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Specialized training courses with particular reference to the present offer in Mexico

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SPECIALIZED TRAINING COURSES WITH PARTICULAR REFERENCE TO THE PRESENT OFFER IN MEXICO AND ITS POSSIBLE IMPROVEMENT

by
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Mexico

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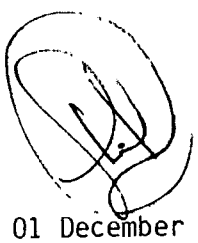
The contents of this paper reflect my personal views and are not necessarily endorsed by the UNIVERSITY.

Signature: 

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ABSTRACT

This paper deals with the development of advanced maritime training through of the implementation of specialized training courses. The content has been divided into five chapters.

Chapter one gives an introduction to the actual situation in the maritime field regarding the importance of specialized training.

Chapter two describes in an international perspective, the policy as regards specialized training courses for shipboard personnel.

Chapter three deals with the framework of the Mexican maritime education system, including an overview of the development of the department of specialized training courses.

Chapter four gives full information of the courses conducted at the Mexican maritime academies.

Chapter five establishes recommendations and specifications needed for the implementation of the courses proposed herein.

TABLE OF CONTENTS

CHAPTER IV

CHAPTER V

LIST OF TABLES AND FIGURES

TABLES PAGE

FIGURES

CHAPTER I

INTRODUCTION

Historically, shipping has always been, and still is one of the world's important industries. Maritime transport has been changing over the past two decades, at first the rate was slow, but over the past decade this change has been faster.

Today as a result of advanced technology, shipboard equipment has been introduced in the shipbuilding industry, leading a.o. to the existence of very specialized ships. Advanced offers in maritime education and training such as specialized training courses have been developed.

This paper pays attention to the development of such courses because they are a fundamental requirement for the improvement in standards of maritime personnel. Moreover, while wider will be the knowledge and greater the number of skills acquired during such specialized training, ships officers will become

capable to man ships in an economical and safe manner.

Governments, shipowners and seafarers have become conscious of these training needs through the work of the IMO as outlined in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW Convention). This very important convention provides on an international scale minimum standards for seafarers in theoretical knowledge, in practical knowledge linked to professional experience and in specialized training required for the certification.

To achieve this, maritime centers for education and training of seafarers will need to be flexible in their operations, innovative in their concepts, dynamic in their motivation and most of all, supportive of the maritime industry they intend to serve.

This paper tries to give much thought to progressive training for shipboard officers and includes the description of courses in Mexico and basic information on courses developed in this field by maritime institutions in different countries around the world.

Also included in this paper are suggestions for further research aimed at maintaining a gradual improvement in standards, effectiveness and efficiency of specialized training.

To accomplish the objectives of this paper the method of research used included interviews with officials at maritime institutions of the various countries

visited; lectures received at the World Maritime University; observations made at numerous maritime institutions and the valuable information and data collected by means of library research.

CHAPTER II

THE ROLE OF SPECIALIZED COURSES IN TRAINING OF SHIPBOARD PERSONNEL

Changing technology requires specialized training courses for shipboard personnel in every discipline in order to update constantly the ways in which they work and the techniques they use.

In attempting to define the training requirements and to identify the most appropriate methods for the development of specialized courses, it is necessary to examine and to determine the different factors affecting the international shipping industry, as follows:

- modern technology in shipboard equipment
- safety on board ships
- protection of the marine environment

As regards modern technology in shipboard equipment developed by the shipbuilding industry, it is clear that new ships require more attention for ergonomic principles in their design to provide for safe and efficient operation. Such vessels are being increasingly introduced in the shipping industry and appropriate procedures are also being developed in order to make the ship operation more functional. Moreover, in the

analysis of ship operation it is important to note the following trends of development:

- increased automation through the use of micro-computers, electronic control equipment and their associated hardware/software

- increased use of "ship operation teams" composed of the minimum number of crew

- increased use of bivalent certificates with which officers are allowed to work part-time in the deck and part-time in the engine department

It is necessary that specialized courses become oriented to these developments in ship operation. Such courses and expertise are going to have a valuable influence on shipboard operations, the work in shipping companies, ports, and other sectors of the maritime industry.

Safety on board is the second factor in the development of shipping which establishes an increased need for specialized training. This approach becomes linked to specialized training courses due to the fact that a high percentage of maritime accidents have resulted from human failure. Investigations show that 75 % or more of maritime accidents involving loss of life and property are caused not only by a single failure, but also by a combination of causes. Technical insufficiencies besides human failure may also play a significant role. However, human involvement in the development of accidents has to be carefully noted.

Maritime accidents can be divided into four main categories:

1. collision
2. fire and explosion
3. damage due to adverse weather conditions
4. grounding/stranding

Then, endeavours aiming at the reduction of all those accidents above mentioned, must take the human contribution to safety or lack of safety of ships into consideration. Thus, specialized training courses are of the greatest importance as an answer to unsafe shipping; the solutions are provided in their programs which give priority to the appropriate safety relevant subjects.

Finally, the third important factor is the protection of the marine environment. Pollution of the world's oceans has become a matter of increasing international concern.

Most of the marine pollution comes from land-based sources, however, a very significant amount of it is caused by shipping and maritime activities. The substances involved vary in quantities transported and their potential harm to the marine environment.

Among the different types of marine pollutants concerning shipping activity are found the following:

- crude oil
- chemical products

- noxious substances in packaged form
- harmful substances in solid form
- garbage and sewage

Particularly oil has been in the focus of this problem due to the big disasters caused by the great amount of this product spilled in the oceans. Similarly all the above mentioned pollutants can cause serious environmental damage as well as damage to resources such as fisheries and tourism for long periods.

The measures evolved by IMO in the field of environmental protection are normally contained in international treaties which enable maritime nations to prevent and control pollution from ships. In addition to IMO conventions, codes and recommendations; specialized courses in this field help to strengthen the provision of effective programs designed as the best long-term solution to the shortage of skilled manpower.

2.1 GENERAL ASPECTS

Specialized training courses need to provide a properly planned course of study for shipboard personnel for coping with the new training and qualification requirements concerning the shipping industry and world trade in general.

This progressive training can be divided into two classes depending on the nature of the objective:

- updating courses
- refresher courses

Updating courses relate to the growing specialization in shipping and training needs required now and in the future.

Certain specialized knowledge and capabilities have in many cases to be taught to a restricted number of seafaring personnel only. The ideal of a single certificate of competency may then be frayed out by specialized certificates which have to be issued in addition.

The refresher courses have become necessary because after some period, officers have to re-develop qualifications which are of great relevance to safety.

Both, updating and refresher courses which involve innovation and repetition aspects respectively, together with the concept of safety, place considerable importance on the identification, elaboration and implementation of appropriate training courses.

2.1.1 Elements of a specialized training course

First of all it is necessary to recognize the need for a specialized training course which will serve to develop further steps in the process of development and implementation of such courses.

Needs may result from the introduction of technically

sophisticated ships or from certain types of casualties and often by a combination of both.

Once the need is recognized as well as analysed and a decision is made for the implementation of a new course, design and elaboration have to be initiated. The following steps are within such process:

- preliminary framework
- aims and objectives
- participants: entrance qualifications, number per course
- course contents, syllabus and course plan
- course duration, lecture hours and laboratory hours
- teaching methods, aids and facilities, laboratories, equipment and simulators
- course material and textbooks
- field trips to special facilities
- number of trainers, desired qualifications, academic and professional minimum experience
- cost per participant per course
- initial trial courses
- regular courses
- course evaluation and continued updating

A group of experts should be identified at the design stage of the course and they should be assigned the following tasks:

- designing the course
- selecting and training the trainers

- developing the course material including audio-visual aids, tests, etc., together with the trainers
- checking, evaluating and updating the course at regular interval

2.1.2 Specialized training courses of the STCW Convention

The 1978 STCW Convention calls implicity or explicity, in a mandatory or recommendatory form for the development of refresher and updating courses for masters, deck officers, engineer officers and radio officers. During the seventeenth session of the IMO 's Sub-committee on Standards of Training and Watchkeeping, a list of, "Model Specialized Courses for Selective Offering", was given in the Annex to paper 17/9. This list of courses is reproduced at table 1 on page 11.

2.2 CATEGORIZATION OF SPECIALIZED TRAINING COURSES

A specialized training course is normally directed towards a specific objective. The advantage of such approach is the provision for training in one single topic focused to a specific field. Arrangements should be made to enable all persons concerned to attend such courses as relevant to their expertise and duties. Once the subject of the course has been identified it is important to determine the categorization for the specialized training courses in a precise form.

TABLE 1

LIST OF MODEL SPECIALIZED TRAINING COURSES

Subject	Attendance	Level	Remarks
1. Dangerous and hazardous cargoes (other than special requirements for oil, chemical and liquefied gas tankers)	ap/cs (1)	advanced	STCW Conference Resolution 13 Assembly Resolutions A.537 (XIII) and A.437 (XI)
2. Bridge Team Training and Passage Planning	cp/cs	advanced	STCW Regulation II/1, 6 (A) STCW Conference Resolutions 17, 18 and 20)
3. Specialized Oil, Chemical and Liquefied Gas	cp/cs	familiarization	STCW Convention Chapter V Resolutions 10 11 and 12
	cp/cs	advanced	Resolution 16 Assembly Resolutions A.286 (VIII) and A.437 (XI)

(1) see note on page 13

Subject	Attendance	Level	Remarks
4. Human Relation-ships	cp/as (1)	advanced	STW Conference Resolution 22
5. Shiphandling Simulator	cp/as	advanced	STW Conference Resolution 17
6. Radar Simulator Training	cp/as	advanced	STW Conference Resolutions 1 & 18, Assembly Res.A.483(XII)
7. Automatic Radar Plotting Aids (ARPA)	cp/cs	advanced	STW Conference Resolution 20 Assembly Res.A.482(XII) Use of simulator included
8. Radio/Electronic Equipment Maintenance	cp/as	advanced	STW Conference Resolution 14 Part II. Course may include use of simulator
9. Medical Care	cp/as	advanced	IMO Resolution A. 438 (XI)

(1) see note on page 13

Subject	Attendance	Level	Remarks
10. Electronics	cp/as	advanced	Course may include use of simulator
11. Control Engineering and Automation	cp/as	advanced	Course may include use of simulator
12. Fuel Combustion and Plant Efficiency	cp/as	advanced	for engineer officers
13. Planned Maintenace for Machinery Installations	cp/as	advanced	for engineer officers
14. Engineering Department Financial, Technical and Personnel Management	cp/as	advanced	for engineer officers

Note: cp = certain personnel
ap = all personnel
cs = certain ships
as = all ships

Categorization, therefore is to serve with regards to:

- addressees
- types of ships
- main ship activities

The purpose of such categorization is of great importance because the courses may have to be designed to:

- all officers in all ships
- certain officers with special responsibility on all ships
- certain officers in special ships only

The combination all personnel/all ships will only apply for courses whose contents could alternatively be an integral part of a syllabus leading to a certain certificate, but dealt with separately because they are connected to a central location and combination of equipment.

Specialized training courses may not only be for seagoing personnel, but also for former seafarers who are working in shore-based positions such as technical and managerial personnel.

That personnel generally is employed in areas which require the need for such specialized training, being the most common the following areas:

- marine insurance
- canal and harbor pilotage
- maritime education and training

- naval architecture
- shipbuilding
- port authorities
- admiralty law
- oceanography
- salvage
- marine surveying
- stevedoring and port operations
- brokerage, etc.

Four categories can be formed with respect to main ship activities:

- navigation category
- transport and handling of cargo category
- marine engineering category
- miscellaneous

Within such categories, a wide range of countries have developed specialized training courses with the purpose to cover subjects which are normally not included in basic training or which require special equipment or facilities.

A broad guide to what is available at the present is listed in the following. No attempt has been made to describe detailed syllabus contents or course arrangements.

2.2.1 Navigation Category

Course	Remarks
1. Automatic Radar plotting aids (ARPA)	advanced navigation and ARPA simulator
2. Radar simulator	
3. Shiphandling simulator	
4. Electronic Navigational systems	
5. Navigational procedures	bridge team training
6. Radar maintenance	
7. Dynamic position simulator	possibilities: operator course, system course, info course
8. Satellite communication	
9. Emergency procedures	evaluation of alternative strategies in emergency situations
10. Shiphandling with manned model	training using manned ship models
11. Marine electronics	
12. Maritime satellite training	including operation and maintenance
13. Compass compensation	restricted and full

14. Gyro, autopilot and satellite communication system maintenance

2.2.2 Marine Engineering Category

Course	Remarks
15. Engine room simulator	possibilities: -electronic and automation -industrial logic systems and micro data processing -slow and medium speed diesel engines
16. Diesel training	-for chief engineers
17. Electronics for engineers	-course divided in three levels (I,II,III)
18. Control engineering	
19. Instrumentation and control	
20. Computer applications for engineers	
21. Electrical familiarization for engineer officers	
22. Marine welding	

23. Welding techniques	-oxy-acetylene and electric arc welding
24. Welding appreciation	
25. Materials and materials testing	
26. Oil fuel economy	
27. Fuel control	
28. Marine fuel oils	
29. Marine engineer officers/ chief engineer	

2.2.3 Transport and Handling of Cargo Category

Course	Remarks
30. Oil safety	variations: -familiarization and advanced -chief mate and master -officers with specific cargo duties -officers with immediate cargo-handling responsibilities -combined with COW -spill control, fire-fighting -ships over 20,000 dwt. -ships under 20,000 dwt.
31. Chemical tanker safety	variations: -familiarization and advanced -chief mate and master

	-officers with specific cargo duties and responsibilities -officers with immediate cargo-handling responsibilities
	-spill control/fire-fighting
32. Liquefied gas tanker safety (LPG)	variations: -chief mate and master -officers with specific cargo duties and responsibilities -officers with immediate cargo-handling responsibilities
33. Crude oil washing (COW)	
34. Inert gas systems	
35. Loading, discharging and traffic operations for shore personnel	-tanker terminal
36. Jetty operations	-tanker terminal
37. Tanker simulator	-familiarization and advanced
38. Load on top	
39. Cargo handling simulator	possibilities: -oil, chemical and liquefied gas

40.	Packaged dangerous goods	-focused on basic hazard and safety procedures required for the carriage of hazardous cargo
41.	Container handling	variation: -for hazardous cargo in freight containers
42.	Cargo stability	
43.	Cargo techniques, longitudinal strength	
44.	Cargo port operations	
45.	Cargo port supervision	
46.	Cargo handling in roll-on/roll-off ships	-for the carriage of hazardous cargo
47.	Sea transportation of coal	
48.	Sea transportation of dry hazardous cargoes in bulk	

2.2.4 Miscellaneous

	Course	Remarks
49.	Fire-fighting prevention and control	-basic/advanced
50.	Medical care	-beyond basic first aid
51.	Ship's health supervisor	

52.	Ship masters medical	
53.	Emergency medical training	
54.	Marine emergency duties	
55.	Management	
56.	Using micro processing for ship efficiency	
57.	Data processing in shipping	
58.	Master and shipping	
59.	Shipboard -use of micro-computers	
60.	Ship management	
61.	Port and shipping management	
62.	Marine information management systems	
63.	Shipboard safety officers	-for officers responsible for health and safety on board ships
64.	Radio room management	
65.	Marine control	
66.	General radio-telephony	
67.	Marine telex	
68.	Offshore communications	
69.	Satellite communications	
70.	Radio-telephony	-restricted communi-cations
71.	Marine radio-general certificate conversion	-for holders of second class certificate in radiotelephony

72. Semi-submersible stability	
73. Dynamic positioning	
74. Leading personnel /semi-submersible	variations: -for stability supervision -for technical supervision -for control room supervision
75. Rescue at sea	
76. Survival at sea	
77. Survival craft	-proficiency course
78. Combined basic offshore	-survival, fire fighting and first aids
79. Offshore survival	-for rig personnel and vessels
80. Safety and survival modules	-for marine and stand by vessel personnel
81. Enclosed spaces	-safety and rescue procedures
82. Evaluation of tank atmospheres and entry procedures	

2.3 TEACHING AIDS

The purpose of teaching to bring about a decisive change in the trainee's behavior. This change is normally achieved by the instructors employing a specific teaching strategy so as to accomplish his objectives. Training methods are generally supported with teaching aids in order to increase the impressiveness of the presentation.

Teaching aids are any physical devices used by the instructor as an added means of communication to help trainees learn. They are used in conjunction with instruction when explaining a principle, demonstrating an operation or providing trainees with practical exercises in certain skills.

Their selection depends upon the theoretical learning objectives that are to be realized and the structural properties of the task.

An important approach carries the basic assumption that complete learning can only come from those teaching materials and equipment which represent reality most closely.

Generally, teaching aids have five properties:

1. the ability to help promote perception
2. the ability to help promote understanding
3. the ability to help promote transfer of training

4. the ability to provide reinforcement of knowledge of results
5. the ability to help retention

In many countries at present there is substantial emphasis on practical training in specialized courses, where this training forms an integral part of the maritime training scheme.

This practical training is carried out with the support of teaching aids and training facilities such as laboratories, practical workshops and special marine simulators.

On the other hand, visits and field trips, on the basis that they provide reality, properly occupy a prominent position in many educational and training programs. They offer an advantage because trainees are given the opportunity of making use of existing maritime facilities such as ships in ports, shipyards, engineering workshops, port installations, and other establishments performing operations related to the shipping industry. Consequently it can be observed that teaching aids introduced in specialized courses have improved the efficiency of training giving as a result an easier understanding and fuller retention by the trainee as well as producing more competent seafarers.

2.3.1 Teaching Equipment and Materials

There are a variety of teaching equipment and materials on the market. Some of them are very complicated and

others are quite simple to operate.

From the point of view of classroom utilization teaching equipment and materials can be classified into four categories on the basis of their function:

1. simple visual aids
2. three dimensional models
3. audio aids
4. audio visual aids

2.3.1.1 Simple visual aids

Simple visual aids which include materials and equipment are inexpensive, often simple to use, and above all, clear and impressive in their presentation. Visual presentations are generally preferable to purely verbal ones because their use consolidates what instructors have already taught.

Simple visual aids are listed below:

- chalk and blackboard
- felt or flannel boards
- magnetic boards
- newsprint pad
- picture or flash cards
- photographs
- wall charts, posters, teaching charts, diagrams illustrations
- exhibitions and displays
- overhead projector
- slide projector

- episcope
- epidiascope
- wall screens

The use of such material and equipment stresses the power of the learning process, re-emphasizing their advantages over the words.

2.3.1.2 Three-dimensional models

Three-dimensional models are usually the show pieces of most audiovisual aid exhibitions, where they normally attract a great deal of interest and attention.

They include such visual aids as mock-ups, cutaway models, full-size copies and scale models. Often, they are extremely expensive to manufacture or purchase. Their advantages are small in relation to their overall cost, however, three-dimensional models may be useful in the learning of special tasks and skills.

2.3.1.3 Audio Aids

Sound presentations which rely on only one of the five senses do have a number of drawbacks from the learning point of view.

Radios, record-players, tape recorders and the loud speaker system equipment are rapidly becoming as common place in the classroom or any seminar/conference room. They are not expensive at all and very easy to use.

Audio learning aids have been shown to be useful for learning skills involving sound-patterns. Particularly their cheapness and flexibility have been the main reasons for their extended use in teaching and learning tasks.

2.3.1.4 Audio visual aids

The sight and sound presentation forms tend to be more useful from the educational or training viewpoint. Films, videotapes and television are the main media for these presentations.

The equipment can be purchased from commercial sources and its cost is not too high if it is compared with their effectiveness and the increasing amount of educational related material available in the market.

Television, on the whole, tends to be used either as an alternative to live teaching or as a means of allowing students to observe themselves or others at work. On the other hand, films and videotapes are used for a much wider range of situations such as imparting information about objects and demonstration of a particular phenomena.

The equipment and materiales generally are:

- slide projector with sound
- film projector (8 mm, 16 mm)
- television set
- video tape recorder (SECAM, PAL, NTSC)

- video camera (VHS, BETA, VIDEO 8, N-MATIC,etc.)
- closed circuit television

Selected training films and videotapes in any format and type can be included in the library of any maritime institution as well as those locally produced while a special task is performed at the training institution.

A great number of films and videotapes have been produced by maritime establishments in certain countries and others by manufacturers of machinery, equipment and shipowners' organizations and can either be bought on loan.

2.3.2 Simulators

Marine simulators have been increasingly used by maritime training over the last decade, usually because of the high cost or the dangers or difficulties involved in training personnel on the real equipment.

In general, a simulator is designed to represent a specially created environment to provide a trainee with controls over the situation and to vary conditions so the taks can be made progressively more difficult.

Simulators have four properties which make them a desirable means for instruction:

- training without risk (no danger)
- availability

- versatility/flexibility
- cost between 25:1 and 10:1; for training in reality : training in simulation

Among the most popular of the marine simulators found and manufactured at the present are:

- radar simulators
- ship handling simulators
- cargo handling simulators
- engine room simulators

Regardless of the form used, they all entail trainees following procedures or making decisions similar to those they would expected to make in a real job situation.

Once a simulation is executed, trainees readily see the relevance of what they are learning, and can perfect the skills involved until they reach a level of adequacy. However, the most important advantage of simulators and simulation is found in the immediate knowledge that a trainee gets of the consequences of each one of his actions.

2.3.2.1 Radar simulator

Radar simulator provide facilities to train and examine maritime students, deck officers, master mariners and pilots to a high standard in the correct use of radar, ARPA, and navigational aids. Radar training enables officers to meet the specific IMO requirements. The design of Radar simulators has been carried out by

different manufacturers and among the more common types available are:

Manufacturers	Country
RACAL-DECCA	U.K
SOLARTRON	U.K
MARCONI	U.K.
PLESSEY	U.K.
SPERRY	U.S.A.
NORCONTROL	Norway
FURUNO	Japan
JRC (Japan Radio Corporation)	Japan
KAE (Krupp Atlas Elektronik)	F.R.G.

When it is necessary to make a choice of radar simulator facilities, some factors should be taken into consideration, a.o.:

- number of students
- type of training
- space available
- audio/visual simulation required
- costs factors.

For the different courses carried out by a radar simulator facility, some of the main exercises may be conducted in e.g.:

- radar interpretation and plotting
- use of ARPA equipment
- collision avoidance

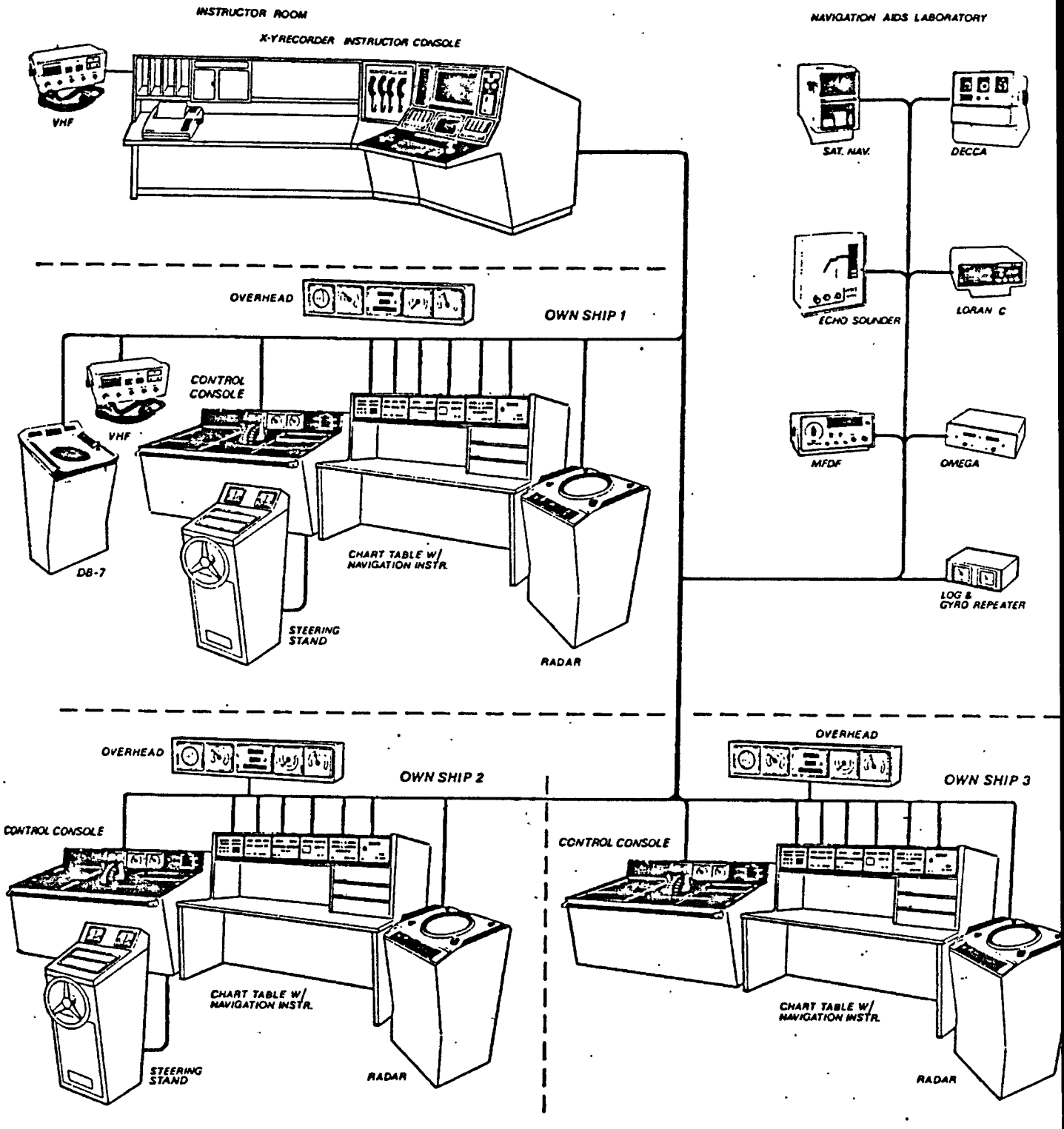


Fig.1 Radar Navigation Simulator Configuration (NORCONTROL)

- navigation in confined waters
- high density traffic navigation
- blind pilotage
- appreciation of ship characteristics
- parallel indexing techniques
- use of electronic navigation aids
- navigation in port approaches
- pilotage

The equipment, technical specifications, system features and presentations may vary from one simulator to another, but all of them can be traditionally done on board. The radar simulator can also play a relevant role in maritime casualty investigation.

A typical radar navigation simulator configuration (NORCONTROL) is given as an example in figure 1 in page 31.

2.3.2.2 Shiphandling simulator

Shiphandling simulators are generally contain full-scale replicas of modern ship bridges. These simulators employ certain types of screen projector that send images onto circular screens arranged around bridge structures. The images projected are produced in a computer generated system that can simulate any type of ship, port or area in the world, as well as any environmental condition during day-time or night-time.

The main objectives which lead to the installation of any shiphandling simulator are:

- to train sea-going personnel for acquisition of maneuvering qualifications
- to familiarize masters, navigation officers and pilots with particular areas
- to refresh the knowledge and skills of sea-going officers
- to develop future shiphandling techniques and rules
- to reconstruct real situations which have led for marine accidents
- to provide culpable behavior in maritime court actions, and
- to improve the safety of shipping.

The entire exercise procedures and the contents of the courses should comply with the Appendix to Regulation II/2, Regulation II/5 and Resolution 17 of the 1978 STCW Convention.

The most important shiphandling simulator manufacturers are the following:

Manufacturer	Country
NORCONTROL	Norwey
RACAL-DECCA	U.K
SPERRY	U.S.A.
SHIPANALYTICS	U.S.A.

TNO-IWECO	Netherlands
KAE	F.R.G.
MBB (Messerschmidt Bolkow Blohm)	F.R.G.

The cost of the above mentioned simulators can vary from 500.000 to 5,000,000 USD. according to their versatility.

At the present SUSAN shiphandling simulator at Hamburg Polytechnic School of Maritime Studies (F.R.G.) is one of the best examples of this kind of simulation in this area developed for the purpose of training and maritime research by the KAE firm. Figure 2 on page 35 shows the layout of the ship operation and simulation facility and Table 2 on page 36 gives its technical details.

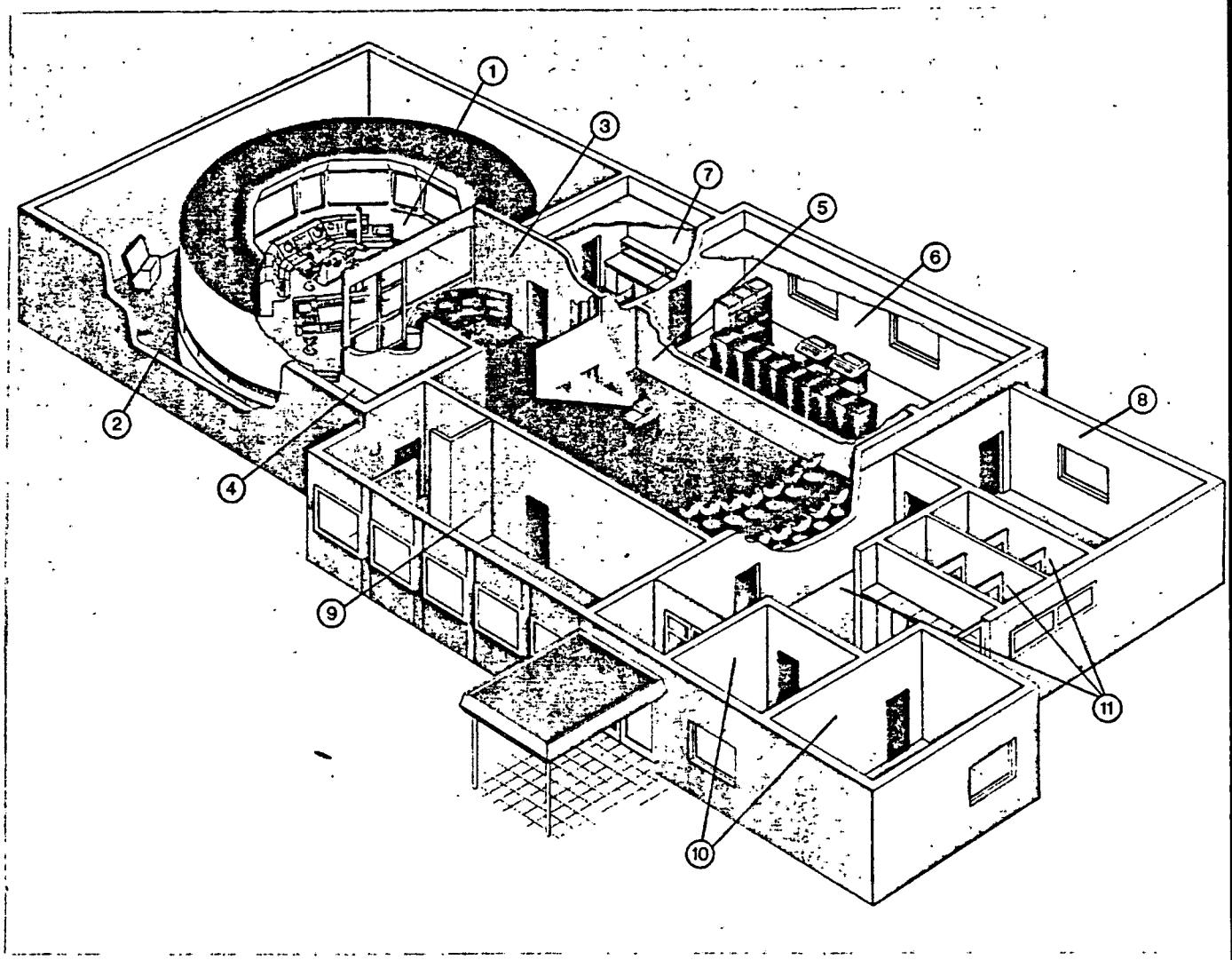


Fig.2 Layout of the "SUSAN" Simulation Facility

1. Ship's bridge with motion system
2. Visual systems room with projectors and screen
3. Instructors' room
4. Adaptation lock
5. Auditorium
6. Electronics room
7. Maintenance room
8. Air-conditioning room
9. Preparation room/pantry
10. Staff rooms
11. Lavatories

TABLE 2

SHIP OPERATION AND SIMULATION FACILITY "SUSAN"

TECHNICAL DETAILS

1. COMPUTER SYSTEM

a) HARDWARE

- Central processors:
  DEC PDP 11/60 - 16 bit, 256 KB memory, four 1.2 MB disk drives and 2 floppy drives.
- Peripheral Processors
  5 Krupp Atlas EPR 1100's - 16 bit, 64 KB memory
  1 Krupp Atlas EPR 1300 - 16 bit, 512 memory
  16 MB disk drive (data base)

b) SIMULATION PROGRAM (Software)

- Own ship Dynamics:
  Non linear differential equations with 25 coefficients, most of them depth dependent.
- Propeller Effects:
  Function of depth, ship speed and propeller revolutions.
- Environmental Effects:
  Effects of shallow water, proximity to bank and channel sidewalls, wind direction and strength and current, squat effect (dynamic data base including simulation of time of day and tide).

- Tugboats:
  Force of up to 4 tugboats applied to own ship hull in a direction relative to own ship bearing.

- Passing Ships:
  Function of speed, course, size, and separation distance between the traffic ship and own ship.
- Data Logging:
  Data logging is done via hard disk. Maximum capacity per run is 6 hours.
- Update Rate:
  1 sec, interpolates every 40 msec for point to point in visual scene.
- Own Ship Models:

General Cargo (CONRO)	14,740 GRT
Container (1758TEU)	32,930 GRT

  1) 1 propeller, 1 rudder
  2) twin propeller, twin rudder

VLCC (317207TDW)	162,026 GRT
LNG-Carrier	125,000 m^3

  Models exist for above ships under different loading conditions. System has capacity for additional ship models.
- Movable Objects:

Tugboat	
Fishing Vessel	
Coaster	499 GRT
General Cargo Vessel	15,000 GRT
LNG	125,000 m^3
VLCC	320,000 TDW
Passenger Vessel	6,000 GRT
Container Vessel	33,000 GRT

Sailing Yatch 20 m
Single Point Mooring Type Statfjord B
SAR Helicopter Seaking

- Pier:
  Effect of fixed pier and fender on berthing and deberthing

2. VISUAL SYSTEM

- Basic Functional Characteristics:
  Computer generated imagery 1,000 visible faces, 20 manoeuvering traffic ships (library currently contains 10 ship types), landmass, ligths.
- Image Projection:
  Front projection color TV - 11 channels.
- Field of View (FOV):
  Horizontal 249° with a screen diameter of 13 meters, vertical 16.3° (+6.3°, -10°).
- Resolution:
  Horizontal: 2.7 arc min, vertical: 2.0 arc min.
- Visibility Conditions:
  Dynamical change from full day light to night, from good visibility to dense fog.
- Special Effects:
  Sea texturization according to sea state (5 states), bow and stern wake of traffic ships according to their speed, motion: heave of horizon provided to complement ± 5° roll and pitch of bridge motion plaform, ambient lights.

- Data Base:
  Maximum operating area 100 / 100 nm,
  capacity: 200,000 faces (for online access).

- Exercise Areas:
  German Bight with rivers Jade, Weser and Elbe,
  harbor facilities of Wilhelmshaven, Bremenhaven
  and Hamburg, SIMLAND (synthetic exercise area),
  CANALLAND (synthetic canal-area).

3. RADAR SYSTEM

- Basic Functional Characteristics:
  Full digital radar signal generator,
  ARPA functions, true/relative motion on the
  bridge radar unit, relative motion in instructor's
  station radar unit, 0.3 nm minimum range scale.
- Resolution:
  Fine range scale with a resolution of 12 meters
  and 0.4 degrees.
- Special Effects:
  Sea clutter, rain clutter, interference.

4. BRIDGE EQUIPMENT

a) EQUIPMENT

- Steering:
  Wheel, pushbuttons, tiller and autopilot.

- Propulsion:
  Twin screw throttle control, twin screw engine order telegraph, RPM indicators and alarm panel.
- Ship Motion Indicators:
  Doppler log and conventional speed log, ROT, radius display.

- Navigation:
  Radar (relative/true motion with ARPA), Loran-C, OMEGA, DECCA, depth sounder and compass (gyro and magnetic), RDF.
- Communications:
  VHF and intercom.
- Other:
  Wind indicator and multi-color information display.

b) CONFIGURATION

Flexible layout, one man conning, bridge console arranged for either twin row or single row console concept, size: 6.1 / 7 meters.

c) MOTION SYSTEM

± 5° roll and pitch + vibrations effects.

5. INSTRUCTORS' CONSOLE

- Human Factors Monitoring:
  Direct visual observations of trainee on the bridge.

- Communications:
  VHF and intercom.
- Control:
  1 relative motion radar for own ship situation and 2 high resolution multi color exercise situation displays.

6. AUXILIARY EQUIPMENT FOR DATA BASE HANDLING

Digitizer tablet, color graphic display with commands to rotate and view objects, computer system for the creation of radar, visual and environmental data bases.

2.3.2.3 Cargo handling simulator

A cargo handling simulator has the same advantages as the simulators already discussed, such as capability to repeat exercises, no risks and low cost of operation and maintenance.

The simulation itself represents a complete cargo handling system by the application of a mini computer programmed to represent all system components such as pumps, valves, tanks, etc. The systems are designed in such a way that all operational actions taken by the trainee produce the exact operational functions of a typical cargo handling system..

In that way the training in cargo operation processes in tankers as well as in the role of the ship officer while on duty become the main purpose of the use of such simulators.

The STCW Convention contains special requirements concerning tanker operation which are divided into regulations specifically for oil tankers, chemical tankers and gas tankers.

These special requirements call for additional training in an "advanced tanker operation course" after basic certification consisting of a "tanker familiarization course".

Several simulators have been introduced in the field of liquid cargo handling and are used in the training of

tanker personnel. The simulator which taken as example

was developed in F.R.G., designed and built by the staff of the Department of Nautical Studies of Bremen Polytechnic, with financial assistance from several shipping companies and other firms in Bremen and Hamburg.

The Bremen simulator is based on a 392,000 dwt. crude oil carrier and consists of a hardware model of cargo control room (CCR) and a mathematical model of the rest of the ship as far as cargo operations are concerned.

The CCR panel is equipped with:

- 113 switches for remote controlled valves
- 36 pointer instruments showing valve positions
- 6 control levers for pump speed control
- 6 pointer instruments for pump speed display
- 21 pointer instruments for pressure display
- 10 pointer instruments for various other displays
- 5 digital readouts for pump temperature display
- 4 digital readouts for draught display
- 27 digital readouts for ullage display
- 48 switchable notice lamps for manually set valve indication
- various other signal lamps and alarm buzzers
- intercommunication device for five addresses (master, engine-room, pump-room, deck and shore)
- realistic sound simulation of pumps in operation
- a load master computer
- and all necessary documentation (ullage tables, piping plans, pump performance diagrams and operating instructions)

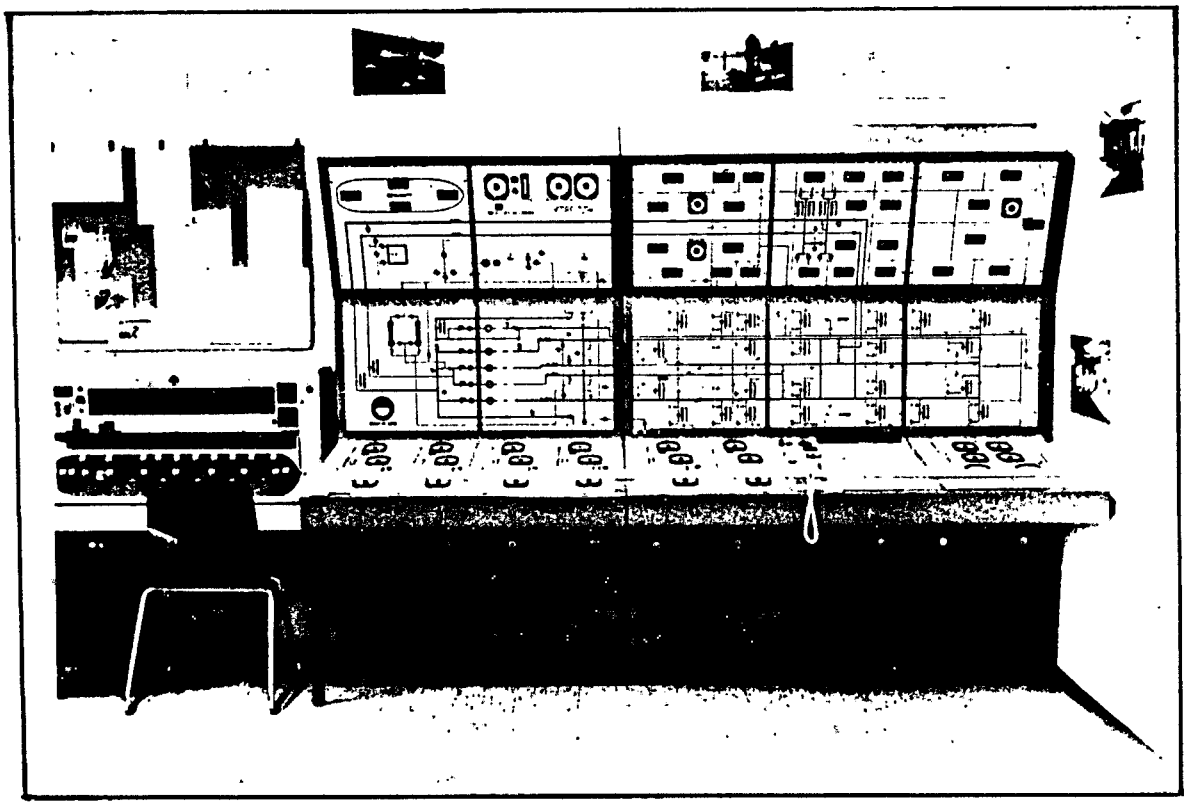
The mathematical model covers:

- the hydrostatic behavior of the vessel results of draughts, list deflection and geodetical levels of tank bottoms;
- the evaluation of liquid levels in tanks with respect to flow, volume and trim;
- the evaluation of gas pressure, hydrocarbon and oxygen content in tanks and I.G. main line;
- the state of tank washing machines in terms of nozzle elevation and moving direction;
- the working conditions of centrifugal pumps, reciprocating pump and shipping eductors with respect to suction and discharge conditions, gas ingress, liquid level in vac-ship-device and physical properties of liquid;
- the flow and pressure distribution in the piping system based on turbulent flow characteristics and typical throttling behavior of valves.

All calculations are carried out by a fast Hewlett-Packard desk computer. Real time simulation as well as condensed time simulation up to a rate of 20 are available.

Figure 3 on page 45 shows the LCH simulator and the layout of the seminar room.

Training programs are imparted in two courses, the familiarization and the advanced course. Simulation facilities also serve as an aid to research where new programs test certain techniques before they are utilized on real tankers.



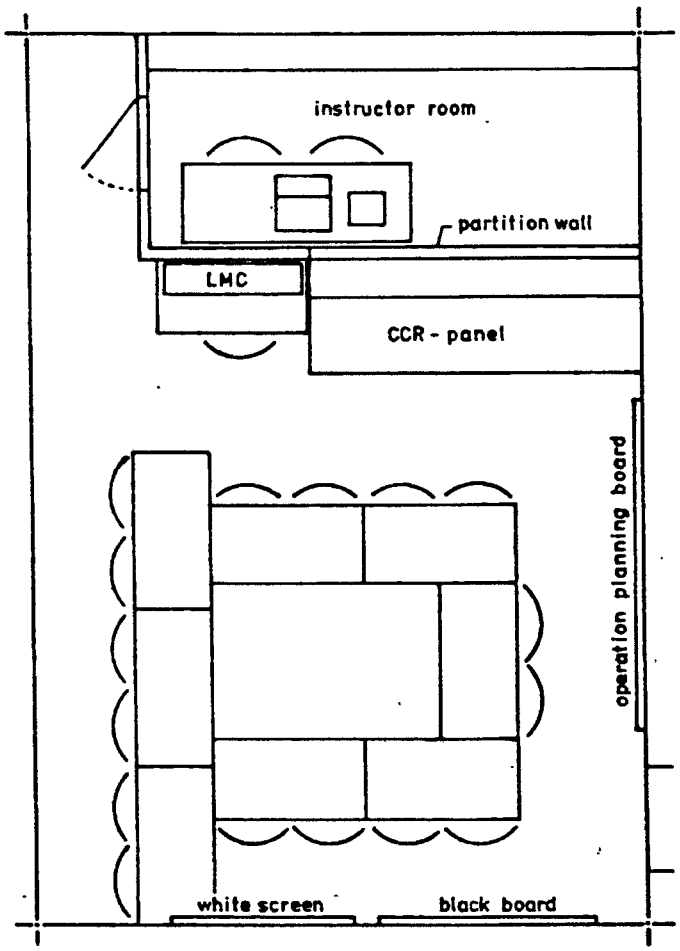


Fig.3 LCH-Simulator and the layout of the seminar room

2.3.2.4 Engine room simulators

An engine room simulator is a complete engine room system where all machinery has been reproduced through the application of a computer program to present specific engine room components as they would be available on board modern vessels.

The system is designed in such a way that all operational actions taken by the trainee produce fair operational functions of a typical main propulsion plant. The simulated engine room system covers both the main propulsion plant and the auxiliary components throughout the engine room.

The engine room simulators are divided into two classes:

- Steam plant simulators
- Diesel propulsion plant simulators

The purpose of using such simulators is to provide an educational and training aid for the marine engineers who will gain significant experience in skills to efficiently operate and trouble shoot modern automated propulsion systems.

Figure 4 on page 47 shows a complete diesel propulsion simulator (NORCONTROL) including the necessary auxiliary equipment.

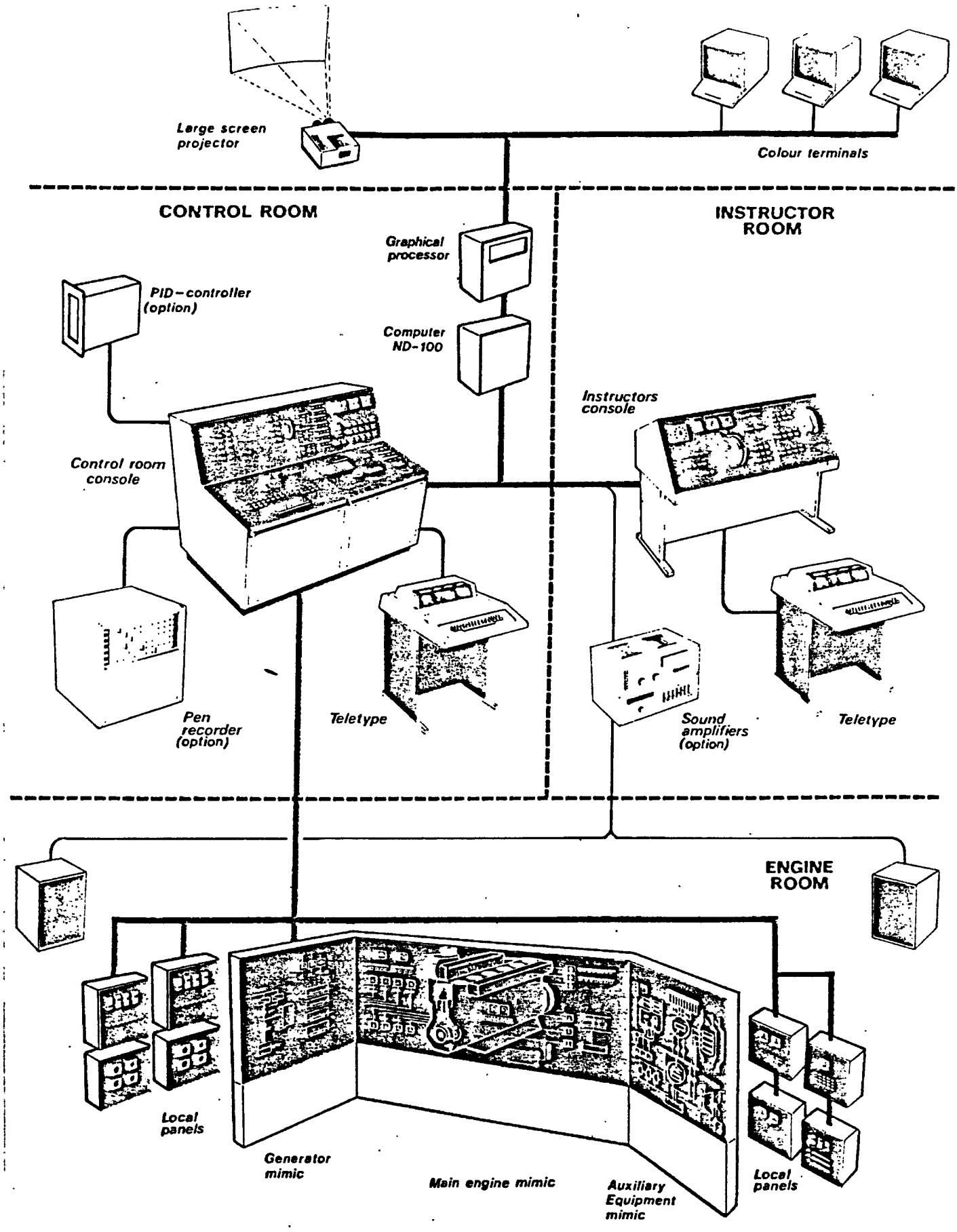


Fig.4 Diesel propulsion simulator (NORCONTROL)

An important point to consider is the range of simulated aspects controlled by the instructor's station such as:

- changing of operational and environmental conditions
- setting of faults and deteriorations, single or in series

- resetting of faults
- recording of events and alarms
- general system communications
- controlling of the sound generating equipment

The training courses are divided into three categories:

- Basic
- Advanced
- Process studies

BASIC OPERATIONAL TRAINING

The content of this course includes:

- Preparation for getting underway
  Lining-up of auxiliary systems
  Starting of pumps, compressors and fans
  Starting of diesel generators
  Synchronizing and correcting alterators to main switchboard
  Procedures for making main engine ready for start

- Manoeuvering to open sea
  Manoeuvering of main engine
  Change form diesel oil to heavy fuel and viceversa
  Putting exhaust gas boiler into operation

- Steady steaming
  Regular watch routines

- Manoeuvering into harbor

- Shutting down the engine room

- Operations of auxiliary boilers, cargo pumps and turbo generators

- Tuning and adjustments of governors and controllers

ADVANCED OPERATIONAL TRAINING

The tasks involved in this course derive from the following questions:

- How will an engineer react when faced with serious problems?

- How will a crew operate together when an abnormal situation develops?

- How can errors within the system be traced and corrected?

- How can the engine room system be restored to normal operation?

PROCESS STUDIES

The process studies are:

- fuel economy
- planned maintenance
- fouling and wear
- combustion performance
- control loops
- heat balance and heat recovery
- variable pitch performance
- effect of environmental conditions

CHAPTER III

MARITIME EDUCATION AND TRAINING IN MEXICO AND SPECIALIZED TRAINING COURSES

3.1 GENERAL BACKGROUND

Ever since its colonization, Mexico has been considered a maritime nation, the country has a vast coastline which extends from the Gulf of Mexico to the Caribbean Sea in the Atlantic Ocean and along the western coast, the Pacific Ocean.

Since 85% of the international trade in Mexico is transported by sea and in spite of the serious economical problems in the maritime sector during this decade, the Mexican Government has been trying to solve the situation by improving the development of its merchant fleet.

In order to achieve this, Mexico has been promoting the creation and consolidation of new shipping companies and encouraging (both of them, the new and the established) to acquire new ships wich will enable the participation of the country in the fierce competition which the international shipping industry is facing at this moment.

The national fleet has been increasing over the last ten years, at the present fleet includes a large number of very specialized ships such as the vessels designed to carry vehicles, gas and chemicals, bulkers, drilling ships and supply vessels, as well as the more traditional types.

According to the national plan for development, the Mexican fleet will reach 7 million deadweight tons in 1988 of which 4 million will be to deep seagoing fleet. The table 3 on page 53 shows the actual merchant fleet.

The development of maritime education and training in Mexico has observed radical changes which have taken place in the national maritime industry according to the policy and programs for the development of the Mexican Merchant Marine.

This aim has been achieved. The study programs in the maritime academies have been restructured as required by th minimum international standards of the 1978 STCW Convention, and associated IMO Recommendations.

In considering this kind of maritime education provivision, the Government has developed various short-term objectives, but it still exist the need to consider carefully its long-term goal, namely how best to provide training not only for undergraduate students but also for the specialized training for holder of certificates of competency.

TABLE 3

FLEET IN OPERATION *

TYPE OF VESSEL	No.	GRT	DWT
Bulk carriers	46	787,001	1,135,039
General cargo vessels	17	127,129	170,045
Tankers	60	1,250,152	2,173,135
Chemical tankers	9	202,373	286,551
Gas tankers	4	49,997	59,465
Multipurpose vessels	7	88,614	123,819
Container vessels	3	18,800	27,331
Ferries	11	42,026	14,585
Tugs	6	4,096	14,160
Barges	23	56,507	76,745
Roll on/Roll off vessels	1	8,537	8,826
Passenger-cargo vessels	6	2,448	5.000
Supply vessels	1	273	878
TOTAL	194	2,637,953	4,095,579

* Merchant Fleet as on 15 September, 1985.

3.2 THE ORGANIZATION OF MARITIME EDUCATION AND TRAINING

Maritime education and training in Mexico as in most countries operates under the jurisdiction of and in an interrelationship with the national maritime administration (General Directorate of Merchant Marine) and in certain form with the shipping companies of the country (Trusteeship for the Education and Training of Personnel of the National Merchant Marine).

The ministry responsible for the maritime education system is the Ministry of Communications and Transport under which the General Directorate of Merchant Marine is located; the activities of the Trusteeship come directly under the chairmanship of the latter organization. The organizational chart of the General Directorate of Merchant Marine is shown in Figure 5 on page 55.

The Trusteeship is the executive department dealing most closely with the maritime education and training system. This department which was founded under Presidential Agreement in 1972, is headed by one director who works on behalf of the board of trustees. The parties involved in the board of trustees are mainly coming from governmental bodies, state and privately-owned shipping companies and national maritime trade unions.

The Trusteeship, besides filling a leading role in the organizational and administrative functions, is in

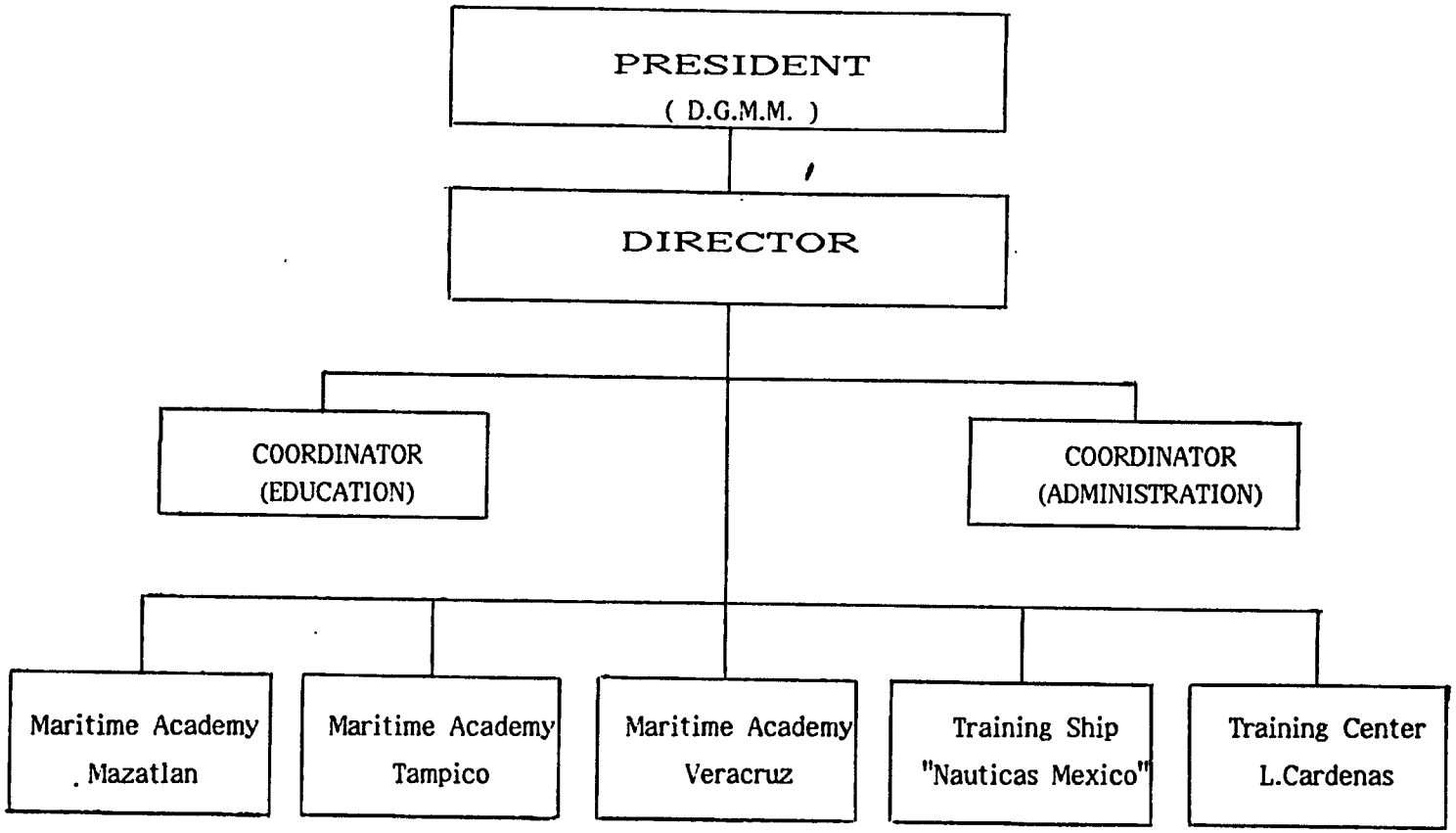


Fig.5 Organizational chart of the General Directorate of Merchant Marine.

charge of providing maritime education and training for:

- ratings in the deck department
- ratings in the engine department
- ratings in the catering department
- port operators
- officers in the deck department
- officers in the engine departemnt
- officers in the radio department
- officers in the deck, engine and radio department (specialized training)

Within its framework the Trusteeship is entrusted with supervision of the maritime educational and training facilities of the following institutes for the various categories of marine personnel:

-- education and training of ratings and port operators:

- the center for maritime training and port operation "Emilio Barragan" in Lazaro Cardenas City

-- education and training of radio officers:

- the aforesaid center

-- shore-based education and training of officers in deck and engine departments:

- The Maritime Academy "Capitan de Altura Antonio Gomez Maqueo" in Mazatlan City

- The Maritime Academy in Tampico City
- The Maritime Academy "Fernando Siliceo y Torres" in Veracruz City.

-- shipboard training of officers in deck and engine departments:

- the training ship "Nauticas Mexico"

-- specialized training of officers in deck, engine and radio department:

- the three principal maritime academies mentioned above.

The position of the head of the Trusteeship, the Director, and most of the administrative and executive posts are held by marine personnel who have had extensive experience as seafarers in the national merchant marine and as lecturers in the maritime education system as well.

3.3 EDUCATION AND TRAINING PROGRAMS FOR SHIPBOARD OFFICERS

The Mexican Merchant Marine Academies offer a three-year undergraduate program which leads to a bachelor of science degreee for deck and engineer officer certificate in 1978 STCW Convention, Regulations II/4, III/4.

The training of junior deck and engineer officers is undertaken at the three principal maritime institutes in Mexico; in the maritime academies of Veracruz and Tampico, both on the Gulf coast, and in Mazatlan on the Pacific coast.

3.3.1 Admissions and Entrance Examination

Admission to the maritime academies is based on the qualifications of the applicant. As admission is competitive, decision are based on educational background, performance in high school and test scores.

All candidates must submit three documents, an application for admission, a personal data form and a physical and mental examination report and also fulfill the following pre-requisites in recruitment entry to any of the three maritime academies:

- to be Mexican by birth
- to be single
- to be no more than 22 years of age
- to have a high school degree in physics or mathematics
- to pass a selective examination

Applicants must be high school graduates and are requested to sit for an entrance examination, which tests their knowledge in the following academic subjects:

- mathematics
- physics
- chemistry
- English language

The selective examinations will determines candidates the may occupy seats as students for the maritime studies.

3.3.2 Education and Training Programs up to the Third Officer Certificate

The programs for training junior deck and engineer officers are conducted according to, and indeed they exceed, international standards of training for such officers as described by the 1978 STCW Convention.

The academic program consists of three years of education and training, of which the first two-year period corresponds to shore-based education and the last year to supervised shipboard training. The academic year spans about ten months, generally from the first week of September to the end of June and is divided into two semesters.

Shore-based education runs from the first to the fourth semester, and all students during that period, undertake their studies in a regimental life system. Each academy has housing facilities which accomodate 150 students.

A common program of basic science and humanities courses and introductory courses in nautical science and marine

engineering is followed by both deck and engineering students, during the first semester of education.

As a part of their training, professional courses from the second to the fourth semester; in both, deck and engineering areas, are designed to provide theoretical education with practical training by means of extensive use of laboratories, workshops, simulators and training facilities ashore, such as local port installations and shipyards.

The shipboard training program consists of the last two semesters on board the training ship "Nauticas Mexico". Students are given the opportunity to use the ship as sea-going laboratory in addition to performing shipboard duties. The training ship was specially designed and built by a Dutch company and was delivered on July 31, 1981. Besides her facilities as a general cargo vessel, the ship is equipped with the most advanced teaching aids and facilities which provide for and ensure the familiarization of students with all aspects of ship operation.

The training ship particulars are the following:

- dead weight 12,000 tons
- LBP 150.5 m.
- beam 21 m.
- draught 9.2 m.
- holds capacity 15,000 m
- main engine Sulzer 6RND 68 M.
- power 10,200 BHP at 137 RPM.
- speed 18.0 knots

- able to carry general cargo, in bulk and/or containers
- facilities to accomodate 200 students

At the end of the shipboard training, students sit for a final examination in order to qualify as officers in training (oficiales en practicas).

The deck officer in training must undergo a minimum period of at least six months of bridge watchkeeping duties under the supervision of a qualified officer in order to satisfy the requirements of regulation II/4 paragraph (c) for certification as officer in charge of 200 gross registered tons or more.

After passing the final examination, the engineering officer in training is required to serve for a further six months aboard ocean-going vessels before being awarded the engineering officer certificate. At the conclusion of this education and training period and once he is awarded the engineering certificate, the officer is qualified to take charge of the engine room watch on any sea-going vessel (1978 STCW Convention Regulation III/4).

3.4 CERTIFICATION AND THE DEPARTMENT FOR SPECIALIZED TRAINING COURSES

CERTIFICATION

After qualifying as either deck or engineering officers, shipboard officers seek a position on board different types of vessels. Officers will be in charge of a watch on the bridge or in the engine room, and they will also be responsible for the safety of the ship or its propulsion plant while on duty.

After an established period of shipboard duty the officers are qualified to sit for an examination, which will entitle them to be candidates for the Chief Mate's or First Engineer's Certificate. The final step, after additional sea service and experience is to sit for the certificate of Master or Chief Engineer.

Certification and examinations for promotional degree award of shipboard officers are established under the Official Bulletin of the Nation according to the 1978 STCW Convention, regulations II/2 and III/2.

For fulfilling legal requirements of the Ministry of Education and the Ministry of Communications and Transport, deck and engineer officers with a promotional degree must register their certificates in the presence of the General Directorate of Professions.
To facilitate understanding of the maritime education system and the certification procedures in Mexico, specific diagrams are shown in Figure 6 on page 63.

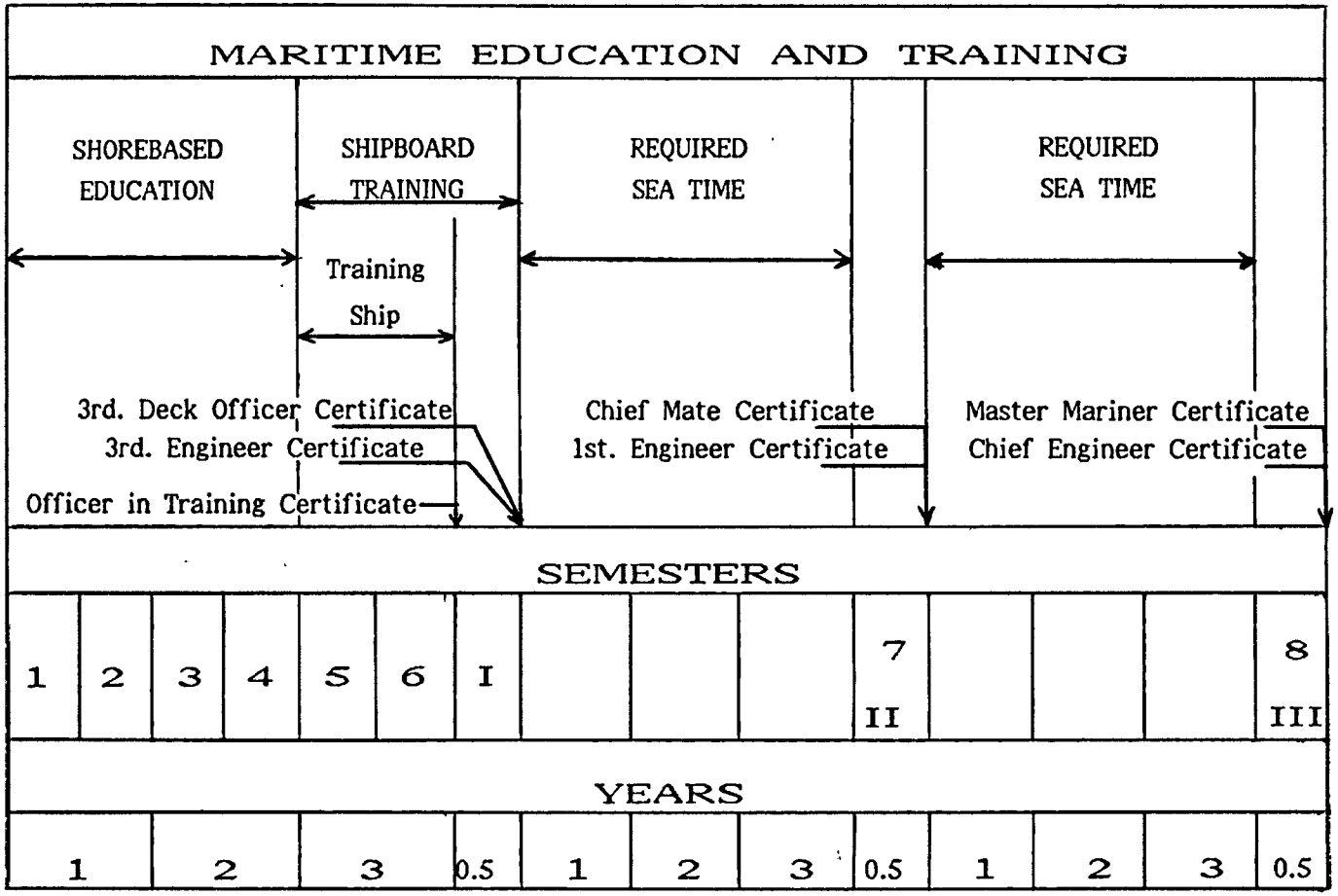


Fig. 6 Diagram of maritime education and training leading to master mariner and chief engineer certificate

I. Six-monthx supervised watchkeeping duties

II. Required period for specialized training courses leading to chief mate and first engineer certificate

III. Required period for specialized training courses leading to master mariner and chief engineer certificate

THE DEPARTMENTS FOR SPECIALIZED TRAINING

A certificate is issued only after a candidate has met certain minimum requirement as mentioned before and has established competence by passing an examination and undertaking either obligatory or voluntary specialized training courses as defined in the national regulations for certification of seafarers.

Specialized training has been the consequence of the expansion and development that has taken place within the maritime sector in Mexico, resulting also in a pressing need for highly qualified officers, senior administrators, managers and other technical personnel. This development in the maritime sector has lead to the expansion of maritime technology and capability for the succesful management and operation of its maritime administration.

Centers for specialized training courses have been set up as special units attached to and forming part of the three academies. The department for specialized courses is in charge of providing the necessary training for both sea-going and shore-based marine personnel. The programs for specialized training courses are described in detail in Chapter IV.

To conduct these courses the department, as a part of the maritime academy, is able to share, utilize and benefit from the maritime training f acilities and equipment available at the maritime academies.

Participants attending courses are separated from those

in the undergraduate program, both academical and socially. They have their own working and social environment within the maritime academies.

The department is headed by the director of the maritime academy followed by one deputy director who is in charge of the department itself. The teaching staff is recruited from highly qualified personnel of the maritime field. They are permanently updating the course programs according to developments in international regulations.

The organizational chart of an academy as regards specialized training is shown in Figure 7 on page 66.

Finally in order to reach not only an international standardized level, but also to improve in the short and long-term the professional level of the merchant marine, Mexico is taking advantage of higher maritime education and training that is offered on the level of a Master of Science degree at the World Maritime University in Malmoe, Sweden.

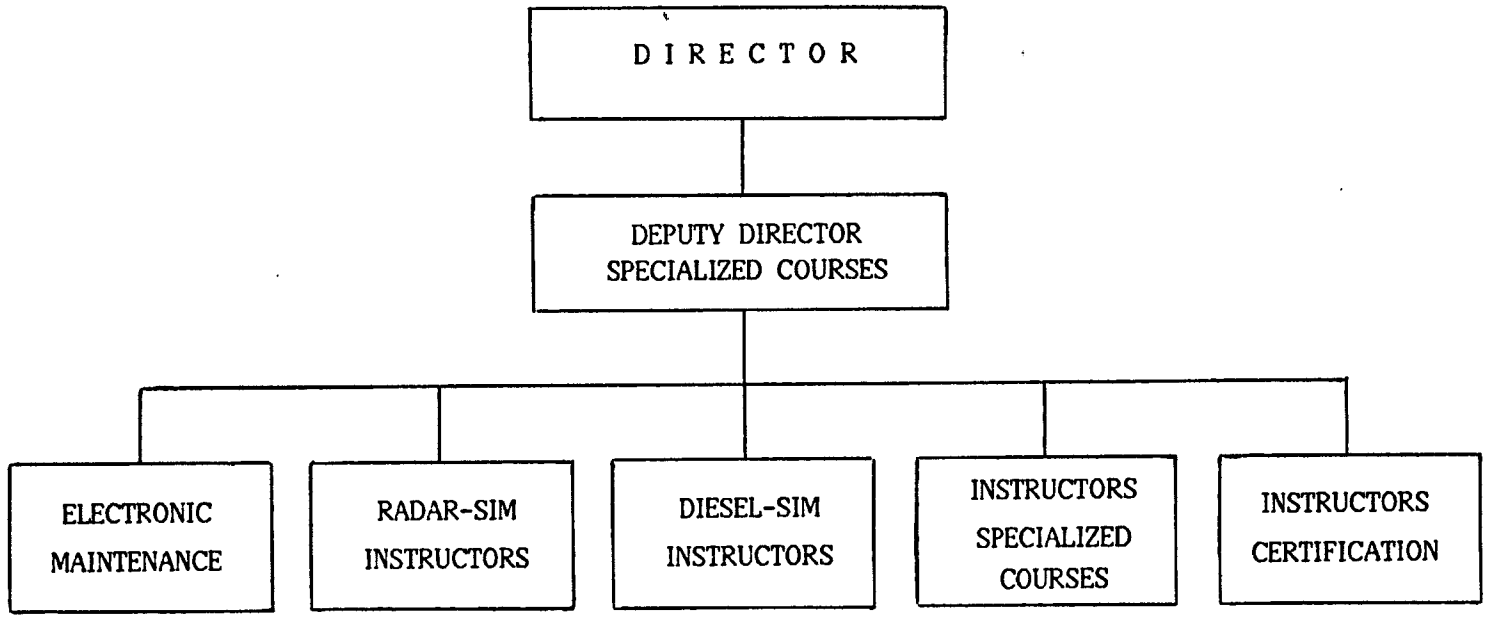


Fig.7 Organizational chart of the Department of Specialized Training Courses

CHAPTER IV

SPECIALIZED TRAINING COURSES IN MEXICO

The training departments of the three maritime academies in Mexico have developed a number of specialized training courses sponsored by the "Trusteeship for the Education and Training of Personnel of the National Merchant Marine". These courses comply with the "Standards of Certification and Identification of Seafarers" issued by the General Directorate of Merchant Marine and all international requirements given by STCW 78, by IMO, in particular those of the STCW Convention, 1978.

Although specialized courses for seafarers have been conducted for several years, it was in 1985 that specialized training programs took a new turn. Numerous new courses were implemented with the aim of complying with international agreements about maritime educational and training matters.

Therefore, course programs are identified in connection with the international requirements for training and the national needs of the state and privately-owned merchant marine fleet.

TABLE 4

SPECIALIZED TRAINING COURSES

Course/duration	Attendance	Level	Conducted
1.Nav-Sim (Radar observer) 3 weeks	cp/as (1)	advanced	M,T,V. (1)
2.Diesel-Sim (Auto-Chief) 5 weeks	cp/as	advanced	M,T,V.
3.Chief Engineer 11 weeks	cp/as	advanced	V
4.First Engineer 11 weeks	cp/as	advanced	V
5.Tanker Safety Operation (oil, gas & chemical) 9 weeks	cp/cs	advanced	V
6.Water Pollution Prevention one week	cp/cs	advanced	T,V.
7.Master Mariner 12 weeks	cp/as	advanced	M
8.Chief Officer 12 weeks	cp/as	advanced	M

(1) see note on page 69

Course/duration	Attendance	Level	Conducted
9. Safety at sea (fire-fighting & first aid) 2 weeks	ap/as	advanced	M,T,V.
10. Radiotelephony Operator one week	cp/as	advanced	V
11. Marine Surveying/ International Maritime Safety 3 weeks	cp		V
12. Marine Surveying/ Average adjusters 3 weeks	cp		V
13. Marine Surveying/ Marine Surveyors 3 weeks	cp		V
14. Maritime English Deck terminology 3 weeks	cp/as		T,V
15. Maritime English Engine room terminology 3 weeks	cp/as		T,V

Note: M=Mazatlan ap=all personnel cp=certain personnel
T=Tampico as=all ships cs=certain ships
V=Veracruz

4.1 COURSES CONDUCTED BY THE MARITIME ACADEMIES

Firstly, it is observed that all officers who participate in such courses must submit the following documents prior to attendance in a course:

- registration form signed by the participants and co-signed by the company representative
- photostatic copy of birth certificate
- six individual photographs of the applicant (wearing black uniform); 7cm x 5 cm in size
- medical certificate issued by the "Preventive Medicine Department" of the Ministry of Communications and Transport.

The maritime academies in Mexico presently are conducting 15 different courses; however not all of them are carried out in any one single academy.

Courses are held regularly depending on the course itself either once or several times in a semester from Monday to Friday, with approximately six to seven daily hours of theoretical and practical instruction. Courses are normally held in the Spanish language , except for those related with the English language. They are open to everybody meeting the qualifications, i.e. holding a professional certificate of competency as master, deck officer, chief engineer, etc. and having gained practical experience on the job.

Courses are not free of charge, but fees are moderated

depending on duration, staff and equipment requirements.

Participants obtain a certificate of satisfactory attendance or special competency (with formal examination) which is acknowledged by the authorities for the purpose concerned. The certificate officially declares the compliance of the course with IMO regulations and/or the 1978 STCW Convention .

The courses which are presently being conducted on a regular basis, are given in Table 4 on page 68.

4.2 NAVIGATION CATEGORY

Within this category the Navigation and Radar Simulator Course (NAV-SIM) is included. No other course has been developed at present.

4.2.1 The Navigation and Radar Simulator

The course was established with the primary purpose of assisting deck officers in practical training with the aid of simulation techniques, which will build up their confidence and will prepare them to face real situations at sea. This course is conducted at the three maritime academies in Mazatlan, Tampico and Veracruz. Attendance is obligatory.

Objectives

The objectives of this course are as follows:

- to comply with the requirements of STCW 78, Regulation II/2, "Mandatory Minimum Requirements for Certification of Masters and Chief Mates of Ships of 200 Gross Register Tons or More", Appendix paragraph 4, "Radar Equipment"

- to comply with the requirements of STCW 78, Resolution 18, "Radar Simulator Training"

- to comply with the requirements of STCW 78, Resolution 20, "Training in the use of collisions avoidance aids"

- to comply with the requirements of IMO Resolution A.482 (XII) "Training in the use of automatic radar plotting aids"

- to comply with those regulations from the national legislation.

Participants

The participantes for this course are masters and navigation officers. The number of course participants should not exceed 8.

Duration

The duration of this course is three weeks/ 120 class hours.

Cost

The cost for attendance is 110 USD.

Faculty

The faculty consists of experienced master mariners.

Course Content

- radar -principles of radar function-
- interpretation of targets on screen operation controls
- false echoes
- plotting techniques
- maneuvres to prevent collision
- radar navigation
- rules of the road
- ARPA training

Teaching aids

Training is held in simulation facilities utilizing all necessary equipment and audiovisual aids.

Norcontrol Simulator
- instructor console

- teletype
- x/y register
- own ship # 1 with Norcontrol "16", ARPA
- own ship # 2 with Raytheon radar, model Ray RM/TM 1625/9XR
- VHF system

The following publications are used in the course:

- "Standard Marine Navigational Vocabulary"
- Search and Rescue Manual
- Route planning
- Bridge Procedure Guide

4.3 ENGINE ROOM CATEGORY

Within this category the diesel simulator, chief engineer and first engineer courses have been developed.

4.3.1 Diesel-sim (Auto Chief) Course

The diesel-sim course was established with the purpose of assisting engineer officers in practical training with the aid of simulation techniques. This course is conducted at the three maritime academies, Mazatlan, Tampico and Veracruz. Attendance is obligatory.

Objectives

- to develop knowledge and skills of marine engineers
  in the operation of modern equipment in new ships through the use of simulators, and
- to utilize the knowledge gained in improvement of performance with regards to opertation, control, and regulation of computer-based instrumentation systems.

Participants

- the participants for this course are chief engineers and marine engineers. The number of course participants should not exceed 6.

Cost

The cost for attendance is 140 USD.

Faculty

The faculty consists of experienced chief engineers

Course Content

Control and operation of an unmanned engine room:

- introduction to unmanned systems
- description of installations
- description and control of computerized control panels

- engine room operation in various conditions
- detection and control of computer failures
- control of operations and maintenance by computer

Automated controls:
- practical system for manoeuvring
- general description of remote control
- r.p.m. control -with electric governor
  -with woodward governor
- protection of main engine
- adaptions to engine types
- practice of remote control operation
- digital techniques of integrated circuits
- identification of failures in printed and integrated circuits
- failure simulation
- adjustment and control practice
- adjustment and control techniques

Teaching Aids

Training is held at simulation facilities and includes:

Engine room equipment:
- main engine control pannel with air coolers and turbo chargers
- diesel generator
- turbo generator
- boiler systems
- combustion treatment system
- temperature control systems
- fresh water pumps LT FWS

- fresh water pumps HT FWS
- sea water pumps
- lubrication pumps
- fuel booster pumps
- oil pumps
- compresssors, including air starters and instruments
- indicator panel
- mechanical engine simulator

Control room equipment:
- control console
- teletype
- electric panel
- graph marker
- P.I.D. control

Instructor's console:
- control system
- bridge control (telephone and teletype)

4.3.2 Chief Engineer Course

The chief engineer course was established to enable first engineers to obtain the degree of chief engineer. This course is conducted at the Maritime Academy in Veracruz. Attendance is voluntary.

The course includes professional subjects developed by

specialists who have arranged course contents in a detailed way in order to improve the management and operation of today's ships.

Additionally, the assessment of the course has the advantage that the evaluation is taken into consideration for the promotional degree award of chief engineer. This is possible because the course covers the same material required for the professional examination.

Objectives

The objectives of the chief engineer course are as follows:

- to comply with the requirements of STCW 78, Regulation III/2 "Mandatory Minimum Requirements for Certification of Chief Engineer Officers and Second Engineer Officers of Ships Powered by Main Propulsion Machinery of 3000 KW Propulsion Power or More" and the Appendix to Regulation III/2.

- to comply with the requirements of STCW 78, Regulation III/5, "Mandatory Minimum Requirements to Ensure Continued Proficiency and Updating of Knowledge for Engineer Officers".

Participants

The participants in this course should be first

engineers who have fulfilled the required sea-time service.

Duration

The duration of this course is 11 weeks.

Cost

The cost for attendance is 180 USD.

Faculty

The faculty consists of experienced chief engineers, qualified instructors and senior lecturers.

Course Content

The course content covers the following:

- technology of materials
- maintenance methodology
- maritime insurance and classification societies
- interpretation of plans and machines' drawings
- spare parts stock, inventory and handling
- technical English
- technical supervision and leadership
- management
- automation control and instruments

Teaching Aids

Lectures are held in seminar rooms on campus, utilizing all necessary audio-visual aids. Field trips are planned to different factories, laboratories nearby Veracruz City, as well as the shipyard "Astilleros Unidos S.A." in San Juan de Ulua, Veracruz.

4.3.3 First Engineer Course

The first engineer course was established to train marine engineering personnel with the aim of obtaining the degree of first engineer. this course is also conducted at the Maritime Academy in Veracruz. In addition to the professional subjects the course includes subjects of relevant importance in the field of Economy and Management in order to help provide a healthy mental attitude and pleasant ambience for those who man and supervise the work aboard ships.

Successful completion of this course, as the chief engineer course, allows for receipt of first engineer's certificate. Attendance in this course is voluntary too.

Objectives

The objectives for this course are the same as the chief engineer course and related to the

requirements of STCW 78, Regulation III/2, its Appendix and Regulation III/5.

Participants

Participants in this course should be third and second engineers who have already fulfilled the required sea-time service.

Cost

The cost for attendance is 180 USD.

Faculty

The faculty consists of experienced first and chief engineers, qualified instructors, senior lecturers and some visiting lecturers.

Course Content

The course content covers the following:

- engine technology
- operational routines
- preventive and corrective maintenance
- programming and supervision techniques
- inventory control
- hydraulic systems and equipment
- instrumentation
- automation controls
- human relations and leadership

- steam boilers
- maritime English
- safety and medical care
- electrical engines
- engine installations
- starting procedures of a diesel plan
- starting procedures of a steam plant
- watchkeeping procedures
- interpretation of drawing and diagrams
- turbines and steam engines
- internal combustion engines
- compressor maintenance
- refrigeration plants
- pumps
- steering gear plants
- combustion, combustibles and lubricants
- damage control
- deck equipment
- drydocking procedures
- centrifugal equipment

Teaching Aids

Lectures are held in functional seminars rooms equipped with the necessary audio-visual aids which are supported with an ample collection of written materials. Some visits to metal industry factories, laboratories and shipyards are included.

4.4 TRANSPORT AND HANDLING OF CARGO CATEGORY

The tanker safety course has been included in this category; the syllabus consists of courses in oil, gas and chemical tanker operations.

4.4.1 Tanker Safety Operation Course (Oil, Gas and Chemical)

The tanker safety operation course was established to enable deck and engine personnel to obtain the

certificate of oil, chemical and liquefied gas tanker operator, the course is carried out at the Maritime Academy in Veracruz.

Objectives

The objectives of this course are as follows:

- to comply with the requirements of STCW 78, Regulation V/1, V/2 and V/3, "Mandatory Minimum Requirements for the Training and Qualifications of Masters, Officers and Ratings of Oil, Chemical and Liquefied Gas Tankers, respectively".

- to comply with the requirements of STCW 78, Resolution 10, 11 and 12, "Training and Qualifications of Officers and Ratings of Oil, Chemical and Liquefied Tankers, respectively".

Participants

The participants for this course should be masters, chief engineers, deck and engineer officers on duty on board tankers.

Duration

The duration of this course is 9 weeks.

Cost

The cost for attendance is 180 USD.

Faculty

The faculty consists of tanker-experienced masters, chief engineers and chemical engineers.

Course Content

The course content covers the following:

- transport and handling of oil
- hazardous material (health risks)
- physical and chemical properties of oil
- transport and handling of liquefied gas
- general construction of tankers
- transport and handling of chemical products
- measurement and control instruments
- operation of inert gas plant
- international and national regulations

Teaching Aids

Lectures are held in seminar rooms equipped with audio-visual aids and supported with field trips which include visits to liquefied gas and ethylene plants in Pajaritos, Veracruz; a visit to an LPG tanker; a visit to a chemical tanker; a visit to the "Astilleros Unidos S.A." shipyard in San Juan de Ulua, Veracruz.

4.5 MISCELLANEOUS

Within this category, several kinds of courses have been grouped; water pollution prevention course, master mariner course, chief officer course, safety at sea course, marine surveying courses, radiotelephony operator course and maritime English courses.

4.5.1 Water Pollution Prevention Course

The water pollution prevention course was established with the aim of incresing awareness of sea-going personnel of the marine environment and its spoilage by oil, chemical products, garbage and sewage. The course is conducted at the maritime academies in Tampico and Veracruz.

Objectives

The objectives of the water pollution prevention course are as follows:

- to comply with the requirements of SOLAS 74 and its protocol of 1978.

- to comply with the requirements of MARPOL 73 and its protocol of 1976.

Participants

The participants for this course should be masters, chief engineers and deck and engine officers.

Duration

The duration of this course is one week/30 class hours.

Cost

The cost for the attendance is 70 USD.

Faculty

The faculty consists of tanker-experienced personnel.

Course Content

The course content covers the following:

- general deterioration of the environment
- International Convention for the Prevention of Pollution for Ships, 1973/1978
- Protocol relating to Intervention on the High Seas in Cases of Marine Pollution by Substances Other than Oil, 1973
- international certification
- anti-pollution equipment

Teaching Aids

Lectures and conferences are held in seminar rooms equipped with audio-visual aids.

4.5.2 Master Mariner Course

The master mariner course was established to train first officers with the aim to be familiarized with modern technological development. This course is conducted at the Maritime Academy in Mazatlan and attendance is voluntary. After succesful completion participants are awarded with the master mariner certificate due to the fact that course program covers professional subjects which are included in the promotional examination if applicable.

Objectives

The objectives of this course are as follows:

- to comply with the requirements of STCW 78, Regulation II/2 "Mandatory Minimum Requirements for Certification of Masters and Chief Mates of Ships of 200 Registered Tons or More" and its Appendix.

- to comply with the requirements of STCW 78, Regulation II/5 "Mandatory Minimum Requirements to Ensure the Continued Proficiency and Up-dating of Knowledge for Masters and Deck Officers"

Participants

The participants for this course should be chief mates with the required sea service period.

Duration

The duration of this course is 12 weeks/480 class hours.

Costs

The cost for the attendance is 180 USD.

Faculty

The faculty consists of experienced master mariners, pilots, English professors and harbor masters.

Course Content

The content of the course covers the following:

- management and maritime economy
- maritime law
- marine insurance and classification societies
- maritime safety
- electronic navigation
- shiphandling and manoeuvring
- cargo handling and stowage
- meteorology and oceanography
- ship stability
- technical English

Teaching Aids

Lectures are held in seminar rooms on campus, utilizing all necessary audio-visual aids as well as laboratories, workshops and radar simulator. Some visits are planned to the local shipyard and port facilities.

4.5.3 Chief Officer Course

The chief officer course was established under the same purpose as the master mariner course. This course is conducted at the Maritime Academy in Mazatlan and attendance is voluntary.

Objectives

This course has the same objectives than the master mariner course.

Participants

Participants for this course should be third and second officers who have accumulated the required sea-time period.

Duration

The duration of the course is 12 weeks.

Cost

The cost for attendance is 180 USD.

Faculty

The faculty consists of master mariners and first officers.

Course Content

The content of this course covers the following:

- navigation
- meteorology and oceanography
- ship stability
- shiphandling and maneuvring
- cargo handling and stowage
- maritime law
- management of personnel
- maritime safety
- English language
- medical care
- communication at sea
- methodology of maintenance

Teaching Aids

Lecures are held on campus utilizing the equipment and facilities available at the Academy. Some visits are planned to local institutions and port facilities.

4.5.4 Survival at Sea Course
(Fire-fighting and Medical Care)

The survival at sea course was established apropos of the terrible tragedies that have occurred at sea and the

vital need for safeguarding human life. The course is run at the three maritime academies.

Objectives

The objectives of the course are as follows:

- to comply with the requirements of SOLAS 74, and its amendments of 1981 and 1983.

- to comply with the requirements of STCW 78, Appendixes to Regulations II/2, II/4 and III/2 paragraph 2 (c), Regulation III/4 paragraph 2 (f), Regulation IV/1 paragraph (e), Regulation V/1 paragraph 1.

- to comply with the requirements of STCW 78, Resolution 19, "Training of Seafarers and Personal Survival Techniques" and its Annex.

- to comply with those requirements of national regulations.

Participants

The participants for this course should be all ship officers. This course is obligatory and upon completion participants are awarded a special competence certificate. The maximum number of participants is 20.

Duration

The duration of this course is two weeks/70 class hours.

Cost

The cost for attendance is 110 USD.

Faculty

The faculty consists of qualified instructors and experienced personnel from the local fire brigade.

Course Content

The course content covers the following:

- man overboard drill
- abandon ship drill
- the helicopter as rescue device
- inflatable raft operation
- fire-fighting drill
- medical care, first aids

Teaching Aids

The equipment and facilities used in this course are the following:

- fiberglass lifeboat
- self-inflatable rafts
- necessary equipment for rafts and boats
- fire-fighting area
- smoke-room
- seminar room with audio-visual aids
- medical aid room

4.5.5. Marine Surveying Courses

The maritime surveying courses are divided into three parts; international maritime safety course, average adjusters course (underwriters and/or chartering surveyors), and marine surveyors course (on behalf of shipowner). These courses have been developed of provide the ship surveyor with the knowledge and skills to represent a governmental body, insurance company, classification society and/or the shipowner.

Objectives

The objectives of this course are as follows:

-to prepare on a professional level with better qualifications those who perform the duties in the area of marine surveying and those who wish to do so.

Participants

The participants for these courses should be masters and chief engineers. Participants can

attend each course separately.

Duration

The duration of each program is 3 weeks.

Cost

The cost for attendance is 120 USD per program. The total cost for the whole course is 280 USD.

Course Content

The content of the international maritime safety course is as follows:

- IMO, SOLAS and MARPOL
- Load Lines
- ship surveying
- periodical and annual surveys
- tonnage measurement

The content of the average adjusters course is as follows:

- inspection of condition
- ship appraisal
- hull damage inspection
- cargo damage
- spillage and damage to port installations
- load draught determination
- fuel determination
- insurance coverage of damages

- particular average
- general average
- abandonment figure
- salvage and recuperation

The content of the marine surveyor course is as follows:

- international safety inspections
- ships' classification
- inspection of cargo equipment (general cargo vessels)
- damage inspection
- ship afloat inspection
- drydock inspection
- basic principles of shipyard quotations
- quotation analysis prior to selection of a shipyard
- guidelines on tolerance of hull plating thicknesses
- non-destructive tests
- tests on tanks, boilers and pressure tanks
- technology of materials
- cathodic protection/electrolysis
- hull coating
- tests of engines and hull
- welding inspections

Teaching Aids

The courses are held at campus in fully equipped seminar rooms, supported with films and visits to port facilities and the "Astilleros Unidos S.A." shipyard in San Juan de Ulua, Veracruz.

shipyard in San Juan de Ulua, Veracruz.

4.5.6 Radiotelephone operator

The radio telephony operator course was established as an extension of the safety at sea course due to its nature in emergency communications procedures. This course is conducted at the Maritime Academy in Veracruz.

Objectives

The objectives of this course are as folows:

- to comply with the requirements os StCW 78, Resolution 15, its Annexes and Appendix.

Participants

Participants to this course should be deck and engine officers, radio officers, and other related to maritime radio communication services such as traffic control operators, agents and port authorities.

Duration

The duration of this course is one week/ 30 class hours.

Cost

The cost for attendance is 70 USD.

Faculty

The faculty consists of an electronic engineer and a radio officer.

Course Content

The course content covers the following:

- principles of radiotelephony
- operation of shipborne radiotelephone communication equipment
- operation of portable radio apparatus for survival craft
- sending and receiving spoken messages by radiotelephone
- radiotelephone watchkeeping
- avoidance of causing harmful interference particulary with distress traffic
- distress radiotelephone message
- urgency radiotelephone message
- safety radiotelephone message
- use of the international phonetic alphabet and figure code

Teaching Aids

The course is held on campus in seminar rooms with radiotelephone equipment and a portable radio apparatus.

4.5.7 English Language Course

The English language course was established in order to extend the knowledge and practice in the English language. The course is divided into two branches, deck and engine room terminology and are conducted at the maritime academies in Tampico and Veracruz.

Objectives

The objectives of this course are as follows:

- to enable seafarers to communicate in a foreign language which is considered in the maritime industry as vitaly important

- to enable participants in the interpretation and comprehension of publications, catalogs, text-books, etc., written in English.

Participants

Participants for both courses should be deck and engineer officers, employees in shipping companies, maritime authorities, shipyards, agents, etc.

Duration

The duration of each course is 3 weeks.

Cost

The cost for attendance is 80 USD.

Course Content

The content for the deck terminology course is as follows:

- shipping (fleet operation)
- buoyage
- types of vessels
- special duty vessels
- shipbuilding
- manning
- seamanship
- terms relating to life-saving appliances
- VHF communication, Seaspeak
- classification societies
- marine insurance terms

The content for the engine room terminology is as follows:

- different types of marine engines
- cause and effect of failure
- two and four stroke cycles
- description of an engine governor
- boilers
- auxiliary machinery
- fuel oil systems
- pumps
- fault chart

- safety aboard
- life-saving appliances
- communications at sea
- introduction to sea speak
- classification societies

Teaching Aids

Classes are supported with language laboratory and audio-visual aids.

CHAPTER V

RECOMMENDATIONS FOR THE EXPANSION OF THE TRAINING OFFERED IN MEXICO

Mexico as was already mentioned, operates both state and privately-owned vessels. The national merchant fleet is manned totally by personnel who have been trained in the national maritime academies.

The existence of specialized training courses provides such personnel with the qualifications necessary to fulfill the requirements of the shipping industry. These highly specialized shipboard personnel will have a beneficial effect on the national economy, the society, as well as on the maritime administration itself.

Now, looking at the courses already established in Mexico, and considering their value in the field of training, it is necessary to recognize the need for expanding the scope of such courses. The development of new courses in Mexico will allow the country to adapt more widely to the international requirements in maritime education and training.

5.1 ASSESSMENT OF NEEDS

At present the Mexican system of education and training of seafarers have covered its needs as regards specialized training. However, the need to revise carefully future courses in order to introduce new training programs for seafarers still exists. The assessment of needs requires knowledge, comprehension, analysis and evaluative capabilities which are necessary for the implementation of such courses.

Taking into account that the sea as a career has evolutionary process, emerging needs in training well arise constantly and specialized courses will have to be succesfully executed.

Despite the variety of courses that could be recommended at the present, only two assumptions have been made on the basis of safety at sea and modern technology.

The first assumption is based on the fact that the country has a considerable number of vessels carrying packaged goods, considered dangerous because of their hazardous characteristics and which may pose a danger to ships, the marine environment or those people who work on board or in ports.

The variety of dangerous goods in use today is tremendous and diverse and at the present the amount of such cargo handled in Mexican ports and transported by the national shipsis growing.

Because of this, it is essential to introduce a specialized training course on packaged dangerous goods which provides the participants with the appropriate training skills and qualifications. This would enhace the safe transport of the cargo and ensure safer working conditions.

The second assumption is based on the evidence that human failure is the most important cause of maritime accidents which involves among others, strandings, groundings, collisions, etc. It is, therefore necessary to implement a specialized training course where a shiphandling simulator can be used as a training tool under the most relistic environment.

The shiphandling simulator course can provide the highest level of skill and judgement regarding navigating and manoeuvering under different conditions and situations. All of this can be accomplished because in a brief period of time simulation can provide an experience which take a longer period of time to acquire on board ships.

5.2 OUTLINE OF COURSES

Following is an outline of the specialized courses suggested in section 5.1 which is currently needed in Mexico.

5.2.1 Packaged Dangerous Goods Course

This course deals with different types of hazardous cargoes, their properties and their carriage by sea. Specially this kind of cargo could result in serious damages to the ship, its personnel and the marine environment if not transported with proper knowledge and awareness. Some examples of casualties caused due to lack of knowledge of their safe handling could be discussed in order to impart and idea of the hazards which arise from such cargoes. The course should convince the participants of the need for an effective control of the carriage of dangerous goods by sea and should enable them to apply such controls. Because of its nature is recommended that this course be conducted at all three academies because of its low investment and the fact that there are no costly requirements in for implementation.

Objectives

The objectives of the hazardous cargoes course are as follows:

- to comply with the requirements of IMO, Resolution A. 537 (XIII) "Training of Officers and Ratings Responsible for Cargo Handling on Ships Carrying Dangerous Substances in Solid Form, in Bulk or in Packaged Form" and its Annexes.

- to comply with the requirements of SOLAS 74, Chapter VII and MARPOL 73, Annex III

Participants

The participants for this course should be masters and deck officers.

Duration

A two-week duration of 60 class hours is suggested for this course.

Cost

The cost should be established by the Academy.

Faculty

The faculty should consists of experienced masters chief officers and chemical engineers.

Course Content

The course content should cover the following:

- properties of packaged dangerous goods
- chemical hazards
- health hazards

- international conventions, codes and recommendations, and pertinent national laws and regulations
- analysis of IMDG Code
- shipment of dangerous goods
- shipboard application
- safety management on board ships with regards to dangerous goods
- emergency equipment
- emergency procedures

Teaching Aids

Lectures should be supported with audio-visual aids.

5.2.2 Shiphandling Simulator Course

This course should utilize the simulator as a mean of illustrating bridge procedures and developing decision-making skills in trainees. The course should be composed of exercises designed to develop skills necessary for a succesful performance while officers act as watchkeepers. Some of these exercises should require teamwork, thereby instilling and reinforcing the importance of communication and cooperation. It is also conceivable to make use of the simulator for examinations. As the cost of this equipment is rather high it is recommended that this course be established in only one of the three academies.

Objectives

The objectives of this course are as follows:

- to comply with the requirements of STCW 78, Regulation II/2 and Resolution 17 "Additional training for masters and chief mates large ships and of ships with unusual maneuvering characteristics.

Participants

The participants for this course should be masters and deck officers.

Duration

Two weeks duration of 70 class hours is suggested.

Cost

The cost for attendance should be established by the Academy.

Faculty

The faculty should consits of experienced pilots and masters with previous special instruction as trainers of the shiphandling simulator.

Course Content

- bridge procedures
- passage planning
- approaching and boarding pilot
- harbor entrance
- harbor manoeuvres
- the anchor as manoeuvering aid-emergency anchorage
- berthing and unberthing
- turning circle manoeuvres
- navigation in shallow waters
- navigation in channels
- passage of two ships in a narrow channel
- radius constant steering
- navigation in open sea
- overtaking in a channel
- crash stop manoeuvre
- turning circle manoeuvre
- emergency manoeuvring in coastal waters and heavy weather (broken rudder)

Exercises should be run in different weather and current conditions and for various types of vessels.

5.3 FURTHER SPECIFICATION AND IMPLEMENTATION

Some aspects should be taken into account before implementing a new course. Different views should be carefully analysed in order to know which one of them is the

most suitable and worthwile for the structure of the national maritime education and training system.

Course contents have been presented in a general form, but it is expected to develop the complete syllabus for both courses. This is not an easy task and requires a conscious effort which certainly could be accomplished by professional personnel, knowledgeable and experienced in such fields together with the maritime lecturers graduates of The World Maritime University who have already resumed work in Mexico and have gained knowledge and experience in both subjects.

The dangerous cargoes course proposed does not present a large problem in its implementation because of its nature and the fact that its development and management is mainly done through theoretical work which represents only a minimum amount of investment achieved through the recruitment of the right personnel for such training.

On the other hand, the shiphandling simulator course requires the need for acquisition of very sophisticated and expensive equipment and special facilities for its implementation which should require a higher effectiveness in its operation.

Before making any acquisition, it is recommended that broad consultation with the various existing maritime simulator manufacturers in the market is made in order to evaluate the different options they can offer.

Several types of these simulators can be found, from the most sophisticated to the simplest one. Rather than

make a choice of the largest and the most expensive, it is better to choose one which is flexible in its functions, and where price provides for a good own benefit ratio.

In the case of Mexico two alternatives exist if the course is to be implemented. The first possibility is offered by NORCONTROL which allows, by means of interfacing and adaptation systems, the use the radar simulation equipment currently available at the three academies with a nocturnal scenario displayed through the bridge windows.

This presentations viewed on a curved screen produced by a projection system which could be very versatile, allowing e.g., the introduction of additional sea traffic, variation of visibility and light levels as well as the light levels and navigational marks. The bow of own ship could be displayed with a slide projector.

The cost of adapting this system represents a cost saving because of the existing facilities in the country.

The second possibility is to acquire a complete ship-handling simulator, which besides the features mentioned above can allow display in day light visual scenes. In addition to that, the bridge equipment and control system provide an authentic training environment.

Comparing the first possibility with the second one makes a enormous disproportion in the investment for acquisition of a new simulation equipment.

Furthermore, with respect to the course itself, it is important to mention the fact that within the Master Mariner and Chief Mate courses described in Chapter IV, there exists the theoretical knowledge based on shiphandling ans ship manoeuvering, this aspect could be covered by the course proposed and it seemns possible to separate that subject from the courses mentioned. Thus, the duration for those courses could be cut down in order to conduct appropriately, the shiphandling simulator course.

Besides its function in training activities the shiphandling simulator could carry out research projects and also offers its facilities to foreign countries for that research. Also this course could be offered to merchant marine officers from Latino American countries.

5.4. FUTURE NEEDS

The contribution of specialized training courses in the maritime field has demonstrated a faster response to shipboard requirements in a more efficient and effective manner.

Considering the future development of specialized training courses, it can be taken for granted that new needs for qualification and training in shipping will arise and that such courses are needed to fulfill emerging and future needs. It is therefore, important to be very objective in this aspect and to demonstrate

and observe carefully the greatest influence that these courses have in the field of maritime education and training. However, to contemplate all concepts discussed in this paper, the need for cooperation among Latin American countries seems to be a fundamental principle supported by the expertise which those countries with highly developed maritime structure can offer.

Thus, the impact of such training has been and should still be fruitful, but it is important to preserve the best of the old experience and knowledge in examining and accepting new techniques since they result in making our industry more profitable.

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