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A proposed maritime education and training system "Nautical Plus" for the Philippine Merchant Marine Academy

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A PROPOSED MARITIME EDUCATION AND TRAINING SYSTEM "NAUTICAL PLUS" FOR THE PHILIPPINE MERCHANT MARINE ACADEMY

by

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Philippines

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

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

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- Angelo -

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INTRODUCTION

"History does not repeat itself, but in times past nearly every one of the issues that are so hot today has appeared in one form or another, and men and women have grappled with them, and have disposed of them in some fashion for their time, or passed them on." So wrote Charles A. Beard in 1938. It is a fact and simply understandable that every generation has to create its own fashions, styles, ideas, tastes, phases and most especially its own system. Among the systems that history has to let through, the most important of them all is the educational system which pushes man to the height of civilization. Education is the framework of development and progress. It is the beacon that shines forever with an all around light to show the way to a brighter tomorrow. It is the foundation of man's life and existence. And because education plays a major role in our society, then we should treat our curricular structure with thorough investigation and an overall fair consideration of what is going on in our generation and the generations to come. At the rate that world's technological advancement is going, curriculum events are destined to be treated as "this season's" sports scene or fashion scene. What is applicable this year might be obsolete in the next five years or so. Time reveals that many curricular reforms have been painfully instituted and painlessly discarded because of their isolated characteristics which the maritime education and training environment has a lot of them nowadays. Progress depends upon the correct redirection of experiences where demands and needs are

requiring them. In short, the sense of perspective provided through the generations should enable us to gain a vision of prospect.

The ideas, prospects and motives of this project to upgrade the present maritime education and training system in the Philippines, are based on the past and present curricula in the maritime education and training systems worldwide plus the vision for the future demands and needs which are obvious on today's trend and development. Curriculum is the heart and soul of every educational institution. Therefore, whatever decisions made, consciously or unconsciously in the development of the curriculum would greatly influence the instructional set-up and learning activities of the whole institution. Curriculum development is a continuous and a never-ending process because learning is a never-ending adventure.

Significance of the Study

The World Maritime University has been the talk of the town since 1983 in the maritime community specially in Asia where a great number of seafarers are coming from. One of the University's objectives is the technological transfer from the developed countries to the developing countries. I believe that this objective has been satisfied to a considerable height but not in every country. Although much had been achieved through the graduates of the University, still "IMO's" objective of updating maritime curricula has only been partially fulfilled. This is because of the fact that some graduates are not in the right positions to do some changes when they go back to their home

countries. This project will be considered to be one of the most controversial issues in the maritime field because of its impact and influence in the educational set-up of every maritime institution in the entire Philippines.

The author attempted to come up with such a project believing that his home country is in need of an up-dated and comprehensive curriculum that will meet the demands of the maritime industry.

Purpose and Objectives

The purpose and objectives of this project are as follows:

1. To present a thorough study and comparison of the curricula of the developed countries with the curriculum of the Philippines so as to come up with an ideal one, suitable for the educational, cultural, social and economic set-up of the Philippines.

2. To show a design of an updated version of a maritime education and training system considering all the technological developments and existing shipping trends that dictates what type of officers and crew are to be produced by the nautical institutions.

3. To simplify and upgrade the present maritime education and training curriculum of the country by removing all unnecessary subjects that are overloading the cadets but not contributing in the development of a well trained marine officer which is the primary goal of every nautical school.

4. To utilize this project as a tool in molding the new breed of cadets intended to serve the so called "ships of the future".

The Philippines has several Nautical schools offering maritime education and training in all levels from ratings up to the masters level. Some are producing hundreds of graduates every year without any guaranty of employment after receiving their diplomas and certificates of competency. The only institution in the country where the cadets are assured of their apprenticeship training while studying and of their employment after graduation is the Philippine Merchant Marine Academy. Why? It is because of the standard of training that the cadets have continuously proven to shipowners and shipping companies worldwide. But what was good yesterday and what is good today does not necessarily mean that it is still good for tomorrow and will last forever. Definitely no! Therefore, it is now my duty being a graduate of the academy and a fellow of the World Maritime University to elevate my alma mater's standard of education and training in my own little way through this humble project of curriculum development. I believe that this is not an easy task.

This project might not even enjoy the much needed approval by the proper authorities to be able to serve its purpose. But my purpose and objectives are directed towards a better maritime education and training system which I am sure will be realized if not today, someday - when the purpose and objectives of the World Maritime University has fully been appreciated in the whole wide world.

Scope and Limitations

The desire to improve the maritime education and training system is a very huge task, but my intentions are limited within the interests of the Philippine Merchant Marine Academy where I am hopefully pushing my project on to be implemented in the near future. The information gathered in the process of its composition are purely based on the available materials acquired during our field studies in the United States, United Kingdom, France, Germany, Denmark, Holland and Sweden. Most of the information are coming from the different publications present at the library of the World Maritime University and other foreign papers shared by other fellows working on the same subject matter in their particular countries. This project will present to you some important developments in the maritime industry and shipping business and their influences on maritime education and training. It will also highlight some points in the present educational system of the country with a modest analysis on what is to be added, changed, up-dated, eliminated and maintained for a well rounded system geared for the maritime demands.

CHAPTER 1

The Present Maritime Education and Training System at the "PHILIPPINE MERCHANT MARINE ACADEMY".

1.1 The Present Curricular Set-Up

The Academy at present is at the state of revising its curriculum to meet the demands and needs of the market in particular the foreign trade where most if not all of our graduates are going.

All faculty members have been involved in the revision which started a couple of years ago. The International Maritime Organization, through the work of its various experts had been very successful in updating the curriculum in the past decade. But with the pace that the development in maritime industry is going, ten (10) years is but just enough for some parts of the system to be up-dated and eventually needs a good and thorough study, analysis or evaluation of its usefulness for the present time.

A Maritime Technical Panel composed of ten major associations in the private sector has drafted and recommended measures for the improvement of the existing curriculum of the Bachelor of Science in Marine Transportation and the two year Associate in Marine Engineering Course.

The Philippines is producing at least 8,000 to 10,000 graduates per year. It is a fact that the Philippines is not contented to simply be called the world's leading supplier of seafarers, bringing in huge foreign exchange revenue to an ailing economy. In an

attempt to cope with the demand for seafarers capable of serving the modern vessels of the vast shipping industry of maritime countries, manning and shipping companies have launched training programmes in partnership with foreign owners such as the Norwegians, Germans and Japanese among others. For better training, an agreement was signed in December 1989 between the Philippine Merchant Marine Academy and the Norwegian Shipowners Association for the PMMA cadets to be trained onboard Norwegian vessels. That was followed by the Japanese, as NYK set up its own training center in Manila in partnership with its local agents. Mitsui OSK Line has lined up similar onboard training as part of a mixed manning agreement with the Japanese Seamen's Union. At the same time, German shipowners are planning to introduce a training ship for the PMMA to train both academy and non-academy cadets. The two parties have proposed the setting up of the Hanseatic-PMMA foundation to manage a 3,000 grt multipurpose tanker to be deployed in the domestic trades. Shipowners, particularly in Japan and Europe, have been scouting the maritime schools in the Philippines for crewing. But the emerging pattern of recruitment is setting up of training centers, because the maritime schools are producing cadets who are still raw. And this boils down to a single reason, the curricular set-up of the schools offering maritime education and training is not enough to meet the demands or needs of the present shipping trends. The German shipowners established a couple of years ago, a training programme for the "masters, mates and engineers" housed at the Philippine Merchant Marine Academy compound, to train experienced officers of

ocean going vessels to update their knowledge to ongoing development in the maritime industry.

With the opportunity given to me here at the World Maritime University where the training of maritime personnel of different countries is first and foremost in its objectives, I would like to try, with the support of the professors, lecturers and other academic staff to come up with a new system of maritime education and training for our students at the academy.

The curricular set-up that we are currently implementing is the revised conventional method of training cadets to become deck officers in the monovalent discipline. The focus of the different syllabi is of course on the respective department most of the time and a little basic knowledge about the other department's daily operations.

This means that a nautical student is only given little chance to understand clearly the engine room's technical "SOP" Standard Operating Procedures, which the present practice is asking for. These days a maritime officer is expected to know both the deck and engine department's functions. I would like to give some highlights on the major subjects regarding their weights and scope of coverage in relation to the present trend in shipping and various maritime developments. This is not to criticize the existing curriculum but rather update it and eventually add some improvement on the scope and contents of each subject especially the major ones as far as possible.

My analysis does not rely completely on the systems of the developed countries but rather on the possibilities for our own system on the basis of our cultural, social and economic background. After

visiting various maritime educational institutions, and personally realizing the differences plus the obvious advantages of every set-up of each country, I can now work on my ideas.

1.1.1 Navigation

Navigation at present is 90% electronic on modern ships. The International Maritime Organization is on its way to implement more rules and regulation world wide which will surely displace the old conventional way of navigation.

For example, let us take the installation of "GMDSS" - Global Maritime Distress and Safety System and "ARPA" Automatic Radar Plotting Aids. These are compulsory installations to ships of certain sizes and types with respect to their ports of call at present, but in the next few years it would be for all major ports all over the world.

The existing syllabus has a great number of hours being spent mostly on manual terrestrial and celestial navigation theory which is slowly getting into a state of just being a small portion of the fast improving electronic navigation. In the previous years, entering a channel or a river is being done solely by the officers of the ship manually, while at present it is being manipulated already by the coastal Vessel Traffic Services including the ship's course and positions. Position fixing by stars and planets with the use of the sextant, is no longer the mode onboardship, a fix is quite accurately determined by satellite aided equipment like the Global Positioning System and the Starfix. Instead of consuming several hours studying

to the old fashioned way, it seems more logical to spend more time on the electronic navigation which is loosing the needed time due to the size of time allotted for the old conventional terrestrial and celestial navigation.

The curriculum is ideal if it is being realized up to the last letter of its content as it was planned, and if it is timely with respect to the present trend in the industry where it is actually intended for. The "IMO" updated curriculum seems so huge and heavy that the students could hardly breath between subjects. Basing it on the number of units that the cadets are receiving every semester, it is exactly the biggest compared to any other four year course being offered in the country. Could you imagine carrying (36) thirty six units per semester? That is 36 hours per week and there are only forty (40) hours in an academic week. It is only fair and more practical if part of the load would be decreased, paving the way for the latest development to be incorporated in the revised subjects. I believe that the past is the foundation of the present, but we should spend more time for the present that we may prepare for the future.

Navigation is not only to transport cargo from one port to another in order to gain profit and render service. It must always be associated with optimum safety for the crew and the environment as well.

1.1.2 Seamanship

The simplest definition of seamanship is the work of a seaman onboardship which is to maintain the vessel in a ship shape condition. Most of the time you would

see sailors chipping and scaling the rust, painting or washing the decks and bulkheads, splicing fiber or wire ropes and cleaning the whole ship in general. Now that the reduction of crew is the thrust in the industry, you could not expect this maintenance to be included in the daily routine of the remaining crew members onboardship. Eventually, the stress of the subject should not be focused on such application but rather be on "automation" and quality control which is occupying most of the necessary ship's activities nowadays.

1.1.3 Cargo Works

Within our present course outline, there are still topics in cargo works that deal extensively on cargo gears such as booms, derricks, purchases, slings, blocks, hooks, shackles, chains and many more which are quite old fashioned. Cargo handling is now shifting from ship's equipment to port facilities due to the increasing volume of containerization which is very difficult to be handled by ship's installation and cargo gears. Containerization is found to be more economic, safer and reliable, particularly for hazardous cargoes. They also create a faster "turn around" for the vessel, saving a lot of time and gaining more profits for the operators, and far quicker services to the shippers.

It is therefore rational to give the cadets the necessary information about container vessels' system of cargo operation, like proper securing or lashing of containers, working knowledge about labelling and container identification as well as the safe loading and unloading operations. As far as containerization

is concerned, we have the so called "loading computers", everything is taken care of by the computerized system of a particular port like in the case of Rotterdam, Bremen, Hamburg, Antwerp, New York and Singapore to mention a few. The computer will provide all the necessary information about the location, availability, capacity and specifications of containers all the time. This means that computers have to be included in the process of instruction and training in order to understand and interpret all the provided information.

There is another very important subject matter which is to be stressed and be dealt with accordingly in cargo works. This is the "tanker operation", the knowledge every seafarer must know and fully understand. Several types of tankers are now existing in the industry, carrying various forms of cargoes from petroleum to liquid hydrogen. Many of these products if not all, are toxic and quite hazardous to the human body and to the waters also where we are navigating onboard our ships. It is not only oil spill that pollutes the environment. The gases being released from chemical tankers and barges navigating in the heart of our cities can be very poisonous and harmful to mankind.

The International Maritime Organization had introduced two short courses about tanker operations for officers and crew before working on these types of vessels. They have recommended an introductory course for beginners and a more detailed advanced course for masters, mates and engineers. I believe that it is necessary to incorporate all the new safety courses and practices in our curriculum.

1.1.4 Ship Handling

Ship maneuvering knowledge plays a great role in the seafaring career. A vessel without any cargo costs millions of dollars nowadays. What more with a fully loaded vessel of an average size of 20,000 grt regardless of type. The principles of operation of the instruments onboardship that offer "automation" for an easier and faster action when dealing with the "six degrees of freedom" such as rolling, pitching, yawing, heaving, surging and swaying should be fully understood with due regard to the limitations when used in ship's maneuvering. I believe that this subject matter should be given enough time and attention.

1.1.5 Naval Architecture

This subject matter has been treated with lesser weight than the other major subjects but I think it deserves equal concentration now that the naval architecture field influences the shipping industry more and more especially matters of strength and structures are becoming critical during operations. Ships' designs and constructions are varying due to the especial demands of the trade with respect to cargoes, port facilities and qualifications of officers and crew. The necessary education and training is sometimes dependent on the type of vessel that the seafarers would be working on after graduation.

1.1.6 Shipping Operations and Economics

With the introduction of artificial intelligence

systems, many basic shipping functions would probably end up as software and marvelous computer programs. The officers and crew who used to be directly involved in the shipping business would find themselves idle because of the clear possibility of an electronic data interchange where transactions could be handled in a much faster and easier way. Computerization would definitely change the set-up of any educational institution. The degree of changes may depend on the demands to be answered by the graduates on their way into the profession. Still shipping operations & economics remain a major concern in the industry. For our graduates to be ready to serve as shipping executives and port administrators in the future, they should also take a bigger slice of this subject matter.

1.1.7 Automation

This field of technical investigation can be quite heavy if it would be taken as a major subject, but due to the increasing applications of automation and control systems onboardship, I believe it is very important for this topic to be given a deeper attention. Many accidents happened beyond the control of the officers due to the scanty information about the characteristics and behavior of shipboard equipment and instruments.

Other subjects like Mathematics, Physics and Chemistry should be structured carefully to create the necessary relevance for the topics to be covered to the direction of maritime applications. Some related technical subjects like safety courses could be blended to avoid overlapping and repetition of instructions

which consumes so much time. With the vision of introducing new technical subjects like satellite communication and automation, the entrance level of the students intending to be trained to serve the ships of the future, a thorough analysis drawing the obvious relationship of the two should be taken into account.

1.2 The Regimental System

The Philippine Merchant Marine Academy is the only maritime institution in the country offering a unique form of education envied by most of the students and seafarers coming from other colleges both public and private. What makes it so different is based on the lifestyle of the cadets or midshipmen whose routine has been revolving around a system not being used by other colleges called "The Regimental System".

This system does not only prepare the midshipmen educationally for their profession but also psychologically by making the atmosphere inside the academy exactly patterned after the setting of a real vessel's shipboard conditions. As the word implies, midshipmen are grouped into battalions, companies, platoons and squads. This gives an easy way of conducting musters and facilitates the identification of "who is who" in the "Corps of Midshipmen". The graduating midshipmen being the most senior in the corps enjoy the privilege of holding high positions such as; regimental commander or the so called corps commander, regimental staff and their corresponding ranks, battalion commanders and company commanders. The junior cadets can then handle positions like platoon leaders, squad leaders flag bearers and as

elements of every unit in the regiment. Seniority serves as the factor that keeps the relationship and camaraderie between the midshipmen in ship shape. They practice a chain of commands from the president of the academy through channels and down to the lowest students in the academy.

Midshipmen could be identified by their uniforms' paraphernalia, haircut and nameplates whether they are seniors or juniors. They are made to follow a very strict set of routines from "reveille" to "taps" or from sunrise to sunset. Just like the real officers and crew onboardship, midshipmen are also standing on watch similar to what they will be expecting when they go onboard as deck hands and as officers for the seniors who are about to graduate as third mates or as fourth engineers. With this system, the students are getting familiar and adjusted to the mariner's way of life while taking the theoretical side of their profession. Giving them the taste of the sailor's routine will make them realize that sailing is not an easy task but a great responsibility to the country and to mankind. We call this the physical and mental conditioning in addition to the academics that they are having in the classrooms.

This system has been proven to be very effective in preparing the young cadets for their sea life and for other professions related to shipping and maritime industry. The regimental set-up serves as the heart and soul of the academy & the academics as the brains.

1.3 The Scholarship Grant

The Philippine government has been very supportive

to the youth of the country who are aspiring to become seafarers through a scholarship program being given by the Philippine Merchant Marine Academy to deserving students. The primary objectives of the academy in giving such scholarship are as follows; To provide the Philippine Merchant Marine with efficient and well-trained marine officers capable of meeting the needs of an ever-expanding foreign and coastwise trade; To produce competent naval officers to serve the armed forces in time of war or national emergency; To give adequate background to graduates for responsible positions in the various fields related to shipping such as port supervisors, marine surveyors, shipping executives and academy instructors; And to develop in our youth a high moral character by inculcating the sense of responsibility, self discipline and righteousness. The scholarship grant covers all expenses from matriculation fees, tuition fees, medical and dental care, board and lodging, daily subsistence, field trips and many others. This privilege will have to be maintained by complying with certain grade requirements and acceptable aptitude level for discipline and training. A failure in any of the subjects means a termination of the scholarship privilege. And a student who loses his privileges has to pay all the expenses incurred during his training if he still wishes to continue his studies. But, in a case of failure in more than a single subject, it automatically ends the training of the cadet with the academy and will not be allowed to continue even if he can afford to pay the costs of his education. All male citizens of the Philippines who are within the age bracket of seventeen (17) to twenty two (22) years of

age are qualified to apply for the scholarship grant. The entrance requirements will later on identify who could benefit of the free education and training inside the academy. A student must first pass the "NCEE" National College Entrance Examination which will give them the ticket to take a four year course or more based on the educational set-up of the country. Failure to pass the "NCEE" will only give them the chance for a vocational course which is not the case inside the academy. Aside from the age limit, the academy has set also weight and height limit for the candidates and a very rigid physical, medical and dental examination to assure that the students are at their best shape before undergoing the training, and as a preparation for their profession onboardship and on land. In short the successful applicants will later on be called as government scholars who are enjoying free maritime education and training with the support of the national treasury under the blessings of the Department of Education, Culture and Sports.

1.4 The Minimum Requirements

The minimum standard requirements for "BSMT" major in Nautical Science is designed by the Department of Education, Culture and Sports to produce appropriate, adequate and well trained marine officers.

For technical teaching staff, the minimum qualification includes a Master's Degree after a Bachelor's Degree in Nautical Studies, two years shipboard practice and a third mate's license.

For the non-technical teaching staff, a master's degree is required and a B.S. degree in the field of

specialization, plus two years teaching experience.

For the curricular requirements, maximum credit units of B.S.M.T. major in Nautical Studies is 168 units including 36 units in apprenticeship. However, the minimum credit units required for graduation is 162 earned units. The difference between the grand total minimum credit units and the maximum grand total units could be allotted for advanced elective subjects.

FIRST YEAR "FIRST SEMESTER"

Subject Code	Course Description	Lec.Hrs.	Lab.	Units
Engl 1	Communication Arts 1	3	0	3
Pil 1	Sining ng Pakikipag-talastasan	3	0	3
Math 1	College Algebra and Plane Trigonometry	5	0	5
Phys 1	Engineering Physics 1	3	3	4
Ethics	Intro. to Shipboard Practices & Professional Ethics	2	0	2
Seam 1	Ship Nomenclature and Practical Seamanship	2	3	3
SOLAS 1	Personal Survival Tech. and First Aid	0	3	1
NROTC 11	Naval Reserved Officers Training Course	-	-	1.5
	TOTAL =	18	9	21

FIRST YEAR "SECOND SEMESTER"

Subject Code	Course Description	Lec.Hrs.	Lab.	Units
Engl 2	Communication Arts 2	3	0	3
Math 2	Solid Mensuration and Spherical Trigonometry	3	0	3
Phys 2	Engineering Physics 2	3	3	4
Chem 1	General Chemistry 1	3	3	4
Seam 2	Cargo Handling/Stowage	2	3	3
Nav 1	Elements and Principles of Navigation	2	3	3
SOLAS 2	Survival Craft and Firefighting	0	3	1
NROTC 12	Naval Reserved Officers Training Course	-	-	1.5
	Total =	16	15	21

SECOND YEAR "FIRST SEMESTER"

Subject Code	Course Description	Lec.Hrs.	Lab.	Units
Engl 3	Business English Correspondence	3	0	3
Comm.	Maritime Communication	3	3	4
Met.	Meteorology	3	0	3
Mar. E	Basic Marine Engr'g	3	0	3
Seam 3	Stability and Trim	2	3	3
Nav 2	Terrestrial Navigation	3	3	4
PE 3	Physical Education 3	0	3	1
NROTC 21	Naval Reserved Officers Training Course	-	-	1.5
	Total =	17	12	21

SECOND YEAR "SECOND SEMESTER"

Subject Code	Course Description	Lec.Hrs.	Lab.	Units
Engl 4	Tech. Report Writing	3	0	3
M. L.	Maritime Law 1	3	0	3
Ocean	Oceanography	3	0	3
Col. 1	Collision Regulation 1	2	0	2
Elec. Nav. 1	Electronic Navigation 1	2	0	2
Seam 4	Ships Manoeuvring	3	0	3
PE 4	Physical Education 4	0	3	1
NROTC 22	Naval Reserved Officers Training Course	-	-	1.5
	Total =	19	6	21

Certificate of completion of the first two years in Nautical Studies may be issued to cadets who wish to take their apprenticeship on their third year. The

cadets have the option to take their shipboard training either on the third year and then come back for the remaining units or take it on the fourth year after finishing all the units and all other academic requirements prior to their graduation.

THIRD YEAR/FOURTH YEAR "FIRST SEMESTER"

Subject Code	Course Description	Lec.Hrs.	Lab.	Units
Pil 2	Panitikang Pilipino	3	0	3
Soc. Sc. 1	Phil. Constitution	3	0	3
Soc. Sc. 2	Taxation, Land Reform & Family Planning	3	0	3
M. L. 2	Maritime Law 2	3	0	3
Col. 2	Collision Regulation 2	3	3	4
SOLAS 3	Maritime "SAR"	2	0	2
S. B.	Ship Business	3	0	3
	Total =	20	3	21

THIRD YEAR/FOURTH YEAR "SECOND SEMESTER"

Subject Code	Course Description	Lec.Hrs.	Lab.	Units
Soc. Sc. 3	Life & Works of Rizal	3	0	3
Soc. Sc. 4	General Psychology	3	0	3
Comptr.	Computer Programming	2	3	3
Mgmt.	Shipping Operations and Management	3	0	3
Eco.	Transportation Economics and Accounting	3	0	3
Elec. Nav. 2	Electronics Navigation	3	9	6
	Total =	17	12	21

The system of "TEU" Time Equivalent Unit is about (20) twenty hours for every one credited unit. The meaning of (1 unit = 20 hrs) requires the student to take the subject 1 hour per week for twenty weeks which is the duration of one whole semester.

"THE SHIPBOARD TRAINING YEAR"

As earlier mentioned, the cadets could take their shipboard training or apprenticeship either on their third year or on their fourth year of education and training. This is equivalent to two semesters with 18 units each for a total of 36 units which is required to complete the four year course and it is also a prerequisite before taking the third mate's licensure examination.

Those are the minimum requirements for any maritime school to comply with. The Philippine Merchant Marine Academy is even doing more than that. Just like in any other educational institution, the academy also has set such limit to the requirements for the training and academic progress of every midshipman for each semester. A grade of at least 75% from all the contributing factors such as quizzes, preliminary examinations, midterm and final examinations plus the homework assignments or projects as the case may be. Failure to reach such required level will surely mean a disqualification from the academic department. A midshipman may be very good in academics but may still be disqualified if on the contrary his character receives unpleasant comments from the training and disciplinary department which is under the Midshipmen's Affairs. The students are evaluated by the manner they

conduct themselves during day and night watches just like any other shipboard watches of regular deck hands and officers. Examination on this part is not so rigid as the academic examination but instead an actual evaluation on their performance and outcome of every duty completed daily is being monitored regularly. Every cadet has the chance to stand on watch at least ten (10) times within a semester which is fair enough to exhibit one's ability to lead and to obey and to maintain a smooth sailing of the daily routine of all midshipmen inside the academy. Two subjects are considered under this department namely "discipline" and "leadership". Failure to comply with these requirements will also terminate the training of the involved students even if they are very good in their academic subjects. As a part of the unique curricular set-up of the academy, all midshipmen are mandated by the constitution to take the so called "NROTC" "Advanced Reserved Officers Training Course" under the Philippine Navy to qualify them to be commissioned to the Armed Forces of the Philippines right after graduation. This serves as an incentive to the students for they may enjoy the privilege of serving the country as officers of the armed forces. For people who may not survive sea life for several years and wish to stay with their families on land, this is another alternative waiting for every graduate. But this does not come on a silver platter, it has to be earned the hard way by participating in all the drills and military tactics lectures and combat duty training conducted by active officers and men of the armed forces of the country. There are also periodic examinations, midterm and final evaluation which could

be written and actual performance test to be administered inside the camps of the military. Usually, the summer break of the students is taken by the Department of the Military Training for the completion of their full advanced instructions to the cadets. Failure in this field will also disqualify a cadet from graduation or may require the student to take extra projects to be accomplished in the fulfillment of the course.

1.5 The Selection, Examination and Certification Board

The Philippine Merchant Marine Academy under its original "Charter" has a "Board of Trustees" of its own with the powers given and mandated by the government to look after the needs of the academy and its students from all aspects of maritime education and training and other forms of certification and awarding of degrees and diplomas to the graduates. It is independent but honestly complying with the highest practicable standards set by the (IMO) "International Maritime Organization". The academy has its own competent validating committee working for the certification and final examinations of all midshipmen prior to their graduation. Graduates of the academy are automatically awarded the licenses of third mates to nautical students and as fourth engineers to the engineering students. In accordance with the provisions of Section 10 and Section 13 of "Presidential Decree No. 97, and after complying with all the requirements prescribed by the law and by the rules and regulations of the Professional Regulation Commission of the Republic of the Philippines, the graduates are given

the authority to command and/or navigate as third mates or fourth engineers on merchant marine vessels of any tonnage upon the waters of any sea or ocean. Aside from the "validating committee", the academy has another group of examiners composing the selection and examination committee responsible for the screening of the applicants wishing to join the academy as scholars of the government. They look after the distribution of application forms all over the country and they see to it that all examination centers throughout the nation are coordinated properly and orderly with the utmost fairness and legality. They are also responsible for the formation and contents of the "Entrance Qualifying Examination" to be given to aspiring applicants. These committees are not beholden to anyone and are independent from any other department inside and outside the academy. Whatever decisions passed by the said committees shall be honored by everyone with faith and confidence. Examinations prior to acceptance as cadets and the examinations prior to graduation and certification are only once a year. Failure to reach such passing mark set by the committees disqualifies any applicant for enrollment, otherwise he needs another year for re-examination. The validating committee covers only the first licensure examination, the second mate, chief mate and the master's examinations for deck officers and their corresponding level of examinations for engineers, will later on fall under the authority of the Professional Regulation Commission of the country. All major decisions and alterations regarding this matter must first be approved by the "PMMA Board of Trustees" before its actual implementation or materialization as policy.

1.6 Commissionship to the Armed Forces of the Philippines.

The Philippines being a country which has been disturbed for many times by foreign aggression, had decided to include in its national defence set-up the idea of introducing a very vital subject to all universities and colleges both public and private the so called "RTOC" Reserved Officers' Training Course. The Armed Forces of the Philippines is divided into four (4) major services; the Philippine Army, the Philippine Navy, The Philippine Constabulary and the Philippine Air Force. In this regard, the academy being a nautical school serves as the best source of naval officers capable of sailing or navigating the high seas. All maritime students in the country are chosen to take the "NROTC" Naval Reserved Officers' Training Course as a basic preparation for national defence. In the case of the academy, the midshipmen are given the Advanced "NROTC" which made them one level higher than the other college students in terms of reservists qualifications. This has been proven for several years, as a matter of fact, many high ranking officers of the armed forces are graduates of the Philippine Merchant Marine Academy. While at the academy, the cadets are introduced to Navy life giving particular attention to the relationship of the Navy and the Merchant Marine in time of peace and national emergency. They are made familiar to the organization of the armed forces, the naval rank structure, the officers and the career, the vital functions and operational set-up. The midshipmen are trained to know the components of the naval weapons and the elements of

safety precautions to protect the fleets and the merchant marine vessels. Actual naval maneuvers and strategic operations are conducted in cooperation with the United States Navy stationed at the Subic Naval Base for several occasions as a part of their exercise in the Navy. During summer shipboard training which is usually held at the Head Quarters of the Philippine Navy, the cadets are strictly undergoing advanced instruction to prepare themselves for their commissionship and for possible call to active duty in case they feel to choose to serve the Navy over the merchant marine.

Some students are serving the navy first after graduation and later on the merchant marine. But most of the graduates are going directly to the overseas shipping companies and only few of them are going to the Navy on the later part of their profession when they already wish to stay close to their families. There are also cases when graduates feel like serving the other branches of service like the Philippine Air Force, wherein you could also find pilots coming from the academy who have decided to continue on a different path of navigation.

The academy is proud for being the only institution in the country capable of producing graduates who could serve both the private and the public sector in the most unique and professional way that only PMMA could do.

CHAPTER 2

THE DEVELOPMENT IN THE MARITIME INDUSTRY AND SHIPPING BUSINESS AND THEIR INFLUENCE IN MARITIME EDUCATION AND TRAINING.

The maritime industry is a living field of real professionals always on a constant move towards a better prospect of nice eventualities leading to ever-ending search for progress and development. In a twinkling of an eye, a fast phase of evolution could occur creating changes in the maritime industry, the shipping world and its different fields of interests. A couple of decades ago, the reliability of men running the ships was quite different from the reliability of the present ships' officers.

The revolutionary age of computerization has come so fast that instrumentation and equipment operation became highly technical and fields of specialization are drawing closer to integration due to the ability of computers to understand each other and work on a hand to hand concept. At present the ship owners, shippers, brokers, agents and other personalities of the maritime industry are relying more on the accuracy and efficiency or reliability of the machines in carrying out their everyday business. And the development which I am about to enumerate together with their advantages would surely create waves with strong current for revision, evaluation, updating, changing or even integrating the maritime education and training system.

Some years ago, students had to learn by heart some aspects like the solar system and its effects and

characteristics in their early stage of navigation lessons. Later on their instructor or professor had to spend with them several hours learning all the different ways and means of magnetic compass corrections and compensations. Needless to say that the cadets are also expected to be able to memorize the various formulas in getting a line of position by the star, planet, sun and an extra way by the celebrated star Polaris. They are like astronomers storing all the data about the constellations of stars in their heads.

Today, all those things are history. And time has come for us to be more practical and wise. Let us face the fact that the world is changing as well as its people.

With the faith that each and every country is aiming towards a better goal for the future of its people and in particular the seafarers, please allow me to give some good examples of the latest technological development which I believe are influencing the maritime education and training systems already existing all over the world with the view that the impact would be greater on the set-up of the developing countries which brought us here at "WMU".

The following topics are already existing and indeed influencing the industry with considerable amount of changes.

2.1 The "Esprit Project 2163" - "KBSSHIP"

KBSSHIP means Knowledge Based System Ship which is a joint project of the European community headed by Denmark through the expertise of the staff of the

Danish Maritime Institute based in Lyngby. The other members of this joint project are: Krupp Atlas Elektronik GmbH of Germany; Lloyd's Register of Shipping of the United Kingdom; National Technical University of Athens in Greece; The East Asiatic Company Ltd. of Denmark and Soeren T. Lyngsoe A/S of Denmark too. The components of the "KBSSHIP" are as follows:

i. "SMES" - The System Manager Expert System controls the entire integrated system of the ship. Its main task is to look into the communication between subsystems. Any malfunction or trouble detected within the system, an "on-line environment display" will give the advice for possible solutions to eliminate the so called "conflict" which is the term used in the language of Artificial Intelligence. The "SMES" is working through a common DataBase where all important information are being updated.

ii. "EVP" - The Expert Voyage Pilot serves as a decision support tool for voyage planning onboardship. Given the main route data such as destination, estimated time of departure, estimated time of arrival and other charter contract related data, the upper planning level of the "EVP" will generate an initial route considering the relevant data such as weather scenario, ocean current, vessel characteristics, loading condition, charter requirements and sea keeping criteria. The system has a built-in route optimizer which could calculate the shortest and safest possible track for almost all of the major ports worldwide.

iii. "ELS" - The Expert Loading System is responsible in producing a loading plan containing the type and amount of cargo to be stored in each cargo hold or ship tank and then prescribes the series of operations to realize the loading plan. The system will analyze the distribution of cargo among the holds or tanks while observing all constraints related to draft, stability, strength of the ship, cargo handling equipment, storage factor and other parameters to arrive at the optimum loading condition.

iv. "EMS" - The Expert Maintenance System will provide a maintenance plan maximizing ship availability and minimizing maintenance costs. The system will keep a record of maintenance for the proper scheduling of works from a five year basis down to the daily level. It takes into account the future needs for particular spare parts, tools and machinery condition to avoid any delay in the ship's operations.

v. "EDS" - The Expert Diagnostic System will maintain a continuous monitoring of the whole integrated system, interpret the current sensor values, identify defects in the engine room installations and will give various repair suggestions. It will also give prediction of consequences from the current set of defects in terms of safety and manoeuvrability of the vessel.

vi. "SCES" - The Statutory Requirements and Classification Expert System will provide the ship's personnel with the necessary and relevant operational and classification regulations applicable to the ship of a given class and type. The "SCES" has two

components called "Updater" which is land-based, and the ship based component called "Advisor". The system holds a master set of all the regulations for ships from the IMO's SOLAS, MARPOL, STCW, Port Regulations and others.

2.2 Datamation

The one man bridge concept, the bridge to the future, is technically called "datamation". It is an integrated bridge management system allowing the navigator to control and operate on all the navigational equipment on the bridge in the most efficient, economic and scientific procedure of navigating safely. The installation on the bridge is designed so that all the necessary connections to the propulsion machineries and the communication system in and out of the vessel are accessible. All information coming from the engine room operation is displayed such as temperatures, pressure, RPM and other readings of the different gauges through a separate screen especially installed for that purpose. Datamation has a unique system of operation where a duty officer could deal with the important functions, controls and provision of information from the bridge down to the engine room including the cargo and ballast controls. By the use of a built-in personal computer, constant data and possible emergency situations are displayed on the "Operation Video Screen" which is positioned in the center of the bridge for an easier access all the time. This simply means that a voyage of a vessel controlled by datamation gives an increased safety onboard both to the officers, crew and to the cargoes and eventually

to the whole vessel. It is the sum total of what we call efficiency, accuracy, reliability and safety that costs less in the long run. I guess it is but just fair and rational to go with the modernization to make a lot of things easier.

2.3 The Electronic Chart Display Information System

One of the most remarkable developments is the introduction of the electronic chart. The electronic chart display information system is based on fixes, whose data are retrievable from a database and could be continuously updated by satellite communication systems. If the electronic chart detects any deviation from the course, the chart passes these pulses on to the navigation and control system which automatically corrects the deviation error from the course without any interference from the duty officer on the bridge. It is slowly but surely replacing the old conventional sea chart. One of the Dutch world wide suppliers of the professional electronic charts are now offering ECDIS with built-in voyage planning system called Canis. Various hydrographic services all over the world are now working on the standard of the electronic sea-chart. Because it is operating on a database system, all necessary information about a particular vicinity are readily and speedily accessible in seconds. You can zoom-in or zoom-out any area you are working with to make an easier manoeuvre when approaching ports or restricted areas along the coast. Its range is adjustable from one (1) nautical mile to ninety nine (99) nautical miles. The electronic chart operating on a compact disk could accommodate all the

navigable areas in the world in just two disks which makes it more convenient to work with. It also has the option of removing some data from the display when you don't need them and displaying only the information that you need for that particular time. So far "ECDIS" Electronic Chart Display and Information System is receiving a lot of support from the International Maritime Organization and various major institutions for its future utilization, believing that it is a safe, accurate, convenient and economic method so far.

2.4 The Global Maritime Distress and Safety System

The GMDSS is hopefully to be implemented or come into force during the 1990's following almost twenty (20) years of careful preparation and thorough study. The basic concept of the system is that search and rescue authorities ashore, as well as the shipping in the immediate vicinity of the ship in distress will be alerted rapidly to a distress incident so they can assist in a co-ordinated search and rescue operation with the least possible time. What is so beneficial about the system is the fact that it will also provide for urgency and safety communication and the dissemination of marine safety information including navigational and meteorological warnings. This simply means that every ship will be able, irrespective of the area in which it operates, to perform those communication functions considered essential for the safety of the ship itself and of the other ships operating in the said area. The GMDSS will be using satellite communication systems to improve safety and to establish a reliable communication network. It will

be provided both on a ship-to-shore and shore-to-ship directions. The International Maritime Satellite Organization "INMARSAT" satellite system which employs eight geostationary satellites, four (4) on an active operation and the other four (4) on a back-up mode, will provide the means of alerting in the 1.5 GHZ and 1.6 GHZ frequency bands from ships by using the ship earth stations or the satellite EPIRB's and the capability for two-way communication using the radio telex and optional radio telephone. Broadcasts of marine safety information to ships via radio telex will also be available through the INMARSAT system using the standard "A" ship earth station and associated equipment or dedicated facilities. A near polar-orbiting satellite Emergency Position Indicating Radio Beacon "EPIRB" service, a "COSPAS SARSAT" system operating in the 406 MHZ to 406.1 MHZ frequency bands will provide a means of distress alerting and determining the location of float-free satellite EPIRB operating through the system.

For terrestrial communication systems, HF (high frequency) will provide long range service to be used in the ship-to-shore and shore-to-ship operation with designated frequencies of 4, 6, 8, 12 and 16 MHZ bands to provide means for transmitting and receiving distress and safety call and for passing traffic information. For medium range communication, 2MHZ band is also available and 2187.5 MHZ will be used for safety calls by Digital Selective Calls (DSC). And the frequency of 518 KHZ will be used to transmit navigational and meteorological warnings in the NAVTEX system. For short-range services VHF (very high frequency) has 156.525 MHZ channel 70 for distress

alerts and safety calls by DSC, another 156.8 MHZ band on channel 16 is available for distress and safety traffic calls by radio telephony that includes the "SAR" Search and Rescue. Remember, before anything else "Safety First".

2.5 Fiber Optics for Shipboard Sensing and Information Transfer

Fiber optics is a method of transmitting information by conducting light through optical fibers. Typically the fibers are strands of ultra-pure glass, about 100 micro meters in diameter and the light is of infra-red wave length. The information is usually a train of pulses representing ones and zeros, the digital bits used by computers. Power level ranges from hundredths of milliwatts to several milliwatts (mW).

Fiber optics has been a rapidly growing field over the past decade. It has been utilized extensively by the fast growing telecommunication industry, an application which requires the transmission of large amounts of information at a high data rate. More recently, many firms have initiated the development of fiber optic sensors. These are transducers that use purely fiber technology for sensing physical parameters, such as pressure, temperature and strain, which are the most important parameters in maritime fields like handling of special cargoes, loading and/or unloading operations, ballasting, pumping of liquid cargoes, maintenance of the propulsion machineries, data from different navigational instruments and correct ship handling practice in general. Trends and

projection for ships of the future indicate that dramatically increased monitoring and computer control will be necessary for more ship systems. Not only will automation be used for meeting reduced manning requirements, other economic concerns will require extensive machinery monitoring for improved proper maintenance scheduling.

Integrated navigation system on commercial ships will require high resolution displays and rapid transfer of data between satellite, radar, and bottom-sounding sonar navigation subsystems. These various applications will be utilizing fiber optic both in the data transfer and in the sensor's reliability and accuracy. The principle of fiber optics is simple. In essence, a fiber optic system can be reduced to three elements, namely the source, fiber and the detector. In addition, processing electronics such as analog-to-digital converters (A/D's), multiplexers, FM modulators and various encoding formats are often used at the input, with the corresponding digital-to-analog converters (D/A's), demultiplexers, FM decoders and protocol decoding at the output. The optical source converts the signal to be transmitted from electricity to light. The signal in this case may be a single telephone channel, thousands of multiplexed telephone channels, one or more video channels, a stream of computer data, or a combination of these and/or others. These aspects show that the optic fiber technology will be a great advancement which the shipping world could rely on for the coming years or even decades in the communication system and instrumentation for sensing operational set-ups which is indeed very useful for shipboard integration.

2.6 Automatic Radar Plotting Aid (ARPA)

With the development of computer technology, several sophisticated array of tools and instruments are now available on the market. Systems integration, product data modelling, software engineering, optic imaging, electronic data interchange and custom-designed training programs are but just some of what the computers could do. Before, a ship sailing with a couple of radars onboard seemed to be very modern and safe as far as collision avoidance is concerned. Now that an automatic radar plotting aid is available onboardship, the officer of the watch is more likely equipped with a better instrument capable of analyzing the situation with greater number of alternatives so as to maintain a safe passage wherever the ship goes. "ARPA" was designed to reduce the workload of observers by enabling them to automatically obtain information so that they can perform as well with multiple targets as they can by manually plotting a single target.

Aside from the excellent collision avoidance capability, the "ARPA" has also several additional alarms and warnings. The anchor watch facility - this attempts to offer automatic warning of the observing vessel or other vessels dragging in an anchorage. If a known stationary target is acquired and designated as such, then an alarm will be activated if the said target moves more than the preset distance from the marked position. Alternatively, it will give a warning if another "tracked" vessel in the anchorage drags her anchor. The track change alarm - this is associated with an algorithm which quantifies departures from the predicted tracks of targets. The alarm will sound if

there is any change in the tracks of the contacts, and the targets activating the alarm will be shown or indicated by some graphic symbols. The loss of sensor input - one of the examples for an occurrence which will activate the alarm is the loss of sensor input from the speed log or the loss of sensor input from the gyro compass. The wrong or invalid input alarm - when the operator feeds in incorrect data or data in an unacceptable form like "375 degrees for a course" an alarm will be activated and will continue until the correction is made. The "IMO-SOLAS" (1974) convention which was amended up to 1983 sets out schedule whereby various sizes and types of vessels are required to be fitted with an approved "ARPA" over a period of four years which ended on 1 September 1988. As a result, all tankers of 10,000 gross tons upwards and all ships other than tankers of 15,000 gross tons and upwards should be fitted with an approved "ARPA". In the particular case of vessels constructed on or after the September 1, 1984 cut-off date, all vessels of 10,000 gross tons and upwards should be fitted with an approved "ARPA".

There are two types of (ARPA's) existing now in the market, the older ones being known as the stand-alone ARPA's and the modern ones called integral ARPA's. The stand-alone ARPA's were primarily intended as additions to the conventional radars with all the necessary ARPA facilities but are taking their data from the host radar. This was an attractive means of upgrading the ship's radar system without incurring the expense of removing the old existing radar and installing a new ARPA system. Stand-alone equipment had to be interfaced to the different equipment

onboardship. While the integral ARPA is a form of a computer usually referred to as the processor, is incorporated in the radar/ARPA system so that the ARPA data can be displayed on the same screen as the conventional radar data. The main operational advantage is that the radar and ARPA data are readily comparable.

2.7 The Electronic Data Interchange (EDI)

In the shipping business and other industries, there is a modern way of communication which is called "EDI" the electronic data interchange which is a paperless trading by making the computers talk to other computers in the world of business even with several miles away between companies involved in the industry. The electronic data interchange will surely eliminate the wasteful use of paper for local and international trade and eventually save some acres of our forest which are getting abused by foresters due to the high demand for paper in this industrialized world of ours. It will also facilitate the direct transfer of information without bothering to put it in writing and at the same time ensuring that the real idea of the message remains intact and arrives on time. This is possible by the use of pre-formatted and standardized codes of information interchange between the different parties involved. Some big companies like the NEDLLOYD of Holland, the P&O Containers Ltd (P&OCL), the Atlantic Container Liner (ACL) and the International Maritime Satellite Organization and many other institutions are already utilizing the electronic data interchange procedures. Many are even establishing

their own network to maximize efficiency and at the same time expand the services of "EDI" to places were it is believed to be very much needed in carrying the commitment of the shipping industry to its valued customers.

NEPTUNE is an example of a network owned and established by the NEDLloyds' group of companies to serve their clients from Europe to Asia & Africa and to different areas where the giant company has its own branches or sister companies. The electronic data interchange is very useful especially in declaration matters which is why it is being spread globally with the support of the Customs Co-Operation Council (CCC), International Chamber of Shipping (ICS), EDI Association, International Association of Ports and Harbors (IAPH) and the International Maritime Satellite Organization (INMARSAT) and other private and government establishment who believe in the idea of a paperless trading which they call the silent revolution.

In April of last year, ten big shipping companies set up an electronic system called "EDISHIP". The group of companies is composed of ACT Group Lines, Compagnie Generale Maritime, Cunard Ellerman, Hapag-Lloyd UK, NYK Line, Orient Overseas Container Line, P&O Containers and Sealand Services Inc. The idea was to come up with a simplified common approach to "EDI". This means that the system is now ready for the exchange of any standardized messages. The "Edisship Tradanet" was designed in accordance with the EDIFACT standard already known to several shippers. This will allow the users to make bookings with their preferred shipping lines and received bills of lading, invoices

and status of messages electronically. The network is supplied by International Network Services (INS) and the software by Vistec Business Systems. Ultimately the mover of cargo will benefit through lower costs and better cargo tracking. The EDISHIP initiative is committed to extending the community by offering help and advice to newcomers.

2.8 The Vessel Traffic Management System "VTMS"

The vessel traffic services sound so ordinary in the developed countries but not in the third world countries where many of the seafarers are coming from. Due to the nature of their livelihood and geographical location of their home countries, their only way of moving from one place to another is by sea, rivers or straits. Taking into consideration that the congested areas are very vulnerable to accidents, the only solution is a well managed "VTS" to monitor all the movements of the vessels in and out of the vicinity like in the busy ports of Rotterdam and Singapore. The presence of the "VTMS" will not be very beneficial if the people within the area are not properly educated about the operational advantages and the legal functions of the said establishment. From a technical point of view, a "VTMS" is composed of radars, trackers, radio direction finders, televisions, hydro-meteo sensors, communication equipment, voice-logging recorders, data processors and consoles with radar screens and visual display units, all accommodated in especially designed buildings. The main sensor of the system is a network of radars. Each radar has its own tracking system. The trackers calculate every three

(3) seconds which is actually the duration of the turn of the radars' antenna, every echoe's position, dimensions and orientation. These data are sent via telephone lines to the real time computers in the traffic centers. The computers which are part of the data handling system will combine the information from the different trackers into one traffic picture which is shown on the screens of the operators. The process of combining and comparing is called "multi-radar-track" processing. The double radar coverage makes it possible to distinguish the false echoes from the real echoes. The so called "raw-radar" video is transmitted by micro wave links or co-axial cables and is also shown on the screens. Prevention of accidents is far better accomplished with the aid of a vessel traffic management system plus an easier way of prioritizing port services to vessels based on the types of cargoes and availability of facilities. The vessel traffic management system has all the necessary information from the vessel, its cargo, the quantity, the destination and the ship's particulars. Lately, the International Maritime Organization (IMO) has a recommendation that each and every coastal state should establish a vessel traffic management system for the protection and safety of all ships engage in the trade and for the environment as well. This will also help in making a faster manoeuvre that leads to saving time which means profit for the industry in general.

2.9 The Satellite Communication and Navigation Systems

With the introduction and utilization of modern satellites in almost all types of existing electronic

communication systems, several navigational and meteorological instruments have taken great association with the system for accurate position fixing, weather forecasting, mapping and other explorations via satellite. The United States of America has indicated its full support to its fast growing baby, the Global Positioning System "GPS" which will be a very reliable and accurate navigation tool in the years ahead. There are several systems being developed at present plus of course the ongoing projects of the International Maritime Satellite Organization "INMARSAT" which is exhausting all possibilities to offer the maritime community the best satellite services of all sorts as years go by. With the market getting crowded of many different types of radionavigation systems, we need to give the necessary education and training to the students and they will surely enjoy the luxury and full convenience of the various sophisticated instruments with utmost safety and confidence.

2.10 Air Cushion Vehicles & Surface Effect Ships

An air cushion vehicle can be defined as a craft entirely supported by air pressure, in close proximity to the surface, whether over water, land or areas like intermediate terrain such as beaches and marshes. While surface effect ship operates only over water and has a small percentage of its weight, about ten (10) percent, supported by the displacement of its catamaran-like sidehulls. It has a shallower draft and less wake than the comparable catamaran displacement hull. The air cushion vessel is fitted with flexible seals, often called skirts that allow a generous clearance between

the land or water and the craft hard structure. Obstacle may pass beneath the skirts without damaging the skirts. Very high lift power is required to maintain a useful ground clearance. Air leaks to the atmosphere around the periphery of the skirt through a narrow gap and this leakage must be constantly made up by the lift fans. Both the air cushion and surface effect ships are now being used for passenger ferry and car ferry operations.

But this is not the end of the technological development, in a matter of time this concept could also be dealing with large and bulky craft that would be very useful in the shipping industry. And with their high cruising speed, these vessels could offer more benefits to the users.

2.11 The Liquified Hydrogen Carrier

With liquid hydrogen in mind as possible future alternative for oil and nuclear power as a world fuel, the German ship builders have produced a revolutionary design for a liquified hydrogen tanker based on the "SWATH" small water plane area - twin hull concept which has already been applied to several small ships. But the present design is for a twin hulled vessel of more than 300 meters in length, with a beam of 87 meters and a height of 72 meters. The cargo would be carried at remarkably low temperature of minus 253 degrees Celsius. Because of the low density of liquid hydrogen, the cargoes would be very light in spite of their bulk, and would not submerge a single hulled ship enough in the water for stability and safety. The twin hulled design, shaped like a cargo carrying semi-

submersible drilling rig would overcome this problem. However, lack of training and thorough understanding of this particular operation may lead to some unwanted incidents which could be harmful to man and his environment. Therefore, officers and crew who would be working on this type of vessel need a special training and education for this vessel's operation to ensure safety all the time.

2.12 The Automatic Container Stocking Equipment

In the port of Rotterdam there is a new container terminal being developed for the accommodation of Sealand containerized goods alone which would be employing machines instead of people operating the conventional stocking gears. According to the port authorities, the efficiency of the computerized equipment was predicted to be more reliable and they do operate on a much faster pace than the ordinary stevedoring gang of the same number of personnel. If you are a Chief Officer and you are well prepared with your loading or unloading plans, how would you deal with machines for the first time if you're coming from a conventional port to a computerized port like Rotterdam. And this is not only possible in that particular port. Singapore, Japan, USA and other European ports are moving in that direction as well. If there are special containers with particularly dangerous goods in them, then a communication with the main console operator is necessary because the stocking machines are fully sensors operated and only the operator on the main frame can do prioritizing or container selection during loading or unloading

operation. The operation will surely be smooth and orderly if the user is conversant about the standard operating procedures of such sophisticated system. This could only be possible by proper training.

2.13 Marine Vapour Recovery & Liquification

Several marine vapor recovery systems designed for dedicated ships in a dedicated trade have been operated successfully over the past few years, but a universal system is now being developed for the recovery of vapor from marine loading operations to help meet the Environmental Protection Agency (EPA) mandated ozone level regulations. The vapor recovery process or the hydro carbon recovery can be done onboard the tankers themselves or on shore. The required systems are not simple and to avoid requiring each ship to install its own vapor recovery process facilities, most of the time it is being done with the shore equipment. Several processes exist to recover the hydrocarbon vapor in low concentrations from a vapor stream.

The term "recovery" usually means either disposing of the hydrocarbon by incineration after collection or recovering the hydrocarbon for use as fuel in a refinery fuel gas system. Aside from the danger that it offers to the environment, vapor from ships carrying special cargoes in terms of chemicals in liquid form means a lot of losses to the shippers whose cargoes fail to reach the discharging port in the same quantity as in the loading port.

To solve this problem, a process of liquification is now possible in some ships with the installation of a liquification plant onboard which after collecting

the vapor, transforms it again to its original liquid state and makes it ready for discharging at the destination port. Most of the tankers are structurally designed for pressures in the cargo tanks, but to prevent structural damage while loading or during the voyage due to some uncontrolled parameters, the tank vent system is fitted with PV valves to release excessive pressure. For the whole process to be realized safely, it needs a thorough study and a good understanding theoretically and practically to avoid all the unnecessary consequences.

2.14 The HeelMaster Stabilizers

Stability is the most important parameter in the ship's environment. Everything will be at risk if the vessel is unstable. The Engineering Company M. G. Honkanen Ltd has developed various methods of stabilizing a vessel in a more effective and cost competitive way. HeelMaster has an answer to "rolling" problem which they call roll stabilizer. Rolling is an undesirable characteristic of ships. It creates stresses in the ship's structures, causes unpleasant experiences to passengers and crew, increases the risk of cargo shifting which may end up in loss of stability and eventually to the capsizing of the vessel.

The said company has designed stabilizers in a form of a closed U-tank with an air pipe connecting the two reservoirs of the tank which transfer water automatically athwartships by air blowers to compensate the heel due to unsymmetrical weights. The blower together with its control valves are designed as an integrated unit to be connected to the air pipe with

only two interfaces. The physical principle of the said roll stabilizer can be explained by the double pendulum analogy. A ship rolling at resonance lags the wave exciting moment by 90 degrees, and a moving weight in the ship tuned to the same frequency in turn lags the ship by 90 degrees being exactly in the opposite phase with the wave exciting moment which brings back the vessel in its usual up-right position. The heel angle of the ship is measured by a very sensitive inclinometer, and the fluid in the tanks will automatically transfer in case a heel is created. A special option of the HeelMaster stabilizer include the operational inclining experiment to determine the metacentric height or the rolling mode of the ship to set the vessel in a forced rolling motion to get its natural rolling period. Having all these vital information at hand is already an advantage to minimize risk along the way.

The HeelMaster stabilizer makes use of a micro computer based control unit called "Sea Master". All necessary control programs and all system parameters are included as micro chips on the control unit's computer board. This enhancement in ship handling is not only beneficial to mariners but to shipowners as well.

2.15 Thermal Lifesaver & The Freefall Lifeboat

Everybody is aware of the saying "SAFETY FIRST". A new and long overdue "SOLAS" regulation requires that from July 1991 the lifeboats of all merchant ships of 500 gross tons and above are to carry sufficient thermal lifesavers or "TPA" thermal protective aids for

the number of persons certified to be carried on the craft. Survival at sea is a question of time "how long ?" and temperature "how cold ?". There is a so called "4 degrees - 4 minutes" survival time, after which you are dead. What do you expect in a freezing water without a survival suit when you have to abandon ship? The required survival suit is made of a tough laminated film called X-F, chosen for its exceptional toughness and resistance to tearing and puncturing. The "TPA" is a potential lifesaver for anyone who has to abandon ship. It is insulated against the loss of body heat when you are wearing one, especially in freezing areas. Another thing is that the "TPA" is like a life jacket itself as it makes the user float even without lifejacket. And it covers and protect your whole body except for your face where you need to breathe and be able to communicate. As the word says, it is a real lifesaver.

Another development is the carriage of a <u>free fall lifeboat</u> that makes abandoning ship a lot faster and much easier by the nature of its operation. It is fully automatic and built to survive fire as well as bad weather. No davits, lines, nor plugs are needed just "push a button" and the lifeboat will fall safety alongside the vessel. Its construction is specially designed where everyone could be properly secured to his/her own seat with belts and clips. It is capable of withstanding fire and heavy weather, and it is completely water tight and very stable. Just like the other types of lifeboats, it has all the necessary provisions plus additional modern equipment for navigation and emergency communication systems. With this lifeboat there is a greater chance of survival.

2.16 Expert System Applications to Shipping Operations

Artificial intelligence has been emerging as one of the fastest growing technologies during the past five years. The development of expert systems applications for shipping operations has also been growing with various systems nearing completion in the United States, Europe and Asia. These will surely affect radically how vessels are operated and managed at present.

Artificial intelligence is the study of the mental faculties or ideas through the use of computational models to enable computers to do things that intelligent people are doing. Computers of course can accomplish the required output on a much faster basis and more accurate level. Most shipping companies nowadays are relying largely on computers in performing basic shipping functions such as cargo documentation, financial control and container management. We have at present the so called "Loading Computers" which take good care of all container related operations from loading, unloading and transporting of empty containers from one port to another in the most economical ways. Many software modules are now being developed for all functions of shipping company operations. This particular area should be considered in the molding of our graduates knowing that we are suppose to run the shipping business through the modification and tuning of our present educational system to the course where the maritime industry is going to.

Many shipping companies are now being run by personnel not coming from the seafaring profession but

are business administration graduates who know nothing about ships. I guess we don't want these people to replace us.

2.17 Shipping Operations - Costs and Regulations

In the shipping environment, there are a lot of factors, conditions, circumstances and influences that are affecting the shipping operations in general. Let us take the factors one by one.

First we have the financial factor. The financial condition in the maritime industry is very uncertain. There are times when the operators need to raise capital for the construction, reconstruction, repairs or acquisition of new ships to be added in their existing fleet. In investing a great amount of money, it is of course necessary to know all the other factors surrounding the shipping operations. Here the crewing and maintenance of the vessels come in. Is a one-man-bridge type of vessel practical to be purchased taking into consideration the source of the manpower to be used in running the ship? Now the maritime education and training plays a major role. After the financial concern, let us take the competitive factor which is also influencing the business. If the shipping operators would like to offer lower rates in general with reliable service to their customers, the "FOC" flag of convenience will always be the answer. But the question is - can our seafarers meet the demands of the modern technology being injected continuously? Again, the maritime education and training plays a major role in this field. Next we have the physical factor. The places where the shipping operators find themselves

connected with are the port areas, sea passages, harbors, rivers, canals, straits and bays where the vessels are going back and forth. This third factor would be very visible upon the introduction of the fourth factor which covers the rules and regulations in the shipping industry. The International Maritime Organization has all the necessary rules and regulations for the betterment of the shipping industry and the seafarers as well. Minimum requirements, certification and examination are but just few items in the roster. The whole picture of the operation should be known to the institutions responsible for the maritime education and training for them to make the essential adjustment in the education system so as to cope up with the modern trade.

2.18 The Design/Architecture of Vessels

The ships nowadays are very much different in their architectural design and purposes. Mainly because of the pressing needs on the trade and for the purpose also of environmental protection. The shipping industry obviously is changing its operational set-up considering the various fatal accidents recorded in the previous years. For example, the idea of coming up with the Double Hull-Ships or tankers for transporting liquid cargoes in bulk particularly crude oil, was conceived after the disastrous Exxon Valdez oil spill incident. Development could not just take any path in the maritime industry. Designers might be very successful in creating magnificent ships and facilities, but if such projects would not guarantee acceptable safety requirements, then it would just be

useless. We have the widely used "OBO-Ships" - these ships have been around for quite sometime and they are designed to carry oil, bulk or ore. The design of such vessel would allow the ship owner and the shipper to deal with the three different cargoes. But the stability characteristics of these vessels is unique and requires especial attention particularly when loading oil with respect to the holds' construction. I believe that the ship's safety should also be tackled with due regard to the architectural design of vessels. New development in the containership design has been introduced recently in the industry.

Container ships now are more sophisticated and are capable of carrying larger number of containers due to their constructional set-up. At present we have modern types of vessels such as RO-RO = roll on - roll off, RO-LOW = roll on - roll off / lift on - lift off, RO-FLOAT = roll on - roll off / float on - float off and the so called Semi-Submersible vessels carrying heavy loads.

2.19 The Self-Unloading Bulk Carrier

With the introduction of the self-unloading bulk carriers, the role of the ship's personnel during unloading of such cargo would be affected considerably not only in the number of crew but also in the knowledge each officer of the watch has to possess. This idea is indeed a very pleasant development for the ship owners and shippers as well.

Some of the benefits include; reduction in voyage time, multi-port discharge, minimal dock structure requirements, ship's discharging flexibility and

environmental and pollution control. This self-unloading procedure allows cargoes of different qualities requiring blending to be loaded into each of the cargo holds and be blended in the conveyor belt system at the bottom of the hold as it is being discharged. The self unloading system would help to overcome the problem of inadequate port facilities, knowing that for such port infrastructures heavy initial investment in needed. A wide variety of self unloading systems are currently available on the market. The majority of which are of the gravity feed/conveyor belt/elevator type. Discharging becomes faster and safer in this system of operation. But an officer who has not been trained for this type of ships would find it very hard to manage any operation if ever he would be in such position.

The problem however does not rest on the hands of the officers but on the hands of the training centers and colleges for their students to be aware of all various developments in the maritime industry and eventually include the said development in their training programs.

2.20 The Polyvalent System of Maritime Education & Training

The European community has already been under the crucial period of transition which satisfactorily gave very positive results in converting the educational set-up from the monovalent to polyvalent licensure of their marine officers. The Netherlands, France and Germany to mention a few, are successfully delivering their new graduates of officers to the shipping

companies who have been looking for officers who are capable of working both as navigators and as engineers onboardship. The development is asking for these new breed of men. The industry is in its move of harmonizing the long divided deck & engine departments. The time has come for the changes. The economy is pressing for the issue of crew reduction with the general mastery of the shipboard operations. The universities and colleges must answer the needs and the demands of the shipping industry. The industry must survive because it plays a major role in the economy of the country especially in the third world environment. This is reality and we have to deal with it.

CHAPTER 3

The Proposed Maritime Education & Training Curriculum at the Philippine Merchant Marine Academy.

The idea of coming up with a new curriculum for our Academy was not conceived overnight and it is not intended to be a total imitation of the Western systems of education. However, it may appear to be similar to the systems of education of the developed countries due to the fact that my intention is to update, upgrade and accelerate the standard of our education and training system to be able to meet the needs and demands of the maritime industry all over the world. It is true that my ideology was influenced very much by the European and American standards, still my concern is focused on the national environment taking into consideration our geographical, political, social, cultural and economic set-ups in the Philippines.

Based on the different topics I have enumerated and discussed in the previous chapters, I believe that this revision is truly rational and timely. The shipping industry has not yet reached the state which the airline industry has been enjoying for the past years. This is mainly because of the heterogeneous standards existing within the trade. The International Maritime Organization "IMO" has been passing a lot of rules, regulations and various recommendations to make the standards uniform and acceptable to the whole shipping community. Why is it then that there are still a lot of countries maintaining some old fashioned equipment and outdated system of education and training? Shipping comprises the largest portion of

the transportation industry than that of the air and land transportation with respect to the volume of cargoes, nature of cargoes, costs of transport and the distance to be covered. Due to the fact that the maritime industry plays a major role in the economy of every country, its existence is a "must" and it should be given priority in its development and progress.

Complying with all the standards set by the International Maritime Organization means a lot of money and resources to be invested plus the huge preparations and alterations that they may bring in the "operational environment". Installing modern equipment and buying sophisticated vessels would not solve the problems unless the maritime education and training system is updated and changed to meet the current trends. If my anticipation of our future status in shipping may pave the way for the implementation of this project, then let it be written and let it be done.

In the process of my research and data gathering, I tried to look into the different curricula of the following countries: The United States, Germany, Holland, France, Russia, South Korea, Denmark, Norway, Middle East Countries and the other Asian Countries.

This curriculum is designed to educate individuals up to the level of a "master mariner theoretically". But only a third mate license with the capacity for an ocean trade would be awarded to the graduates after the course. This is because of the fact that it takes an actual sea experience of at least one year and another board examination before the next license/certificate would be issued. And that is the procedure for all the licenses up to the captain/master certificate.

However, subjects like shipping economics and personnel management & training plus other subjects for second mates, first mates & masters have already been incorporated within this module, because of the reason that no further formal education is needed for the next licenses except for a minimum one year of sea service with the latest license, and other short review courses for technical advancement and updating with the present technological trends in the maritime field.

This curriculum intends to offer all the necessary theoretical knowledge for the entire seafaring career plus additional basic knowledge in management for graduates who are planning to go into shipping business management or port operations after a short experience of seafaring life.

The academic set-up is on a semestral basis. Every year is composed of two semesters, and every semester is about 20 weeks. The teaching load has an equivalent of (1) one unit per 20 hours of lecture while laboratory works has an equivalent of (1) one unit for every (40) forty hours of work on practical exercises like in the cases of physical education, experiments in Physics & Chemistry, hours spent in radar simulation training, cargo handling equipment, lifeboat & liferaft launching, fire fighting and other practical works necessary for the education and training of seafarers. It simply means that a subject with a weight of (1) one unit, should be taken (1) one hour per week if it is theoretical and (2) two hours per week if it is practical/laboratory for a total period of (20) twenty weeks which is the duration of (1) one semester. All subjects must comply with this "Time Equivalent Unit" (TEU) for all levels.

This curriculum leads to a Bachelor of Science Degree in Marine Transportation "Nautical-Plus" thus, awarding every candidate with a Third Mate Certificate and a Qualified Engine Officer Certificate "QEOC".

Just like any other college degree, this package is complete with all the required subjects to be included in a bachelor's degree. All the requirements of the International Maritime Organization are satisfied completely in this set-up plus the necessary math & sciences and humanities subjects needed to complete the bachelor's degree.

3.1 The Curricular Set-Up

The Proposed Maritime Education and Training System "Nautical-Plus" at the Philippine Merchant Marine Academy will still satisfy fully the national requirements set by the Department of Education, Culture and Sports plus several new subjects. The next few pages will show the general set-up of each academic year with the corresponding weights and sequence.

The Course Structure will serve as the guideline for the instructors/professors who would be handling any of the subjects included for this course. With the detailed syllabi of all the subjects from the first year to the fourth year, the faculty members could easily make a plan on how to budget their time for the whole semester taking into consideration the coverage of each subject within this curriculum.

The writer's idea about a Maritime Education and Training System "Nautical - Plus" Curriculum, will eventually go like this:

FIRST YEAR "FIRST SEMESTER"

	SUBJECTS	CLASSROOM	LABORATORY	UNITS	HOURS
1.	English I	3	0	3	60
2.	Mathematics I	4	0	4	80
3.	Physics I	4	2	5	120
4.	Navigation I	4	0	4	80
5.	Tech. Drawing	3	0	3	60
6.	Electricity	3	0	3	60
7.	Physical Educ.	0	2	1	40
8.	Machine Shop	0	4	2	80
9.	Naval Science	2	2	3	80
	TOTAL LOAD:	33		28	660

FIRST YEAR "SECOND SEMESTER"

	SUBJECTS	CLASSROOM	LABORATORY	UNITS	HOURS
1.	English II	3	0	3	60
2.	Mathematics II	4	0	4	80
3.	Physics II	4	2	5	120
4.	Navigation II	4	0	4	80
5.	Metallurgy	2	0	2	40
6.	Physical Educ.	0	2	1	40
7.	Survival Craft	1	2	2	60
8.	Seamanship 1	2	0	2	40
9.	Medical CareI	1	0	1	20
10.	Naval Archi. 1	2	0	2	40
11.	Naval Science	2	2	3	80
	TOTAL LOAD:	33		29	660

SECOND YEAR "FIRST SEMESTER"

	SUBJECTS	CLASSROOM	LABORATORY	UNITS	HOURS
1.	English III	2	0	2	40
2.	Mathematics III	4	0	4	80
3.	Navigation III	4	0	4	80
4.	Radar 1	2	0	2	40
5.	Ship Stability I	3	0	3	60
6.	Cargo Work I	2	0	2	40
7.	Seamanship II	3	0	3	60
8.	Electronics	2	2	3	80
10.	Meteorology 1	2	0	2	40
11.	Naval Science	2	2	3	80
	TOTAL LOAD:	30		28	600

SECOND YEAR "SECOND SEMESTER"

	SUBJECTS	CLASSROOM	LABORATORY	UNITS	HOURS
1.	English IV	2	2	3	80
2.	Mathematics IV	4	0	4	80
3.	Navigation IV	3	2	4	100
4.	Communication	2	0	2	40
5.	Ship Safety I	2	0	2	40
6.	Cargo Work II	2	0	2	40
7.	Naval Archi. II	3	0	3	60
8.	Marine Propulsion	4	0	4	80
9.	Naval Science	2	2	3	80
	TOTAL LOAD:	30		27	600

THIRD YEAR "FIRST SEMESTER"
AND "SECOND SEMESTER"

12 MONTHS PLANNED, SUPERVISED SHIPBOARD TRAINING

The third year students must have to accomplish a good "Sea Project" and also a "Record Book" which is the day to day work book to be signed by the Master or the Chief Officer or by the Chief Engineer after every accomplished job listed in the said record book. Some of the jobs are: Cleaning the hatches, refilling fire extinguishers, sewing canvas, mixing paints, proper opening and closing of the holds, securing and preparing the anchor, splicing mooring lines, stowing the lifeboat, hoisting shapes and flags/pennants, greasing runners and topping lifts of cranes or derricks. Bridge or engine room jobs. Taking sounding of tanks and doing draft survey. As cadets, they are also required to stand on watch as look-outs, helmsmen and aides at the bridge by day or by night depending on the scheduling of the chief officer to his deck hands. It is also agreed upon between the academy and the shipping companies that the cadets be allowed to stand on watch at the engine room for a considerable number of hours during their contract to familiarize themselves with the operations and various jobs at the engine room. At the end of their training, the master of each vessel concerned sends a <u>"confidential report"</u> to the academy for the students assessment and evaluation. Their performance does not only affect their grades but as well as their future employment with their particular companies.

FOURTH YEAR "FIRST SEMESTER"

	SUBJECTS	CLASSROOM	LABORATORY	UNITS	HOURS
1.	Navigation V	4	0	4	80
2.	Radar 2	2	2	3	80
3.	Ship Safety II	3	0	3	60
4.	MARPOL	2	0	2	40
5.	Shipping Economics and Personnel Management and Training	3	0	3	60
6.	Pilipino I	3	0	3	60
7.	Automation 1	3	2	4	100
8.	Chemistry	1	2	2	60
	TOTAL LOAD:	27	24		540

FOURTH YEAR "SECOND SEMESTER"

	SUBJECTS	CLASSROOM	LABORATORY	UNITS	HOURS
1.	Ship Handling	3	0	3	60
2.	Ship Stability 2	3	0	3	60
3.	Cargo Work III	3	0	3	60
4.	Maritime Law	3	0	3	60
5.	Automation 2	3	2	4	100
6.	Pilipino II	3	0	3	60
7.	Mar. Power Plants	3	0	3	60
8.	Meteorology 2	3	0	3	60
	TOTAL LOAD:	26	25		520

3.2 The Course Structure

English 1 - Grammar and Composition = 60 hours

Basic English grammar. The art of theme writing, proper construction of sentences, uses of punctuations, coordination and paragraphs. Vocabulary and diction. Essay and letter writing. This is designed to enable the students to communicate in a clear and concise manner and the use of phonetic alphabet in spelling out names. An awareness that the use of axioms and idioms in a ship to shore & ship to ship communication may create ambiguity.

English 2 - Communication Arts = 60 hours

Comprehension. To read and understand materials on a wide range of subjects with the good & correct interpretation of written instructions and information of a professional nature. Extensive use of technical and professional journals with the mastery of the International Maritime Organization's Standard Navigational Vocabulary.

English 3 - Technical Report Writing = 40 hours

Principles of writing technically about accidents, damages marine protests and proper handling of official correspondence and reports. Exercise in writing these papers involving maritime situations including the process of completing standard forms for cargoes, passengers and legal notices will be taken carefully.

English 4 - Communication Arts = 80 hours

This will cover the proper communication during anchoring, berthing and identifying one's vessel when approaching a port or passing through channels with the aid of a vessels traffic system or other ports' operational communication specially in crowded and restricted areas.

Mathematics 1 - Algebra and Geometry = 80 hours

Simple, quadratic and simultaneous equations, fractions, factors, matrices & inverse matrices, fraction and negative indices. Logarithms, graphs, construction of statistical diagrams, axis of reference and rectangular coordinates. Areas and perimeters of different shapes. Volumes of regular solid bodies. Properties of angles, triangles, circles and tangents.

Mathematics 2 - Trigonometry = 80 hours

Trigonometric ratios of angles of different magnitudes, graphs, complimentary & supplementary angles, natural and logarithmic functions and traverse table. Spherical triangle, Napier's Rule and haversine formula. Use of sine and cosine formula in solving oblique spherical triangles. Circular measures and their practical applications.

Mathematics 3 - Analytic Geometry = 80 hours

A study of lines, conic section, derivation of circles, ellipse, parabola and hyperbola, their

properties with respect to navigational importance. Polar coordinates and solid analytic geometry. Introduction to vector geometry, their magnitude and directions. Vector operations and scalar products. Vector triangles, resultant forces and their components. Geometric construction by vectors.

Mathematics 4 - Calculus = 80 hours

Exponential equations, graphs of functions, linear, algebraic and trigonometric operations, notations, gradient, slope, rate of change, maximum and minimum. Differentiation from first principle, differentiation of simple functions products, quotient, and functions of functions. Second derivatives, velocity in rectilinear motion, acceleration, integration as a reverse of differentiation, applications on areas, solids of revolutions, moments and centroids, second moment and moment of inertia, center of pressure and computation of work. Simpson's first and second rule.

Physics 1 - General Physics = 120 hours

Statics. Composition and resolution of forces. Moment of force, torque, center of gravity, center of mass of a body and a system of masses. Stable, unstable and neutral equilibrium. Simple machines, lever, screw jack, pulley system, velocity ratio, mechanical advantage and efficiency. Elasticity and energy stored. A simple treatment of sheering force and bending moments.

Dynamics. Concepts of change of position,

velocity and acceleration. Linear motion, distance-time, velocity-time graphs and the relationship between them. Newton's Law of motion. Work, power, kinetic and potential energy. Friction, dry and wet surfaces, coefficient of friction, momentum and conservation of momentum.

Hydrostatics. Density and specific gravity of solids and liquids. Archimedes principle of floatation. The marine hydrometer and its uses.

Physics 2 = 120 hours

Fluids. Simple hydraulic machines, pumps gauges & siphons.

Heat. Measurement of temperatures, thermometer, thermocouple, Fahrenheit, Celsius and absolute temperature scales. Effects and ways of heat transfer, convection, conduction and radiation. Expansion of solids and liquids, heat energy, thermal capacity, specific heat and latent heat. Property of gases, Boyle's Law, evaporation, vapor pressure, humidity, dew point, Charle's Law, expansion and compression of gases. Principles of refrigeration.

Lights. Laws of reflection, mirrors, law of refraction, prism and lenses. Formation of images and optical instruments.

Sounds. Production and propagation of sounds. Wave theory, frequency, wavelength, interference and resonance. Factors affecting the propagation and the behavior of sounds in gases and liquids.

Magnetism. Elementary theory of magnetism, laws of magnetism, materials, soft and hard iron, methods of magnetizing iron, magnetic intensity, permeability,

susceptibility, retentivity, and magnetic elements. Magnetic poles, field strength, magnetic moment and couple, deflection of a magnetized needle and simple quantitative treatment.

Electricity = 60 hours

Electric charge, the nature of electric current, elements of electric circuit, potential difference, insulators, conductors and semi-conductors. Resistance, Omh's Law, capacitors, relationship between electric charge, potential difference, capacitance and energy stored. Simple circuits, parallel and series connections, inductors, effects of making and breaking circuits. Fuses and other circuit breaker devices their functions and operational uses. Electrolysis, electrolyte, chemical effects, simple electrode reaction. Primary and secondary cells and batteries in common use, their care, their characteristics, maintenance and precautions. Current in metals, heating effect of an electric current, procedural handling of electric circuits, properties of circuits, watts, kilowatts, joule, coulomb, kilowatt-hour and amperes. Determination of an open circuit, short circuit and leakage on simple electric circuits. Effects of dirt and moisture on insulation. Onboard simple treatment of lighting circuits, alarming circuits, indicator lamps and signalling lamps. Protective devices on faulty circuits and their detection. Elementary treatment of electromotive force, direct current and alternating current. Magnetic field due to a straight conductor, coil and solenoid. Functions of simple motors, generators,

alternators and their constructional features. Static electricity its behavioral nature and its function in a given circuit. Emergency power supply operations and its maintenance. The navigational bridge switchboards and power controls.

Electronics = 80 hours

Electromagnetic waves, radiation, propagation, frequency, velocity, wave length and their characteristics. Sky waves and ground waves, their transmission and reception. The ionosphere and the troposphere, refraction and reflection of electromagnetic waves. Thermionic and semi-conductor devices, properties and characteristics of diodes, triodes, cathode ray tubes, semi-conductor diodes and transistors. Functions and actions of rectifiers, amplifiers, oscillators and their marine applications.

Chemistry = 60 hours

The basic principles of inorganic Chemistry stressing the atomic structure, periodic tables, chemical bonds, chemical equations, gases, liquids, solids, solutions, acids, bases, salts, electro-chemistry and hydrocarbons. The various characteristics and properties of the different elements and their hazardous effects. Proper identification and precautionary measures.

Automation 1 = 100 hours

Introduction to the elements of digital computer

organization, programming formulation of algorithm, theory and applications of numerical methods drawn from the different branches of navigation, engineering and business. Introduction to automatic controls, closed-loop systems versus open-loop systems; dynamics of mechanical, hydraulic, pneumatic, thermal and electrical controls; solving systems' differential equations using the classical methods, the analog computer and Laplace transforms, system response, block diagrams and transfer functions; control actions and frequency response.

Automation 2 = 100 hours

Microcomputer programming and interfacing, digital controls, investigation of the concept of modular computer building blocks; application of root locus techniques in control system analysis, improving system response, compensation techniques, the systems of nonlinearities, describing functions, state variables and phase plane analysis. Data system and data-base system, higher level programming language; designing, coding, testing, interpreting and documenting programmes; measuring techniques with sensors and transmitters, sensors for temperature, pressure, current, speed, stresses, viscosity and liquid level.

Navigation 1 - Principles of Navigation = 80 hours

Introduction, aims, objectives, brief historical review of the improvement in the methods of navigation and the modern development employed.

Shape and size of the earth, the sphere, poles,

equator, meridians, great & small circles, and parallel of latitudes.

Position of latitude and longitude, directions, distances, bearings, units of measurements, rhumb line, difference of longitude, departure, mean & middle latitude, meridional parts, difference of meridional parts and the relationship between departure and the difference of longitude. The solar system. Composition and dimensions, inferior and superior planets, Kepler's Law of planetary motion, perihelion, aphelion, earth's rotation and movements on the orbit and the ecliptic, characteristics and interdependence within the solar system. The first point of Aries, eclipses, equinoxes, solstices, the four seasons, day & night, sunrise & sunset, twilight and the effect of the change in latitude and date, the whole year cycle with its effects on the different parts of the globe.

Earth-Moon system. Phases of the moon, lunar month, lunar day, apogee, perigee, conjunction and quadrature. The effects of the moon's position to the earth's environmental behavior and to tidal changes.

The celestial sphere and definitions in nautical astronomy. Apparent motion in the celestial sphere, declination, azimuth, amplitude, altitude, zenith, nadir, zenith distance, co-latitude, polar distance, rising, culmination and setting of heavenly bodies, circumpolar stars, geographical positions of celestial bodies and their movements on the sphere. Measurements on the sphere with corresponding measurements on the earth surface to complement such positions and distances.

Time. Greenwich and other standard times, zone time, relationship of longitude and time, local hour

angle, Greenwich hour angle, apparent noon, conversion of arc to time and time to arc, the sun as the time reference, advantages and disadvantages, international date line, solar and sidereal time, apparent and mean time and the equation of time. True and mean sun with reference to the dynamic mean sun, solving for the hour angles of the stars, an introduction to time diagram and the components of measurements. The horizon system. The orthographic, steriographic and the equidistant projection on the celestial sphere.

Navigation 2 - Practical Navigation = 80 hours

The components of celestial navigation and its reliability in determining a fix position by the use of the heavenly bodies. The major constellations, navigational stars and planets, their identification, magnitudes and groupings.

The sextant. Principles and correct usage of the different parts, proper care and maintenance, types of sextants, reading on and off the arc, adjustments and determination of sextant errors, laboratory tests and certification, practical assignments to obtain index error, vertical and horizontal angles, altitude of heavenly bodies and the use of artificial horizon, back sight or back angles, when to use shades, how to adjust the telescope, swinging or rocking the sextant. Brief explanation of the vernier scale and other types of sextant measurements.

Principles involved in the correction of sextant altitude of celestial bodies to obtain true altitude, itemizing each individual correction, reasons for application and how to treat them.

The traverse tables, dead reckoning and estimated positions. Plane sailing, parallel sailing, middle latitude sailing and mercator sailing.

Navigational publications and their uses, the nautical almanac and nautical tables, notices to mariners. Meridian altitude, determination of latitude by meridian altitude of the sun, stars and planets.

Astronomical position line, geographical position of a celestial body and the position circle, mercator charts and its limitations, intercepts, plotting and transferring position lines. The PZX triangle and its components, procedure in taking an accurate sight, the determination of true bearings, procedure in making a mercator plotting sheet.

Navigation 3 - Electronic Navigation = 80 hours

Basic principles of hyperbolic navigation systems. Nature of hyperbola with reference to position fixing. Diagrammatic explanation of hyperbolic pattern around two foci, causes of ambiguity and their correct removal. Combination of two hyperbolic pattern to illustrate method of obtaining position. Coverage, accuracy and advantages of hyperbolic position fixing systems.

General description of the system involving the principles of the Decca navigator, the Loran, the Omega, the Satellite navigation system, and the Global Positioning system. The techniques involved and their practical operation.

The Radio Direction Finder. Basic principles upon which the RDF is based, identification of components on a simple block diagram. The RDF loop and sense aerials,

Bellini-Tosi aerial system and operation of search coil, factors affecting accuracy, calibration curve, errors due to ship, track of radio waves, errors due to coastal reflection & refraction and the night effect. The practical operation. The "ITOFAR" - Interrogated Time Offset Frequency Agile Racon. The source of information relating to radio beacons and identifying the information contained therein, choice of station having regard to possible errors and maximum range. Use of radio bearings, convergency of the meridian, plotting of bearing after correction and the curves of constant bearings.

The Echo Sounder. The characteristics, functions and components of echo sounders, selection of oscillator position and the effect of bubble stream, methods of fitting oscillators and proper spacing, interpretation of variable and multiple trace echoes, inaccuracy due to false echoes and scale error, potential error due to trim heel, basic user's maintenance, cleaning, changing of paper, adjusting stylus, recorder speed, phasing. Use of echo sounder in shallow water and the correct allowance for ship's draught.

Automatic Pilot. Detailed description, method by which the system senses that a vessel is off course and the application of necessary corrections. Changing over between automatic and manual operation, components functions, controls and setting to maximum performance.

Gyro Compass. Detailed description of gyro compasses and principal parts. Simple treatment of control required to convert a free gyroscope into a terrestrial directional instrument. General understanding between applied force and precession,

drift and tilt, undamped and damped oscillation, methods of damping, errors affecting gyro compass, course and speed,latitude, ballistic deflection and its relation to course and speed error, rolling error, follow-up and repeater systems, Operation, care and maintenance of makes of gyro compasses normally fitted on merchant ships.

Navigation 4 - Chartwork and Pilotage = 100 hours

Introduction and description of charts used in marine navigation. General requirements of a chart appropriate for ocean navigation. Description, salient features and principle of constructing a Mercator chart. How to distinguish a well surveyed chart, degree of reliance, scales, graduation, natural scale and distortion. The nautical mile, chart catalogues and chart folios. Proper use of navigational chart. The different instruments used in chart work, chart publications and "pilots", list of lights, radio signals, tide tables, tidal stream atlas and off-shore distance table. Interpretation of coastline contours, bottom topography, depths and nature of the bottom. Traffic lanes and separation zones.

Chart corrections, sources of corrections, notices to mariners and navigational warnings, temporary and preliminary notices. Brief description of lattice and economic charts and their uses.

True course, magnetic course, compass course, the compass rose, application of gyro errors, effect of height of tides, dipping distance, use of deviation table and extraction of deviation for conversion of courses, checking deviation for transit bearings.

Defining and plotting a position, finding compass course between two positions, compass bearings, relative bearings, effect of current and allowance for leeway, distance made good, course to steer, set and drift, dead reckoning position, estimated position, position fixing by simultaneous cross bearings, by bearing and range, cocked hat position, use of station pointer, running fix with wind and with current, three bearing problem, determination of the distance at which a ship will pass off at any given point, the use of bow and beam bearings, changing speed, changing course and finding the new position.

Tide tables, description and explanations, time and height of high and low water at standard and secondary pots, use of tidal information given on the charts, utilization of the tidal curves to find the height of tide at a given time, correction to soundings and charted heights and precautions to be taken with respect to the accuracy of the information available.

Navigation 5 - The Magnetic Compass = 60 hours

Follow-up of the studies of magnetism in Physics I. Description of the different types of compasses, their construction and parts. Azimuth mirror, pelorus and other instruments for taking bearings. Checking accuracy of the azimuth mirror, description of compass cards, their construction and method of suspension, care while handling and proper stowage after being used. Principles of operation of dry cards and liquid compasses, earth's magnetic field, magnetic poles, magnetic equator, magnetic force, horizontal and vertical components, angle of dip, magnetic variation

and the effects of constraining a compass needle on a horizontal plane.

The ship as a magnet and the effects of ship magnetism on the compass, hard and soft iron effects, principles of compensation.

Reasons for changes in deviation with alteration of course and magnetic latitude, hard iron correctors, functions of sphere and flinder's bar. Causes and effects of retentive error and Gaussin error. General description of swinging a ship for adjusting a compass and methods of obtaining a table of deviation.

General Navigation - Theory of circles of equal altitude, further study of position circle, position lines and intercepts. Factors affecting rates of changes of altitude and azimuth, error in altitude due to error in time, error in longitude due to error in latitude, choice of celestial bodies suitable for observation to minimize probable errors, procedure for morning and evening stars sight, caution when abnormal refraction is suspected.

Tabular methods employed, general understanding of the principles underlying the construction of a short-method sight reduction, mastery of the most common terms and their proper usage.

The principles of a Great Circle sailing and composite tracks, basic knowledge in determining the initial and final courses, distance on the great circle track, latitude and longitude of the vertex, the positions of a succession of points along the great circle at a given intervals of longitude, the use of the gnomonic chart.

Passage Planning. General ideas of passage planning & navigation in all conditions, determination

of the optimum speed, ideal course to take in order to avoid resonance with respect to the state of the sea. Pointers when going to an extremely cold areas or extremely hot territories, plotting ocean tracks with the least possible time, shortest route and convenient to safety, restricted visibility, restricted waters, ice, special areas as declared by the International Conventions under the International Maritime Organization with respect to the hatch cleaning, waste disposal and deballasting.

Radar 1 - Basic Radar Theory = 40 hours

General introduction to radar and the description of the capabilities and limitations of a radar as an aid to navigation. The principle of operation of a radar, the determination of range and bearings, radar horizon and pulse length.

The radar aerial, horizontal and vertical beam width, the polar diagram of the beam, shadow sectors measures of reduced sensitivity resulting from funnel, masts and superstructure. Non-technical description of a radar set, the PPI type of display and its associated range and bearing measuring system, heading marker and bearing cursor.

Radar block diagram and the functions of each component, path followed by a single pulse from transmitter to target and the path followed by a returning echo through the receiver to its appearance on the screen. Characteristics of the radar set, minimum range, range discrimination, bearing discrimination and the power of the transmitter. Measurement of ranges, linear scale, fixed and variable

range marker, ranges of stated intervals, digital counter, factors affecting maximum detection range and accuracy of information. Bearing measurement, rotatable cursor on transparent disc covering display, electronic bearing cursor, effects of receiver noise, ability to display weak echoes and noise saturation.

Radar displays, true motion, north up, stabilized relative motion ship's head up and ship's head up relative motion. Radar targets, reflectors, Racons, Ramarks and others.

Radiation hazards, precautions to be taken in the vicinity of radar aerials and open wave guides, proper stowage of spare parts. Basic radar plotting working on a single target, identifying the speed and course of another vessel, alteration of course and speed with due regard to multiple contacts and traffic density.

Radar 2 - Radar Operation/ROC/RSC/ARPA = 80 hours

Practical radar operation, proper adjustment of controls, functions, inter-relationship of the effects when adjusting such controls, optimum point of reception, detection of maladjustment and proper sequence of correction, accuracy of information displayed, effects of compass errors on stabilized and true motion display, inaccurate speed setting, checking range and bearing, targets movements, after glow trails, delay between alteration of course or speed and the actual display.

The marine radar performance specifications, mechanical aids for obtaining information, automatic relative plot, photographic plotter and the reflection plotter. Position fixing from land targets and sea

marks, collision avoidance, recommendable course alterations, safe speed, closest point of approach, radar reporting procedures, radar watch. The operational principle of an "ARPA". "ARPA" for collision avoidance and coastal navigation.

Seamanship 1 - General Ship Knowledge = 40 hours

Shipboard organization, departments and chain of commands, arrangement of watches, indication of time, time keeping and synchronization of time onboardship, description and maintenance of the different log books, engine movements record book when leaving and entering a berth or port.

Types of ropes used on ships including synthetic fibers and wire ropes, their characteristics and usage. Safe working load, breaking load, proof load of wire ropes and fibers.

Canvas. Material used and grades, the use of the palm and needle, fire proofing and maintenance.

Bridge and engine room telegraph, steering wheel, autopilot, helm indicators, the different helm orders, steadying the vessel on a given course, boxing the compass, methods of bridge reporting, the proper way of being a look-out.

Anchors and anchor cables, different types of anchors and the functions of each part, holding power, securing and housing, getting an anchor ready for anchoring, types of anchor cables, markings, joining shackles, length, size, storage, breaking and working load, care and maintenance.

The windlass. Procedure of handling the windlass during anchoring and berthing operations, anchor breaks

and securing devices, the fore castle deck and stores. Blocks and tackles, types, parts, sizes, uses, care and maintenance. Bollards, staghorns, cleats & fairleads.

Seamanship 2 - Practical Seamanship = 60 hours

Practical exercises on knots, bends, hitches, worming, parcelling, serving, rigging and reeving various types of purchase, canvas work, steering, splicing of fiber and wire ropes, rigging derricks and boat falls, rigging boatswain's chair and stages. Launching and retrieving lifeboats.

Riggings of the ship, standing and running gears on deck, masts, posts, derricks, cranes and stays. Deck machineries and other fittings, openings on weather deck and below deck, methods of closing and opening, hatch covers, battening down and securing, watertight and fire proof doors. Differential pulleys, purchase rigged to advantage and to disadvantage, power gained, calculations. Logs and mechanical sounding appliances, rockets, line throwing apparatus and distress signalling equipment.

Preparation for coming to an anchor, warming up the windlass and preparing the anchor for letting go, paying out anchor cables, ship being brought up to an anchor, hanging off an anchor, weighing and heaving up an anchor, duties of officers and crew when a vessel is at anchor. Preparation for getting underway, general arrangement prior to proceeding to sea, making harbour, entering dock, berthing alongside quays, jetties, securing to a buoy or to other ships. Proper use of mooring ropes and wire ropes for securing, the wire and chain stoppers, duties of officers and crew forward and

aft and on the bridge during maneuvers, communication procedures from all stations to the bridge.

Dry docking. Safety precautions when entering a dry dock, routine inspection of the vessel for dry docking, the job order lists to be carried out in the dry dock, duties of officers and crew when a ship is at the dry docking, treatment of the underwater portion of the hull, precautions before leaving the dry dock.

Surveys and Fumigation. General knowledge of preparations to facilitate various types of surveys, the different methods employed in fumigating a ship, precautions before and after fumigation.

Survival Craft and Fire Prevention = 60 hours

Introduction to boats of various types carried onboard merchant ships, different parts of the lifeboats and their functions, care, inspection and maintenance of the boats. The types of liferafts onboardship, launching of boats and rafts on different weather conditions, statutory equipment in lifeboats and liferafts under the SOLAS Convention, precautions relating to food, water and medicine carried in the survival crafts. Types of davits and their functions during launching operation, usual shipboard arrangement of the crafts, life jackets, life rings, survival suit and the individual duties of each officer and crew.

Identification of emergency and abandon ship signals, procedure to be done when hearing such signals, swinging out, embarking, lowering and launching a lifeboat or a liferaft, picking up a buoy, clearing away from the ship and bringing alongside the

ship, stepping a boat mast and setting of lifeboat sail, theory of sailing and sailing terms, the sea anchor, beaching or landing, power boats, starting and handling the engine, man overboard operation, different boat commands and maneuvers and anchoring.

Theory of Fire. The elements of fire and explosion, fuel, source of ignition, oxygen, the fire triangle, the chemical, biological and physical properties. Description of flammability, ignition point, flash point, automatic ignition point, induced and spontaneous combustion, explosive mixtures, burning speed, burning temperature, thermal value, lower and upper flammable limits, flammable range and process of inerting.

Classification of fires onboardship, causes of fire, fire hazards, fire by radiation, convection and conduction, reactivity, burning solid, liquid or gas.

Fire prevention and Extinguishing agents. Precautions to be observed to prevent fire, organization of fire drills, fire and smoke detectors, fire escape routes, gas freeing, putting out the fire by cooling, smothering or by starving. Water in jet, spray, fog or flooding, use of foam, high expansion, medium or low, use of steam, sand, carbon dioxide, halon, dry powder and other chemicals.

Alarm Procedures. Fire Fighting Equipment. Fixed installation onboardship and their location, automatic sprinkler system, pressure water spray system, emergency fire pumps, emergency generators, portable fire extinguishers, mobile fire apparatus, fire hoses, nozzles, fire axe, fire blankets, protective clothing, fireman's outfit, breathing apparatus, smoke helmet and fireproof lifeline.

Ship Safety 1 = 40 hours

Knowledge of content and application of the International Regulations for the Prevention of Collision at Sea, the general rules, steering and sailing rules, lights and shapes, sounds and lights signals, exemptions annexes to the rules specially those concerning distress signals and safety for navigation.

Identification of the different types of vessels by hierarchy and aspect in accordance with the collision regulation. The distress signals as listed in Annex IV of the regulation and the signals made by vessels in sight of one another and during restricted visibility. Introduction to IALA BUOYAGE SYSTEM, shapes, lights' characteristics and top marks, wreck marking system. Musters and drills, safe procedures of the use of distress signalling appliance and safety equipment carried onboardship. Requirements of the 1978 STCW Convention.

Ship Safety 2 = 60 hours

Working knowledge of the SOLAS Convention, fire regulation and safety regulations, relevant notices contained in the annual summary of the Notices to Mariners. Abandoning a ship, emergency cases in port, comprehensive roster and emergency station lists, merchant ships position reporting system, the IMO Merchant Ship Search and Rescue Manual (MERSAR), Recognition of the types and functions of helicopters used in search and rescue operation, coordination procedure of a search and rescue operation, strict

radio discipline in an inter-ship communication within a rescue area and the proper chain of command from the On-scene commander to the rescue units and the present merchant vessels in the vicinity. Proper establishment of a search "DATUM" & various techniques of searching.

Ship Stability 1 = 60 hours

Principles of hydrostatics; mass, density, relative density, weight, buoyancy, reserved buoyancy, freeboard, displacement, deadweight, pressure and thrust. Determination of these values for box-shaped vessels, Archimedes' principle and law of floatation. Calculation of pressure at a given depth and density, thrust computation with a given pressure and area including effects of liquids on tanks, center of pressure, form coefficient, definition of waterline length, beam, AP, FP, LBP, draught, block coefficient, waterplane area coefficient, displacement calculation from given coefficients and dimensions.

Draught markings, forward, aft and mean draught, effects of various densities, fresh water allowance, dock water allowance, use of hydrometer, the trim of the vessel.

Load lines. Reasons for allocating loadlines, drawing and identification of loadlines to scale, calculation of distances between loadlines, charts and loadlines zones. Stability of floating bodies with especial reference to ships, condition of equilibrium, stable, neutral and unstable equilibrium, center of gravity, center of buoyancy, transverse metacenter and metacentric height, forces with given angles of heel, righting levers and righting moments, effects of these

factors on loading and unloading or shifting of loads, determination of CG, KG, GM, and GZ. Effects of suspended weights, stiff ship & tender ship.

Inclining experiment. Purpose and correct procedure of the inclining experiment and necessary conditions to be carried out during the tests. Qualitative treatment of free surface effects of liquids on the stability of ships. The construction, use, and interpretation of displacement and deadweight scale curves, and curves of statistical stability.

Ship Stability 2 = 60 hours

Effects of beam and freeboard on transverse stability. Stability at large angles of heel, thorough understanding of the hydrostatic curves, angles of roll and heel, calculation of volumes and areas, the Simpson's Rules, buoyancy and displacement of the different shapes of ships, variation of TPC with different draught and density.

Longitudinal Stability. Longitudinal centers of gravity, buoyancy and floatation, longitudinal metacenter and metacentric height, trimming moments and trim, draught survey before and after cargo operation whether loading or unloading or shifting of cargoes. Calculation of changes in trim and draught, the forces involved and the angle of loll.

Cargo Works 1 = 40 hours

Cargo handling equipment. Items of cargo gear, trays, nets, slings, snotters, pallets and containers. Derricks and cranes together with associated fittings,

various uses, care and maintenance. Different purchase arrangement, use of preventer guys, advantages and disadvantages of crane over union purchase rig, crane jib and span, turning and traversing arrangement, stress on hauling part, friction allowance, forces on the topping lift and derricks.

Description of the main features and various characteristics of winches, measurement of cargo, grain space, bale space, dead weight, stowage factor, broken stowage, loading and unloading calculations. Preparation of holds and other cargo spaces for dry cargo, inspection of bilges, drainage wells and spar ceiling, dunnaging and proper separations, cargo inspection.

Hygienic standards in holds & bilges, precautions to be taken when entering ballast tanks and void spaces, general knowledge of loading and discharging cargoes to prevent an outbreak of fire from dangerous goods, danger of overheating in cargo spaces, working knowledge on IMO's recommendation on the safe use of pesticides onboardship, cleaning and preparing deep tanks prior to loading liquid cargo with special reference to vegetable oils, animal oils and latex, testing and heating deep tanks, necessity of ullage spaces, cargo work safety, proper ventilation, maintenance of cargo gears, knowledge of the relevant sections of the "Code of Safe Practice for Merchant Seaman".

Cargo stowage organization. The vessel's trim, port rotation, weight, metacentric height, leakage, hogging, sagging, taint, use of cargo handling equipment and tallying. Cargo plans, preparation , interpretation and implementation, damage by sweating

its prevention and control, the ventilation systems of holds and tanks, natural ventilation, forced ventilation and humidity control.

Basic knowledge of heavy lift cargo gear, stability requirements of heavy lift operation, precautions before, during and after discharging or loading heavy loads, proper stowage, strengthening and securing heavy weights on different places of the vessel. The use of electro-magnets for discharging and loading cargo with respect to the compasses and compass cards onboardship, proper handling and operational procedure to avoid any unwanted effects to the accuracy of the navigational equipment of the vessel.

Cargo Works 2 = 40 hours

Loading and proper stowage of the different types of general cargoes, containers, unitized cargoes, liquid cargoes other than petroleum in deep tanks and refrigerated cargoes.

Carriage of coal, types of coal, specific hazards, shifting, fire due to gas build-up, spontaneous combustion, rigging of thermometer pipes and proper ventilation.

Carriage of bulk cargoes, knowledge of the general requirements of the IMO's "Code of Safe Practice for the Carriage of Bulk Cargoes". Hold preparation, hazards associated with bulk cargoes, angle of repose, concentration, flow moisture point, special attention on the carriage of grain, the IMO's Grain Rules, capacity regulations, definition of grain and a good understanding of the IMO's "code of Safe Practice for Solid Bulk Cargoes", and the requirements for vessels

carrying ore. Carriage of timber, requirements of the IMO's "Code of Safe Practice for Ships Carrying Timber Deck Cargoes", timber load line, the moisture absorption's effect on stability, securing timber on decks.

Preparation , stowage and particular precautions when carrying pig iron, steel rails and similar dead weight cargoes.

Special preparation, safe carriage, stowage and ventilation when carrying rice, sugar and other grains.

Carriage of Dangerous Goods. Knowledge of the International Maritime Dangerous Goods Code (IMDG), classification and labelling, nature and various characteristics of dangerous goods, precautions to be observed while loading, securing and unloading explosives, pollutants, poison and other chemicals, proper care of the cargoes during the voyage.

Carriage of special cargoes, valuables, mail and passengers' baggage, special stowage to prevent pilferage, tampering and loss.

A detailed and thorough study of the carriage of oil cargoes, cargo systems, operations and safety. LNG, PLG, Chemical tankers and carriage of dangerous chemicals in bulk. Pollution Regulations, ballasting, tank cleaning and gas freeing. Requirements of the law relating to carriage of goods by sea and relevant IMO's Conventions, Rules and Codes. Properties of common oils like crude oil, naphtha and middle distillates. System of operations, cargo pipelines, pumping arrangement, cargo venting system, inert gas system, frequent sampling of the atmosphere in the inerted tanks, oxygen analysis, cargo heating system, proper procedure of tank washing, dangers of static

electricity and its causes in tanker operation, procedure of loading and unloading crude oil and products tankers, ballasting and discharging ballast with or without segregated ballast tanks, description of the safety of oil cargoes, knowledge of the "International Oil Tanker and Terminal Safety Guide", and the International Chamber of Shipping's "Tanker Safety Guide (Petroleum)", tanker officers' safety check list before commencement of cargo operation or gas freeing, use and limitation of the explosimeter, chemical absorption gas detectors, toxic effects of petroleum products, skin ailments likely to result by contact with oil cargoes, health hazards particularly to the carriage of cargoes containing hydrogen sulphide and benzine.

Ship Handling = 60 hours

Study of the effects of the rudder and propeller on the ship's movements and their uses in manoeuvering a ship, screw race, wave current, transverse thrust, helm and engine orders. Effects of various deadweights, draught, trim, speed and clearance under the keel on turning circles and stopping distance. Effects of winds and current on ship handling, the shallow water effect. Coming to a single anchor, emergency use of anchors, turning a ship short round with respect to trim, wind, displacement and type of machinery, turning the ship in heavy weather, berthing and unberthing under various conditions of winds, tide with or without tugs, securing to a single buoy or between buoys, slipping and buoying a cable, mooring in restricted spaces, approaching a pilot vessel with due

regard to prevailing tide and weather, handling a vessel in rivers, estuaries and other shallow waters with respect to restricted room on the response to the helm and interaction to the passing vessels together with the wind and current. Choice of Anchorage, operation of anchoring to two anchors in unrestricted and limited anchorage, determining the scope of cables to be used, methods of determining if a vessel is dragging and the remedies for such situation, use of the second anchor, clearing hawser, clearing fouled anchors. Precautions when manoeuvering for launching lifeboats and liferafts in heavy weather, methods of taking onboard survivors from lifeboats, liferafts and from the water, man overboard procedure, drydocking in both intact and damaged conditions, means of keeping an unmanageable ship out of a sea trough, heaving to and lessening drift, use of oil, avoidance of broaching and pooping, navigating with reduced speed to avoid damage caused by own bow and stern wave, familiarity with the manoeuvering and engine characteristics of major types of ships with reference to stopping distance and turning circles at various draught and speeds. Navigating in ice.

Naval Architecture 1 = 40 hours

General knowledge of the types of ships commonly use in maritime transport. Brief historical background of the development and improvement in ship design. Deadweights and Gross tonnage. An outline of the use of computerized sail in conjunction with the normal ship propulsion. Profile of general cargo vessel, bulk carrier, ore carrier, tankers and container ships.

Passenger ships, OBOs, hydrofoils, RO-Ros and hovercrafts. General definitions of the main dimensions, names and description of the different parts of the ship, forms and coefficients, general arrangement and lay-out of the main ship types, materials used in ship building, process of ship construction and shipyard practice, launching of ships, gross tonnage, net tonnage, register tonnage, Suez Canal and Panama Canal tonnage. Constructions of lifeboats and various fishing boats.

Naval Architecture 2 = 60 hours

Structural Terminology, ships' plans and hydrostatic curves. Familiarization and understanding of the different terms like camber, rise of floor, flare, sheer, rake, intercostal etc., stresses in ship's structure, hull stresses, panting, pounding, longitudinal and transverse stress, local stresses, structural members and methods of connection, longitudinal, transverse and combined system of framing, beam and beam knees, girders, pillars, stringers, webs in tankers and bulk carriers, watertight bulkheads, hatchways, rudders, shell and deck plating, double bottom and peak tanks. Bilges keel, tank wing brackets, margin plates, side and wing tanks. Propellers and propeller shafts, stern tubes, tunnel bearing, thrust block, keel, center girder and duct keel. Air and sounding pipes, bulwarks with freeing ports. Masts, derrick posts and stays. Identification of shell strakes, shell expansion and variation in shell plating, meaning of scantlings. Stiffening and strengthening to resist panting,

pounding, longitudinal stress and other local stresses. Special features of the forward end and after end structures. Continuity of strength in way of deck openings. Chain lockers and arrangement for proper stowage of anchor cables.

Sketches in detail to gain a thorough understanding of various sections and connections. Special construction features of oil tankers, bulk carriers and container ships.

General maintenance of ships. Causes and prevention of corrosion in ship's structure. Prevention of initial corrosion by preparation and barrier coats, scaling, flame cleaning and sand blasting. Action between dissimilar metals, galvanic corrosion and cathodic protection, anti-corrosives and anti- fouling.

Communication/Radio Telephony and VHF = 80 hours

Use of radio telephony and VHF with special reference to distress, urgency, safety and navigational warnings. Procedure for emergency distress signals and radio medical systems. Associated publications. The "IMO's Standard Marine Vocabulary" , and the "Merchant Ships Search and Rescue Manual" with reference to radio communication specially in ships' position reporting systems and procedures. Regulations and radio technique required for the radio telephony certification.

Flags. Recognition of all international code flags and the meaning of single and two-flag signals. Correct usage of substitute & pendants. Understanding of the international code of signals and its practical

use. Coding and decoding messages. Understanding of the medical section of the codes. The "GMDSS" Operational Set-up, its uses for ships and shore installations.

Maritime Law = 60 hours

An outline of the Philippine Merchant Marine Regulations. Maritime courts and inquiries required under the law. Law of contract, valid and enforceable contracts, discharge of contractual obligations, Law of Tort, Engagement of crew, statutory formalities, approved crew agreement, forms, terms and their uses. Incorporation of collective agreement into contract of employment, duties & responsibilities of the employer.

General knowledge of the objectives and functions of the "IMO", "ILO" and "UNCTAD". Outline of all the international convention with special attention to international laws and regulation related to safety at sea, loading and carriage of cargoes, seafarers, pollution, collision, tonnage, carriage of passengers, etc.

Certificates and documents required to be carried on ships. Knowledge of maritime declarations and health regulations, free pratique and immigration laws. Responsibilities under the International Conventions and Codes. Statutory duties of the master relating to distress, collision, accidents, danger to navigation and safety of life at sea.

Carriage of Goods by Sea. Law relating to common carrier as it affects the carriage law. The nature and use of the various contracts of affreightment and hire. The Hague Rules and the Hamburg Rules. Bills of

Lading, different charter parties, Responsibility of the owner, charterer and shipper in each type of charter party. Sale of goods, FOB and CIF contracts. Law relating to the carriage of dangerous goods.

Marine Insurance. Basic principles (utmost good faith, insurable interest, indemnity), types of marine policies, insurance brokers. Construction of the policy with respect to implied and expressed warranties. Memorandum of claims, total & constructive total loss. The P&I Clubs their nature and functions.

Salvage. Legal nature of salvage services. Law relating to assessment and apportionment of salvage reward. Lloyds Standard Salvage Agreement.

Understanding of the nature of "wreck", "flotsam" and "jetsam". Towage as opposed to salvage and contract of towage.

General Average. Law relating to general average, York-Antwerp Rules. Assessment and payment of contributions. General average assessors in relation to marine insurance and salvage.

Particular Average. Difference between general average and particular average regarding the extent of contribution and responsibility.

Limitation and Liabilities. Civil and criminal liability of ships. Powers of coastal states in relation to such liability, basis of the legal rights to limit liability. Rights of the port states and the duties of the port of registry or administration.

Pilotage. The pilotage law. Nature and extent of the ship owner's and master's duty to carry a pilot on his ship. Knowledge and understanding of paragraph 10 of regulation 11/1 and paragraph 25 of the annex to resolution 1 of the STCW Convention.

Shipping Economics & Personnel Management = 60 hours

Ship Management. Historical background of the growth of shipping in the Philippines. Present structure and development in the Philippine Merchant Marine. Extent of foreign competition and development. Authorities and organizations related to the administration of merchant shipping in the Philippines. Port Authority, Bureau of Customs and the Maritime Administration Authority (MARINA).

General knowledge of the structure, system of organization of the different shipping companies. Trends in merchant ships. Shipboard organization and routine. National, Regional and International organizations and associations of shipping companies and shipowners. (International Chamber of Shipping), "Classification Societies", Cargo and Liner Conferences and Federations. Shippers Council, objectives and functions.

Economics of Ship Operation. Introduction to the terms used in ship finance. A simple presentation of the financial structure of a shipping company, company revenue, balance sheet, profit and losses.

The Basic Accounting & Economic concepts. Planned maintenance and budgetary control.

Meteorology and Oceanography 1 = 40 hours

Instruments. Principles underlying the construction and use of meteorological instruments carried onboardship like the mercurial barometer, aneroid barometer, barograph, thermometers, hygrometer, psychrometer and others. Care and attention given to

the instruments. Understanding of the instruments. Various methods of obtaining sea surface temperatures, measuring current and getting samples of sea water at the surface and at sub-surface depths.

Observation of weather elements. Methods of estimating visibility at sea by day and by night, direction and strength of wind by the appearance of the sea surface and the factors affecting the appearance. A knowledge of the Beaufort Wind Scale and weather notation used at sea. Determination of apparent and true wind and its velocity by vector diagram. Observation of waves.

The Oceans. The characteristics and properties of the seas and oceans with due regard to navigation and seamanship and safety of marine transportation.

The atmosphere. The composition, structure, outer layers and the heat exchange process. Zones and temperatures, solar radiation, scattering, reflection and absorption, isolation, environment curve, relationship of temperature and pressure with height, surface inversion and environment lapse rate. Mean pressure distribution, daily and seasonal variation in atmospheric pressure, permanent high and low pressure areas, modification of the basic pattern of pressure distribution due to the variation in the declination of the sun, distribution of land masses and earth's rotation. Units of atmospheric pressure, millibars, definition of isobars, isallobar, pressure gradient and pressure tendency.

Prevailing winds. Local and regional effects of heating and cooling. Doldrums, trades, variables, westerlies, monsoons, land and sea breezes, anabatic and katabatic winds. Effects of pressure gradients and

earth's rotation on wind speed and direction, thermal winds, Curiolis effect. Circulation of air around areas of high and low pressure. Geostrophic and cyclostrophic forces, relationship between pressure distribution and wind. The Buys Ballot's Law. Vertical movement of air by local heating, orographic up-lift, turbulence and convergence. Temperature of a rising parcel of air and its effect, stable & unstable air, water vapor in the atmosphere, evaporation, condensation, saturation, relative humidity and dew point. Precipitation. Formation and classification of clouds. Characteristics of the various layers of the atmosphere and their effects in navigation, like in a satellite positioning system and other equipments influenced by the ionospheric and tropospheric effects.

Meteorology and Oceanography 2 = 60 hours

Synoptic Meteorology. Air masses; formation, characteristics and source regions, characteristics of Arctic, Polar, Tropical and Equatorial air mass types. Weather influence by various air mass types, modification of air mass. Monsoons. In depth treatment of the causes, areas which experience true monsoons, weather associated with January and July monsoons of the Indian ocean, China sea, North Coast of Australia, West Coast of Africa and North-East coast of Brazil.

Warm and Cold Fronts. Symbols and identification of a weather map. Diagrammatic description of weather experienced during the passage of warm or cold fronts. Comparative characteristics of an active and weak fronts. Depression. Definition and identification on

a surface synoptic or prognostic chart. Polar front theory of the formation and structure of depression. Life cycle of a polar front depression. Diagrammatic explanation of a polar front depression for both hemispheres showing isobars, warm and cold fronts, wind circulation, cloud and precipitation areas. Process leading to the occlusion of a polar front, its characteristics and associated weather. Trough of a low pressure both frontal and non frontal, synoptic pattern, weather associated with the passage of a trough, line squalls. Tropical Storms. Conditions favoring the development of a tropical storm. The seasons, localities and nomenclature. The life cycle, precursory signs, winds and weather. Rules in avoiding tropical storms. Weather routing of ships, concept of optimum route, minimizing heavy weather damage. Anti-cyclones. General characteristics and synoptic pattern. Formation of warm and cold anticyclones, weather associated with anticyclones in winter and in summer. Ridge of high pressure, wind circulation, extension of an anticyclone as well as a ridge between two low pressure areas.

Forecasting technique. Meteorological Codes and Weather Messages. Types of weather messages adopted by the World Meteorological Organization which are available for shipping. Representing meteorological elements by symbolic letters. Plotting a weather report, decoding a reduced message from a radio station, barometric observations and record keeping weather signs. Observation of the sea, reception of weather services for ships from organizations involved in the forecasting and navigational warnings. The facsimile recorder.

Oceanography. Ocean currents, main causes, drift and density currents. Surface circulation of the oceans and its relation to prevailing winds, geotropic effect, water mass formation, subsidence and upwelling. General outline of the effects of the differences in densities of sea water with particular reference to the Mediterranean Sea. Effects of warm and cold currents on climate and weather at sea and at the coastal areas.

Ocean waves. Formation of waves in the deep water, water movements in the waves, modification in shallow water and breaking. Equilibrium of tide, tides in gulfs and ocean. Effects of weather conditions on water level, storm surges and tsunamis. General topographic features of the ocean basins, bed forms and sediments in shallow sea areas, sea floor structure and continental shelves, dissolved and suspended materials in sea water, marine chemical cycles with respect to sea life.

Oceanic stability, effects of pressure, temperature, salinity and density. Tides and tidal stream. Tide generating forces, effects of the declination and varying distances of the moon and the sun from the earth. Solar and lunar tides, amphidronic system, rectilinear and rotary tides, the tidal stream atlas, measuring instruments and interpretation of the results.

Ice. A general knowledge of the formation of sea ice. Main types of floating ice and their origins. Distribution of ice in the oceans and its seasonal variation. Movements of icebergs of the Northern and Southern hemisphere. The International Ice Patrol Services.

Marine Power Plants = 60 hours

Introduction to the elements of marine engineering and its terminology. A basic study of marine propulsion, internal combustion engines, steam engines and turbines. Shaft and break development and effective power. Simple understanding of the rating of the engine power.

Introductory study of the various types of marine boilers. Description and simple sketches. Methods of obtaining super heated steam. Lay-out of the path of the steam from boilers through the engines and hot well back to boiler, functions of the condensers.

Oil fuel line system from the storage tanks to the main engine in a diesel installation and to the boiler in a steam installation. Function of an oil fuel transfer pump and tank heating coils. Fundamentals of the different types of pumps. Bilge, ballast and fresh water pumps with their associated valves and pipelines within machinery spaces. Engine room systems and auxiliaries.

Marine Propulsion = 80 hours

Engine systems - nomenclature and classification; two (2) stroke and four (4) stroke cycles, supercharging main two (2) stroke crosshead, power rating, constructional details, stationary parts and moving parts; fuel and fuel equipment, lube oil system, fresh water cooling, piston cooling, governing, starting and reversing; gearing and clutch, remote controls, safety devices, operation and maintenance .

Propellers. Materials used in construction,

familiarization with the pitch, rake, skew and other terminology, variable pitch propellers, descriptive treatment of slip, real and apparent with simple calculations. Steering gears. An outline of the modern hydraulic and electric types of steering gears. An understanding of telemotor and electric controls, emergency steering and automatic pilot systems and procedures.

Machine Shop = 80 hours

Use of hand and power tools - files, chisels, hammers, saws, scrappers, taps, dies, drills and grinders. Uses of marking and measuring tools - center punch, scribe, calipers and micrometers. Benchwork - joining of metals by soldering, welding, riveting and brazing. Machine tools - lathe machines, cutting speed and dimensions.

Technical Drawing = 60 hours

Use of drawing instruments, lettering, geometrical construction, proper dimensioning and scaling. Multiview projection and isometric, sectional and oblique view. Topographical drafting. Working drawing, graphs and diagrams and structural lay-outs. Plane Geometry

Protection of Marine Environment = 40 hours

Problems arising from the pollution of marine environment. Sources of pollution and their effects. Oil spills and methods of control. Pollution by sewage,

garbage and non-petroleum substances in bulk. Anti-pollution measures adopted onboardship. Knowledge of the requirements of the International Convention for the Prevention of Pollution of the sea by Oil. International Pollution Prevention Certificates. Responsibilities under the International Convention for the Prevention of Pollution from Ships.

Medical Care - First Aid = 20 hours

Basic course in first aid, necessity and importance of diagnosis, assessment of priorities, general outline of the body structure and the functions of the different systems of the body. Treatment of burns, hemorrhages and fractures. Proper procedural transport of an injured person. Proper care of the eyes, ears and nose in case of foreign objects get into them. International Medical Guide for Ships. Medical section of the International Code of Signals.

Medical First Aid Guide for use in accidents involving Dangerous Goods. Safety related to Radio and Electrical equipment. Radio Medical Systems and Procedures.

Metallurgy

Iron and steel production, testing, solidification of ferrous metals, equilibrium diagrams, heat treatment, alloy steels and iron, non-ferrous metals and alloys, polymers.

The technical properties of metals, composition and their characteristics. Marine metallurgical aspects, corrosion, fatigue & creep.

Pilipino 1 = 60 hours

Conversational Pilipino language - the sentence structure, parts of speech, figure of speech, tenses. Technical report writing and the maritime communication terminology.

Pilipino 2 = 60 hours

Philippine prose and poetry, local novels and the life and works of Dr. Jose Rizal.

Physical Education = 80 hours

For seafarers swimming is a must being at sea most of the time. Certification in this field is a requirement in the Philippines prior to cadets' shipboard training year. Familiarization of the different strokes - free style, back stroke, side stroke, butterfly and threading; basics of tennis, basketball, volleyball and a working knowledge of self defence.

(NOTE) **** Naval Science subjects are taken care of at the Department of Citizen's Military Training. ****

CHAPTER 4

The Implementation of the New MET-(N) System at the Philippine Merchant Marine Academy.

Implementing a new Maritime Education and Training System in the Philippines will not materialize very easily nor will it operate smoothly unless it is done with the blessings of the National Congress of the country through the Department of Education, Culture and Sports. Maritime institutions operate under different charters and structures within the national educational systems of standard. Several nautical schools in the country are falling under the "higher education-category" or what we call the college level. These schools are subject to the rules and regulations of the Education Department when it comes to certification and licensure. Others are existing through the combined sponsorship of various shipping companies and the references for their standard of training are the Conventions ratified by the different nations who are members of the "International Maritime Organization". These are classified as seafarers's training centers. Most of the time, these types of training centers are offering short refresher courses and safety courses to seafarers. But there are occasions when the maritime schools are directly under the supervision of the Department of Transportation and Communications. The Philippine Merchant Marine Academy was indeed successful in its operation for the past decades under this set-up and having its own "Charter" to manage and control its administration. Now, under the new national administration, the Academy is

categorized as one of the colleges in the Philippines under the Department of Education, Culture and Sports. However, the Academy with its unique set-up and structure, still enjoys the rights and privileges to operate on its own in the well tested tradition of maritime education and training which I am intending to up-date through this undertaking I am planning to present to the proper authorities for approval. In other countries which I have visited during our field studies, the Ministry of Transport and the Ministry of Education are working hand- in-hand for the maritime education and training system. Certificates of competency are issued by the Ministry of Transport, while the diplomas are being issued by the Ministry of Education. In the Philippines all schools diplomas are coming from the Department of Education, Culture and Sports, and all licenses or certificates of competency are issued by the "Professional Regulation Commission" which is an independent body of the government taking good care of all certificates in various fields of discipline including medicine, engineering, architecture, commerce, law, education, arts, etc. Knowing all these factors and structures existing in our country, I would like to try my luck in proposing this project for implementation at the Philippine Merchant Marine Academy in the following ways in the near future.

4.1 The Administration

The present administration and organizational set-up of the Academy partly patterned after the United States Merchant Marine Academy, if not perfect is

indeed ideal and very suitable for the Philippine environment. This set-up must be well maintained for the successful operation of the academy no matter how many revisions of its curriculum it will undergo from time to time. I believe that the whole performance of the Academy is conducted and controlled by the people in the administration who are working hard for the improvement and progress of the entire school and its personnel including the students.

4.2 Objectives of the Academy

The goals and vital aims of the Academy will remain the same which are: To produce well trained marine officers capable of meeting the needs of the ever-expanding foreign and coastwise trade; To give adequate backgrounds to the graduates to be able to serve responsible positions in the various fields of maritime industry such as port supervisors, marine surveyors, maritime instructors or shipping managers; To develop in youth a moral character by inculcating the sense of responsibility, self discipline and righteousness.

4.3 Buildings and Facilities

The buildings and all the facilities are the major components of an institution prior to its operation and maintenance. These require a great amount of expenditures to accommodate all the necessary equipment and tools used in maritime education and training. The Academy had undergone a major renovation in its buildings and facilities such as radar simulator

equipment, classrooms, laboratories, audiovisual hall, offices, recreational & athletic facilities, dormitories, mess hall and other in-house facilities. What we need at present are the "simulators" which are essential in the training process. In this regard, the National Maritime Polytechnic "NMP" having the necessary facilities in simulation, could help us in training our cadets in acquiring the needed exposure in that aspect. Another indispensable part of the education and training process is the availability of a complete and well managed "Library". The library of the academy needs a lot more of the latest materials, books, magazines, publications, films and videos, software, journals, newspapers, IMO documents and everything about the maritime industry, shipping business and all other related fields of discipline. It would also be very beneficial to the students and faculty members of the academy, if the library could have an access to the information of other libraries all over the world.

4.4 The Teaching Staff

The "heart and soul" of an institution involved in education and training is its teaching staff. The fundamental requirements of a maritime school to be able to fulfill its objectives and execute its curricular programmes start from the availability of qualified teachers. The number of teachers as well as their qualifications depend on the expected quality of students produced by the school. Various fields of discipline require different kinds of teachers who are well versed technically and academically. The maritime

schools need teachers who are good in theory and in the practical aspects of the trade. This will mean a continuous faculty development programme. Teaching personnel must have the ability to cope with the rapid changes in technology and should possess the sense of interest & commitment to his task and responsibilities. It is the duty of the teacher to prepare the students to meet the demands of shipboard life. The lack of qualified teachers is one of the greatest problems of maritime schools especially in the developing countries. In order to attract experienced ship's masters and chief engineers who are also looking for alternative jobs ashore to be close to their families, it is the obligation of the schools to offer them desirable salaries and working conditions. In the case of the Academy, the government must look after this issue. "Good teachers need good pay".

Minimum Qualifications - For Technical Teaching Staff

i. Educational Qualification - Master's Degree holder in related fields with a Bachelor's Degree in Nautical Science or Marine Engineering.

ii. Experience - (2) Two years teaching experience and (2) two years shipboard experience as an officer.

iii. License - Third Mate or Fourth Engineer's License For the Non-Technical Teaching Staff, the minimum requirements are: Master's Degree holder and a Bachelor's Degree in the field of his or her specialization plus a minimum of (3) three years teaching experience. For further clarification of

eligibility, everyone will be referred to the "Academic Hiring Policies" handled by the "Faculty Screening Committee" which is already existing in the Academy.

4.5 General Entrance Requirements For Students

The entrance level for maritime training institutions all over the world varies on a case to case basis. The requirements largely depend on the country's educational system. However, most of the schools are accepting students after the completion of their secondary education or what we call high school level in the Philippines. The success of the cadets in their academic life depends on the foundation of knowledge they already have upon enrollment. In the Philippines we have the so called "NCEE" National College Entrance Examination which screens the students who intend to go to higher technical courses after their secondary education. Only candidates with good marks are admitted by colleges to take up technical courses, while the students whose marks are not good enough are allowed to take vocational courses like agriculture, secretarial, midwifery or any other (2) two-year course that could also lead them to good paying jobs. In the case of the Academy I would like to propose the following:

a. Must be a Filipino citizen with a good moral character as certified by proper authorities.

b. Must be at least (17) seventeen years of age but not more than (22) twenty two years old.

c. Must meet the physical and medical requirements of the Academy for its midshipmen.

d. Must be a member of the upper 40% of the class in high school or any other colleges of origin.

e. Must acquire an "NCEE" mark of at least 75% in both Mathematics and English and an overall average of at least 80% in order to be admitted.

f. Candidates must pass the Academy's entrance examination conducted on various testing centers all over the country. This test is a competitive type of examination - a "quota" is maintained.

4.6 The Department of Research and Development

For the academy to maintain a constant contact with the fast changing trends in the maritime industry and shipping business, a department responsible for research and development programmes must exist continuously for the upliftment of the academy's functions and operations. In this manner, the Academy will know the demands of the maritime world and the current technological development especially in the maritime education and training systems.

4.7 The Implementation of the New System

This project will go directly to the office of the Head of the Department of Research and Development of the Academy for further analysis. With the permission of the President of the Academy, this paper will be

included in the agenda of the "Board Meeting" regularly conducted at the Academy premises. If the review of the members of the board would result into a favorable acceptance of the proposal, then this project will reach the proper authorities for its possible implementation. However, this project will remain as a useful reference for all the nautical institutions in the country intending to revise their education and training system based on international standards tested by several developed countries. If its implementation will not materialize very soon, still I consider it as a success coming up with what I believe is an updated curricular set-up for a maritime institution in the process of educating and training marine officers capable of meeting the needs of the maritime industry and shipping business to conduct safe transport of cargoes and render service all over the world.

4.7.1 Certification of the Graduates

The most important part of the implementation program is the certification of the graduates molded by this curricular set-up. The students graduating from this system will receive a Bachelor's Degree in Marine Transportation (BSMT) plus a Qualified Engine Officer Certificate (QEOC) which will allow them to stand on watch at the engine room if the type of the vessel requires such competence from the officers. This is not a duplication of the new "Polyvalent System" of maritime education and training, but rather a link or a transition phase from the conventional system to the new multi-purpose system of maritime education and training which produces the new polyvalent officers.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This paper has presented some developments in the maritime industry which are influencing the system of maritime education and training all over the world. A broader philosophy of maritime education and training schemes have been adopted by several maritime schools, and many are sailing to the direction of "polyvalent" system of education and training which according to many experts is one of the demands of the present trends in shipping. Because of the rapid advances in the maritime technology together with the requirements on safety by the International Maritime Organization (IMO) via STCW Convention "Standards of Training, Certification and Watchkeeping (1978) plus the "MARPOL" Convention (1972/1978) to protect the maritime environment against pollution from ships, different countries are now working on to produce marine officers up to the highest practicable standards set by the International Maritime Organization. But all the dreams and aspirations of every country could only be possible if there is stability in the political, social, cultural and economic structure of every nation. With the information and materials gathered for this paper, the author could draw some conclusions and recommendations to pave the way for the possible implementation of this humble project. The conclusions and recommendations are primarily the personal views and beliefs of the author and are not necessary applicable in all situations worldwide. The author is indeed aware of all the limitations he encountered

along the way during his preparation. However, the following conclusions and recommendations are quite obvious in our maritime industry all over the world.

1. Education and Training is Very Expensive.

It really requires a huge capital to invest in the latest facilities for the education and training of our seafarers. Facilities such as ship handling simulator, cargo handling simulator, or a bridge simulator with an average cost of about "Twenty Million US Dollars" each means so much money for a developing country like the Philippines. But, because of its vital role in the education and training of our seafarers, it is a must that "funds" for this purpose should be allocated by the government to upgrade the existing maritime schools in the Philippines. Schools have to produce ship's officers who are competent enough to serve various types of vessels used by the industry. We should work on the quality not on the quantity of our seafarers.

2. Crew Reduction is now the Existing Trend

The new ships are notable for their homogenous crew structure. The separation between deck and engine department has been abolished. Being an extremely technological task, operating a ship today calls for all- around thinking of a kind which transcends sectional boundaries. The smaller that crew become, the greater the value of each individual member and the importance accorded to his training and his involvement in responsibility for the ship. This represents the challenge in devising a crew structure for ships of the

new generation. Managers especially in the manning department of every shipping company are exhausting all means and possibilities to lessen the number of personnel working onboardship for economic reasons and for the application of current technological advancement. This means that the crew being employed are "high caliber" employees whose knowledge and education could satisfy the standards of the existing trade. To meet that standard, maritime schools will always be on the move to up-date or up-grade their systems continuously.

3. Schools Must Always Have Qualified Teaching Staff.

Faculty development programmes must be implemented because further training of the trainers is one of the imperative factors a school has to deal with properly to improve the knowledge and expertise of every instructor involved in the training process. But qualified teachers or professors will never stay for good if the salary and other incentives remains under the poverty level. Many experienced officers like masters and chief engineers will eventually look for other jobs ashore after years of sailing. These are the kind of people rich with experiences and practical knowledge capable of molding the new breed of officers for the next generation and for the ships of the future. Hiring these officers is an investment not just an ordinary expenditure. We also have people trained abroad to handle such specialized education and training for our seafarers. The constraint is that, some institutions are reluctant in injecting major changes in the existing system of education.

4. Recruitment, Examination, Selection of Entrants and Later on - Proper Assessment of the Students

The people responsible in this aspect shall have good credibility for an effective, efficient and fair operation of every institution. No matter how high is the qualification of the teachers set by the schools, if the entrance level for the students is low, then there would be a so called "overdosed" which is completely a waste of time, money and effort. Good officers are coming from good cadets and good cadets are the products of good evaluation and assessment within a good education and training programme.

5. The Scheme of Maritime Education and Training System Must Enable the Graduates to Find Suitable Employment

Maritime curricula should not only be restricted in producing ship's personnel limited to shipboard jobs but a combination of chances to work at sea or ashore in any other field of maritime related industries. An integration of the maritime education and training system together with the national structure of education should be achieved in order to provide more flexibility and mobility for seafarers. All of these factors are dependent of the concern & enthusiasm of the governmental bodies & policies controlling these issues. Many intelligent students refrain from taking maritime related courses due to the fact that maritime education and training offers limited alternatives for employment unlike "business" or "engineering" courses which are acceptable in almost all commercial fields.

6. Future "STCW"- Standard of Training, Certification and Watchkeeping for seafarers requirements.

The future "STCW" requirements will always affect the system of maritime education and training all over the world. This "IMO" convention will eventually and indirectly dictate the practicable standard worldwide. Every requirement that the convention will ask for will be on a "do or die" basis like the "ROC", "RSC" and the "ARPA" certification. Therefore, the maritime schools should look into these needs of the future seafarers so as to prepare them the way they should be prepared.

7. Technological Developments as Trend Setters

Whether we like it or not, the technological developments tend to set the trends and pace in the industry from time to time. If the maritime schools in the Philippines could not live up to the standard and expectations of the shipping companies of the developed countries where most of our seafarers are going, then the demand for the Filipino seafarers will surely drop dramatically. Our neighboring countries are on their toes expending all their resources to upgrade and update their educational system to cope up to the fast coming developments in the maritime industry.

8. The Maritime Industry, the Shipping Business and the Maritime Schools are growing or dying because of government's policies and intervention.

Few years ago, the government of Malaysia made a very strong move to support its maritime colleges,

seafarers, shipowners and shipping companies, by imposing "no tax" to any sort of income coming from shipping industry in general. The said move came like a "Big Bang" in the entire region, thus encouraging a voluntary growth in their national fleet and echoed a strong demand to upgrade the standard of maritime education and training system within the region. The Philippines being a big maritime nation should also look into possibilities of making ways and means easier to the people involved in the maritime industry and shipping business and to support the maritime education and training system of the country which is the primary root of the maritime industry as a whole.

9. Cooperation Between the Government, Shipping Companies and Maritime Schools.

Education and training of future ship officers is not the sole responsibility of every nautical school. The Administration - (Ministry of Transport & The Ministry of Education), all Shipping Companies and all Maritime Institutions must cooperate in order to attain the optimum level of professional standard for the country's seafarers. Now is the time for maritime schools to be active, aggressive and resourceful in order to create a good relationship between the concern government offices, shipping companies and maritime schools all over the country. Education and training system is a national concern and should be dealt with accordingly with the support of the national and local government agencies in order to achieve a common objective. The government officials should realize that the maritime industry plays a major role in the

economy of every country most especially in the case of the Philippines. Without the necessary funds coming from the government, a public school like the academy will never have a successful operation.

10. Changes must always be welcome even if it will cause pain and frustration to the old traditional system of maritime education and training in the Philippines.

The main reason why development is slower in some regions in Asia is due to the strong resistance to change. The realization of every goal and objective does not come in a silver platter. We have to pay for the costs and sacrifice our old practices which are already obsolete. It takes a lot of time, money, effort and real dedication and commitment by all parties involved in the process. If we will not accept the changes that time is offering us, then it will be forever impossible for us to achieve our objectives and our goals. "Patience and determination in carrying out the task is the real key to success in any field of endeavour".

After thorough analysis of the present situation and a careful study of the future demands, this project came into being. Its implementation is not the total solution or answer to all the problems we are obviously experiencing at present. However, it will serve as the necessary cushion and stepping stone towards a better maritime education and training system which is indeed competitive not only in Asia but also to the North American and European standards.

BIBLIOGRAPHY

1. ADAMSON, LEE — Ocean Voice Magazine - William Caple and Company Limited United Kingdom - 1989 to 1991
2. BALDING, JOHN — Health Education - World Yearbook of Education 1989. Nichols Publishing Company New York - 1989
3. BANKS, STEPHEN — Control Systems Engineering Prentice Hall International Limited - United Kingdom 1986
4. BELL, CHRIS — Assessment and Evaluation - World Yearbook of Education 1990. Nichols Publishing Company - New York 19902.
5. BLOOM, BENJAMIN — Taxonomy of Educational Objectives Book 2 "The Affective Domain". Longman Group Limited - London 1973.
6. BOLE * NICHOLLS — The Navigation Control Manual The Redwood Burn Limited - Great Britain 1987.
7. BRADY, ROBERT — Diesel Fuel System - Reston Publishing Company - Reston Virginia 1981.
8. BROCKETT * BOCK — Elements of Applied Thermo - dynamics by Naval Institute Press - Maryland 1982 4th Ed.
9. CENTRA, JOHN — Determining Faculty Effectiveness - Jossey/Bass Publisher, San Francisco 1982.

10. CLEARMAN, BRIAN International Marine Aids to Navigation 2nd Edition. Mount Angel Abbey Ltd. Oregon - 1988

11. COCKCROFT, A. N. Guide to Collision Avoidance Rules 4th Edition - Billing & Sons Ltd. United Kingdom 1990.

12. COMMAND OF THE DEFENSE COUNCIL Admiralty Manual of Navigation Volume 1 - Her Majesty's Stationary Office - United Kingdom 1987.

13. COMMAND OF THE DEFENSE COUNCIL Admiralty Manual of Seamanship Volumes 1, 2 & 3 - Her Majesty's Stationary Office - United Kingdom 1979-1981-1983

14. COOLEN, EDWARD Nicholls' Concise Guide to Navigation Volume 1 - Brown, Son & Perguson Limited - Nautical Publishers Inc. United Kingdom 1987.

15. DAGEL, JOHN Diesel Engine Repair - John Willey and Sons Incorporated New York 1982.

16. DEBATISTA * GASKELL Chorley and Giles' Shipping Law 8th Edition - Pitman Publishing 1988.

17. DERRETT, D. R. Ship Stability for Masters and Mates 4th Edition - Billing & Sons Ltd. United Kingdom 1990

18. ENTWISTLE, NOEL Handbook of Educational Ideas and Practice - Routledge - New York 1990.

19. EYRES, D. J. Ship Construction 3rd Edition The Heinemann Professional Publishing Ltd. - London 1988.

20. HARBOR, ROYCE Feedback Control Systems - Prentice Hall International Limited - United Kingdom 1988.

21. HARRIS, DUNCAN Education for the New Technologies - World Yearbook of Education 1988 - Nichols Publishing Company - New York.

22. HAYLER, WILLIAM Merchant Marine Officers' Handbook 4th Edition - Cornell Maritime Press - Maryland 1989

23. HAYLER, WILLIAM American Merchant Seaman's Manual 6th Edition - Cornell Maritime Press - Maryland 1982

24. HENER, CHRISTOPHER Fairplay Magazine issues of 1989 to 1991 - Fairplay Publications Limited United Kingdom.

25. HOYLE, ERIC The Management of Schools - World Yearbook of Education - 1986. The Nichols Publishing Company - New York.

26. INTERNATIONAL MARITIME ORGANIZATION International Code of Signals G. Beard and Son Limited United Kingdom 1985.

27. INTERNATIONAL MARITIME ORGANIZATION - BOOKS ON - Conventions on the "SOLAS" 1983; "MARPOL" 1978; "STCW" 1979; Search & Rescue 1979; Model Courses - "IMO" London.

28. KEMP, JOHN — Reed's Ocean Navigator 3rd Ed. Thomas Reed Publication Ltd. United Kingdom 1977.

29. KERCHOVE, RENE de — The International Maritime Dictionary 2nd Edition - Van Nostrand Company Incorporated New York 1961.

30. KINGSLEY, JEREMY — Handbook on P & I Insurance 3rd Edition - New Interlitho SPA - 1988.

31. KUO, BENJAMIN — Automatic Control Systems 5th Edition - Prentice Hall Int'l Ltd. - United Kingdom - 1987.

32. LILLY, L. R. C. — Diesel Engine Reference Book Butterworth & Co. Ltd. - United Kingdom - 1984.

33. MOCATTA, SIR ALLAN — Charter Parties and Bills of Lading 19th Edition - Sweet & Maxwell - London 1984.

34. NISBET, STANLEY — Research, Policy and Practice World Yearbook of Education Nichols Publishing Company - New York 1985.

35. ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT — "Educational Planning" A Re-appraisal - Paris 1983.

36. PACK, MARIAN — College, Learning & Libraries The Future - Clive Bingley Limited - London 1986.

37. PRATT, DAVID — The "Curriculum Design and Development" - Harcourt Brace Jovanovich Publishers - New York 1990.

38. RUDOLF, FREDRICK Curriculum - Jossey and Bass Publishers - San Francisco, California 1987.

39. SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS Marine Technology Magazines Volumes 26, 27 & 28; and The Principle of Naval Architecture - SNAME - 1986 Society of Naval Architects And Marine Engineers - 601 Pavonia Avenue, Jersy City New Jersey 07306.

40. SONNENBERG, G. J. Radar & Electronic Navigation Butterworth and Company Ltd. 6th Edition - United Kingdom 1989.

41. STEPHENS, MICHAEL International Organizations In Education - Routledge - New York 1988.

42. STOPFORD, MARTIN Maritime Economics - The Unwin Hyman Limited - United Kingdom 1988.

43. TAYLOR, D. A. The "Dictionary of Marine Technology" - Butterworth and Company Limited - United Kingdom 1989.

44. TANTER, LAUREL The "History of the School Curriculum" - Mac Millan Publishing Company - New York 1990.

45. TETLEY, WILLIAM Maritime Liens and Claims 1st Edition - Business Law Communication Ltd. - London 1985.

46. THE INSTITUTE OF NAVIGATION

Navigation Journal - issues of 1989 to 1991 - Institute of Navigation, Suite 104 - 1026 16th Street, N. W. Washington D. C. 20036.

47. THE NAUTICAL INSTITUTE

Seminar on: The Practice of Maritime Education & Training In Europe and the new "IMO" Requirements. Amsterdam from June 5 - 6, 1980.
Organized by: The Nautical Institute; The Institute of Marine Engineers and by the International Association of Marine Lecturers.

48. THE ROYAL INSTITUTE OF NAVIGATION

The Navigation News -issues of 1989 to 1991; The Journal of Navigation issues of 1989 to 1991; Land Navigation and Location for Mobile Applications 1985 Conference; 1 Kesington Gore, London SW7-2AT, United Kingdom.

LIST OF ACRONYMS

AB	Able Bodied Seaman
AC	Alternating Current
ACL	Atlantic Container Liner
ACSE	Automatic Container Stocking Equipment
ACAD	Automatic Computer Aided Drafting
ACS	Access and Control System
ACU	Automatic Calling Unit
ACV	Air Cushion Vessel
A/D	Analog/Digital Converter
ADE	Above Deck Equipment
ADP	Automatic Data Processing
AFC	Automatic Frequency Control
AFP	Armed Forces of the Philippines
AGC	Automatic Gain Control
AI	Artificial Intelligence
ALC	Automatic Level Control
ALGOL	Algorithmic Language
AM	Amplitude Modulation
AMVER	Automatic Mutual-assistance Vessel Rescue
APC	Adaptive Predictive Coding
ARPA	Automatic Radar Plotting Aid
ASCII	American Standard Code for Information Interchange
ASEAN	Association of South East Asian Nations
AVD	Alternate Voice Data
BCD	Binary Coded Decimals
BDE	Below Deck Equipment

BER	Bit Error Rate
BS	Bachelor of Science
BTU	British Thermal Units
BW	Brackish Water
CBA	Cost Benefit Analysis
CCC	Customs Cooperation Council
CCS	Common Channel Signalling
CDMA	Code Division Multiple Access
CES	Coast Earth Station
CFI	Cost Freight Insurance
CHE	Cargo Handling Equipment
CPU	Central Processing Unit
CRT	Cathode Ray Tube
DC	Direct Current
DCMT	Department of Citizens' Military Training
DECS	Department of Education, Culture and Sports
DMI	Danish Maritime Institute
DSS	Double Skin Ships
DW	Dead Weight
DOTC	Department of Transportation and Communication
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display Information System
EDI	Electronic Data Interchange
EDS	Expert Diagnostic System
EGC	Enhanced Group Calls
ELS	Expert Loading System
ELT	Emergency Locator Transmitter
EMS	Expert Maintenance System
EPA	Environmental Protection Agency

EPIRB	Emergency Position Indicating Radio Beacon
EROM	Erasable Read Only Memory
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
EVP	Expert Voyage Pilot
FFL	Free Fall Lifeboat
FM	Frequency Modulation
FOC	Flag of Convenience
FOB	Free On Board
GMDSS	Global Maritime Distress and Safety System
GMT	Greenwich Mean Time
GNP	Gross National Product
GP	General Purpose
GPS	Global Positioning System
GRT	Gross Registered Tons
HA	Apparent Altitude
HO	Observed Altitude
HPA	High Power Amplifier
IAEA	International Atomic Energy Agency
IALA	International Association of Lighthouse Authorities
IAPH	International Association of Ports and Harbors
IAT	International Atomic Time
IATA	International Air Transport Association
IC	Integrated Circuit
ICAO	International Civil Aviation Organization
ICC	International Chamber of Commerce
ICS	International Chamber of Shipping

ID	Ship's Station Identification
IDD	International Direct Dialing
IDL	International Date Line
IF	Intermediate Frequency
IGOSS	Integrated Global Ocean Station System
IHO	International Hydrographic Office
ILO	International Labor Organization
IMDG	International Maritime Dangerous Goods "IMDG CODE"
IMF	International Monetary Fund
IMO	International Maritime Organization
INMARSAT	International Maritime Satellite Organization
INSA	International Shipowners Association
INS	International Network Services
I/O	Input/Output
ISCC	International Service Coordination Center
ISF	International Shipping Federation
ISD	International Subscriber Dialing
ISO	International Standardization Organization
ITA	International Telegraph Alphabet
ITE	International Telephone Exchange
ITOFAR	Interrogated Time Offset Frequency Agile Reacon
JICA	Japanese International Cooperation Agency
KBSSHIP	Knowledge Based System Ship
KC	Keel Clearance
KNOT	Nautical Mile Per Hour

LASER	Light Amplifier by Stimulated Emission of Radiation
LAT	Local Apparent Time
LC	Loading Computers
LHA	Local Hour Angle
LHC	Liquified Hydrogen Carrier
LMSS	Land Mobile Satellite Services
LMT	Local Mean Time
LNA	Low Noise Amplifier
LORAN	Long Range Navigation System
LOS	Law of the Sea
LPDT	Low Power Distress Transmitter
LSB	Least Significant Bit
MARINA	Maritime Industry Authority
MARPOL	Marine Pollution (Convention for the Prevention of Marine Pollution from Ships)
MCS	Maritime Communication Subsystem
MEPC	Marine Environment Protection Committee
MET	Maritime Education and Training
MHz	megaHertz
MIFR	Master International Frequency Register
MIPS	Million Instructions Per Second
MMSS	Maritime Mobile Satellite Services
MSB	Most Significant Bit
MSC	Maritime Safety Committee
MSI	Maritime Safety Information
MTP	Maritime Technical Panel
NASA	National Aeronautical and Space Administration
NCC	National Coordinating Center

NCEE	National College Entrance Examination
NCS	Network Coordination Stations
NES	National Education System
NMP	National Maritime Polytechnic
NPV	Net Present Value
NROTC	Naval Reserved Officers' Training Course
NTC	National Training Center
OBO	Oil Bulk Ore Carrier
OCC	Operation Control Center
OMB	One Man Bridge
OPEC	Organization of Petroleum Exporting Countries
OSC	On-Scene Commander
OS	Own Ship
OT	Over Time
OVS	Operation Video Screen
OW	Officer of the Watch
OWWA	Overseas Workers Welfare Administration
PCC	Pure Car Carrier
PCG	Philippine Coast Guard
PCS	Philippine Chamber of Shipping
PCTC	Pure Car & Truck Carrier
PDV	Power Driven Vessel
PMMA	Philippine Merchant Marine Academy
PMMR	Philippine Merchant Marine Rules
POEA	Philippine Overseas Employment Administration
PPA	Philippine Ports Authority
PRC	Professional Regulation Commission
PROM	Programmable Read Only Memory

PST	Pacific Standard Time
QA	Quarantine Anchorage
QF1	Quick Flashing
QM	Quarter Master
RAM	Random Access Memory
RF	Radio Frequency
RCC	Rescue Coordination Center
RDF	Radio Direction Finder
R&D	Research & Development
ROC	Radar Observer Course
ROCES	Receive Only Coast Earth Station
ROI	Return of Investment
ROM	Read Only Memory
RSC	Radar Simulator Course
RSS	Root Sum of Squares
RR	Radar Reflector
SAR	Search and Rescue
SARSAT	Search and Rescue Satellite System
SCC	Satellite Control Center
SCPC	Single Channel Per Carrier
SES	Ship Earth Station
SF	Single Frequency
SOP	Standard Operating Procedures
SOLAS	Safety of Life at Sea
SOS	Save Our Souls
SSB	Single Side Band
SSS	Semi-Submersible Ship
STCW	Standard of Training, Certification and Watchkeeping
TDMA	Time Division Multiple Access
TDM	Time Division Multiplex
TES	Transportable Earth Station
TPI	Tons Per inch of Immersion

UNCTAD	United Nation Convention on Trade and Development
UNDP	United Nation Development Programme
UTC	Coordinated Universal Time
VDU	Visual Display Unit
VHF	Very High Frequency
VHSD	Very High Speed Data
VTS	Vessel Traffic System
WARC	World Administrative Radio Conference
WMO	World Meteorological Organization
WMU	World Maritime University

TO MY FELLOW SEAFARERS,

MAY YOU ALWAYS FIND THE BEAUTY THAT LIES BENEATH THE SEA THAT TAKES YOU AWAY FROM YOUR FAMILY... AND THE TREASURE THAT ROAMS AMIDST THE FOAM WHICH DRAWS YOU FAR AWAY FROM HOME...

WHEN THE WAVES ARE HIGH AND THE SKY IS DARK LET YOUR FAITH LEAD YOU TO YOUR DESTINATION... ALWAYS REMEMBER THAT SAILORS NEVER DIE... THEY JUST FADE AWAY...