: the addition of basic course of computer application, the change from metal materials to marine engineering materials, the combination of maritime law and ship administration.

THE EMPHASIS ON COMPREHEN-SIVE CAPABILITY EDUCATION. The humanities courses and economic management courses which cover 4.7% of the total schooling periods are designed in the new syllabus which includes literature, music, fine arts, history, psychology and international conventions, etc.

The reform and practice in cultivation pattern and course system for maritime education is expected to cultivate high quality personnel equipped with the ability in international competition on maritime technology.

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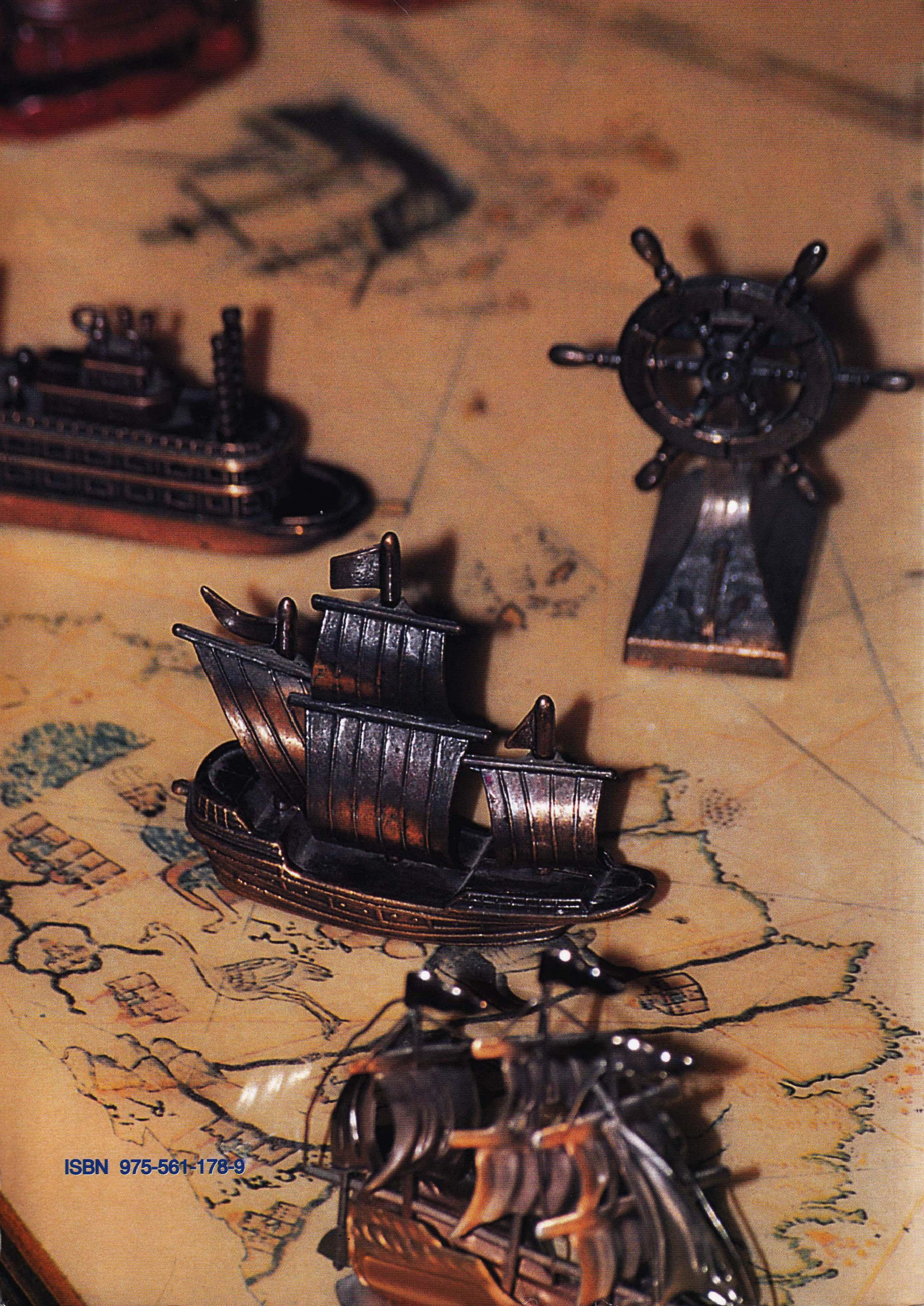
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