BASIC DESIGN STUDY REPORT
ON
THE MARITIME EDUCATION AND TRAINING PROJECT
IN
THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

MARCH, 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Socialist Republic of the Union of Burma, the Government of Japan has decided to conduct a basic design study on the Maritime Education and Training Project and has entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Burma a study team headed by Capt. Hirohisa MATSUDA, Maritime Technological Officer, Education Division, Seafarers' Department, Maritime Technology and Safety Bureau, Ministry of Transport from December 7 to December 26, 1986.

The team had discussions on the Project with the officials concerned of the Government of Burma and conducted a field survey in Rangoon area.

After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

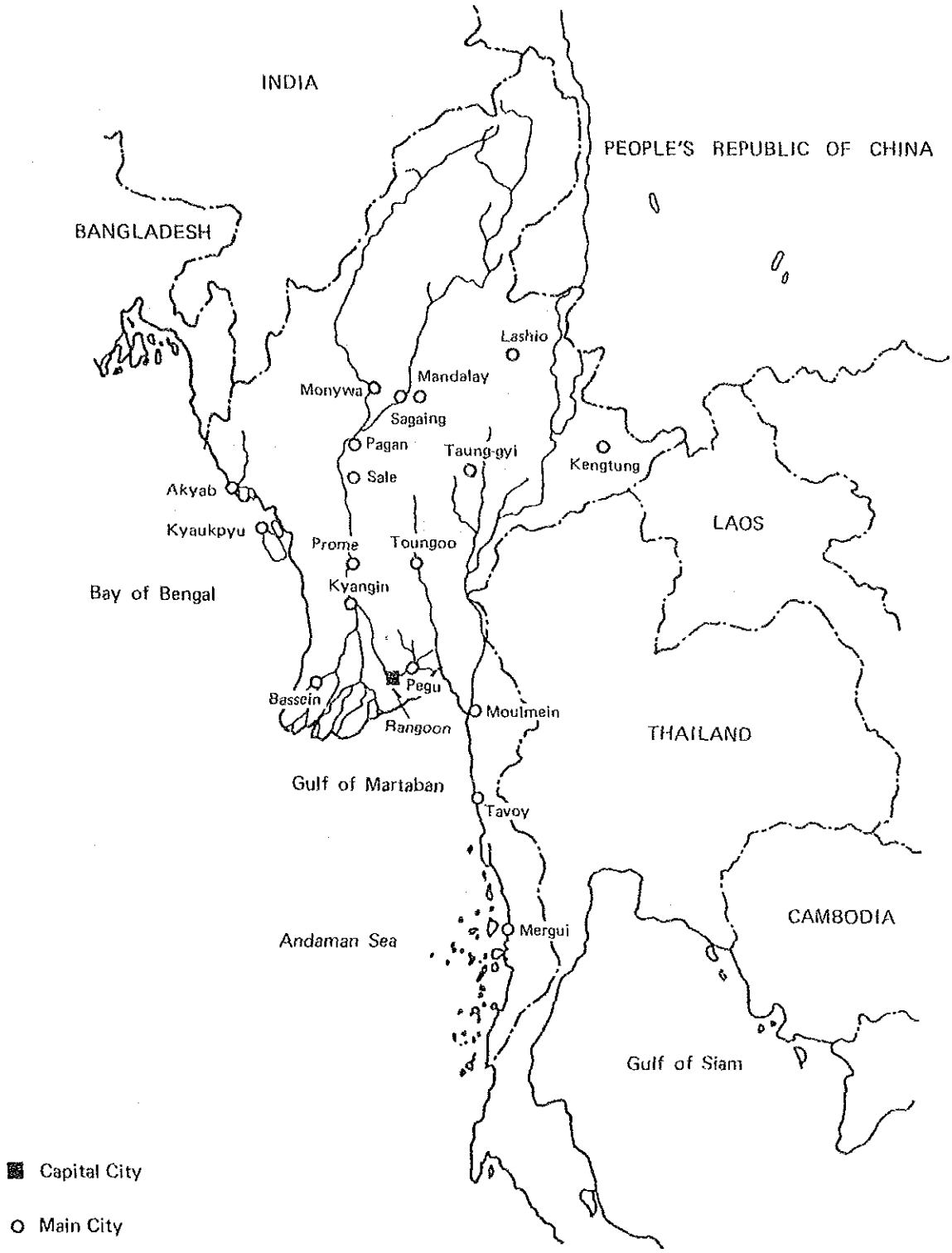
I wish to express my deep appreciation to the officials concerned of the Government of The Socialist Republic of the Union of Burma for their close cooperation extended to the team.

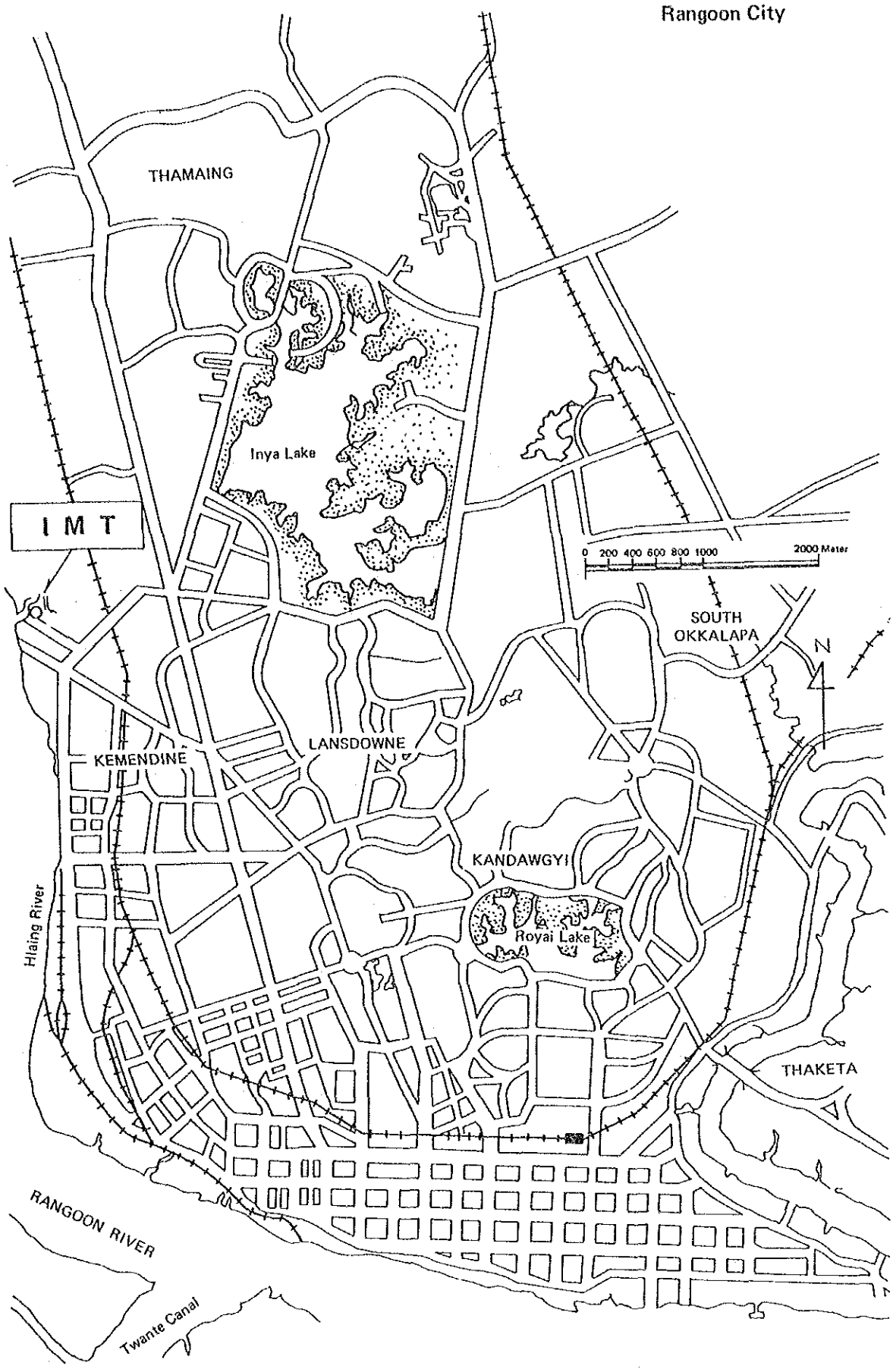
March, 1987

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation
Agency

The Socialist Republic of The Union of Burma

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KANDAWGYI
Royal Lake
Hlaing River
THAKETA
RANGOON RIVER
Twante Canal

List of Abbreviations

Abbreviations	Original names
MOT	Ministry of Transport & Communications
DMA	Department of Marine Administration
IMT	Institute of Marine Technology
FERD	Foreign Economic Relations Department
BFSSC	Burma Five Star Shipping Corporation
IWTC	Inland Water Transport Corporation
ARPA	Automatic Rader Plotting Aid
DF	Direction Finder
NNSS	Navy Navigation Satellite System
IMO	International Maritime Organization
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1987
SOLAS	International Convention for the Safety of Life at Sea

SUMMARY

The Government of The Socialist Republic of the Union of Burma, aiming at the establishment of the Burmese socialism and achievement of the economic independence, formulated a 20-year economic development program in 1970 and has promoted its economic administration by subdividing the program into plans, each for four years. The government-operated shipping industry in Burma commenced in the early 1950s under a series of important policies including promotion of the economy and improvement of the productivity. Since then it has steadily expanded its scale, and now its merchant fleet comprises 100,000 gross tons of ocean going ships and 8,000 gross tons of coastal ships which are one hundred percent operated by the Burmese crew and are handling about 30 percent of the marine transport cargos of Burma.

The Government of Burma, based on the understanding that the safety and operating efficiency of ships would depend greatly on the performance of seafarers, drew up a plan to improve the level of the education at the Institute of Marine Technology (IMT), the only seafarer-training institution in the country. The immediate targets of the plan are:

1) To introduce essential courses for Deck officers in accordance with 1978 Convention on Standards to Training, Certification and Watch keeping for seafarers (STCW).

and

2) To upgrade cadet officer courses presently conducted at the institute.

In this context, the Government of Burma requested the Government of Japan to provide the necessary educational equipment under its grant aid program.

To comply with the request, the Government of Japan decided to conduct a study of the project and through the Japan International Cooperation Agency dispatched to Burma a basic design study team from December 7 to 26, 1986. The team carried out a field survey and examined the propriety of the project and the scope of the required cooperation. Coming back to Japan, the basic design study team consulted with the organizations concerned on the Japanese side,

analised data collected in Burma and carefully examined the propriety, adequate scale and grade of the project, operation management system and project assessment. Consequently it determined the scope of equipment of grant aid and formulated an optimum basic design.

The project is outlined below.

Recently, with infiltration of the remarkable technical innovation into the field of marine transportation, the ship navigators who handle advanced and complex equipment of ship have come to be required of higher knowledge and skills. And, with effectuation of the STCW Convention in 1984, the knowledge, skill and marine technology certification for seafarers was internationally standardized. Under such international situation, it is an urgent problem for Burma desiring to foster an independent shipping industry to develop and improve the domestic system for marine technology and seafarer education.

Summing up the present condition of IMT which is the only institution for seafarer education in Burma, it has many distinguished advantages such as adequate training scale, competent and experienced staff of instructors, properly arranged curriculum, effectively combined apprentice system and disciplinary educational atmosphere. However so long as the educational equipment is concerned, it is belated in quantity as well as in quality.

In order to ameliorate the present situation of IMT and improve and modernize the education at the navigation department of the Institute, the study team examined the request for grant aid from the standpoints of

1. Correspondence to STCW Convention, and
2. General Improvement of the level of education in the respective courses of the navigation department.

   As a result, the team determined the equipment that would be considered to be optimum as below.

Main Equipment

1. Radar simulator (with automatic radar plotting aid)
2. Navigational aids simulator (Navy navigation satellite system, Loran C, Decca, Omega, Direction finder and Echo sounder)
3. Astronomical instructional projector set

4. Science laboratory equipment

- o Optical demonstration set
- o Heat transfer demonstation set
- o Sound wave demonstation set
- o Mechanical and control demonstration set
  - Mechnical control unit
  - Level and flow control unit
  - Pressure control unit
  - Temperature control unit
- o Experimental water tanks
  - For experiment of ship behaviors under rough condition and experiment of the holding effects of anchor and anchor chain
  - For experiment of stability
- o Electricity and electronic demonstration set
- o Computer system

Of the above equipment, the radar simulator, navigational aids simulator and astronomical instructional projector set will be installed in a two storied building to be constructed newly by Burma in the compound of IMT, and the others will be arranged or installed in the existing facilities and schoolrooms. After installation, no particular technical cooperation of the Japanese side is required for operation and maintenance of the equipment.

The total expense to be borne by the Burmese side is estimated at about K640,000. The time periods required to complete each stage of the project are 6 months for detailed design, bidding and contract, 9 months for fabrication of the equipment, 1 month for transportation and 3 months for installation, or a total of 19 months.

In order for the project to be carried out in a smooth manner, Burma is required to have the construction of new building completed before arrival of the equipment and appropriate the necessary maintenance and operation expenses for the equipment.

When the project is completed, IMT, having experience in personnel training for more than 10 years, will be able to enhance education further and, by sending out excellent mates, improve the safety and operating efficiency of the Burmese ships and contribute to strengthening the base of the Burmese shipping.

IMT is contemplating of reforming the educational system drastically in the near future, extending the 1 year cadet classroom course to 3 years to a total of about 5 years of education including the training course. IMT also intends to introduce a shipbuilding engineer training course.

The present project is mainly intended for the improvement of the mate education. Then, for the improvement of the engineer education course which is not included in the project, it is a pending problem for IMT to successively introduce the necessary equipment and teaching materials. In order to further improve the education at IMT as a whole, continued efforts should be exerted towards improvement of the equipment along with acquisition of the maintenance and operation expenses and ensuring of the space for installation.

Contents

CHAPTER 1 Introduction

Chapter 1 Introduction

Characterized by a coastal line extending over one thousand miles and a number of islands stretching along the southern coast and having five big rivers and a network of a number of tributaries and canals in the inland, Burma is a country having a long history in shipping. Over so many centuries until the railway and road developed in the nineteenth century, the Burmese ships had played a leading role in traffic and trades.

After the Second World War, the new Government of Burma quickly nationalized the Irrawaddy Flotilla Co., Ltd. of Scottish origin and with ships numbering more than 300, started the Inland Water Transport Corporation.

Subsequently, in the early 1950s, the government established the Burma Five Star Shipping Corporation, and thus commenced a new shipping enterprise with two ships of its own.

Both companies expanded its enterprise scale gradually, and now, after a quarter of a century, Burma has about 100,000 gross tons of ocean going ships (15), about 8,000 gross tons of coastal ships (11) and about 2,800 inland water ships, with as many as 14,000 Burmese seafarers registered.

The 20-year economic development program of Burma is now in the stage of the fifth 4-year plan under which promotion of the shipping is encouraged in both aspects of quantity and quality. The plan includes the improvement of the ports and harbours as well as docks, renewal of obsolete ships, increase of the bottoms and training of qualified crew, with expansion of the transportation sector and promotion of export taken as an important strategy.

On the other hand, the seafarer education in Burma started in the Seik Naval Base in 1963. It was transferred to the Ministry of Transport in 1971, and with the opening of the Institute of Marine Technology, a systematic seafarer training is now on its right track. The Institute has mainly been involved in the training of seafarers for the Burma Five Star Shipping Corporation and has sent out one thousand and several hundreds of graduates to the shipping industry.

Presently, the Institute is adequate in the formation of teachers and scale of the facilities but has problems resulting from the considerable lack of adequate modern and sophisticated equipment as well as shortage and obsolescence of the teaching materials. In order to cope with the ever-progressing ships and their operating technology and comply with the "International Convention on Standards of Training, Certification and Watch keeping for Seafarers, 1978" effectuated recently, the Institute is urgently pressed for improvement of the teaching equipment. Thus, the Government of Burma requested the grant aid from the Government of Japan.

In response to the request, the Government of Japan decided to conduct a basic design study, and the Japan International Cooperation Agency dispatched to Burma a basic design study team headed by Mr. Hirohisa Matsuda, Director, Education Division, Seafarers Department, Maritime Technology and Safety Bureau, Ministry of Transport, for a period from December 7 to 26, 1986, to conduct a field survey. The study team had discussions with the officials of the Government of Burma on the background of the project, details of the request and management system, visited the related facilities and collected necessary data.

Coming back to Japan, the basic design study team formulated a basic design plan through analysis and examination of the details of discussion and matters of confirmation with the Burmese side, result of the site survey and collected data.

This report summarizes the result of the foregoing basic design study, verifies the propriety of the project and presents an optimum basic design plan for the project.

The report is accompanied with the composition of the study team, study schedule and minutes of the proceedings attached at the end.

CHAPTER 2 Background of the Project

Chapter 2 Background of the Project

2-1 Outline of the country

The area, population, population density,ratio of population increase and the main economic indices and educational situation in Burma are included in the Materials.

2-2 Outline of Maritime Education & Training in Burma

2-2-1 Maritime administration system

Maritime administration of Burma is under the jurisdiction of the Ministry of Transport and Communications (abbreviated as MOT hereafter). (Refer to Table 2-1(1) P26)

Under the Minister of this Ministry there are two secretaries, and one of the secretaries is responsible for administration of the Department of Marine Administration (DMA), Department of Aviation Administration, and the shipping, aviation, port and harbour and shipbuilding enterprises of the government and the Institute of Marine Technology (IMT).

Of these, it is IMT that is responsible for the implementation of the Burma Maritime Education and Training Project, and the duties assigned to the Institute and those to the Department of Marine Administration (DMA) which is closely related with the Institute, are as follows.

1. IMT

   IMT is an organization under direct control of the secretary and is an educational organ training the officers and ratings of the ocean going and coastal merchant ships, inland water ships and fishing boats as well as the engineers in the port and harbour, ship repair dock and other related fields in Burma. (Refer to Table 2-1(2), P26)

   The Institute will be described in more detail in paragraph 2-2-6.

2. DMA

DMA is an internal bureau of MOT connected directly to the secretary and is responsible for all works of maritime administration except those assigned to IMT.

The bureau is comprised of the following five departments. (Refer to Table 2-1(3), P26)

- o Administration
- o Planning and accounting
- o Engineering (engine inspection, ship repair dock and engine department's certificate of competency examination)
- o Seafarer labour administration
- o Navigation (shipping, hull inspection and navigation department's certificate of competency examination)

Of the administrative works which the Department performs, the marine technology administration (the setting of certification system of seagoing personnel, the implementation of certificate of competency examination and licensing,) and seafarer labour administration are closely related to IMT which is a seafarer education organ. IMT's educational activities provide education and training for the trainees for the knowledge, skill which are sought in the seafarers and come to an end with certification through the certificate of competency examination conducted by DMA after completion of the courses.

Thus, the educational organ and certification organ are provided in the same ministry and assume separate functions to ensure fairness. Thus, IMT and DMA are in an integral and inseparable relationship in maintaining alignment at the state level of the seafarer training project through a number of contacts including the educational courses adapted to the setting of a certification system and the creation of an educational curriculum corresponding to the subjects for certificate of competency examination, adjustment of the training scale commensurate with the demand for seafarers and exchange of teachers.

2-2-2 Shipping enterprises and their fleet

As the shipping enterprises, there are two big government operated enterprises, Burma Five Star Shipping Corporation (BFSSC) handling ocean going and coastal shipping and Inland Water Transport Corporation (IWTC) handling inland water transport, and small-scale enterprises operated by cooperative associations and private firms.

The government operated shipping corporation, BFSSC, started with two ships at the end of the 1950s, had the bottoms increased gradually and now has 15 ocean-going ships of about 100,000 gross tons and 11 coastal ships of about 8,000 gross tons.

The fleet of the corporation is comprised of medium-and small-sized multipurpose ships of 800 gross tons in the case of the small ship to 10,000 gross tons in the case of the largest ship. Almost all of the small coastal ships and about one half of the ocean going ships are relatively new with the age of several years or less, but the remaining ocean going ships are obsolete ships with the age of about 20 years. (Refer to Table 2-2, P27)

The corporation assigns its ships and chartered ships to the overseas services to Europe and Far East and coastal services along Burma and assumes marine transportation of about 50% of the import cargo to Burma and about 20% of the export cargo.

The Inland Water Transport Corporation, IWTC, established through nationalization of a Scottish shipping company immediately after independence of Burma in 1948, had the bottoms doubled and now holds about 300 powered boats of 100,000 gross tons and 330 non-powered boats of 50,000 gross tons. But, one half of them are old boats of an age of 30 years or more, and the remaining are over the age of 20 years.

In addition to the foregoing, there are 100 powered boats of 500 gross tons or less possessed by the other government operated enterprises such as People's Pearl and Fishing Corporation, Oil Corporation and Port and Harbour Corporation, and they are of an age less than 10 years.

The ships possessed by the cooperative associations and private sectors number about 1,200 of which about 150 ships, 18,000 gross tons, are operated in the coastal services and the remaining 1,000 ships, 70,000 gross tons, in the inland river services.

The fleets of these corporations, cooperative associations and private sectors operated in the coastal and inland water services are supported by the allocation of the transport of the import materials by the government and are expanding the bottoms by about 5% every year.

2-2-3 Main ports and harbours of Burma and transports by Burmese ships

A number of ports and harbours are located along the coast of Burma extending over one thousand and several hundred kilometers, but only nine ports of (1) Rangoon, (2) Akyab, (3) Bassein, (4) Moulmein, (5) Kyaupyu, (6) Sandoway, (7) Tavoy, (8) Mergui and (9) Kawthoug are authorized as seaport.

Of these, the ports allowing entry and exit of foreign trade ships are limited to four ports of (1), (2), (3) and (4), and particularly for the import cargos, Rangoon is designated as an only landing port.

The Port of Rangoon is located on the east side of the Irrawaddy delta at the confluence of the Rangoon River and its tributary, Pegu River. On account of shallows at the river mouth, it does not allow entry of ships of 15,000 deadweight ton class or higher.

It is still the largest port in Burma, having 13 berths for ocean going ships and handling 85% of the export cargos and nearly 100% of the import cargos.

The marine cargos handled at these nine ports including the Port of Rangoon are increasing year after year, as shown in Table 2-3, P29. Of these cargos, about 30% is reportedly the share of BFSSC. According to the data of DMA, the cargo handling volume and loading rate of all Burmese ships are as shown in Table 2-4, P30.

2-2-4 Shipping activities of BFSSC

If the inland river and local water transports are excluded, the present condition of the Burmese shipping is generally understood from the shipping activities of BFSSC.

When established in 1951, BFSSC had only two ships. It assigned European and Indian/Pakistani crew to them and entrusted the operation to the Zim Israel Line. However, in 1964, the Corporation recovered the independent operation and has thereafter improved the ocean going fleet gradually and now has all crew composed of Burmese except for one European shipmaster. The following is an outline of the current situation of the BFSSC, taking the Corporation's ship, Sagaing as an example:

- o The ship is a multipurpose freighter of 13,105 deadweight tons built by A. G. Wester Shipbuilding Yard, West Germany, in 1985, and is assigned to the tramp services to Europe. The ship is of the largest type capable of mooring at the wharf of the Port of Rangoon.
- o Being provided with electronic navigation equipment, she is an automated ship allowing bridge steering.
- o All of the 35 members of the crew are Burmese, with all deck and engine room personnel under the command of the captain and the engine room chief, being graduates of IMT.
- o The working system aboard the ship is traditional and conventional, with the discipline, maintenance, order and morale kept at a high level.
- o She has 11 IMT trainees onboard the ship in addition to the crew. The shipmaster, chief engineer and senior officers are held responsible for training of the trainees, and the record of training and reports on the trainees are maintained exactly. Trainees completing the schoolroom courses of IMT are automatically boarded on the ship of BFSSC to receive the training in operating technology for a certain period according to the specified curriculum. Thus, under the careful and strict guidance of the staff officers of the ship, the education is carried out on land as well as at sea to produce distinguished effects.

The shipping activities of BFSSC are shown below with reference to the lists of the ocean going and coastal fleets and the tables of the recent sailing schedule, transports and charters. (Refer to Tables 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, P27-P33)

According to the five year development program (1983/84-87/88) of the Planning and Finance Ministry, the Corporation has a plan, as a project of highest priority, of building two multipurpose freighters (15,000 DWT) and purchasing two used freighters (10,000 DWT) and one used coastal freighter (800 DWT) and also a plan, as a project of priority, of building and purchasing five ships. (Refer to Table 2-8, P33)

2-2-5 Supply and Demand of seafarers in Burma, and IMT

According to the DMA data, there are as many as 14,000 Burmese seafarers presently registered with the DMA. They include: 1,057 seafarers working on BFSSC, and 4,732 seafarers on board the foreign ships totaling 5,789.

There are slightly more than 8,000 other seafares registered as unemployed. They are mainly those who died or retired but have not had their registration cancelled and include the seafarers in sickness, in the waiting list and of advanced age in unemployment.

From the foregoing, it seems that the supply and demand situation of seafarers in Burma has a sufficient reserve force. But, in the case of seafarers required particularly for the ocean going ships, if not for the inland water services, advanced knowledge and technology are required in view of the various international conventions, and the technological level of the present surplus seafarers are unable to satisfy the requirement. Thus, the qualified and competent seafarers having a certain level of education and training given before they are on board the ships are in shortage, while the needs for such seafarers are increasing.

To comply with such needs, IMT is conducting training and upgrading of officers* and the scale of such education seems to be adequate from the following.

For example, BFSSC employs 1,507 seafarers. Of these, the officers are:

Navigation department	215, and
Engine department	186

or total 401.

The annual rate of consumption of seafarers (death, retirement, change of employment, etc.) was about 6% during the period of high economic growth of Japan, and in the case of Burma, it is reasonably assumed to be a little higher at about 8% with the labour conditions, employment customs and average span of life taken into account.

Then, the annual consumption of the staff personnel is estimated to be:

Navigation personnel	215 x ab't 8% = 17, and
Engine personnel	186 x ab't 8% = 15, or
Total	32

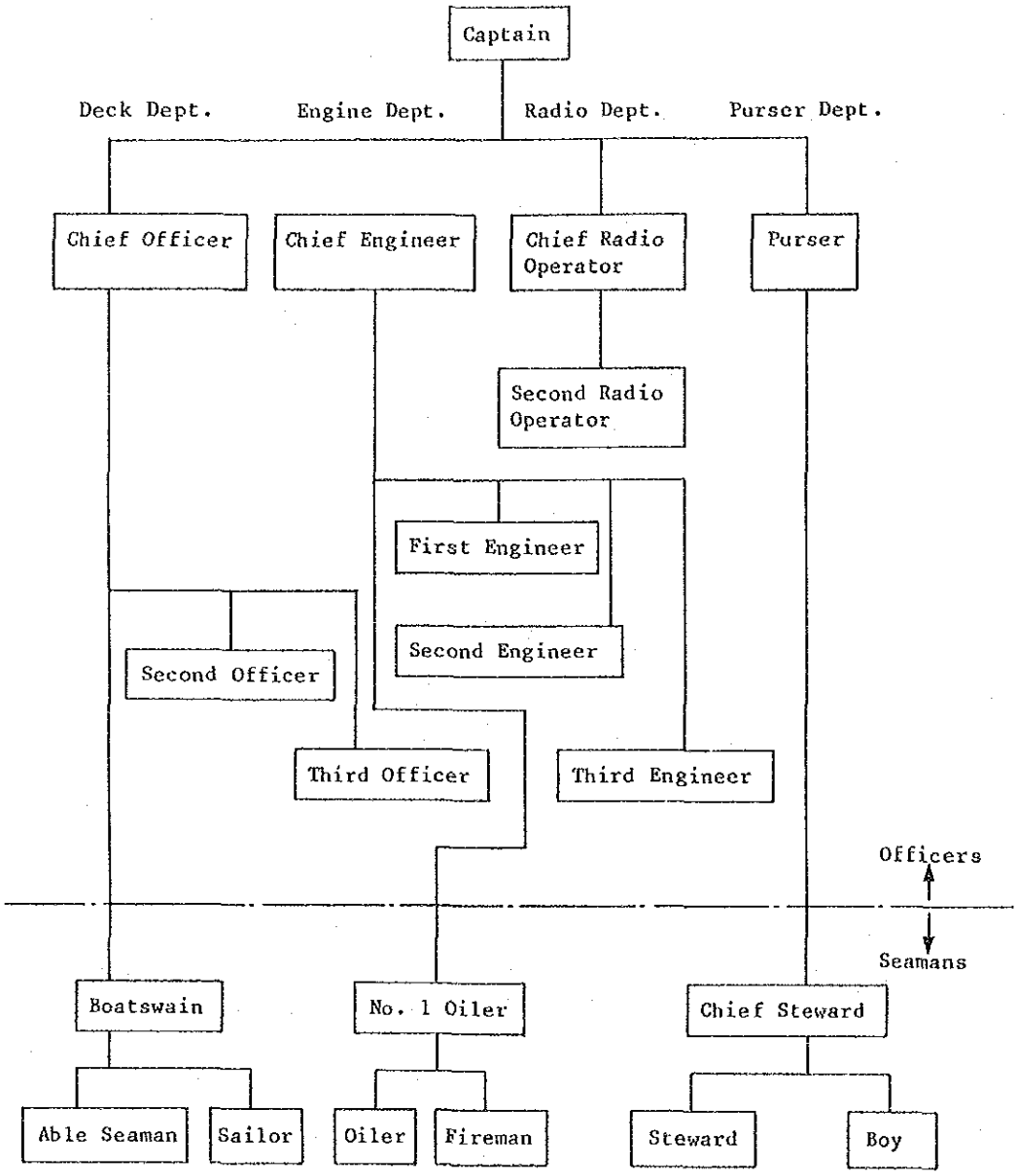
and it is required to supply (train) the corresponding number of personnel every year. IMT is training (navigator and engineer courses), 20 personnel in each course or a total of 40 personnel. This is sufficient to meet the needs for replacement of the natural decrease, the personnel required to man the increased number of vessels, and the requirements in the maritime organizations.

Moreover, for determining the number of cadets, the IMT is conducting discussions with the BFSSC that forms the main source of employment for the IMT graduates, and also with the DMA responsible for marine administration.

The young people of Burma have a professional image that the seafarer or, more particularly, officer aboard the ocean going ship is an attractive occupation along with the medical doctor. The number of applications to IMT is about 20 times the number of places, making it very hard to get into IMT. Only a very small number of students drop out before graduating from the Institute, and about 80% of the graduates of the cadet courses are working in BFSSC, with the other in the DMA, the Ports and Harbours Corporation, the Shipping Corporation, IMT and foreign shipping enterprises.

* Officers and crew:

In conventional type vessels, the configuration of the officers and ratings is as shown below. Those in the rank of Third Offier, Third Engineer or above are referred to as officers, and those below these ranks including the boatswain, the No.1 oiler and the chief steward are called rating.



2-2-6 Outline of IMT

1. History

It was in 1963 that the first systematic education of seafarers in Burma was started at the SEIK Naval Base.

The technical officials now in the leading position of the maritime administration or seafarer education of Burma are those pioneers who studied abroad in their youth, accumulated experience in marine duty for a considerable period of time and acquired the highest certification or title of marine technology in England.

The mercantile marine officer training course established in the naval base in 1963 was a predecessor of the Institute. It lasted for 8 years during which it trained 44 navigators and 33 engineers, then in 1971, it was transferred to the Ministry of Transport to initiate IMT.

The Institute continued its activities as a seafarer education organ intended for training of the officers and staff members aboard the ocean going ships according to the international standards of IMO, training of crew aboard the coastal ships and fishing boats, training of the port and harbour and dock engineers and training for the courses specified by STCW convention including radar observation, first aid, marine survival technology and fire fighting, and has so far sent out a total of 1,575 personnel completing the courses.

2. Educational courses

The crew operating a conventional type of ship is generally comprised of four departments of navigation (deck), engine, radio and pursers and the members composing the respective department are classified into officers and other ratings depending on the level of technology as well as responsibility.

The seafarer education organs are generally training the personnel of two departments of navigation and engine, and the organs for education of officers are called the university, college, institute or academy with heading of maritime or nautical, and the seamen training organs are called the rating school or seamen's training center.

IMT is responsible for training of both officers and ratings of the departments of navigation and engine and has the training courses in the fishing boat related fields provided concurrently, as described later.

The seafarer education organs have it a main course to educate and train cadets having the general education of the level of high school completed and aspiring to a ship's officer for a certain period of time, and the cadets completing this course and passing the certificate of competency examination conducted by the government are given the certificate of the primary class.

When such a seafarer is on board a ship and is to be promoted through accumulation of experience, he must pass the certificate of competency examination corresponding to the superior post. The course extended to the students entering the educational organ again for promotion for education of higher knowledge and technology is called the reeducation or upgrading course. Such system of education to the captain or chief engineer through reciprocation between the sea and the school is called the sandwich system, and such system is prevailing in the European maritime countries. After the British tradition, Burma employs this system.

IMT's educational courses have the certificate of competency system of Burma as mandatory, and extend over the two broad areas of navigation and engineering, under which are incorporated courses in ocean going ships, coastal ships, fishing boats and special lectures, and cadet training and upgrading, and officers ratings, respectively, with curricula provided in detail for each course. (Refer to Tables 2-12, 2-13, 2-14, P37-P39).

Here, the cadet training and upgrading courses of the navigation faculty and the special lecture course, which are particularly related to the present project, will be outlined below.

Also, as a reference, an outline of the certificate of competency system is attached at the end. (Appended materials VI P119)

(1) Cadet training course, navigation department

The persons allowed admission are those who have completed the second year in the faculty of science or mathematics of a university or having an equivalent school career. The period of education is five years, and the classroom course in the first year are devoted for lecture and practice according to the following curriculum.

Principle of navigation	140 Hours
Practical navigation	220
Radio electronic aids to navigation	80
Seamanship	300

General ship knowledge	220 Hours
Communication	80
Meteorology	80
Mathematics	120
Physics	120
Engineering knowledge	120
Common course	160
Boat sailing	88
Swimming/excursion	40
Sea cruising	40
Total	1,848 Hours

Each of the foregoing courses has the allocated hours subdivided minutely for lectures, practice, discussion, report, etc. depending on the contents.

Students who have completed the classroom course of the first year proceed to the training course on board the ship of BFSSC and accumulate practical experience as a trainee for a period of 3 years and 3 months. Then, they are back to IMT to receive the upgrading course for ocean going second mate course (6 months).

(2) Upgrading course

The foreign going second mate course is designed to give the learning and practice to the students having the foregoing nautical cadet course (1 year's classroom learning and 3 years and 3 month's training on board the ship) for 6 months according to the following curriculum.

Mathematics	143 Hours
Principles of navigation	45
Practical navigation and chart work	180
General ship knowledge	90
Orals and practical	127
Radar observer	135
Signals	45
First aid	45
Total	810 Hours

After the education and training throughout the period of 5 years of the nautical cadet and foreign going second mate courses and through the marine technology test, the primary class navigators are trained.

Similarly, the foreign going first mate course and foreign going master course are provided for the seafarers qualified for examination as specified in the certificate of competency system of Burma to give the corresponding knowledge and technology to the posts, and the period of education is 6 months for the respective courses.

(3) Special lecture courses

Radar observer course*

First aid course*

Survival at sea course*

Pre comand/chief engineer course

Special merchant navy course

Oil, chemicals Tanker safety course

These are the short term lecture courses on specific themes.

The asterisked lecture courses are new training themes specified in the STCW Convention. These should be added to the cadet training and upgrading courses as compulsory subjects. But, they are offered independently as special lecture courses in order to open the way of participation to the respective themes for the incumbent seafarers.

3. Teacher organization

The Institute organization is comprised of three departments of navigation, engine and secretary under the President, Dr. Tin Hlaing (having the British special class master certification).

The navigation department has 12 teachers (7 full-time and 5 part-time teachers) and 1 librarian, and the engine department has 16 teachers (4 full-time and 12 part-time teachers) and 1 cartographer, while the secretary has 4 staff members, or a total of 35 personnel.

The teachers are classified into the lecturer, assistant lecturer and instructor. the lecturers and part-time lecturers have generally a highest marine technology certificate of master or chief engineer and include not a small number of those who have received education in Britain or North Europe.

The teachers are considered to be competent in career as well as intelligence.

The full-time teachers are less than one half of the staff, and this is a situation occurring commonly in the seafarer education organs in the developing countries and is unavoidable particularly in the case

of a small scale school. To compensate for such shortcoming, exchange of teachers and dispatch of part-time teachers and guest lecturers from the BFSSC and DMA are carried out since they are under the same jurisdiction of MOT. This has the merit of providing instruction that is in touch with the reality.

4. Location, facilities and equipment

IMT is located at the east bank of the Rangoon River about 8 km north west of the central part of Rangoon and is adjacent to the Sinmalik Shipbuilding Yard. (refer see the map of Rangoon at the beginning of this report.)

The campus is recessed for about 1 km from the trunk road of the city. It has an area of 18,800 m^2 in the form of a trapezoid surrounded by the river bank, agricultural road and shipbuilding yard and has annexed a land of 5,200 m^2 for the quarters for officers and students in the upgrading course.

At the time of the opening, there was only one building serving as administrative building and school room building. With additional buildings constructed year after year, now the campus has a complex of the following buildings.

Admin. building	Brick mortar wall, 2 storied, slate roofing	7680 ft^2 x 2
Cadet building	Brick mortar wall 2 storied, slate roofing	7680 ft^2 x 2
Class room building	Brick mortar wall, 1 storied, slate roofing	2700 ft^2
Junior Cadet building	Brick mortar wall, 1 storied, slate roofing	2700 ft^2
Library building	Brick, mortar wall, 1 storied, slate roofing	3150 ft^2
Gym Shed building	Wooden frame open type, slate roofing	7200 ft^2
Workshop building	Brick, mortar wall, 1 storied, slate roofing	3000 ft^2
Snr. students residence	Brick, mortar wall, 2 storied, slate roofing	3600 ft^2 x 2

Seamen residence	Brick, mortar wall, 1 storied, slate roofing	3600 ft^2
Mess Room	Brick, mortar wall, 1 storied, slate roofing	3600 ft^2
Parade ground		19400 ft^2
Car Garage		
Officers quarter (adjacent to the campus)		10 bldgs
Upgrading course students quarter (adjacent to the campus)		4 bldgs

(Refer to Fig. 2-9, P34)

The educational equipment currently existing is as shown in Tables 2-10 P35, and 2-11 P36. The equipment is in shortage in such articles that ought to be provided for the specialized and fundamental courses of education in the light of the targets and contents of education of the Institute, and there are a number of articles that are noticeable in shape but are not usable because of absence of wiring or ancillary materials.

Compared with the general level of equipment of the seafarers education organs, provision of the equipment is considerably belated.

5. Finance

The finance of IMT is hundred percent supported by the government, and the IMT budgets during the last five years are as shown in Table 2-15, P40.

The appropriation for the working expenses such as wages, remunerations and equipment maintenance expense is increasing, although slightly, from year to year, but the facility expense for construction, civil engineering and other works is decreasing with accomplishment one after another of the yearly programs, and this year ('86/'87) it is about one half of that five years ago.

Particularly, since only K.70,000 - 100,000 (¥1,680,000 - 2,400,000) is appropriated a year for maintenance of the equipment, it is considered to be a matter of course that the facilities are generally obsolete with scarce materials and that some of the meters are left incomplete (without wiring) and displayed in a wrecked condition.

On the other hand, the school expenses are as follows.

	Tuition	Board & Lodging
Cadet	800 (1 year)	110 K/month
Rating trainee	225 (3 months)	
Second mate	300 (6 months)	
First mate	300 (6 months)	
Master, chief engineer	350 (6 months)	

Students in the upgrading course of the second mate or higher, so long as they are dispatched from BFSSC or any other government organ, have not the tuition collected as they have the employment in continuation.

However, the students having the benefit of scholarship granted are under obligation to work in the country for at least five years after completion of the school, and when such a student desires to work in an overseas enterprise within the period of five years, he must pay a great amount of compensation (about K50,000) to the government as a requirement for going out of the country.

6. Future concept

IMT is contemplating of reforming the school system in near future into an academy and drastically expand the contents of education mainly along the cadet course of the nautical as well as engine department and the ship engineer (shipbuilding engineer) training course.

The essentials of the reform are to open the school to high school graduates and modify the training period of 5 years to 3 years of classroom teaching and 2 years of practice on board the ship.

To digest the knowledge and skill which STCW Convention requires of the second mate navigators and engineers aboard the ocean going ships, education and training of at least about 3 years are required.

Accordingly, many countries generally employ an educational system of 3 to 5 years for training. Here, IMT has so far adopted cadets completed the second year in the faculty of science or mathematics of universities and provided learning for 1 year at IMT and practice for 3 years and 3 months aboard the ship.

The new system is advantageous in that with the subjects required for the officers such as fundamental, specialized fundamental, and specialized subjects being organized in three years, the education is made integrally, systematically and concentratedly to conform to the object of education, that by making the training starting age younger by two years, improvement is expectable in both aspects of the technical education and discipline and that with the period of training aboard the ship reduced and thus the whole training period reduced to five years, the employment age is reduced.

Along with such reform the certificate of competency system will have to be partially revised. But, the reform has already undergone the adjustment in the MOT of Burma and is now referred to the ad hoc committee examining the educational system. Here, for implementation of this concept, it is an important problem to improve and expand the contents of education as well as the teaching equipment and facilities.

7. Current problems of IMT

In order for an organ such as IMT specialized in maritime education to function properly, it is prerequisite that the following conditions are met.

- Social and economic demand (activities of the shipping industry in the background - needs for personnel training)
- National administrative and financial supports
- Competent and experienced staff of teachers
- Provision of adequate school grounds, buildings and educational equipment
- Setting of curriculums conforming to the purposes of education and training
- Coordination with the practice on board the ship which is indispensable for acquisition of marine technology
- Presence of applicants with aptitude for occupation (learning)

Summing up IMT as it is presently, the Institute has a number of excellent conditions provided, including the adequate scale of training, competent and experienced staff of instructors, adequate composition of curriculums, effectively linked onboard training system and disciplinary atmosphere.

However, the situation for the provision of educational equipment and facilities is not keeping pace with the other sections at IMT and as an example, the standard teaching materials which are considered necessary for education of the navigation department in order to satisfy the requirements for training as specified by STCW, they are as shown in the References Appendix VIII P131.

For implementing the intended education of ship's officers according to the international standards, the IMT has, when the present IMT equipment is compared with that to be required, nothing to start with so long as the experimental training, an indispensable element for technological training, is concerned if not of the learning of principles in schoolroom.

2-3 Outline of Related Programs

Having established a long term economic development plan of 20 years starting in fiscal 1971/72, Burma is implementing it in five phases of four year plan each. Now, the "fifth 4-year plan" is being carried out with the following main targets and policies.

1) It is intended to harmonize the economic activities with one another and, at the same time, accelerate the pace of production to achieve the targets of the "long term 20 year plan."

Specifically:

- o GDP growth rate is 6.1% a year.
- o During the period of the program, the investment is made in an amount of 14.18 billion Kyat (in terms of the price in 69/70; at the present value, about 7 billion dollars). For this, the saving rate in the final year of the program is raised to 15.05%.
- o In order to acquire the necessary foreign currency for the investment, the exports in the final year of the program is raised to 900 million dollars (current level being about 400 million dollars).

2) Main policies of "fifth 4-year plan"

- o The GDP composition in the final year of the program is comprised of production 55.4%, services 22.9% and commercial dealings 2.17%.
- o During the period of the program, an investment of 14.18 Kyat (in value of 69/70) is made.
- o Investment is made selectively to projects yielding maximum production in a short period.
- o Investment is made with preference given to the production of what is urgently needed by the people and what is exportable.
- o Efforts are made to ensure full operation of the existing factories.
- o When it is difficult to raise a sufficient amount of funds, importance is placed on operating the existing facilities fully rather than building new factories.
- o During the period of the program, the production of the government and cooperative association sectors should exceed that of the private sector.

- o Export is promoted to 2.1 billion Kyat (69/70 value; about 900 million dollars at the present value) in the final year of the program.
- o If the government is unable to provide the necessary funds for developing the natural resources to an maximum extent, or when advanced technology is required, reciprocal economic cooperation is promoted with foreign countries and foreign economic organs with a period specified to such an extent that the socialist system and economy are not impaired.
- o Power generation using oil as a fuel is converted as much as practicable to hydropower generation or gas turbine power generation.
- o The transportation section is expanded commensurate with the improvement of the producing capacity of the production section.
- o For creation of employment opportunities, priority is given to the labour concentrative projects rather than to the capital concentrative projects.
- o To establish harmony between the economic divisions, accurate statistics are provided of the national income distribution. Further, surveys on commodity prices, etc. are made.

Under such policies of the government, the maritime industry has various activity projects embodied in its respective fields, including reinforcement of the transportation fleet (BFSSC development project, referred to above), port and harbour improvement (inland water transportation and basic major port project) and shipbuilding yard and repair dock construction (repair dock and yard construction project) and also those taken up as cooperation projects of Japan.

The immediate target of the present project (The Socialist Republic of the Union of Burma Maritime Education and Training Project) is to update and improve the educational equipment of IMT and promote the level of education of the seafarers of Burma. Such a development project of maritime education is not valid independently but constitutes part of the improvement of the industrial base through organic cooperation with the development project of the maritime industry in the background, and it aims at answering a number of problems taken up by the government as important policies such as promotion of the economy, improvement of productivity, expansion of the transportation division and creation of employment.

2-4 Circumstances and Details of the Request

2-4-1 Purpose

Safety on the ship and efficiency of operation are greatly dependent on the capacity and skill of the crew. From such a point of view, the Government of Burma intends to improve the level of the capacity of the Burmese seafarers in executing their duties and thus set the following two targets for improving the contents of the education at IMT, the sole maritime education and training organ in Burma.

1) Complying with the "International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978" (STCW Convention), introduction of the indispensable courses newly specified for education and training of the mates.

2) Enhancing the contents of the current cadet officer courses at IMT.

2-4-2 Implementing Organ

IMT conducting the education and training of Burmese seafarers comprehensively is taken as an entity for implementation of the project.

2-4-3 Outline of New Courses and Requested Equipment

To answer to the provisions in Appendixes 2 and 4, Rule II-2 and Appendices 3, 5 and 6, Rule II-4, STCW (reference Appendix VII P 125), the radar course now undertaken by IMT with an actual radar used is expanded to include the radar simulator and navigational aids and automatic radar plotting aid simulators. Then, as the equipment required for this course, the following were requested.

1) Radar simulator (2- or 3-ship type) and automatic radar plotting aid

2) Navigational aids simulator

Navigational aids are comprised of the Navy navigation satellite system, Loran C navigation system, Decca navigation system, direction finder and echo sounder.

Further, for strengthening the current cadet officer courses, the following were requested.

3) Nocturnal maneuvering simulator

4) Planetarium

5) Fundamental science experimental and practice equipment

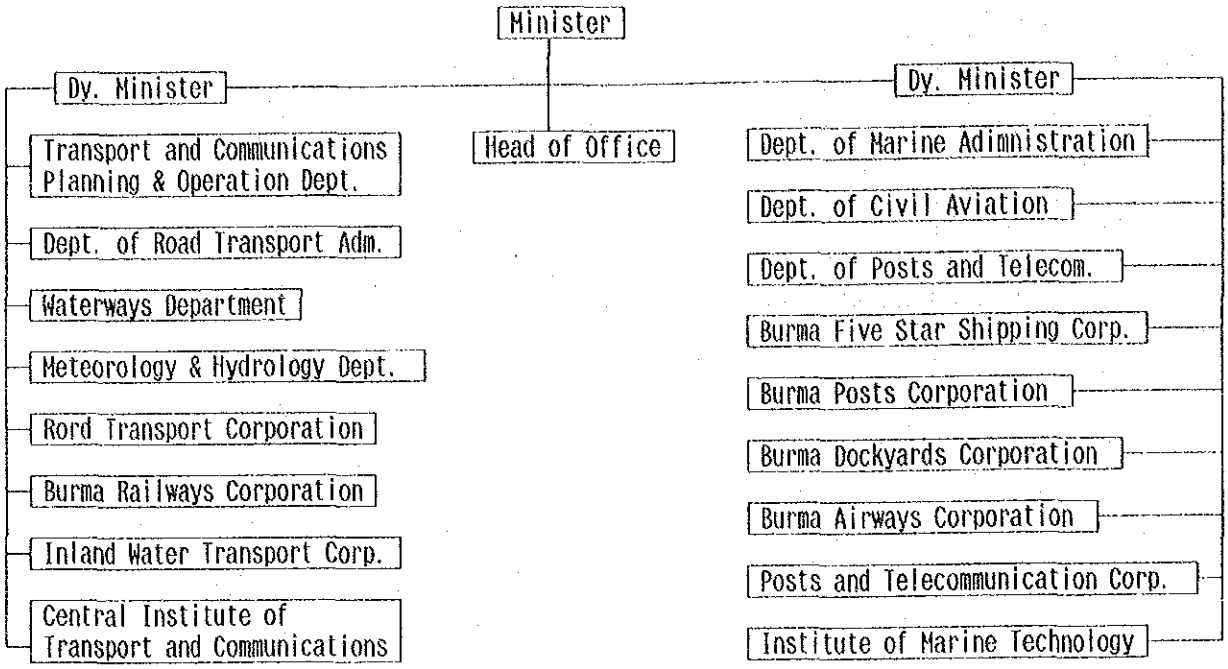
- o Optical experimental equipment (refraction, reflection, etc.)
- o Heat transfer experimental equipment
- o Acoustic experimental equipment
- o Machine and control system practice equipment
- o Experimental water channel (with model ships)
- o Electric and electronic equipment.
- o Computer system

With a supply of such equipment, it is necessary to construct a training building accommodating part of such equipment. But the construction of the building will be made by the Burmese side, and no cooperation is requested.

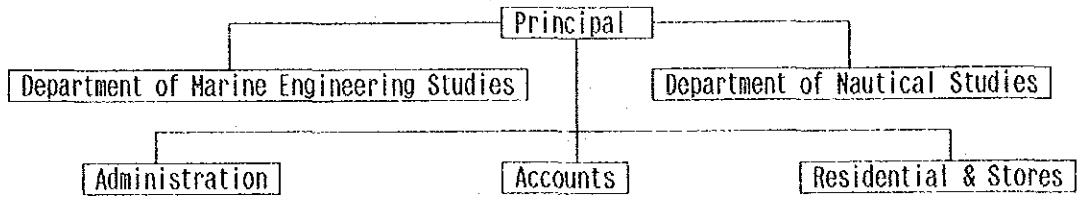
Remarks: Related STCW Rules are appended to this report. Details of the requested equipment will be described in the following chapter.

Table 2-1 Organization chart

(1) Ministry of Transport and Communications



(2) Institute of Marine Technology



(3) Department of Marine Administration

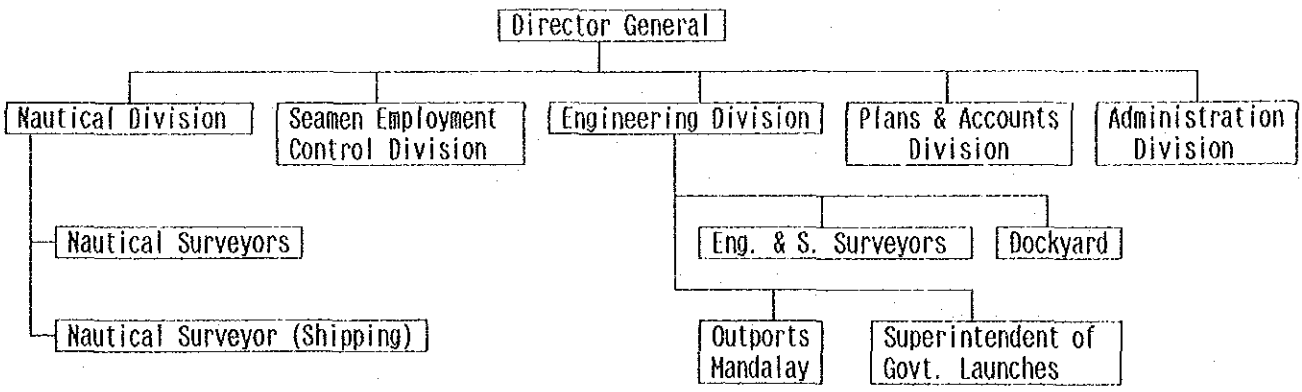


Table 2-2 BFSSC ocean going fleet (1)

Ship name	Ship's type	Deadweight tonnage	Gross tonnage	Year built	Builder	Services
1. PACO	Multipurpose ship	13,105	9,754	1983	A.G.WESTER SEEBECKWERFT WEST GERMANY	Europe
2. MANDALAY	Multipurpose ship	13,105	9,754	1983	A.G.WESTER SEEBECKWERFT WEST GERMANY	Europe
3. MAW LA MYAING	Multipurpose ship	11,660	7,567	1979	FLENSBURGER, SOBIFFSBAUGESELISCHAFT, WEST GERMANY	Far East
4. SITTWAY	Multipurpose ship	11,660 10,120	7,567	1980	FLENSBURGER, SOBIFFSBAUGESELISCHAFT, WEST GERMANY	Far East
5. AVA	Multipurpose ship	10,120	7,435	1963	A.G.WESTER SEEBECKWERFT WEST GERMANY	Europe
6. BASSEIN	Multipurpose ship	10,120	7,435	1963	A.G.WESTER SEEBECKWERFT WEST GERMANY	Europe
7. MERGUI	Multipurpose ship	10,075	7,458	1963	URAGA SHIPYARD, JAPAN	Europe
8. PINYA	Multipurpose ship	10,010	7,423	1963	HITACHI SAKURAJIMA, JAPAN	Europe
9. MYOMA YWA	Multipurpose ship	7,083	5,496	1961	A.G.WESTER SEEBECKWERFT WEST GERMANY	Bay of Bengal
10. PA-GAN	Multipurpose ship	2,076	1,619	1979	KRISTIANS AND MEK VERKSTED A.S., NORWAY	Bay of Bengal
11. PA-AN	Multipurpose ship	2,076	1,619	1979	KRISTIANS AND MEK VERKSTED A.S., NORWAY	Bay of Bengal
12. HTONE XWA	Multipurpose ship	1,720	944	1961	HEINRICH BRANK KG SHIFFSERFT, WEST GERMAY	Bay of Bengal
13. PHA SHWE GYAW XWA	Multipurpose ship	1,575	780	1964	AARHUS FLYOEDOCKOG MASKINKOMPANI DENMARK	Bay of Bengal
14. MAGWE	Multipurpose ship	13,105	9,778	1985	A.G.WESTER, SEEBECKWERFT WEST GERMANY	Europe
15. SAGAING	Multipurpose ship	13,105	9,778	1985	A.G.WESTER, SEEBECKWERFT WEST GERMANY	Europe
TOTAL		130,595	94,407			

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Table 2-2 BFSSC Domestic Fleet (2)

Ship name	Ship's type	Deadweight tonnage	Gross tonnage	Year built	Builder	Services
1. LOIKAW	Liner	800	498.69	1978	BURMA DOCKYARD CORPORATION, BURMA	Coastal
2. NGWAY PALEI	Liner	750	541.64	1981	RICHARDS SHIP BUILDER U.K.	Coastal
3. LASHIO	Liner	700	299.99	1975	A.S.NORDSOVAERF TET RING KOBING DENMARK	Coastal
4. SHWAY PALEI	Liner	357	363.52	1979	STORUIK MGK VERKSTED A/S NORWAY	Coastal
5. KYI-THA (1)	Ocean going tug	184	-	1981	BURMA DOCKYARD CORPORATION BURMA	Coastal
6. KYI-THA (2)	Ocean going tug	184	-	1981	BURMA DOCKYARD CORPORATION BURMA	Coastal
7. HAKA	Liner	948	1,403.16	1979	KRISTIAN SANDS MEK VERKSTED A.S. NORWAY	Coastal
8. MYIT KYEE NAR	Liner	948	1,403.16	1979	LANSTEIN SLIP OC BATBYCCERI NORWAY	Coastal
9. TAUNG GYEE	Liner	948	1,403.16	1980	BOISONES VERFT NORWAY	Coastal
10. AUNG ZEYA	Liner	550	754.46	1960	UJINA SHIP BUILDING JAPAN	Coastal
11. PYI	Liner	1,430	997.56	1980	UJINA SHIP BUILDING JAPAN	Coastal
TOTAL		7,799	7,666			

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Table 2-3 Cargo handling by port (1971/72 - 81/82)

(Unit: 1000t)

		71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
Rangoon	Exports	1,256			745	832	960	1,090	926	1,628	1,485	1,498
	Imports	798			908	614	619	553	841	704	747	769
	Domestic exports	173	n.a.	n.a.	142	138	138	146	130	161	175	176
	Domestic imports	87			80	67	79	70	73	81	90	122
	Total	2,314			1,875	1,651	1,796	1,859	1,970	2,574	2,497	2,565
Bassein	Exports	112	30	14	34	44	106	87	55	86	51	63
	Domestic exports	1	0	0	0	0	6	0	0	0	1	3
	Domestic imports	3 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0)	3 (0)	2 (0)	7	16	14
	Total	116	30	14	34	44	115	90	57	93	68	80
Moulmein	Exports	2	1	8	7	18	21	21	8	13	6	7
	Domestic exports	58	44	46	48	26	37	32	25	22	23	30
	Domestic imports	75(33)	59(28)	55(11)	42(20)	49(20)	45(21)	37(19)	32(19)	32	42	50
	Total	135	104	109	97	93	103	90	65	67	71	87
Akyab	Exports	40	22	34	32	40	27	35	6	46	43	62
	Domestic exports	9	6	6	3	4	6	4	5	8	10	6
	Domestic imports	34(13)	31(18)	30 (5)	25(11)	23(11)	23 (8)	27(10)	22 (8)	23	27	31
	Total	83	59	70	60	67	56	66	33	77	80	99
Kyaupyu	Domestic exports	12	13	15	7	7	6	5	2			
	Domestic imports	8 (1)	7 (1)	6 (0)	5 (0)	3 (1)	4 (0)	4 (0)	3(Nil)	n.a.	n.a.	n.a.
	Total	20	20	21	12	10	10	9	5			
Sandoway	Domestic exports	1	1	0	1	1	1	1	1			
	Domestic imports	2 (0)	2 (0)	1 (0)	2 (0)	1 (0)	3 (1)	2 (0)	1(Nil)	n.a.	n.a.	n.a.
	Total	3	3	1	3	2	4	3	2			
Tavoy	Domestic exports	12	10	7	6	8	9	9	12			
	Domestic imports	27 (7)	20 (6)	25 (2)	28 (5)	28 (6)	26 (9)	31 (8)	30 (6)	n.a.	n.a.	n.a.
	Total	39	30	32	34	36	35	40	42			
Mergui	Domestic exports	36	41	10	43	51	39	48	63			
	Domestic imports	64	54	46	58	58	57	54	70	n.a.	n.a.	n.a.
	Total	100	95	86	101	109	96	102	133			
Kawthoung	Domestic exports	2	2	1	3	7	4	2	2			
	Domestic imports	5 (0)	3 (0)	3 (0)	4 (0)	5 (0)	6	10 (0)	8 (0)	n.a.	n.a.	n.a.
	Total	7	5	4	7	12	10	12	10			
Total of local ports	Exports	166	53	56	74	103	154	143	69	148	102	203
	Domestic exports	130	117	115	111	105	107	100	111	121	149	142
	Domestic imports	218	176	116	164	169	167	168	167	206	247	229
	Total	514	346	287	349	377	428	411	347	475	498	574
Grand total	Exports	1,422			819	935	1,114	1,233	995	1,776	1,587	1,701
	Imports	798			908	614	619	553	841	704	747	769
	Domestic exports	303			253	243	245	246	241	282	324	318
	Domestic imports	305			244	236	246	238	240	287	337	351
	Total	2,828			2,224	2,028	2,224	2,270	2,317	3,049	2,995	3,139

Source: ADB and Ministry of Planning and Finance, Report to the Pyithu Hluttaw on the Financial Economic and Social Conditions of the Socialist Republic of the Union of Burma 1982/83.

Table 2-4 Marine cargo movements and loading on Burmese ships

Items	1975		1978		1984	
	Movement M/T	Cargo share %	Movement M/T	Cargo share %	Movement M/T	Cargo share %
Domestic movement						
Burmese ships	205	100	202	100	268	100
Foreign ships	-	-	-	-	-	-
Total	205	100	202	100	268	100
Export movement						
Burmese ships	167	20	112	12	239	18
Foreign ships	656	80	815	88	1,126	82
Total	823	100	927	100	1,365	100
Import movement						
Burmese ships	309	50	269	32	541	47
Foreign ships	304	50	572	68	607	53
Total	613	100	841	100	1,148	100
Total marine cargo movement						
Burmese ships	681	41	583	30	1,048	38
Foreign ships	960	59	1,387	70	1,733	62
Grand total	1,641	100	1,970	100	2,781	100

(1983 DMA data)

Table 2-5 Assignment of ships

Route	Main loading ports	Main unloading ports	Turn-around	Voyages per year	Main cargos	Conference or Non-Conference
European	RANGOON (EXPORT)	AVONMOUTH, LONDON, ANTWERP, ROTTERDAM, HAMBURG	60	12 Voys (OWN)	Timber, Minerals	Non-Conference
European	LONDON, ANTWERP, ROTTERDAM, HAMBURG, CDANSK (IMPORT)	RANGOON	60	12 Voys (OWN) 4 Voys (OWN)	General Cargo	Non-Conference
Far East	RANGOON, HONGKONG, BUSAN, YOKOHAMA, NAGOYA, KOBE	HONGKONG, YOKOHAMA, NAGOYA, KOBE, BUSAN, RANGOON	90	18 Voys	Timber, Beans & Pulses, Machinries Plant Cargoes, Chemical, Motor, Vehicles, Fertilizers, General Cargo	Conference
Others	RANGOON, BASSEUN, AKYAB, SINGAPORE, PORTKELANG, PENANG, BANGKOK, CALCUTTA, CHITTANG, KHALNA	RANGOON, SINGAPORE, PORTKELANG, PENANA, BANGKOK, CALCUTTA, CHITTAGANG, CHALNA, MANGALOPE, MORMUCOA	25	72 Voys	Timber, Pulses, Rice, Mineral, Cement, Oil goods, Machineries, General Cargo	Conference

Source: BRSSC and report to the Pyithu Huttaw.
September 1983

Table 2-6 Actual transports

(Unit: 1,000 kg.T)

		1978/79			79/80			80/81			81/82			82/83		
		Own ship	Chartered ship	Total	Own ship	Chartered ship	Total	Own ship	Chartered ship	Total	Own ship	Chartered ship	Total	Own ship	Chartered ship	Total
European line	Exports	-	-	-	-	-	-	101.2	8.0	109.2	31.9	8.4	40.3	38.2	4.4	42.6
	Imports	-	-	-	-	-	-	106.7	148.4	255.1	63.3	98.4	161.7	76.2	163.1	239.3
	Total	-	-	-	-	-	-	207.9	156.4	364.3	95.2	106.8	202.0	114.4	167.5	281.9
Far East line	Exports															
	Imports															
	Total			287.9			296.4			240.1			299.8			307.9
Others	Exports	82.4	-	82.4	73.4	-	73.4	70.5	-	70.5	91.4	-	91.4	64.6	-	64.6
	Imports	104.4	8.2	112.6	81.5	5.8	87.3	113.5	-	113.5	151.9	-	151.5	133.0	7.3	140.3
	Total	186.8	8.2	195.0	154.9	5.8	160.7	184.0	-	184.0	243.3	-	243.3	197.6	7.3	204.9
Sub-Total	Exports															
	Imports															
	Total			482.9			457.1			788.4			745.1			794.7
Total of exports and imports (Whole of Burma)				1,836.0			2,480.0			2,334.0			2,651.0			2,588.0
Loading %				26.3			18.4			33.8			28.1			30.7

Source: BFSSC and report to the Pyithu Huttaw.

Table 2-7 Charters (Including V/C)

	1981/82				1982/83			
	Number of ships	Mean DWT	Mean number of days	DWT per day	Number of ships	Mean DWT	Mean number of days	DWT per day
European line	10	15,310	71	29,569	14	14,805	69	39,433
Far East line	8	11,304	46	11,334	8	10,066	45	10,070
Other	16	14,832	55	37,591	20	14,891	45	38,628
Total	34	14,142	58	78,494	42	13,943	53	88,131

Source: BFSSC.

Table 2-8 BFSSC Development Projects

(Unit: Million kyats)

Project Names	Expenses
(Top priority)	
Construction of (2) 15,000 D/W Multi-purpose Cargo Vessel Project	445
Purchase of (2) 10,000 D/W Second-hand Gargo Vessel Project	116
Purchase of (1) 800 D/W Second-hand Coastal Cargo Vessel Project	5
Sub-total	566
(Second priority)	
Purchase of (2) 10,000 D/W Second-hand Cargo Vessel Project	177
Construction of (2) 4,000 D/W Cargo Vessels Project	354
Construction of (1) 15,000 D/W Multi-purpose Cargo Vessel Project	265
Sub-total	796
Total	1,362
(Reference) Total of transport related projects	6,617
(Reference) Total of the whole projects of Burma	45,499

Source: Five-year development programme (1983/84 - 87/88)

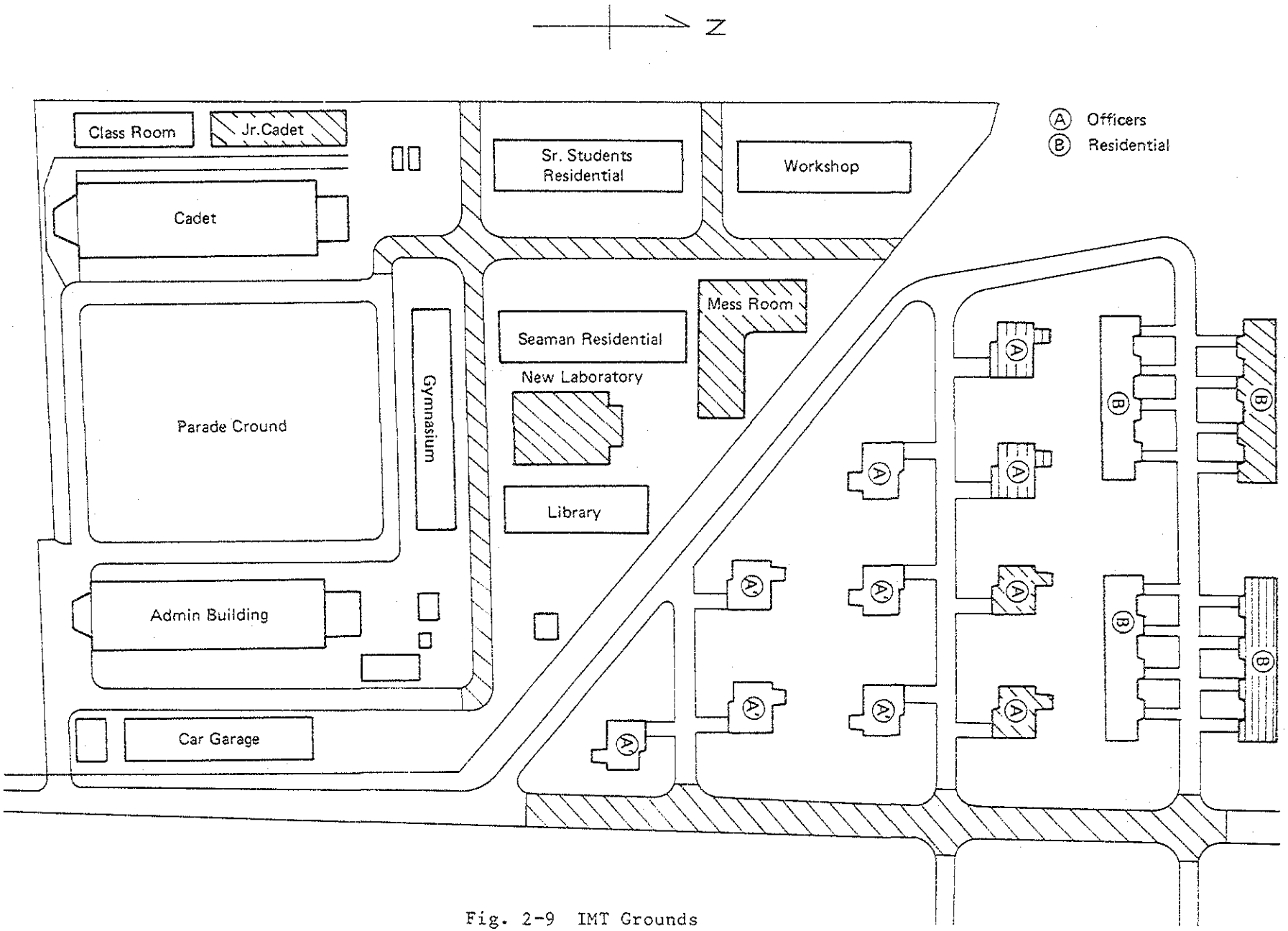


Fig. 2-9 IMT Grounds

Table 2-10 List of Existing Equipment, Navigation Department

	Names	Quantity	Uses	Remarks
1.	Radar	2	Used for Nautical Courses	Stored in air condition room.
2.	Omega Navigator	2	Used for Nautical Courses	Stored in air condition room.
3.	Decca Navigator	1	Used for Nautical Courses	Stored in air condition room.
4.	Auto Direction Finder	1	Used for Nautical Courses	Stored in air condition room.
5.	Echo-Sounder	2	Used for Nautical Courses	Stored in air condition room.
6.	Gyro-Compass	1	Used for Nautical Courses	Stored in air condition room.
7.	Auto Alarm Simrad Watch Receiver	1	Used for Nautical Courses	Stored in air condition room.
8.	Loran Receiver	1	Used for Nautical Courses	Stored in air condition room.
9.	Simrad Simulator for Navigation	1	Used for Nautical Courses	Stored in air condition room.
	Echo-Sounder		Used for Nautical Courses	Stored in air condition room.
10.	Simrad Simulator for Loran C	1	Used for Nautical Courses	Stored in air condition room.
11.	Decca Navigator Simrad Simulator	1	Used for Nautical Courses	Stored in air condition room.
12.	Navigation Computer	1	Used for Nautical Courses	Stored in air condition room.
13.	Johnson Outboard Motor	2	Used for Seamanship Courses	
14.	Sailing Fibre Dingey	4	Used for Seamanship Courses	
15.	Life Jacket	60	Used for Seamanship Courses	
16.	Life Buoy	11	Used for Seamanship Courses	
17.	Fire fighting Equipment	1 Set	Used for Seamanship Courses	
18.	Film	28	Used for Seamanship Courses	
19.	Helmet	60	Used for Seamanship Courses	
20.	Compass and Binacle	1 Set	Used for Seamanship Courses	
21.	Lab Equipment	1 Lot	Used for Seamanship Courses	
22.	Self Contain Breathing Apparatus	1 Set	Used for Seamanship Courses	
23.	Heaving line	1	Used for Seamanship Courses	
24.	Ship Radio	1	Used for Seamanship Courses	
25.	LB Davits	2	Used for Seamanship Courses	
26.	LB Winches	2	Used for Seamanship Courses	
27.	Life Raft	2	Used for Seamanship Courses	
28.	Blocks verious size	20	Used for Seamanship Courses	
29.	Flags - Numeral	2 Sets	Used for Seamanship Courses	
	Alphabet			
30.	Life Boat and its Equipment	1 Set	Used for Seamanship Courses	
31.	Speedline Throwing Apparatus	1	Used for Seamanship Courses	
32.	Distress Signals Red Parachute	6	Used for Seamanship Courses	
33.	Distress Signals Hand Held Red	4	Used for Seamanship Courses	
34.	Smoke Flare Signals	2	Used for Seamanship Courses	
35.	International Flag	3 Sets	Used for Seamanship Courses	

Table 2-11 List of existing Equipment, Engineering Department

Names	Quantity	Uses	Remarks
1. Lathe Machine	5	Used for Engineering Courses	
2. Drilling Machine	2	Used for Engineering Courses	
3. Grinding Machine	2	Used for Engineering Courses	
4. Electrical Shop Equipment	1 Set	Used for Engineering Courses	
5. Main Engine Diesel	1	Used for Engineering Courses	
6. Engineering tool	20 Sets	Used for Engineering Courses	
7. Shaping Machine	1	Used for Engineering Courses	
8. Milling Machine	1	Used for Engineering Courses	
9. Hydraulic press	1	Used for Engineering Courses	
10. Lifting Equipment	1	Used for Engineering Courses	
11. Emergency Fire Pump & Engine	1	Used for Engineering Courses	
12. Emergency Air Compressor	1	Used for Engineering Courses	
13. Auto Testing Equipment (Petrol & Diesel)	1	Used for Engineering Courses	
14. Boiler for Demonstration Purpose	1	Used for Engineering Courses	
15. Engineering Laboratry & Testing Apparatus	1	Used for Engineering Courses	
16. Power Hacksaw	2	Used for Engineering Courses	
17. Electric Winch	2	Used for Engineering Courses	
18. Gas Welding & Cutting Apparatus	2	Used for Engineering Courses	
19. Electrical Welding Set	2	Used for Engineering Courses	
20. Foundry shop Equipment	2	Used for Engineering Courses	
21. Black Smith Shop Equipment	1	Used for Engineering Courses	
22. Wood Cutting Machine	1	Used for Engineering Courses	
23. Carpentry tool	20 Sets	Used for Engineering Courses	
24. Switchboard D.C	1	Used for Engineering Courses	
25. Switchboard A.C	1	Used for Engineering Courses	
26. Hydraulic Jack 20 tons	2 Sets	Used for Engineering Courses	
27. Portable Electronic Instrument for Measuring of Thickness of Hu	1 Set	Used for Engineering Courses	

Table 2-12 IMT Education and Training Courses

	Number	Period	Frequency
(Cadet)			
Mate	20	5 years	(including 3 years 3 months on board ship)
Engineer	20	6 years	(including 4 years 6 months for training in dock and on board ship)
(Upgrading)			
Second mate	40	6 Months	(2 times/year)
First mate	40	6 Months	
Master	40	6 Months	
First mate (coastal)	40	6 Months	
Master (coastal)	40	6 Months	
Second engineer (land)	40	6 Months	(2 times/year)
Second engineer (ship)	40	6 Months	
First engineer (land)	40	6 Months	
First enginner (ship)	40	6 Months	
(Seamen)			
Sailor	40	3 Months	(3 times/year)
Sailor (coastal)	40	3 Months	
Wiper	40	3 Months	(3 times/year)
Able worker	40	3 Months	
(Special Lectures) Held as required			
Radar observation	40	2 Weeks	(3-4 times/year)
First aid	40	2 Weeks	(3 times/year)
Marine survival	40	2 Weeks	(12 times/year)
Administrator (master, chief engineer)	40	6 Weeks	(1 time/year)
Merchant ship seamen	40	1 Week	(1-2 times/year)
Tanker (oil, chemicals) safety	40	2 Weeks	(2 times/year)

Table 2-13 Navigation Department

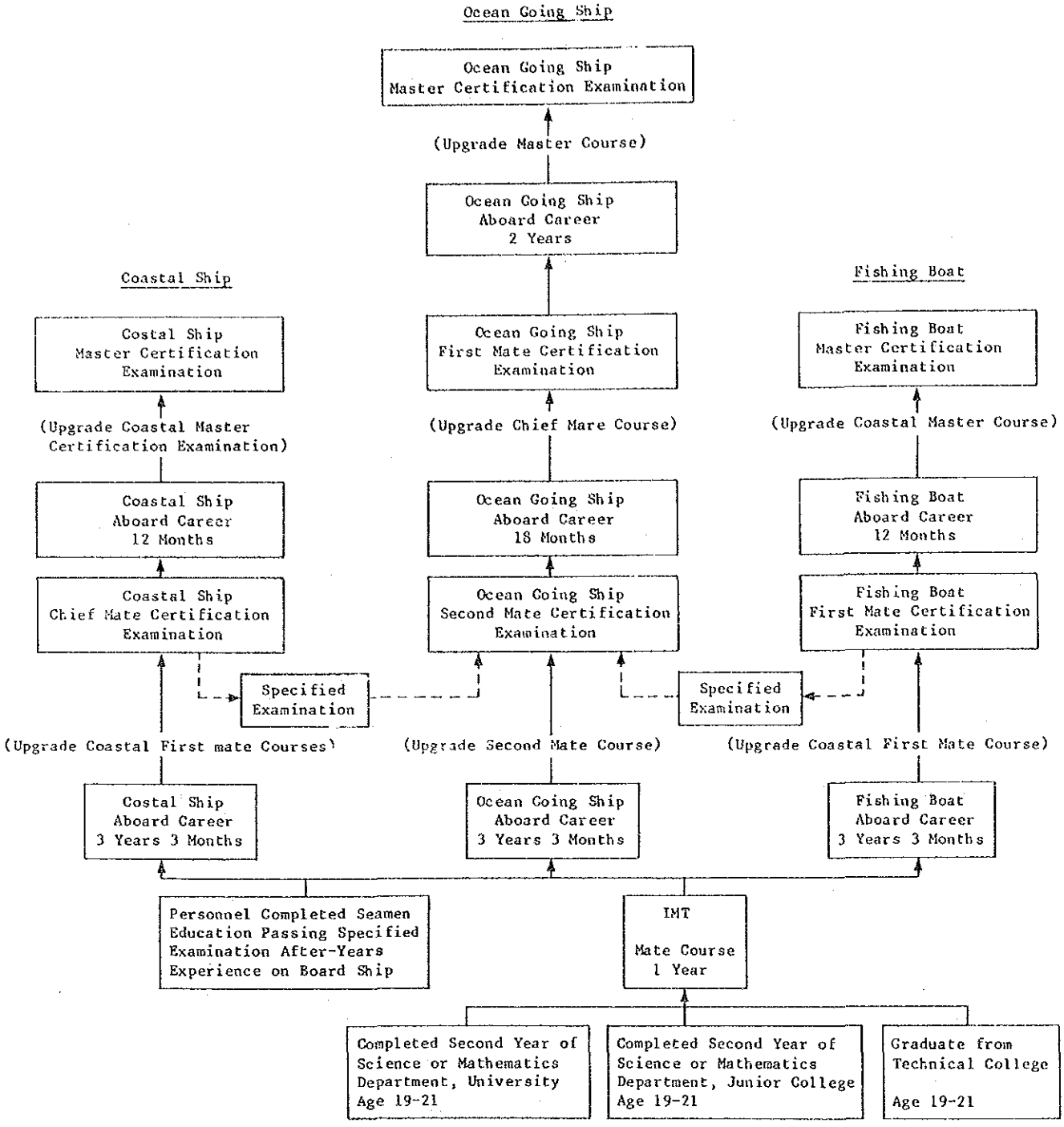


Table 2-14 Engineering Department

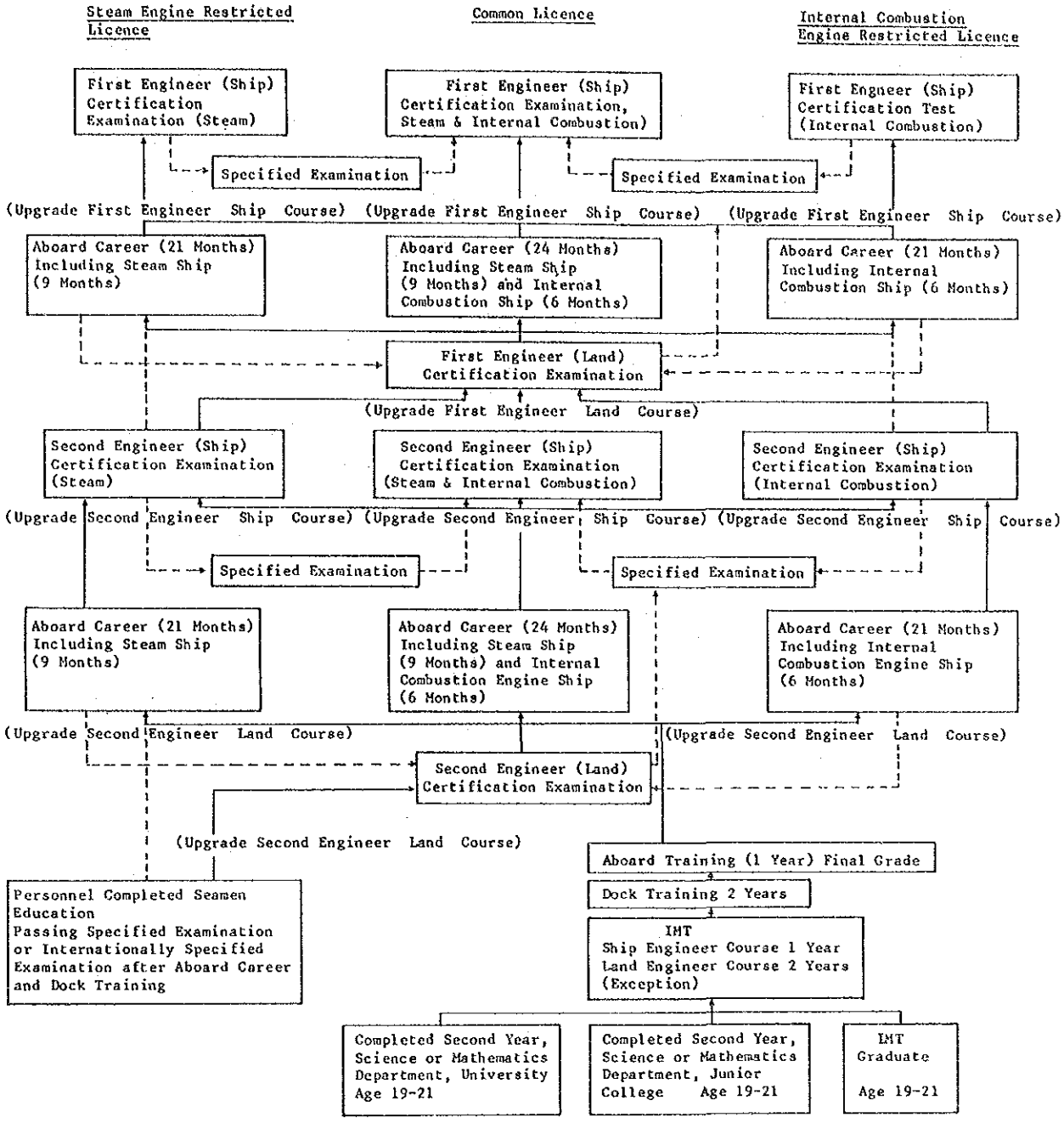


Table 2-15 IMT Budgets in Recent Five Years

		Current	Capital	Total
1982-83	K	686,770	4,098,780	4,785,550
	¥	15,699,562.2	93,698,110.8	109,397,673
1983-84	K	793,630	3,413,900	4,207,530
	¥	18,142,381.8	78,041,754	96,184,135.8
1984-85	K	817,000	2,885,640	3,702,640
	¥	18,676,620	65,965,730.4	84,642,350.4
1985-86	K	840,000	2,364,880	3,204,880
	¥	19,202,400	54,061,156.8	73,263,556.8
1986-87	K	863,000	1,404,700	2,267,700
	¥	19,728,180	32,111,442	51,839,622
Total of 5 years	K	4,000,400	14,167,900	18,168,300
	¥	91,449,144	323,878,194	415,327,338
Average of 5 Years	K	800,080	2,833,580	3,633,660
	¥	18,289,828	64,775,638	83,065,467

(1 K ≒ ¥ 22.86)

CHAPTER 3 Details of the Project

Chapter 3 Details of the Project

3-1 Purpose

With infiltration of remarkable technical innovation in marine transportation in recent years, the ship's officers handling the equipment of advanced and increasingly complex ships are required to have higher levels of knowledge and technology.

Once a fast and large ship is in distress at sea, not only the ship and cargoes are lost but the aftermath of the distress is very great.

Prevention of disasters at sea is a matter of great concern for maritime countries in the world, and in order, at least, to prevent disasters arising out of immature technology of operation of the seafarers, there was a movement built up among the countries concerned to establish international seafarer training standards, certification standards and watchkeeping standards. As the result, the STCW Convention was adopted in 1978, and it came into effect in 1984.

Note: Re STCW Convention

The Convention provides the international standards of training, certification and watchkeeping for seafarers, and thus it is intended for furtherance of safety of life and property at sea and promotion of the protection of marine environment. As main items of regulation, it contains:

- o Requirements for issue of certificates of masters, officers or seamen (age, service, medical fitness, training, qualification etc.) and international format of certificate by endorsement in English.
- o Basic principles to be observed in keeping a navigational watch (watch arrangements, fitness for duty, navigation, navigational equipment, navigational duties and responsibilities, look-out, etc.)
- o Minimum requirements for certification according to the ship type (size of ship) and duty (master, first mate or watch keeping officer)

- o Minimum requirements to ensure the continued proficiency and updating knowledge for master and deck officers
- o Minimum requirements for rating forming part of a navigational watch
- o Principles to be observed in keeping a watch in port
- o Minimum requirements for a watch in port on ships carring hazardous cargo

Also, as a resolution, it indicates specific and technical guidelines with respect to the following.

- o Operational guidance for officers in charge of a navigational watch
- o Training and qualification of officers and ratings of a carrier of hazarodus cargos
- o Radar simulator training
- o Training of seafarers in personal survival techniques
- o Training in the use of collision avoidance aids

The Socialist Republic of the Union of Burma is now in the process of ratification of the convention at its national assembly. But regardless of whether or not the ratification is made, the governments of the countries into the ports of which foreign ships enter have given the right to check the observance of the requirements stipulated in the STCW Convention, and so the ships boarding seafarers not satisfying the provisions of the convention are in fact unable to enter the foreign shipping market.

IMT has been engaged in training the personnel bearing Burmese shipping for the last 15 years, with considerable results. But to comply with the requirements for seafarer education envisaged by the ever-progressing ship operation technology and the STCW Convention, IMT is urgently required to improve, among others, its belated teaching equipment.

With respect to this, the two basic objectives of this plan are as follows.

1) To introduce to IMT courses that are essential for the education and training of cadets, as newly determined in accordance with the

"International Convention on standards of Training, certification and watch keeping for seafarers, 1978" (STCW).

2) To enhance the contents of the current cadet officer courses of IMT.

3-2 Examination of the Contents of Requests

1. Radar Simulator

1) Number of ships

The request was for minimum 2-ship or maximum 4-ship types. A greater number of ships may be advantageous in that the number of students to be trained simultaneously can be increased. But there is a limit in the number of students the instructor can control at one time.

In the mercantile marine universities and colleges in Japan, a class of about 40 students is divided into groups of 5-10 students, and each group of students are trained by a 2 ship type simulator.

The introduction of radar to three or more ships ultimately results in the system becoming partially inoperable and therefore proves not to be a suitable measure to take because of the duplication of expenses.

Instead, it is adequate to attach a repeater PPI to each of the 2 radar simulators and thus double the number of trainees for each training subject.

2) The automatic radar plotting aid is appended to only one of the two radar simulators.

3) The interface to the navigational aids is only from one of the two radar simulators.

4) Of the spurious signals generated by the radar simulator, the following two functions are omitted from the reasons stated respectively in the following.

(1) Indication of radar interference waves of other ships: Radar of a new model has built in a device to eliminate the interference, which no longer appears on the scope.

(2) Display of ray mark: To indicate the bearing of a ship having a radar mounted in use of the microwaves from a land station, two systems are available, "ray mark" and "radar beacon."

The ray mark system is peculiar to Japan and has its range limited, and so it is omitted from a cost-benefit viewpoint, and only the spurious signal of a radar beacon is taken.

2. Navigational Aids Simulator

For the navigational aids to be simulated, the following five of the Navy navigation satellite system, Decca navigation system, Loran C navigation system, direction finder and echo sounder were requested.

Here, the input signal to the satellite system is adequately taken from an Omega navigation system technically, and so the Omega navigation system is added.

A system of generating an input signal separately without installation of the Omega navigation system is not advantageous from an economical viewpoint.

3. Nocturnal Maneuvering Simulator

This simulator is reportedly in use at the educational institutions in Europe. But, in Japan, it is still in the stage of research and trial fabrication, and there is no product to recommend. It is a highly complicated and advanced device, requiring special techniques for maintenance, and is very expensive. It is alleged to be effective for training of the maneuvering technology of masters and pilots but is not always a must for IMT which has the training system aboard ships functioning well. In view of the foregoing, this simulator is omitted.

4. Planetarium

The planetarium is not generally used in the mercantile marine educational institutions in Japan. But in some similar institutions in Europe, it is often used.

The survey team examined the related curriculums to determine the frequency of use and effectiveness of the planetarium. As the result, it was noted that this equipment would be necessary in that the astronomical lessons in which this equipment would be used would be 36 hours/year (about 1 hour/week) for the cadet course only and would

increase further if the other courses were added. It was also taken into consideration that the country, at present, does not have sufficient facilities, equipment, books and mass media for providing the youth with opportunities to cultivate scientific knowledge.

However, the planetarium should be the one permitting projection readily in a classroom and not requiring much cost for installation and maintenance. It is a classroom type astronomical instructional projector set with a capacity accommodating about 20 students or maximum 25 students at one time.

5. Mechanism and Control System Training Equipment

The requested control system training equipment included a bridge control system. But this system is an application of an electricity-air or electricity-mechanism control system. Therefore, the bridge control system may not be necessarily added, but by providing models of 10 kinds of basic control systems, they will serve sufficiently for training purposes.

6. Circulation Tank in Experimental Water Tanks

Among the tanks requested for experiments involving water, there are tanks for testing vessel's motion, tanks for testing the propulsion effect, tanks for testing the holding effect of anchor/chain and also for stabiity measurement, etc. The types of tanks required for education and study of the ship resistance and propulsion and fluid dynamics involve certain problems in the design of the tank characteristics as they are unsuitable for use as circulation tanks. In the case of circulation tanks, for example, the tank must have a surface accelerator, wave plate and air bubble preventive device provided in order to obtain uniform distribution of the flow velocity at the surface, and in such a case, the mechanism of the water tank becomes very complex and the very manufacture of it is difficult technologically. Further, when water is circulated in the water tank, sand placed on the bottom for experiment of the anchor is caused to circulate, producing problems for maintenance of the mechanical part. Therefore, the circulation type of water tank is not adequate. A

separate water tank may be provided. But in terms of the space required for installation, the number of water tanks is limited to two.

Then, the stability experimental water tank and vessel's motion experimental water tank with necessary equipment for testing the holding effect of anchor/chain should be chosen because of their higher preference in the education of seafarers.

7. Electricity and electronic demonstration set

(1) Electric and electronic equipment

For the cross-sectional models of the AC electric motor (rectifier type), AC electric motor (three phase synchronous type) and DC electric motor (compound type) among the other machines requested, adequate ones as teaching material are not available, and so actual machines and their cross-sectional wall charts will be granted.

(2) Electronic circuit experimental equipment

The requested electronic circuit experimental equipment included, as those related to the electronic computer, three models of element experimental apparatus, basic circuit experimental apparatus and computer system experimental apparatus for application to measurement and control. Here, upon combination of the element experimental apparatus and the basic circuit experimental apparatus, the basic technology of hardware and software constituting the computer can be learned. Also, the actual computer system is granted separately as mentioned in next item. Then, the system experimental apparatus is redundant and will not be necessary.

The color television electronic circuit experimental apparatus is not considered to be adequate for education of the mates.

8. Computer System

Since the computer is used in various fields in modernized ships, it is adequate to take up the computer as a teaching subject.

The requested model of computer is developed for the operation by Japanese, so the model as granted should be selected in consideration of the operation by English.

Of the several kinds of requested application software attached to the personal computer:

1) The navigation leader is software for training of the ship maneuvering corresponding to the "flight leader" for training of aircraft maneuvering, but for such purposes, it may be substituted by the radar simulator so that it is omitted.

2) Application software for stowage calculation is actually used in a number of modernized ships with a small exclusive computer used, and so an exclusive model should be used for both hardware and software.

3) The software for maintenance of the main engine (diesel engine combustion analysis) is omitted in that it is beyond the scope of the equipment for education of the mates.

3-3 Outline of the Project

3-3-1 Master Plan

1. Equipment Related to STCW Convention

The equipment is indispensable for the seafarers educational institution and is supported by the STCW provisions as stated. Also, for the sake of education, the equipment scale and capacity should comply with the following applications.

(1) Radar simulator (with automatic radar plotting aid)

(Reason for installation)

In navigation with a radar used, what is most important for the observer is to exactly analyze the information taken by the radar and, upon the information, steer the ship appropriately to clear obstacles as required and check the results.

Such technology is a requisite for the masters and mates in executing their duties.

For acquisition of this technology, an actual radar is not adequate in that the volume of information is extremely small. The training should, therefore, be made with a device simulating other ships encountering sea or land, islands, rain, fog, etc.

The automatic radar plotting aid tracks a dangerous ship or object

for the ship with information received from the radar and displays the extent of danger, and under the SOLAS (Safety of Life at Sea) protocol, it is mandatory that certain ships (ships of 10,000 DWT or greater) carry this device. Then, it is necessary to conduct the training of avoiding other ships in a water area congested with ships with the automatic radar plotting aid used and of the method of handling the aid.

(Outline of the simulator)

The simulator should be adapted for simulating the radar images seen in navigation by a computer installed in a training room on land and displaying them on the radar display and automatic radar plotting aid and thus enabling the training of the radar navigation and prevention of collision with a feeling of being at sea.

Particularly, by generating a collision which is not practicable in the training onboard ship, it is possible to have the trainees recognize in what process the maneuvering failure is apt to occur.

The ships have the trainees assigned. With 2-ships used, they have their dynamic characteristics simulated and are operated on the bridge console. The radar display indicates images of islands, other ships (20 ships), radar noise and reflection on sea surface.

These images are controlled by a digital computer for change in a manner similar to actual navigation.

At the instructor's console, the instructor prepares training programs and also performs monitoring, watching, control functions, as well as recording and evaluation of the training.

The 3-ship type is desirable as far as the number of ships is concerned, but in Japan, the number of trainees that a single instructor at an educational institution can be in charge of is between five and ten, and having the 3-ship type makes little sense even if many instructors can be performing instruction and giving indications at the same time. When such instruction is performed at the IMT with its limited number of instructors, restrictions upon installation require that the 2-ship type of instruction be adopted.

(2) Navigational aids simulator

(Reason for installation)

The main duty of the officer of the watch on the bridge is to navigate the ship safely and efficiently to the destination, and for

such a purpose, it is necessary to exactly grasp the present position, course, speed and the surface and underwater conditions.

Required for such purposes are the nautical instruments, and for handling and maintenance of these instruments and analysis of the data provided, training is required. As the types of information obtainable are limited with actual instruments installed in a classroom on land, a simulator displaying the various data prepared previously on the actual instruments is required.

(Outline of the simulator)

In a training room on land, the simulator generates and sends out the spurious signals of the various navigational aids (Navy navigation satellite system, Loran C navigation system, Omega navigation system, Decca navigation system, direction finder, echo sounder, etc.) to permit reception and display on each instrument in a similar condition to that aboard the ship. With an antenna provided simultaneously, the Navy navigation satellite system is adapted to receive actual signals separately from the simulator.

2. Equipment for Improvement of the Cadet Officer Course

(1) Astronomical Instructional Projector set

(Reason for installation)

To navigate a ship safely to the destination, it is necessary to exactly determine the ship's position at a certain interval of time during the navigation, adjust the course minutely as required and implement the navigation plan.

Although recent ships have electronic navigational aids mounted and, using these aids, can easily determine the ship's position, it is important for trainees to acquire the method of determining the ship's position through astronomical observation or observation of natural features as a most fundamental navigation method. Particularly, for astronomical observation, it is a prerequisite to have knowledge on several celestial bodies used for determination of the position and their movements. Here, the astronomical instructional projector set is adapted to set a desired place and time, and so it will be effective for the trainees to be experienced in identifying the celestial bodies and learn the fundamentals of astronomical navigation.

(Outline of the apparatus)

The astronomical instructional projector set will be a small one capable of projecting the constellations at a desired time and place onto a semi-spherical dome on the ceiling of the classroom to well reproduce the positions of constellations changing from time to time, and it is also suitable for the purpose of learning astronomical parameters.

(2) Fundamental science experimental equipment

(A) Optics experimental equipment (reflection and refraction of light)

(Reason for installation)

The ship operating technology comprises various fields of application of science, and among others, optics is an important field of fundamental science. For the efficient learning of the basic knowledge, the experimental equipment of light reflection and refraction is required.

(Outline of the equipment)

With various parts (lens, slit, screen, etc.) set on an optical bench and various sources of light used, experiments of the reflection and refraction of light are made.

(B) Heat transfer experimental equipment

(Reason for installation)

In order for the crew to adequately and efficiently operate and control all of the thermal engine systems concerned with safe navigation of a ship, it is important that the crew fully acquire knowledge on the theories of thermo- and hydrodynamics concerned with such engines and equipment. For such a purpose, educational equipment consisting of heat exchange and transfer experimental devices, a molecular movement experimental device, etc. should be used.

(Outline of the equipment)

The heat exchange experimental device is a device permitting experimentation of the performance of heat exchange with the cooling water system of a marine engine as a model.

The heat transfer experimental device includes instruments and

implements allowing fundamental experiments concerning the transfer of heat.

The molecular movement experimental device includes instruments and implements allowing fundamental experiments concerning the molecular movement of gas.

(C) Acoustic experimental equipment

(Reason for installation)

The equipment is required for learning acoustic waves as a field of fundamental science in the education of the ship operating engineers.

(Outline of the equipment)

The equipment should allow the following experiments.

- o Observation of sound propagation in a vacuum.
- o Observation of the tone of sound as related to the frequency of vibration.
- o Observation of columnar length and resonance.
- o Measurement of the angle of reflection of sound.
- o Observation of acoustic interference.
- o Observation of the length, tension and thickness of string versus sound.

(D) Mechanical control system experimental equipment

(Reason for installation)

In order for the crew to adequately and efficiently operate and control all systems concerned with ship navigation at all times, it is a prerequisite that the crew have the mechanisms of such a system fully acquired. Particularly, for the control systems, it is important to learn their sequential movements. In the actual control systems, they are correlated with one another in a complex manner, and a failure in operation might result in a serious trouble to all systems.

Accordingly, such educational equipment is required that a plant model is provided for each of the important control systems. Then, using a control system nearly identical with the actual one, a control loop is formed for study of the follow-up to an external disturbance.

As recent ships have a variety of control systems respectively mounted, including the pneumatic, hydraulic, electric, electric-pneumatic and electronic systems, learning these systems is required.

(a) Machine operating equipment

(Outline of the equipment)

For understanding of the control mechanism of machinery, this is a "mobile model" having disposed at the center a mechanism simulating the crank-piston mechanism of a marine diesel engine and reduction gears connected to the input side and a planet gear with a manual differential handle incorporated connected to the output shaft side. With an air motor arranged on the side of the reduction gears, driving compression air is fed through a small capacity compressor, air tank and manual regulator valve. On the other hand, the revolution is taken out of the crank shaft via a level gear, etc. and is connected to the exhaust valve system and mechanical governor system of the simulated engine. All of these are actuated organically with a revolution given to the end of the reduction gears by the air motor.

(b) Control equipment

(Outline of the equipment)

For experiments of (1) follow-up characteristics of the controller, (2) dynamic characteristics of the plant and (3) operation and principles of the control equipment, a simulated plant and necessary control devices are provided for each of the following systems, which are adapted for actual operation.

(1) Level and flow control system

(2) Pressure control system

(3) Temperature control system

For control, the following are used.

(1) Pneumatic

(2) Electric or electronic

Simple experimental systems of hydraulic control and electric-pneumatic control are provided, and experimental circuits are formed for training. To help understand the operating principle of the controller, the following models are required.

(1) Pneumatic dial set controller

(2) Boiler air-fuel ratio controller

(E) Experimental water tank

(Reason for installation)

This experimental water tank is intended for understanding of

seamanship or, more specifically:

- o Effect of holding power of an anchor in anchorage
- o Loading technology for securing stability
- o Ship's movement in rough weather

Usually, this kind of knowledge and technology is acquired through experience during duty onboard ship over a long period of time and sometimes under hazardous conditions upon the elementary knowledge obtained in school education. But, by incorporating the model experiments with this water tank in school education, it is possible to concentratively simulate and reproduce the situations related to the foregoing items, and thus the water tank is effective for education.

(Scale and details of the experimental water tank)

In consideration of the foregoing applications, the water tank shall have the following functions.

(a) Experiments on ship's movement under wind and waves

Details of education: Experiments of movement of swinging and turning of a ship lying at single anchor in a strong gale, rolling of ship by waves, and measurement of wind pressure.

Details of equipment: Wave making apparatus, fan, anemometer, wave gauge, model ship, etc.

(b) Experiments of the holding power of anchors and anchor chain

Details of education: Measurement of the tension, etc. acting on the anchor chain at anchor.

Details of equipment: Water tank with sand bottom, model anchor, windlass model, tensionmeter, etc.

The foregoing functions (a) and (b) are provided with a single water tank of about 11m (overall length, 13m) x 3m.

(c) Experiments of stability

Details of education: Experiments on ship calculation with a model ship used including draft measurement, trim measurement and judgement of stability with cargo loading.

Details of equipment: Water tank, model ship, clinometer, stowage calculator, etc.

The size of this water tank is about 6m x 1.6m x 1.3m.

(F) Electricity and electronic demonstration set

(Reason for installation)

In order for the crew to adequately and efficiently operate and control all of the electric and electronic equipment concerning navigation of the ship, it is a prerequisite that the crew are experienced in such electric and electronic equipment.

Particularly, electric and electronic technology has remarkably developed, and it is introduced in various fields, and so acquisition of the technology in this area has recently been increasingly indispensable for the crew.

Here, this demonstration set is required for acquisition of this technology efficiently in a short period of time.

(a) Electric and electronic equipment

(Outline of the equipment)

For understanding of the dimensions, structures and characteristics of typical electric and electronic machines, the equipment is comprised of actual machines or their cut models.

(b) Electronic circuit experimental equipment

(Outline of the equipment)

The equipment is so comprised as to permit education from the fundamentals of the electric circuits to a higher level to their updated application or on electronic computer with panels displaying developed circuit and block diagrams used and various electronic parts inserted or withdrawn to form circuits to enable measurement of the action and observation of the waveform with ease.

(G) Computer system

(Reason for installation)

Recently, electronic technology has remarkably developed particularly in the fields of computers or, more specifically, information processing, information networks and software. Its introduction to marine equipment is increasing year after year.

In some instances a personal computer is introduced as OA equipment for processing of office work on ships, and it is expected that works using such OA equipment will increase hereafter. Also, for planning office automation of conventional works, it is important to acquire knowledge on computer software.

Computers are also introduced not only for office processing but for stowage planning, and it is required to have acquired the technology of handling the computer in such applications.

(Outline of the equipment)

A computer system designed for each of the office automation and stowage planning is provided for education in various softwares.

3-3-2 Implementing Institution and Operating Systems

The implementing institution is IMT. The principal of the institute assumes the general responsibility for the project on the Burmese side, and for the administration, the Chief of the Navigation Department is responsible for formulation, implementation and maintenance of the education and training project.

The project equipment includes those for fundamental courses used not only by the Navigation Department but by the Engineer Department, and thus support and cooperation of the teaching staffs of the Engineer Department of the institute are also required, and here all of the officers of the institute are applying themselves energetically to the project.

The organization of the institute is as stated in "2-2-6 Outline of IMT" in the previous chapter.

The radar simulator course opened after introduction of the equipment (including the automatic radar plotting aid) is to be carried out under a new curriculum of about 3 weeks, with the current radar observer course extended and updated, but the other courses are not particularly revised except for some improvements made in the contents of training under the current curriculum.

3-3-3 Project Location and Condition

The location of IMT is as stated in "2-2-6 Outline of IMT" in the preceding chapter.

In granting the equipment, the points to be noted from the environmental conditions are: 1) hot and humid tropical climate; and 2) greater fluctuation of voltage (220V fluctuating between 250V-140V).

The meteorological data of the Rangoon District (highest and lowest temperatures and relative humidity) are attached at the end.

3-3-4 Equipment Layout Plan

In order to accommodate the following equipment of:

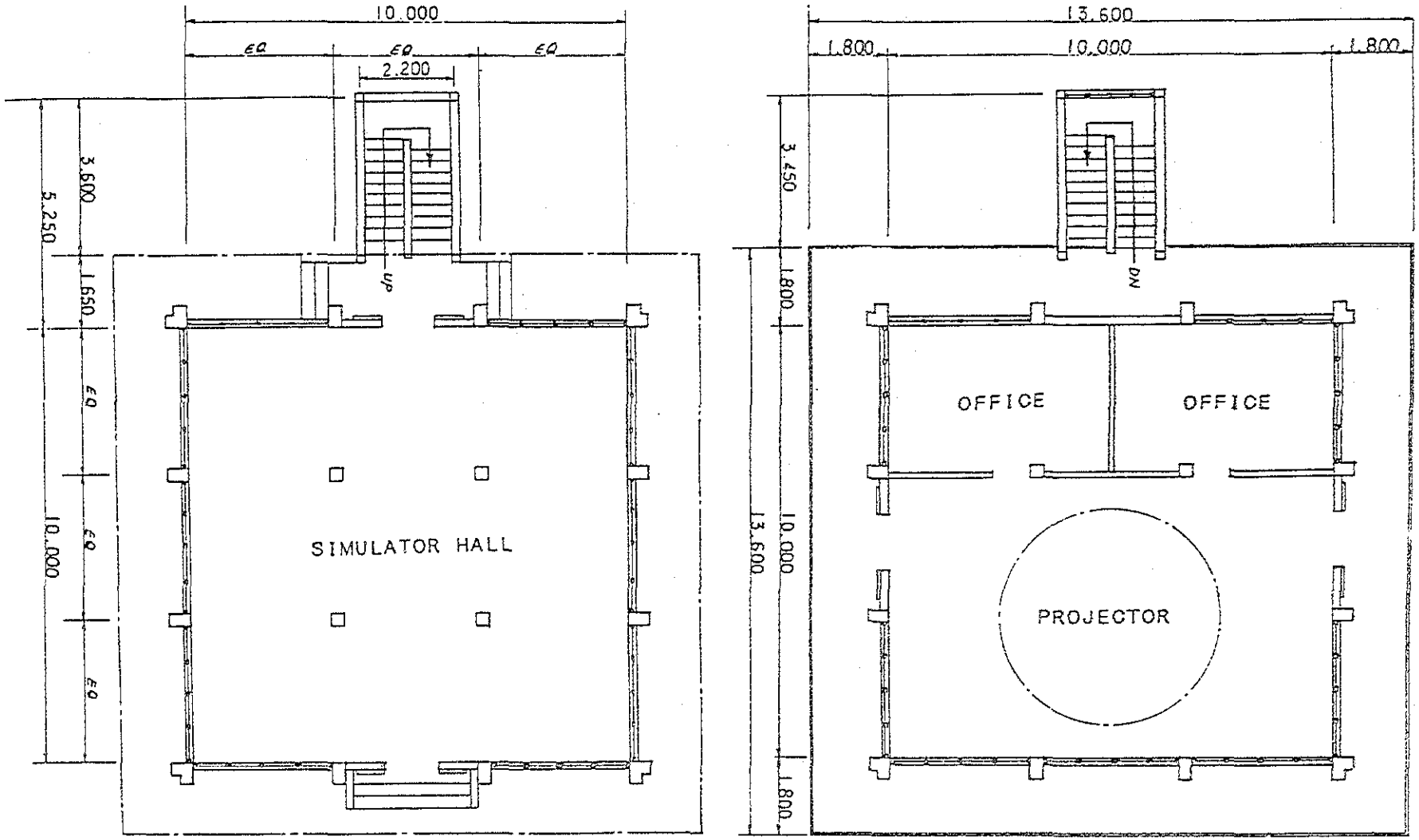
- o Radar simulator
- o Automatic radar plotting aid
- o Navigational aid simulator
- o Astronomical instructional projector set

IMT has a plan to construct a two-storied training building by budgetary appropriation on the Burmese side and has already decided the place in the compound of the institute. The construction plan on the Burmese side and the drawing are shown in Fig. 3-1 P59. The land for the required floor area of about 200m^2 (being a full two-storey building, a base area of 100m^2) is located at an adequate place in the institute, and so there is no problem for acquisition (Fig.3-2 P60). IMT has already secured part of the construction expense and has it in reserve pending grant of the equipment. (For details of the construction expense, see "4-5 Approximate Project Expense.")

The other equipment is installed as below.

- o Science experimental equipment in Electronic Laboratory
- o Mechanical control experimental equipment in Engineer Department Display Room
- o Experimental water tank I in Officers' Mess Hall in Administration Building
- o Experimental water tank II in former Electronic Laboratory

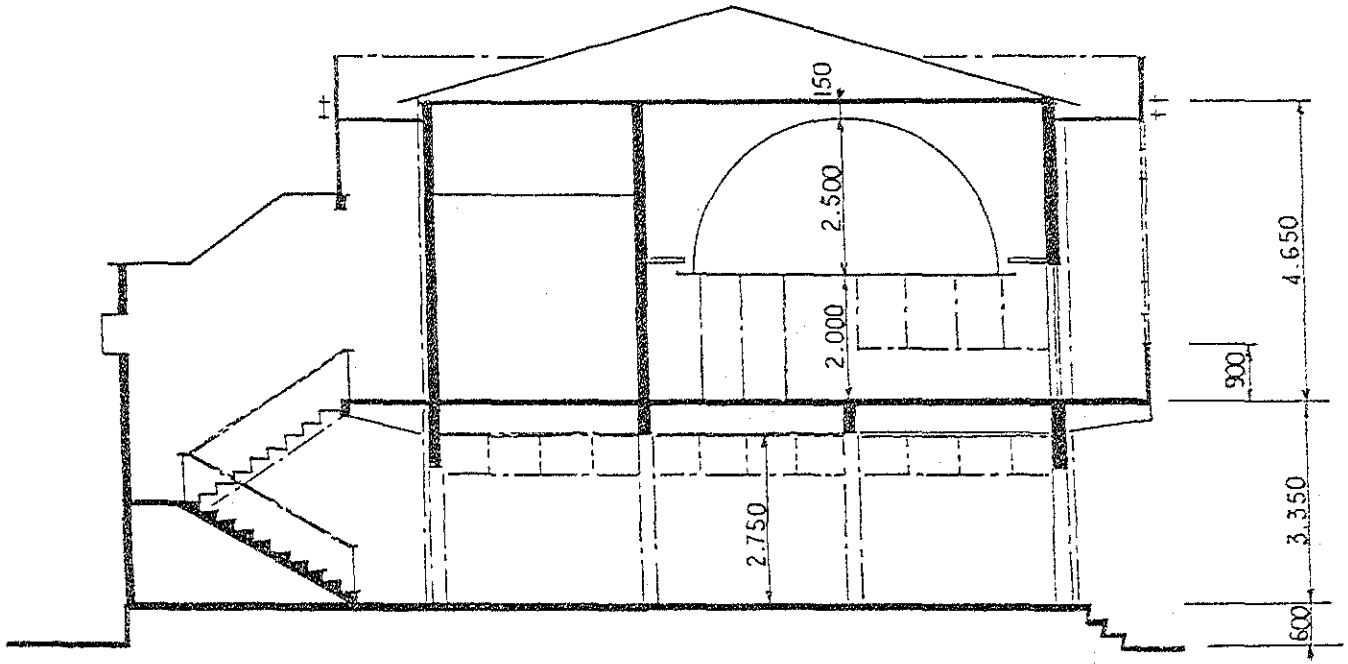
For the foregoing, a sufficient space is available respectively, but incidental works of delivery and installation are required.



GROUND FLOOR PLAN

FIRST FLOOR PLAN

Fig. 3.1 NEW PRACTICE BUILDING



SECTION PLAN

Fig. 3-2 NEW PRACTICE BUILDING

CHAPTER 4 Basic Plan

Chapter 4 Basic Design

4-1 Design Principles

The basic design was made along the following principles for the equipment procurement plan.

(1) Based on the analysis in Japan of the data obtained through the field survey and subsequently, optimum teaching equipment for the project is chosen.

(2) Priority is given to the provision of the equipment specified in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW), International Convention for the Safety of Life at Sea (SOLAS), Document for Guidance-1975 and International Regulations for Preventing Collisions at Sea, 1972.

(3) Improvement is made of the experimental and training equipment concerned with science and engineering which are fundamental to the ship-operating technology.

(4) In consideration of the tropical climate (high temperature and humidity) and the conditions of infrastructures (instability in power supply, etc.) in Burma, every measure is taken in specification for maintenance of the equipment.

(5) In selecting the models and their scales, educational effectiveness and alignment are considered to be most important, with due consideration given to economy in maintenance and stability of the equipment. Therefore, the equipment should be in accordance with the Nippon Kaiji Kyokai Rules (NK), Japanese Industrial Standards (JIS) or specifications of the Japan Electric Manufacturers Association (JEM). Where spares are required, they will usually be granted for two years.

(6) The equipment should be in an adequate number for the number of students.

4-2 Master Plan (Equipment Plan)

1. Equipment for Specialised Courses

(1) Radar simulator (with automatic radar plotting aid)

(Configuration of the equipment)

The simulator shall comprise the ship equipment, instructor's equipment, signal processing equipment and ancillary equipment.

1) Ship equipment

Two ship's positions shall be provided each comprising a radar display, a bridge console and a repeater radar display. An add-on type automatic radar plotting aid shall be connected to one of the ship radar displays.

2) Instructor's equipment

The instructor's equipment shall comprise a console (with a computer built in), printer and X-Y plotter for the instructor to conduct preparation of a training program, guidance in training and keeping watch and recording of the training conditions. Guidance and communication to the trainees at the ship positions shall be possible through an interphone.

3) Signal processing equipment

The signal processing equipment shall comprise an echo generator and a coastline generator to produce a signal of islands, other ships, radar noise and sea clutter along with the maneuvering operation by a trainee at the ship position and will indicate an image on the radar display.

4) Ancillary equipment

The ancillary equipment shall include an automatic voltage regulator, a coastline data editor, a briefing white board and a means of communication between the instructor and the trainees. By interlinking with the X-Y plotter, the coastline editor shall enable generation of coastline data.

(Elements of the equipment)

1) Ship equipment (for 2 ships)

a) Bridge console (for 2 units)

o Engine telegraph (pushbutton type)

- o Steering wheel and rudder order indicator
- o Compass repeater, course setter
- o Ship speed indicator
- o Rate-of-turn indicator
- o Mode panel (incuding collision indicator, fog signal button, etc.)
- o Digital clock, rudder angle indicator
- o Interphone (handset for communication with the instructor's console)

b) Radar display (2 units)

- o PPI system, 16-inch type
- o CRT bright display

c) Repeater radar display (2 units)

PPI system, 16 inch type CRT bright display

d) Automatic radar plotting aid (1 units)

- o PPI system, 16-inch CRT bright display (radar display)
- o 9-inch CRT (ARPA display)
- o Automatic acquisitions of 20 targets within 0.3-32 miles, and automatic tracking and vector presentation of 20 targets within 0.2-32 miles.
- o To be in compliance with IMO and USCG standards.

2) Instructor's equipment

a) Instructor's console, 1 unit

The console shall be provided with a built-in floppy disc drive and adapted for preparation of training programs through the keyboard and for display of training data on a 12-inch display. It shall also be provided with a printer for hard copying the console displays such as initial data and displayed tracking.

b) Radar monitor, 1 unit

Choosing the radar display of either one of the ship positions by a changeover switch, it shall be possible to monitor exercise situations of the trainee.

c) X-Y plotter, 1 unit

Multi-color, X-Y lotter system: It shall be possible to discriminately record the tracking of the ship and other ships together with the identification Nos. on a chart having the coastline printed (or blank paper). It is also used for preparing

coastline data together with the coastline data tape editor.

3) Signal processing unit

a) Echo generator, 1 unit

This is a generator of simulated radar signals. It shall synthesize the radar signal according to the position data of all ships calculated by the instructor's console, sea clutter, radar noise and coastline and depict an image on the radar display.

b) Coastline generator, 1 unit

Reading the map data from a data cassette tape storing a realistic radar image of the training water area including the coastline, port and harbour, land, rivers, buoys, etc. as prepared in combination with the X-Y plotter using the digital synthesis technology. This generator shall send the coastline data to the echo generator for display on the radar display.

4) Ancillary equipment

a) Automatic voltage regulator, 1 unit

This supplies the necessary voltage for the respective units. (less than 5 KVA)

b) Coastline data tape editor

This is used in combination with the X-Y plotter for recording the coastline video signals on a cassette tape. (see Fig. 4-1.)

(2) Navigational aids simulator

(Equipment elements)

1) Instructor's console, 1 unit

The console shall consist of a keyboard, a display and a CPU, and a built-in floppy disc drive. Necessary data for training (initial position, speed and course of ship, water depth at about 250 points, frequencies and call signs of beacon stations, etc.) shall be input from the keyboard, and monitored on the display.

2) Console of signal generators

a) Omega signal generator, 1 unit

Simulated stations: Three chosen among eight stations.

Generated signal setting: 2 systems of remote and local.

Output signal level: 0-120dB, variable in 10dB steps.

b) Loran C signal generator, 1 unit

Simulated stations: Master station, 1; slave station, 2.

Chain selection : At least 16 chains shall be selected among the currently existing Loran C chains.

Generated signal setting: 2 systems of remote and local.

Time difference setting : 0.1 μs steps, remote or local setting.

Output signal level : 0-120dB, variable in 10dB steps.

c) Decca siganl generator

Simulated stations : Master, 1; slave, 3.

Chain selection : Automatic for 40 chains (depending on the position of ship).

Phase difference setting: Automatic control

Signal level : Key input

d) Direction finder signal generator, 1 unit

Simulated stations : Programmable for at least 50 beacon stations; One station chosen for training.

Simulated signals : Loop signals (N-S and E-W) and sense signal.

Frequency range : 200-2000 kHz
200-530 kHz : A2A, 1 kHz
530-2000 kHz: A3E (external modulation by an external input to be possible).

Call signs : Programmable in combination of dashes and dots.

e) Echo sounder signal generator, 1 unit

Simulated water depth range: 0-1300m.

Depth setting : Remote - different water depths settable for about 250 points within the range of 10 x 10 miles or 50 x 50 miles by a computer. Local - set by a manual switch.

Simulated signals : Bottom reflection and noise.

Signal level : Manual setting by a knob.

3) Receiver displays

a) Navy navigation satellite system, 1 unit

Receiving mode : Receiving actual signals from the satellite by means of an antenna provided additionally.

Functions:

(1) In dead reckoning with input of the speed and course, the track shall be displayed on CRT.

(2) Desplay of Loran-derived position data in hybrid mode.

(3) General function of the Navy navigation satellite system by actual signals received with an antenna provided additionally.

Receiving frequency: 399.968 MHz $\pm$ 10 KHz (when received via antenna).

b) Omega navigation system, 1 set

Receiving frequency: 10.2 KHz.

Display : Digital display (on the Omega receiver display or on the display of the satellite navigator interfaced)

c) Loran C navigator, 1 unit

Receiving frequency: 100 kHz

Displayed data : Present position, speed, course, range/bearing to waypoint

Interface with the satellite navigation shall be possible.

d) Decca navigator, 1 unit

The Decca navigator shall enable the trainee to determine ship's position receiving the simulated signals from one master and three slave stations.

e) Radio direction finder, 1 unit

Display : Direct readout on a CRT

Sense determination: Manual or automatic

f) Echo sounder, 1 unit

Depth range : 0 ~ 1300m

Depth display : To be indicated on the recording paper and digital display.

4) Power supply: 110/220 VAC, 50/60 Hz, single phase Power consumption less than 2 kVA

5) Omega charts, Loran charts and Decca charts for 5 playing areas to be specified shall be provided.

(see Fig. 4-2)

2. Equipment for Improvement of Mate Courses

(1) Astronomical instructional projector Set

(Equipment configuration and specification)

a) Configuration

Body	1
Dome (2.5m radius)	1

b) Specification

Projecting unit: Capable of projecting heavenly bodies north of about 70° south of declination, including fixed stars (750), sun, moon, planets (5), galaxy and pointer.

Drive method : Motor drive (diurnal and annual motions)
Manual (variation of latitude)

(see Fig. 4-4)

(2) Science laboratory equipment

(A) Optical experimental equipment (light reflection and refraction)

(Equipment configuration and specification)

a) Light source

(1) Parallel light source (AC100V, 150W bulb).....1

Device producing paralled beams of light in use of a filament bulb, composed of projecting lenses (2 types) and slits (3 types).

(2) Spot light source (AC100V, 150W bulb).....1

Device generating a spotlight source of stable and high brightness.

(3) Line spectrum light source.....1 set

Device providing a monochromatic source of light by means of sodium, mercury and cadmium discharge bulbs, usable for observation of spectral lines and experiment of color interference.

b) Optical bench (overall length 1500 mm).....1 unit

Designed for comparison of light intensity and measurement and experiment of the lens focal distance, mirror image and real image with the following parts set on the bench.

Carrier	7
Photometer	1
Lens holder	3
Screen holder	2
Lamp socket	2
Screen	3
Convex lens	2
Concave lens	2
Plane mirror	1
Candlesticks	
(for 4 and 1 candles)	1 each

c) Light refraction experimental implements.....1 set

Designed for observation of the light refraction with a light source and lenses placed on a white board, and comprised of the following parts.

Light source (2.5V miniature bulb)	1
Light path (radiating to 4 sides)	1
Slits (1-slit)	1 each
Convex lens	3
Concave lens	1
Prism, trapezoidal lens	1 each

(B) Heat transfer demonstration

(Equipment configuration)

(a) Heat exchanger experiment unit..... 1 set

1) Hot water tank (with electric heater, thermometer and flow meter)
2) Cold water supply pressure regulating type tank (with thermometer and flow meter)
3) Hot water circulation pump
4) Heat exchanger
5) Control panel

(see Fig. 4-5)

(b) Heat transfer experimental equipment..... 1 each

1) Crooke's radiometer, absorption of dissipated heat (radiation heat)

2) Dewar's vessel, thermobottle type for cold contact
3) Heat expansion ball and ring
4) Heat coductivity demonstrator
5) Bimetal (thermostat unit)
6) Linear expansion demonstrator
7) Freezing point measuring instrument
8) Specific heat specimens
9) Joule's calorimeter
10) Paul's dew point hygrometer
11) Thermocouples for experiments
12) Convention experimental apparatus

(c) Molecular movement demonstrator..... 1 each
1) Boyle's law experimental apparatus
2) Gas law experimental apparatus
3) Boyle-Charle's law experimental apparatus
4) Bromic tubes
5) Mercury molecular tube
6) Gas molecular movement demonstrator

(C) Sound wave demonstration set
Equipment configuration .....1 each
1) Glass tube set (2 kinds of glass tubes, sound generator, sound receiver, etc.)
2) C. R. oscillator
3) Vacuum pump
4) Mercury manometer
5) Micro ammeter
6) Interference tube
7) Air column resonance apparatus
8) Tuning forks (standard tuning fork set, electromagnetic tuning fork)
9) Rotating cubical mirror
10) Monochord (including accessories)
11) U-shaped magnet
12) Power source

(D) Mechanical and control system demonstration

(a) Mechanical action unit

Equipment configuration .....1 each

1) Air motor
2) Manual regulator valve
3) Mechanical governor
4) Reduction gears
5) Planet gear
6) Cam mechanism
7) Crank mechanism
8) Tachometer (3)
9) Displacement gauge (2)
10) Pen recorder
11) Compressor
12) Air bottle

(see Fig. 4-6)

(b) Control system

(System configuration)

1) Level and flow control mini-process model .....1 set

Fresh water pump	1
Fresh water tank	3
Flow control valve	1
Level control valve	1
Level and flow oscillators	1 each
Instrument panel	1

(see Fig. 4-7)

2) Pressure control mini-process model .....1 set

Compressor	1
Pressure tank	1
Pressure control valve	1
Pressure oscillator	1
Instrument panel	1

(see Fig. 4-8)

3) Temperature control mini-process model .....1 set

Heater	1

Fresh water pump 1

Fresh water tank 1

Temperature control valve 1

Temperature oscillator 1

Instrument panel 1

(see Fig. 4-9)

4) Hydraulic control mini-process model .....1 set

Hydraulic pump 1

Oil tank 1

Pressure control valve 1

Flow control valve 1

Direction control valve 1

Other requirements 1 set

(Note) The following circuits are provided.

Onload, unload circuit

Standard circuit

Position holding circuit

Deceleration circuit

Speed control circuit

Pressure reducing circuit

5) Electro-pneumatic control mini-process model .....1 set

Compressor 1

Air cylinder 1 set

Electromagnetic valve 1 set

Other requirements 1 set

6) Pneumatic dial set controller action unit .....1 set

7) Boiler air-fuel controller simulation unit ....1 set

(see Fig. 4-10)

(E) Experimental water tanks

(Scale and capacity of experimental tanks)

1) Wave making wind tunnel water tank with sand bottom 1 set

2) Cargo loading experimental water tank 1 set

3) Blowers 1 set

4) Wave making apparatus 1 set

5) Wave dissipating apparatus 1 set

6) Stowing apparatus 1 set

7)	Model ships	1 set
8)	Measuring instruments	1 set

(see Fig. 4-11, 12)

(F) Electricity and electronic demonstration set

(a) Electric and electronic equipment

(Equipment configuration)

Battery (8V)	8
Battery charger (AC 220V-6V, 9V, 12V)	1
Stable power source (Input : 220V, 50Hz, 1φ; Output: DC 100V)	1
Motor cut model (AC, squirrel-cage type)	1
Motor, AC, winding type	1
Motor, AC, synchronous type	1
Motor, DC, series winding type	1
Motor generator	1
Inverter (DC 12V-AC 220V)	1
Voltage regulator	1 set
Bridges (for AC and DC)	1 each
Bridge parts	1 set
Transformer	1
Portable generator	2
Heavy duty voltage tester	1
Measuring instruments (OHP electroscope, Van de Graaf, graduated electroscope)	1 each

(b) Electronic circuit experimental equipment

(Equipment configuration)

Pulse circuit	1
Transistor power supply circuit	1
Semiconductor application (power supply)	1
Sequence control (lift) circuit	1
IC logic circuit	1
Computer element	1
Computer basic	1
Pulse modulation circuit	1
Analog/digital conversion circuit	1

Feedback control circuit	1
Diode-transistor logic circuit	1
Wide band amplifier circuit	1
Measuring instruments:	
2-phenomenological oscilloscope	1
Digital meter	1
DC ammeter	2
AC voltmeter	1
Electronic voltmeter	1
Slide resistor	1
C. R. oscillator	1
Sweep signal generator	1
Tachometer	1
Pen recorder	1
Voltage regulator	1

(G) Computer system

(System configuration)

1) OA equipment

Hardware:

Microcomputer (8 MHz, 16 bits, 384 KB RAM)	2
2-1 MB floppy disc drive	2
20 MB fixed disc	2
Color CRT (14 inches)	2
Printer	2
Power transformer (AC 220V-AC 100V)	2

Application software:

BASE III PLUS

GRAPH PLAN

GEM-DRAW

WORDSTAR PRO PACK

BPS BUSINESS GRAPHICS

SUPER CALC 4

MULTIPLAN

GEM-GRAPH

OS: MS-DOS

language: BASIC, FORTRAN, COBAL

2) Stowage plan

Hardware: Stowage computer body 2

(1-CPU, ROM, RAM, 1-14" color CRT)

Printer 2

Application software: Stowage plan

3) Voltage regulator 2

4-3 Implementing Schedule

The schedule of implementation of the project after the official exchange of notes (E/N) concerning the project between the governments of both countries was formulated in the following phases.

1) Period for providing the detailed design upon the basic design after certification of the consultant contract and preparing bid documents - 1 month.

2) Period from notice of the bidding through examination of the qualification of tenders and evaluation of the bids to the procurement contract - 5 months.

3) After execution of the procurement contract and subject to approval of the Government of Japan, production and purchase of the equipment are started. The radar simulator requires the longest period for fabrication, and such a period is 9 months.

4) Period required for marine transportation of the whole equipment - 1 month.

5) Installation work at the site and instructions for handling - 3 months.

The total is 19 months.

- (Refer to Table 4-13 Implementary Schedule, p. 91)

4-4 Maintenance

Instruction and guidance of the maintenance of the equipment will be made to the personnel concerned on the part of Burma according to the manual for maintenance noted in the Operation manual during the period

of about 2 months of installation before delivery and 1 month of instruction and guidance of handling, or a total of 3 months.
At the time of the delivery, spares of the consumble parts that will last for about 2 years will be supplied, and the supplier compensates for any troubles occurring as the result of shortcoming in design or equipment during the period of 1 year after delivery. The subsequent maintenance of the equipment or, more particularly, change of the parts of simulators and computers will be made by instructions, for example, from the supplier in Japan through telex as there is no agent of the supplier in Burma, and for any troubles that are hard to correct, engineers will be dispatched from the agent of the Japanese manufacturer in Bangkok or Singapore or from Japan at the expense of Burma.

The expenses required for the maintenance are classified and estimated as shown in the following.

- Maintenance cost
  - Property mantenance cost
  - Operation maintenance cost
    - Direct personnel expenses
    - Direct maintenance cost

o Property maintenance cost

This is the cost required for change, inspection and repair of the parts for maintenance of the equipment, and about 1-3% of the total cost of equipment is required per year.

o Operation maintenance cost

Direct personnel expense: Operation of the equipment is made by the present IMT officers, and it is not necessary to newly appropriate the personnel expenses.

Direct maintenance cost: Expendables required for operation of the equipment granted for the project are electricity, water, fuel, recording paper, etc. and the annual costs of these are estimated as below.

Electricity: 30 kVa x 1/2 (equipment used) x 4 hours x 60 days x 0.28K = K1,000

Water: 10 tons x 6 = 60 tons (being a small amount, not appropriated particularly)

Oil: 0.3 x 4 hours x 300 days x K0.55 = K200

Recording paper, etc.: K2,000

Total: K3,200

Immediately after the start of the operation, this direct maintenance cost is required, and after a lapse of 1 to 2 years, the property maintenance cost is added.

Thus, at least twice the present IMT maintenance cost of about K100,000 is required. But it is an indispensable expense for promotion of the education at the institute, and judging from the scale of the budgetary appropriation of IMT as a whole, there will be no difficulty in appropriating the foregoing amount.

4-5 Approximate Project Expense

Of the expenses pertaining to the project:

The amount to be borne by the Burmese side is estimated at K640,000.

This amount of K640,000 is the construction cost of the new experimental building housing the radar simulator, navigational aids simulator and planetarium and is the estimate by the officers concerned of the Ministry of Construction and Construction Corporation of Burma upon survey of the present condition.

Of this construction cost, K180,000 has already been allocated to IMT in the fiscal 1986 budget, and the remaining K460,000 was approved by the Construction Committee on December 24, 1986 as an appropriation in the fiscal 1987 budget, pending final approval at the National Assembly in spring of 1987.

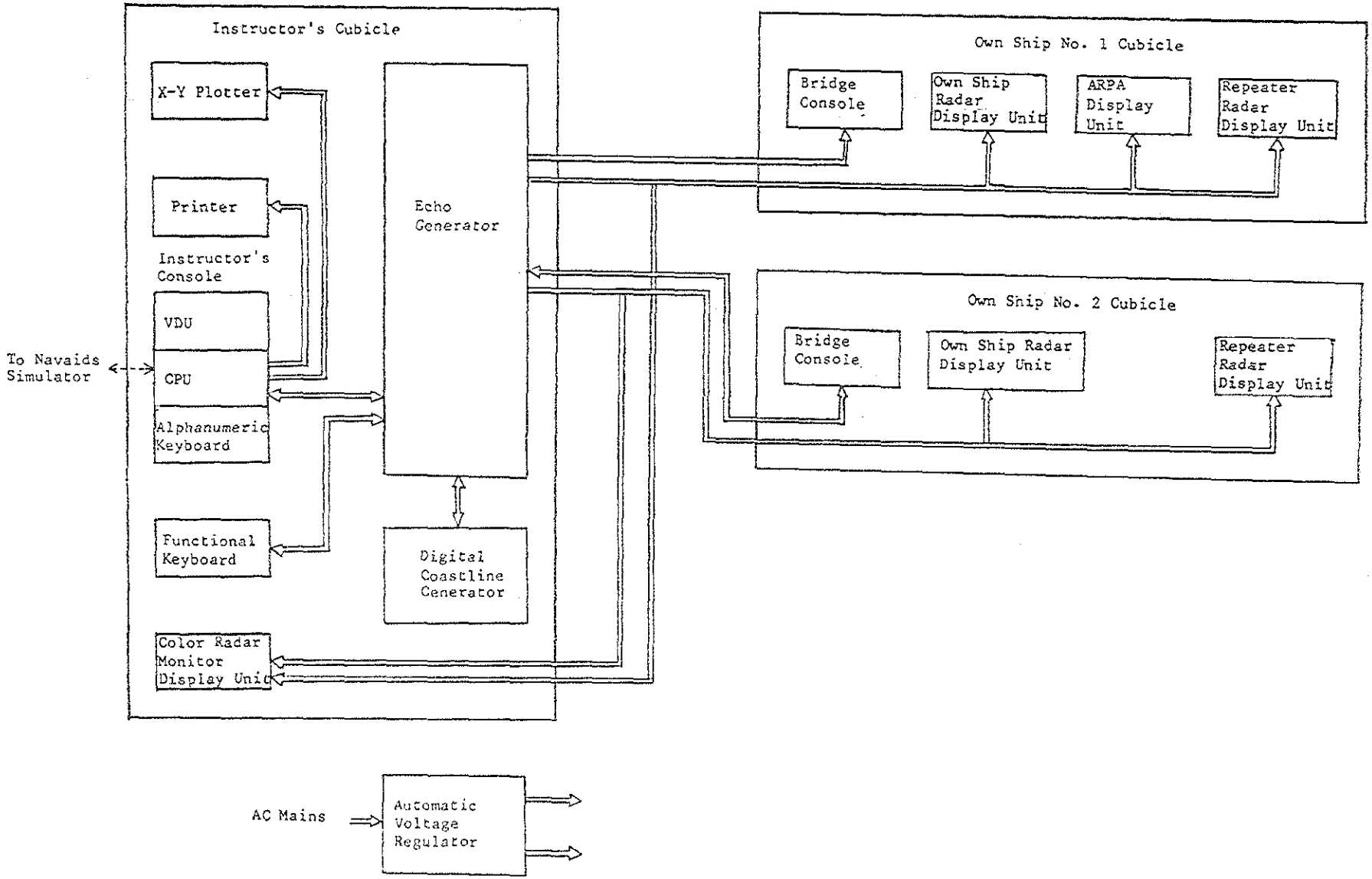


Fig. 4-1 System Diagram for Radar Simulator

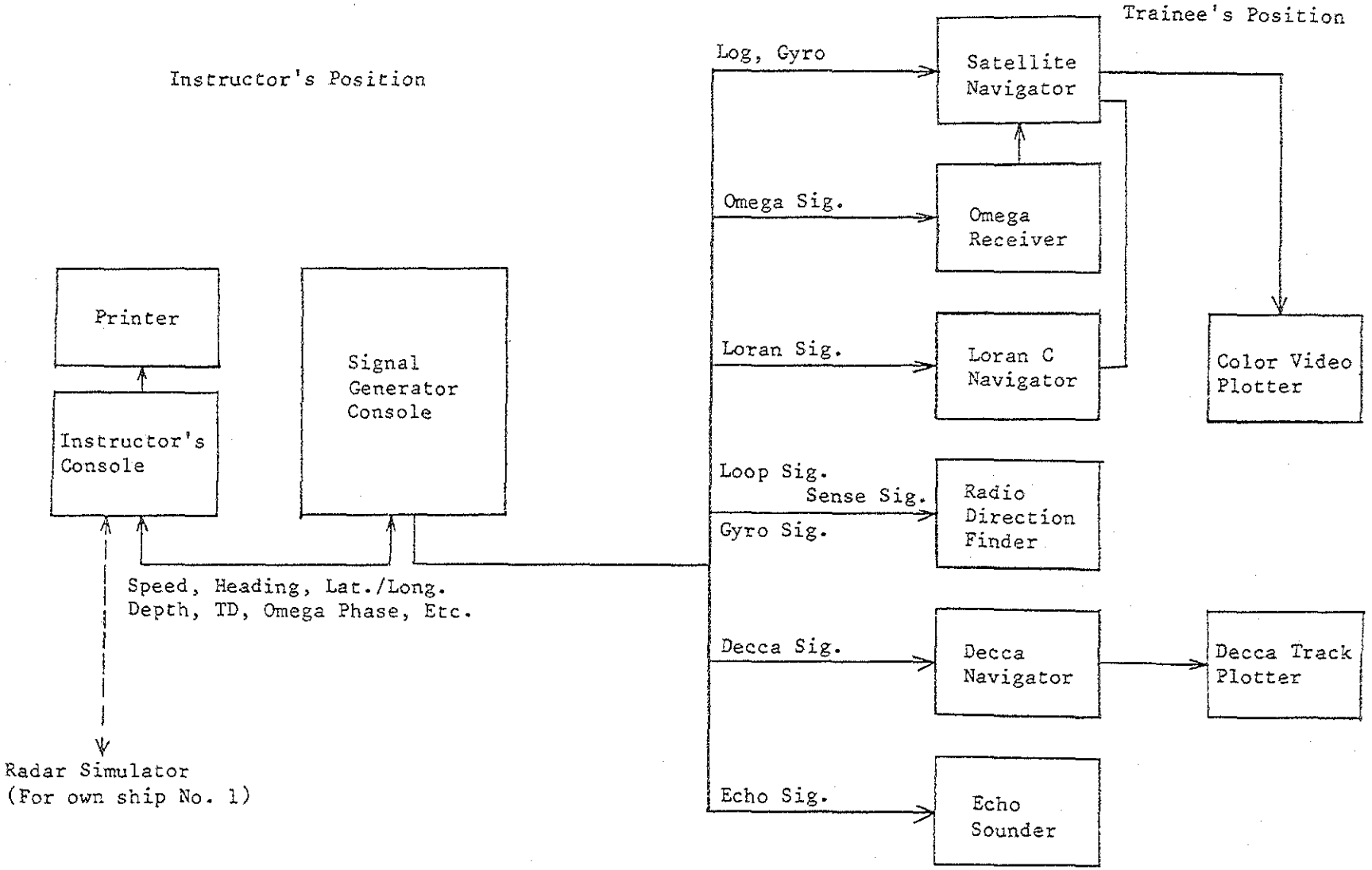
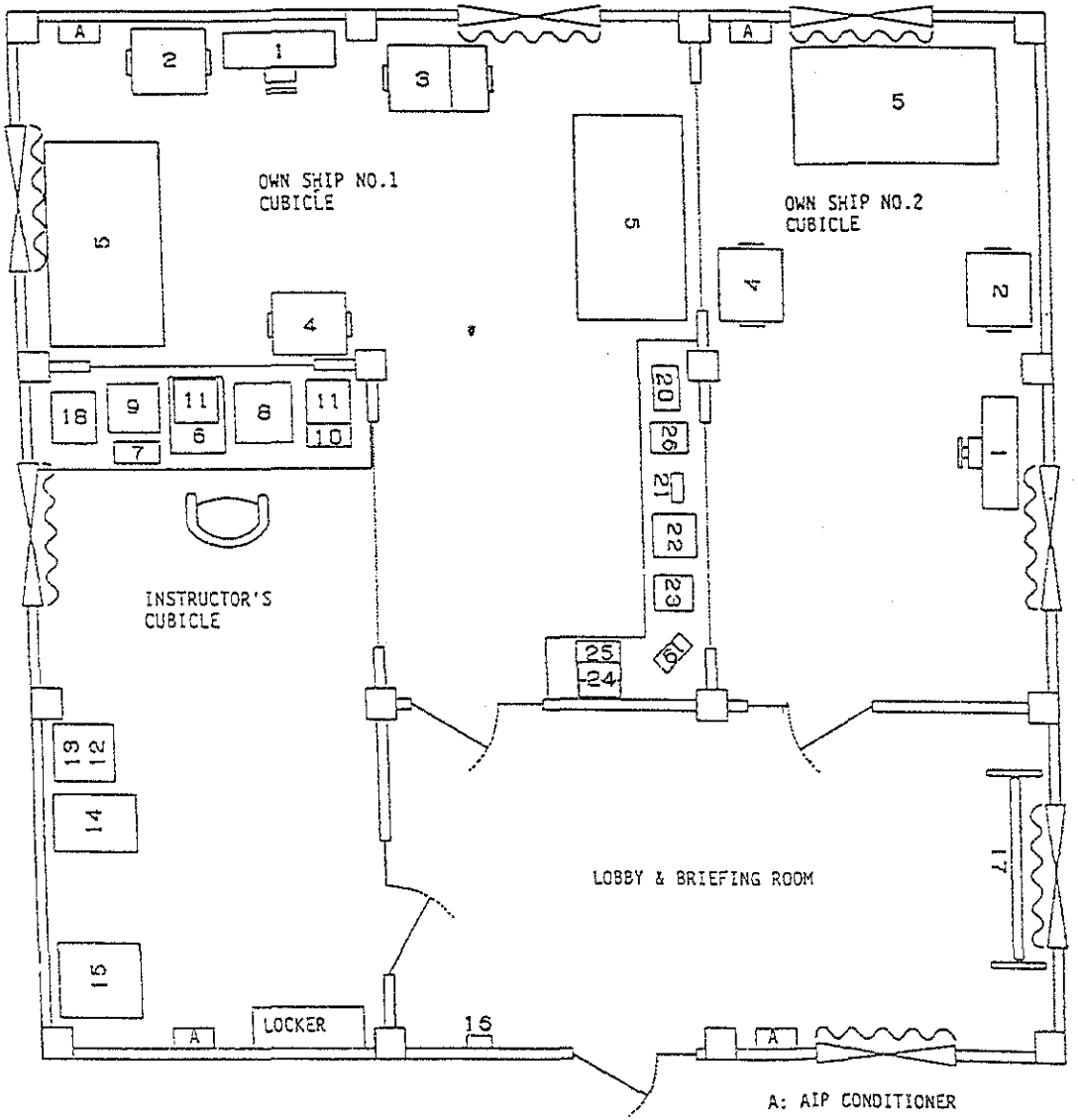
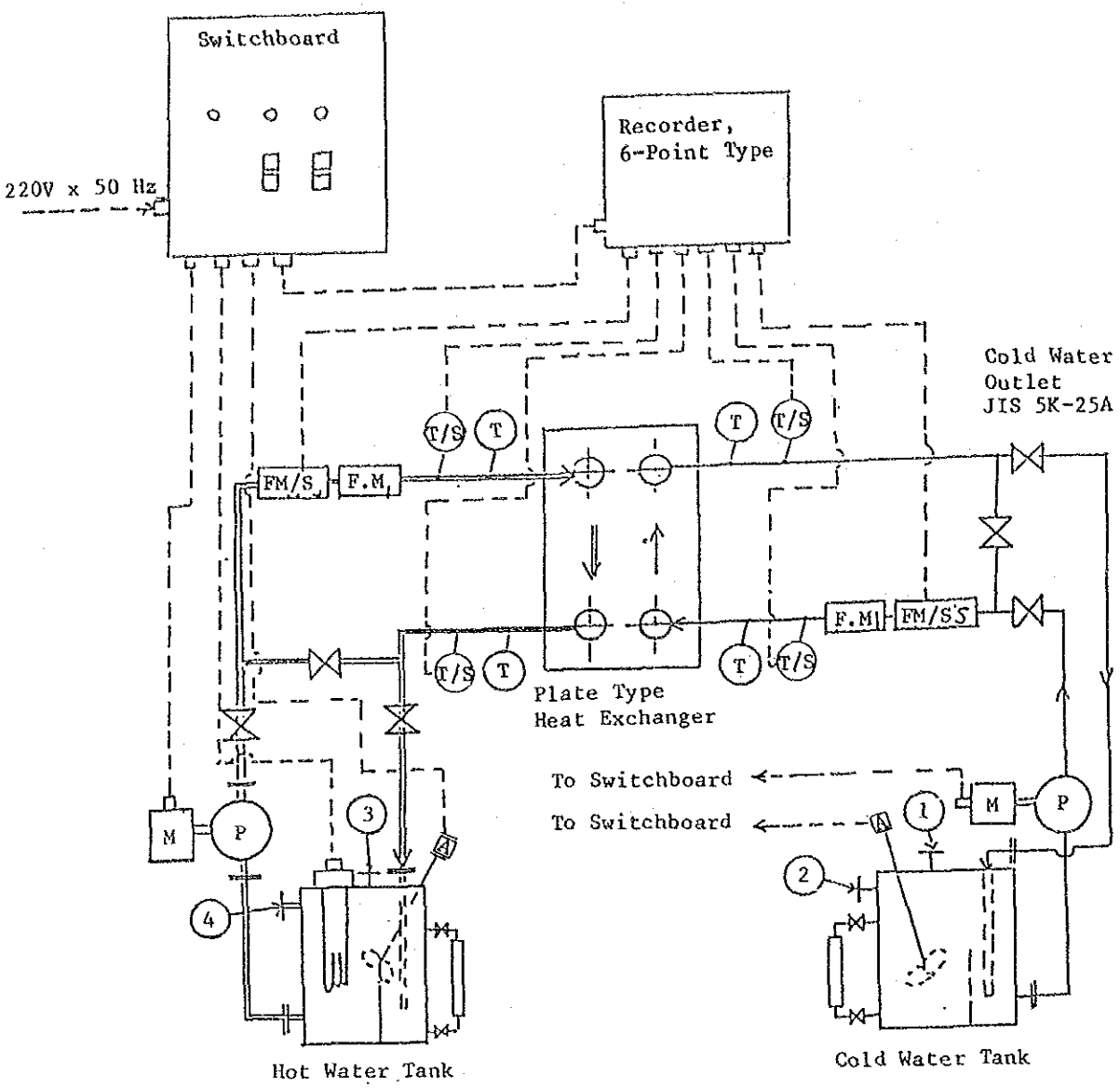


Fig. 4-2 Navigational Aids Simulator System Diagram



1. Bridge console
2. Own ship radar display
3. ARPA display
4. Repeater display
5. Chart table
6. Instructor's console (for radar simulator)
7. Functional keyboard
8. Color monitor display
9. X-Y plotter
10. Instructor's console (for navaids simulator)
11. Printer (one each for radar and navaids simulators)
12. Echo generator
13. Digital coastline generator
14. Navigation signal generator
15. AVR
16. Mains breaker box
17. Briefing board
18. Topography editing unit
19. Echo sounder
20. Direction finder
21. Loran C navigator
22. Satellite navigator
23. Omega receiver
24. Decca navigator
25. Decca track plotter
26. Color video plotter

Fig. 4-3 Recommended Layout for Radar & Navigational Aids Simulator



① : Cold Water Tank Makeup Water Inlet JIS 5k - 25A

② : Cold Water Tank Overflow Outlet JIS 5k - 25A

③ : Hot Water Tank Makeup Water Inlet JIS 5k - 25A

④ : Hot Water Tank Overflow Outlet JIS 5k - 25A

Ⓣ : Thermometer

Ⓣ/Ⓢ : Temperature Sensor

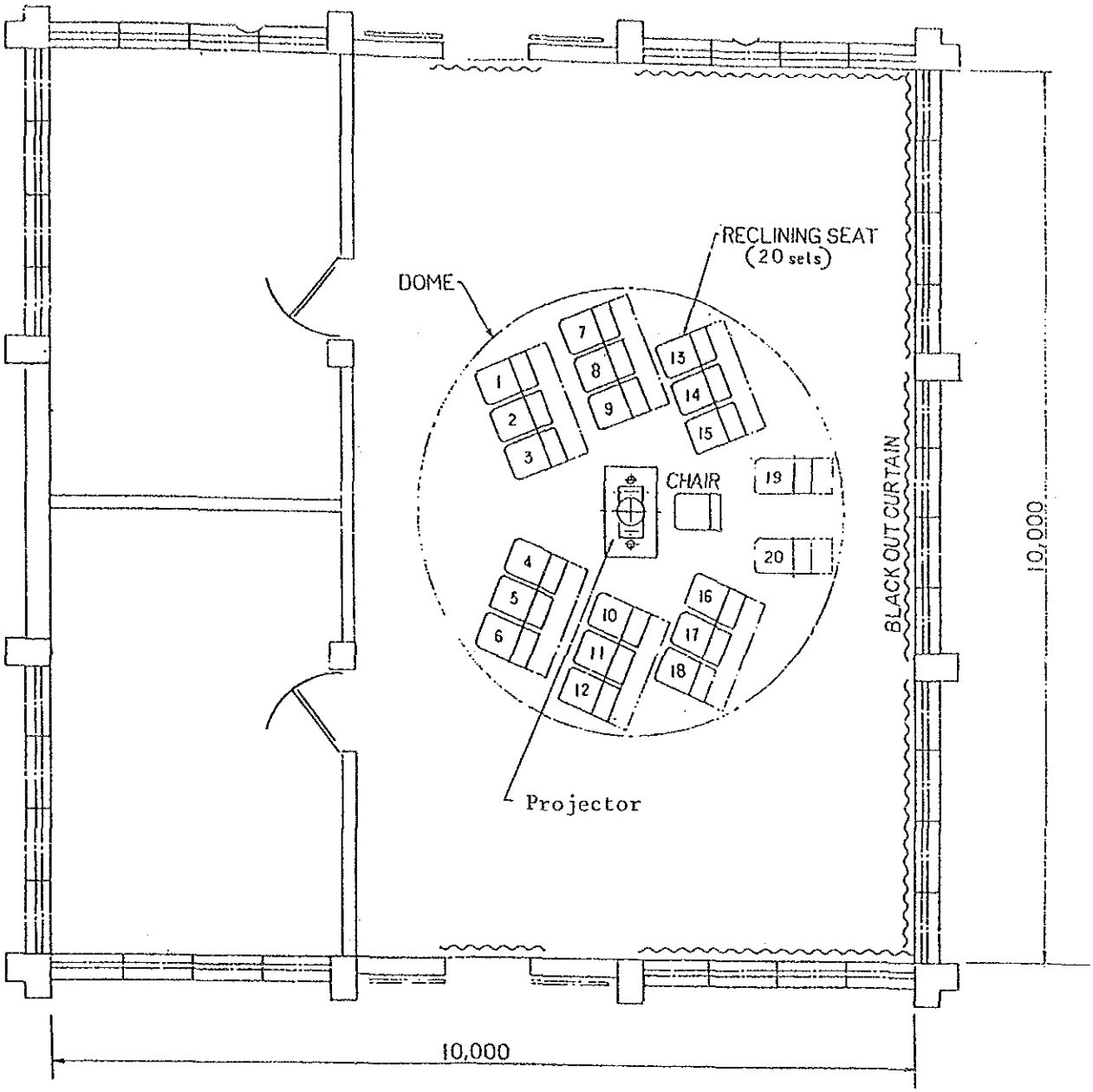
F.M : Flow Meter

FM/S : Flow Sensor

: Electric Heater

: Globe Value or Sluice Valve

Fig. 4-4 Heat Transfer Experimental Equpment
Heat Exchanger Experiment Unit



FIRST FLOOR PLAN

UNIT : mm

SCALE 1/50

Fig. 4-5 First Floor Plan

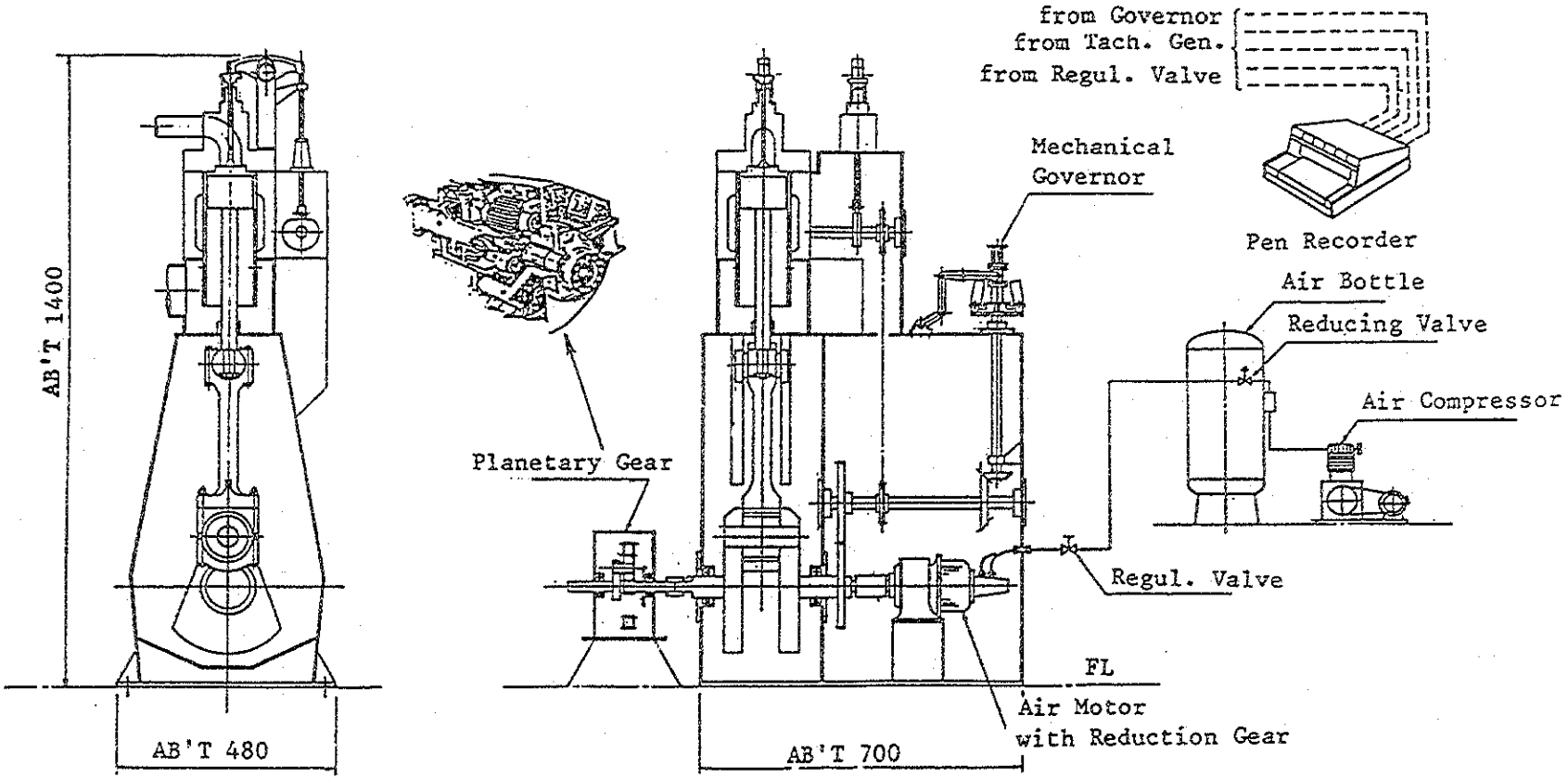


Fig. 4-6 Layout of Mechanics & Control System

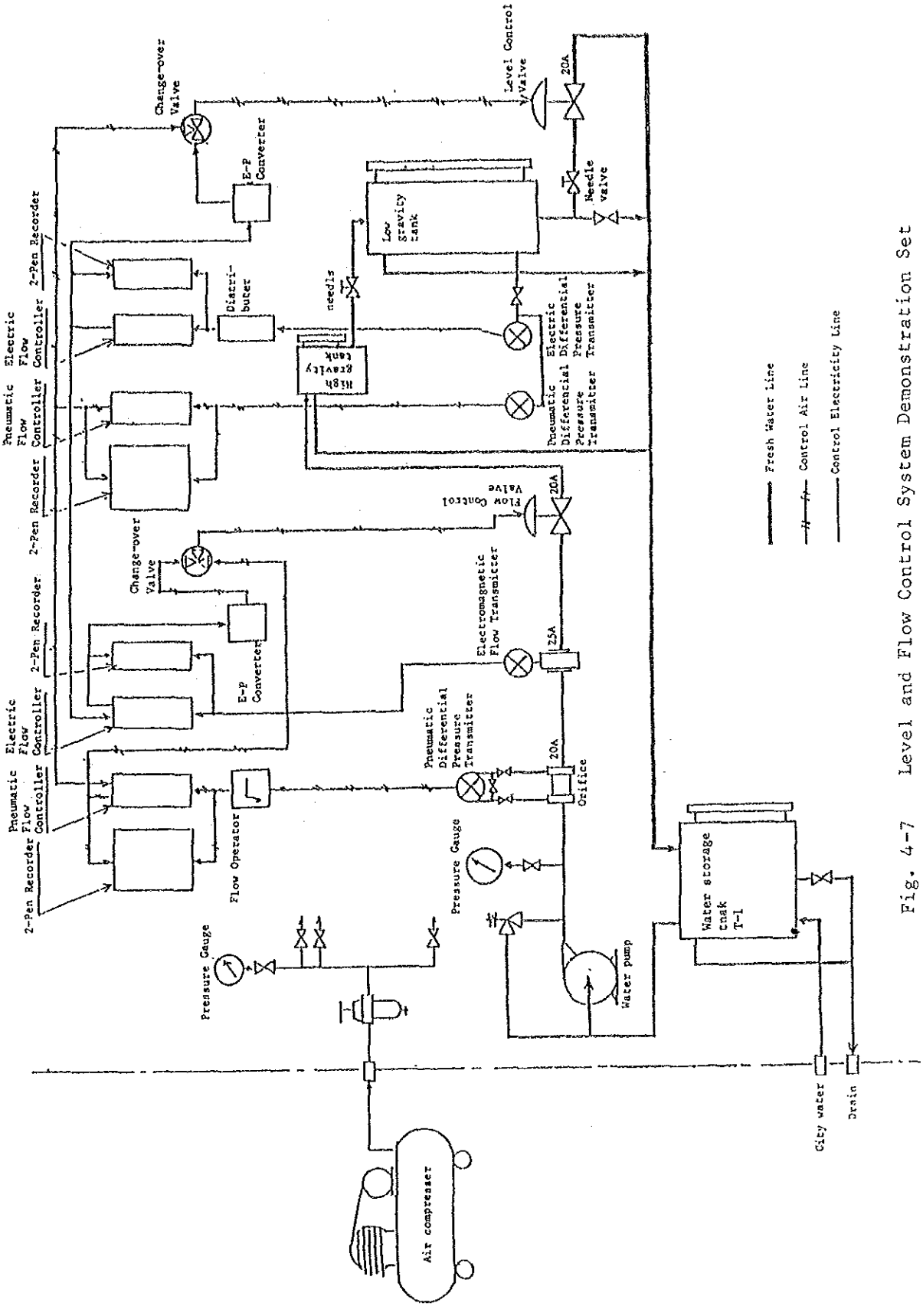


Fig. 4-7 Level and Flow Control System Demonstration Set

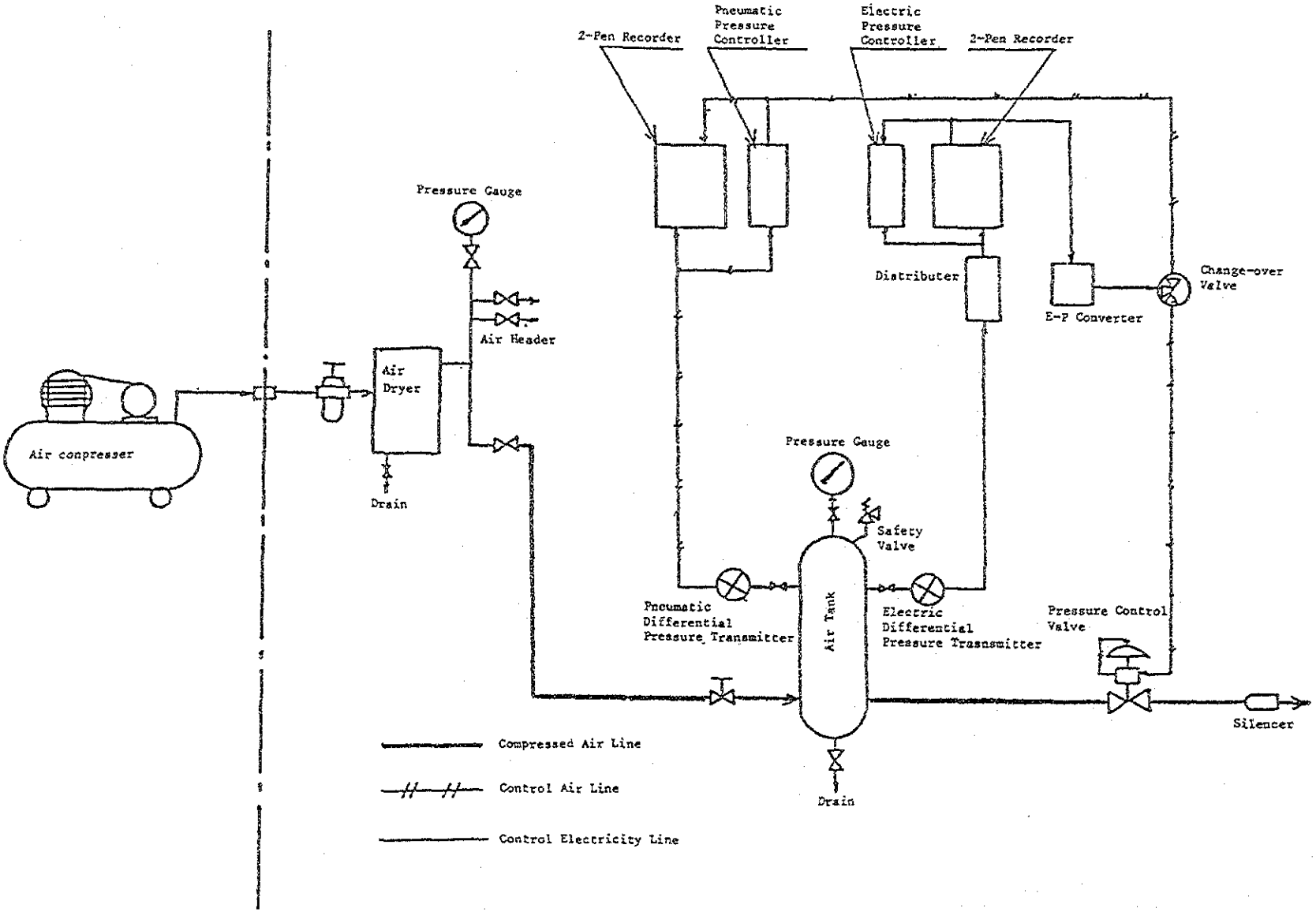


Fig. 4-8 Pressure Control System Demonstration Set

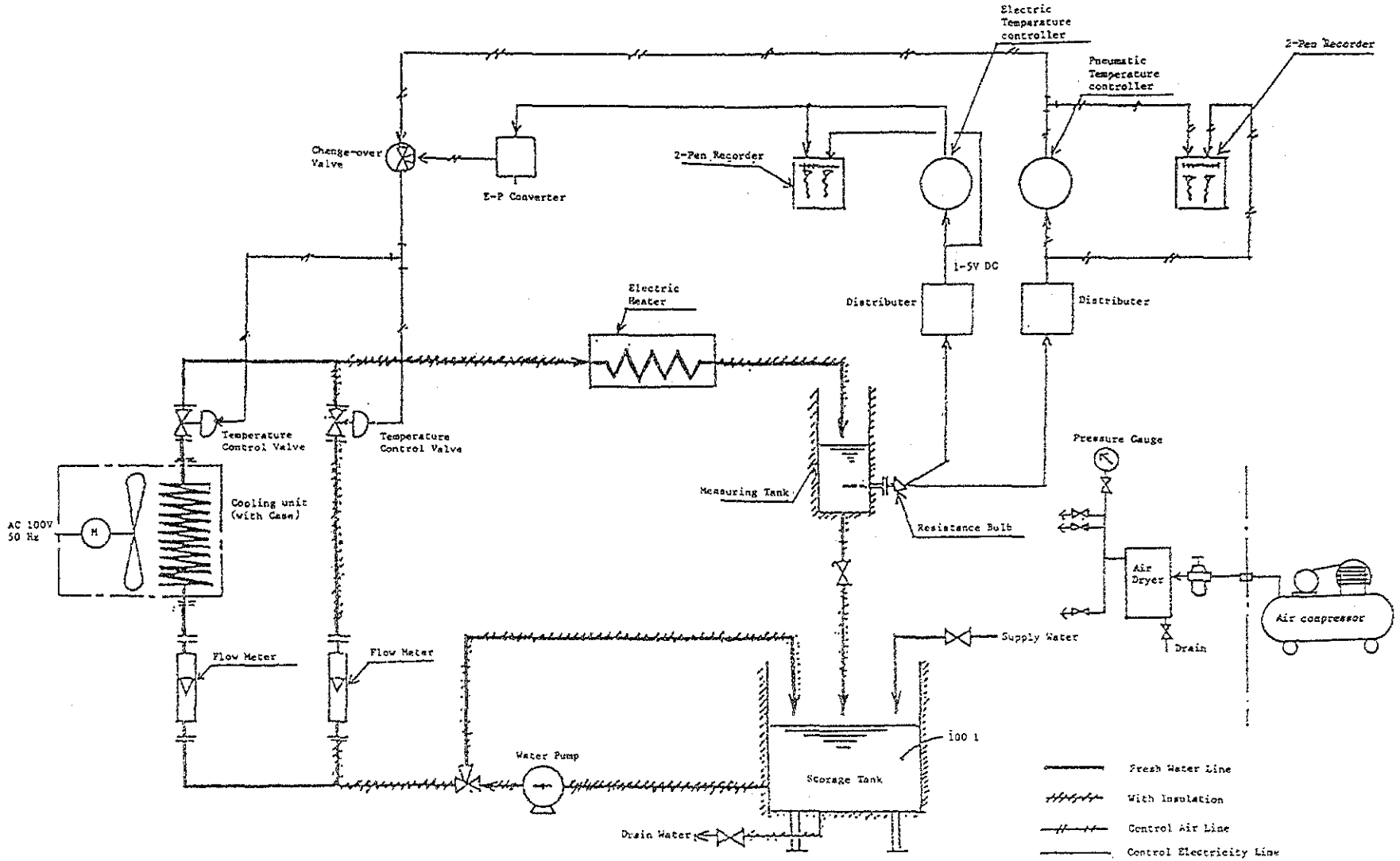
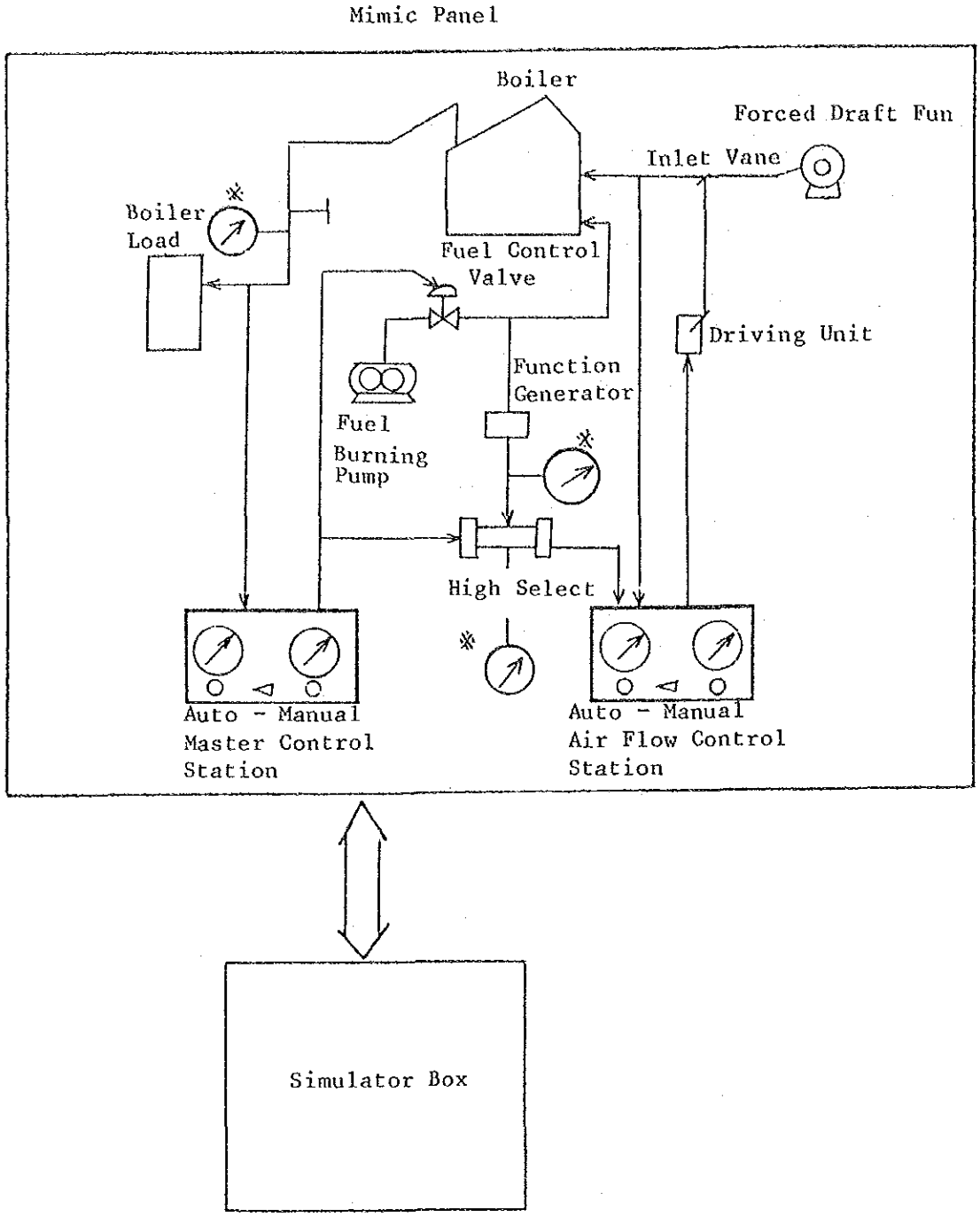
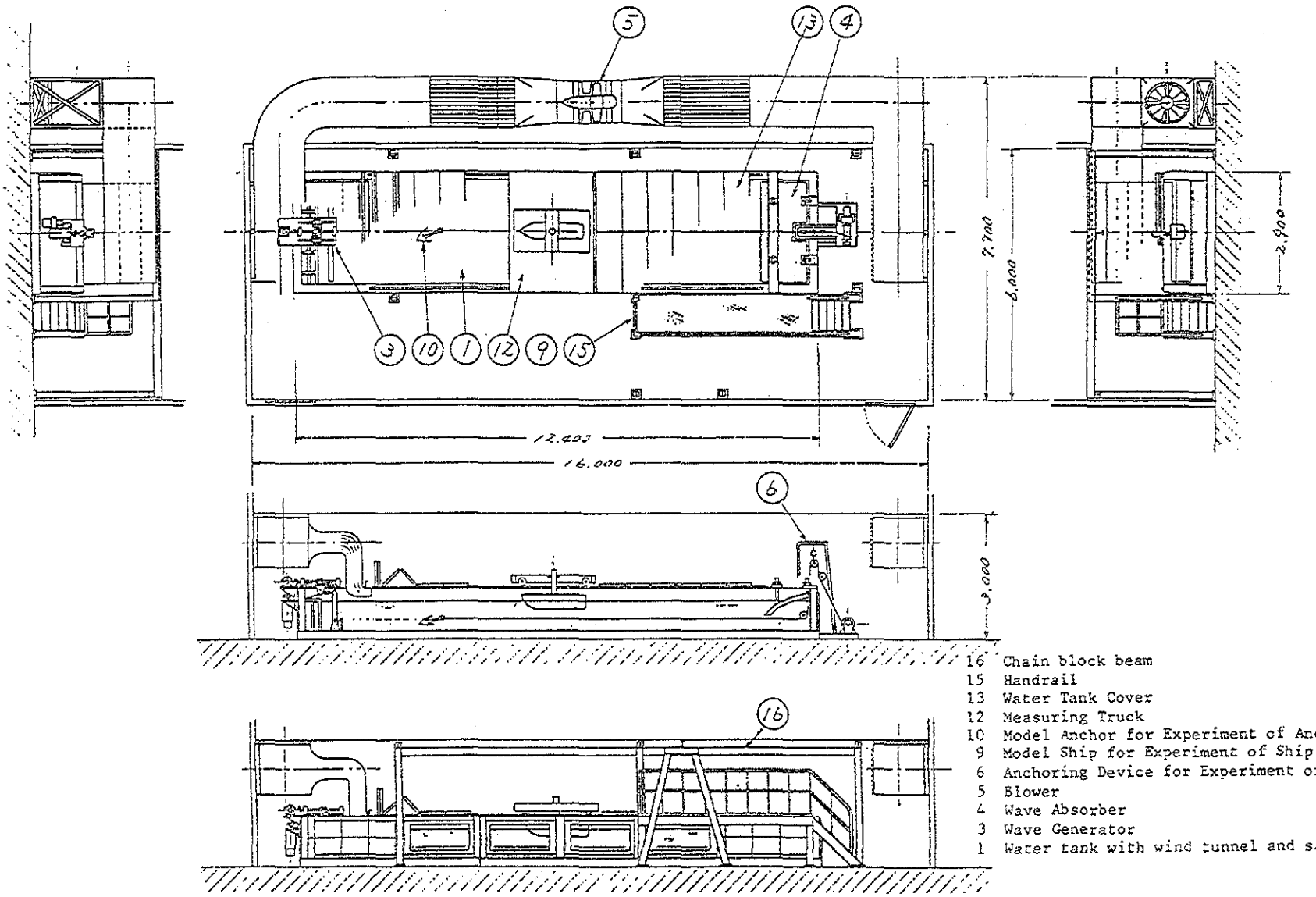


Fig. 4-9 Temperature Control System Demonstration Set



* Pressure indicator is interlinked with the value of calculation by simulation.

Fig. 4-10 Boiler Fuel/Air Ratio Controller



16 Chain block beam
15 Handrail
13 Water Tank Cover
12 Measuring Truck
10 Model Anchor for Experiment of Anchoring
9 Model Ship for Experiment of Ship Movement
6 Anchoring Device for Experiment of Anchoring
5 Blower
4 Wave Absorber
3 Wave Generator
1 Water tank with wind tunnel and sand bottom

Fig. 4-11 Experimental Water Tank (1)

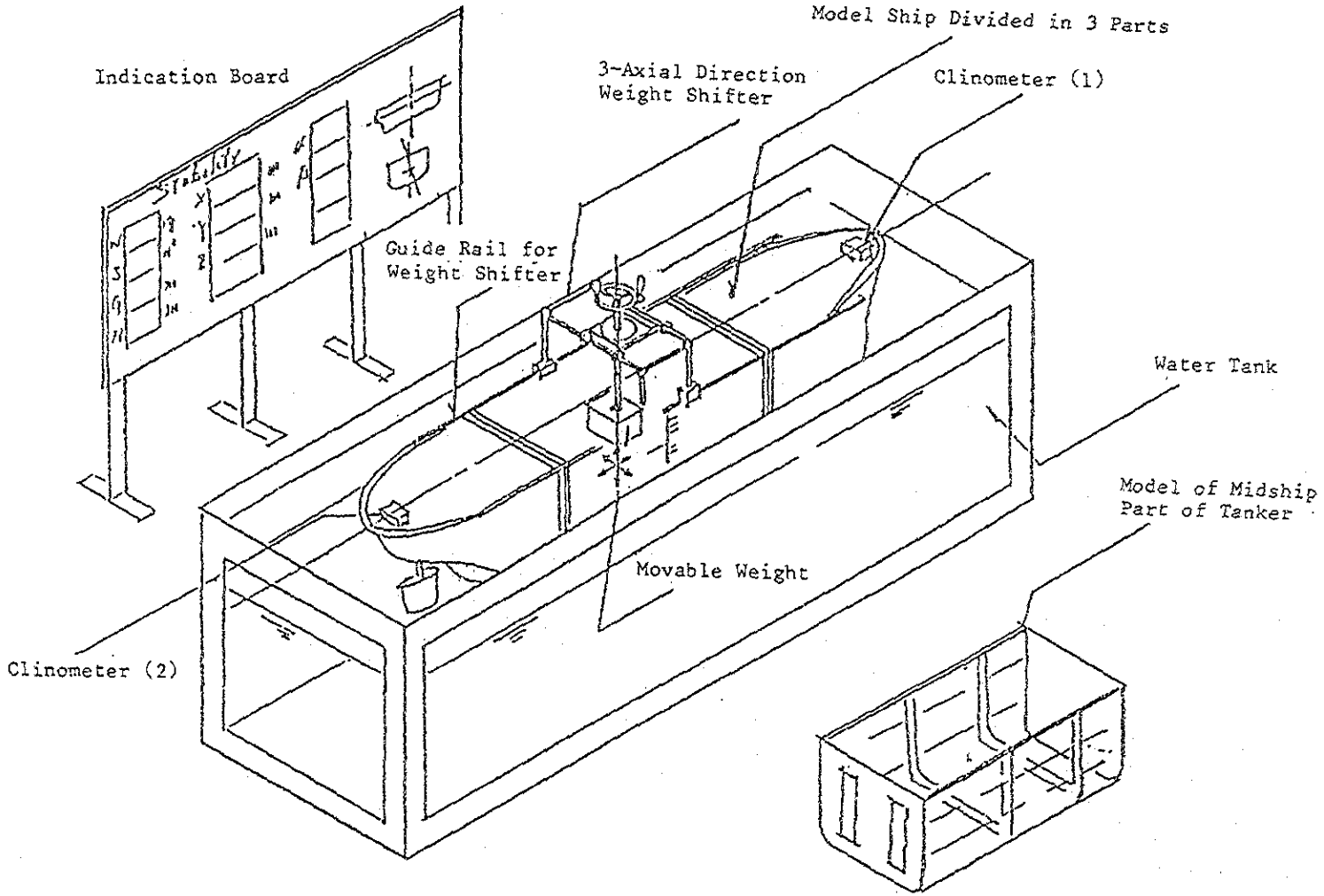
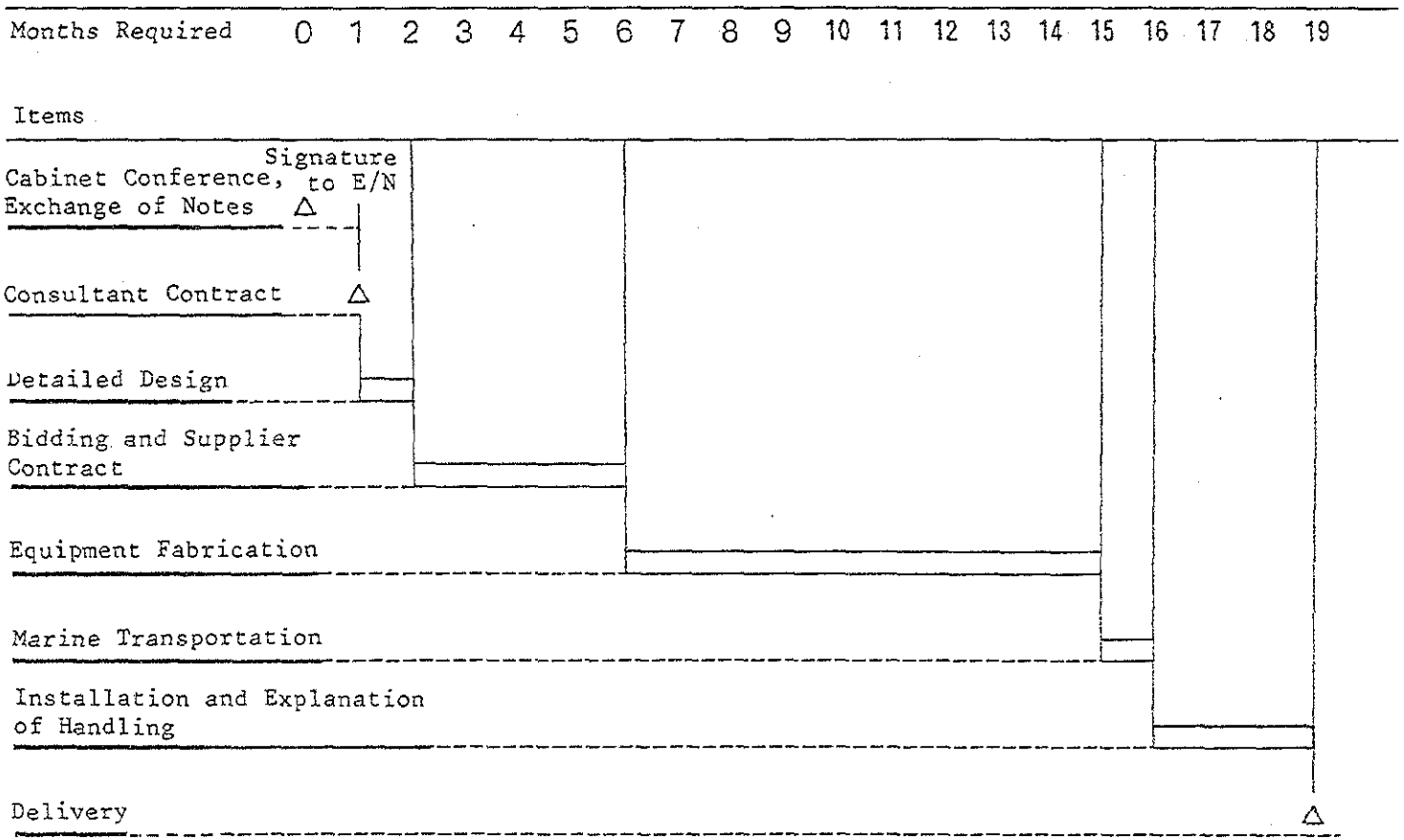


Fig. 4-12 Experimental Water Tank (2)

Table 4-13 Implementing Schedule



CHAPTER 5 Project Assessment

Chapter 5 Project Evaluation

IMT is by no means a large institution, but it is of an adequate scale and is properly organized as a seafarer educational institution.

Having what is consideredd to be most important for a school - excellent staff of instructors and strongly motivated trainees chosen from among a number of applicants, and supported by a trinity of the Department of Marine Administration (DMA), Burma Five Star Shipping Corporation (BFSSC) and the institute (IMT) itself, IMT is blessed with unique characteristics and conditions when compared with similar educational organs in foreign countries.

The seafarer education was possible in the past if there was a single boat in addition to instructors and trainees determined in the same direction. This principle is still true today. But under the present situation of sea traffic in which modernized ships of various countries are moving freely on the sea having no national boundary, what used to be a single boat is becoming more and more complex and rapidly multifarious.

After effectuation of the STCW convention in 1984, the knowledge and skills of the seafarers were internationally standardized according to the type of ship and the position of seafarers, and the marine technology certification was also internationally standardized.

For many developing countries aiming to develop independent shipping industry, it has been an urgent task in recent years to develop and improve the domestic system for marine technology administration and seafarer education and thus satisfy the requirements of the STCW convention.

Burma is not an exception. As a first step to break through the present difficult condition of IMT which is belated particularly in the equipment, she has requested from our country a grant aid for provision of the equipment mainly for the improvement and modernization of the education in the navigation department.

As stated above, this basic design is the result of careful examination of the contents of the request with the present condition of IMT as a premise, and when the equipment is used appropriately after implementation of the project, it will lead to an improvement of the

education in the navigation department.

However, implementation of the project does not satisfy all of the requirements of the STCW convention.

The request itself is not intended for the entire resolution all of the equipment problems of IMT. The equipment was selected from among those most urgently needed and those which can be installed and operated under present conditions of IMT.

Particularly, for the engineering department, only some of the basic equipment commonly usable with the navigation department is improved, and the improvement of equipment for the special courses is left undone.

Nevertheless, there is no doubt that the project, as the first case of grant aid cooperation in the field of maritime education and training of the Union of Burma, will serve as a model for the achievement of cooperation of the personnel concerned of both countries towards steady development of IMT and enhancement of the quality of Burmese seafarers.

CHAPTER 6 Conclusion and Proposal

Chapter 6 Conclusion and Proposal

Conclusion

Through surveys in Burma and post survery analysis in Japan regarding the contents of the Maritime Education and Training Project, the study team concludes that the project is fully qualified for inplementation with Japan's grant aid.

With the completion of the project, IMT will be able to conduct deck officer courceses in compliance with the STCW Convention as well as to upgrade cadet officer courses.

It is expected that, through a supply of the necessary equipment, the project will contribute not only to enhancing the seafarers education in Burma which will lead to the improvement of safety at sea but also to the development of the shipping industry of the country.

The following are the problems concerning the prospects of the project and proposals of the basic design study team.

1) Educational System in Transitional Period

To develop a shipping industry operated by their own people and own ships is a matter of seious concern for all countries aiming at shipping. But an enormous amount of financial investment is required for possession and maintenance of the fleet, education and training of the seafarers and development and improvement of the ports and harbours, and it is not a project that can be achieved in a brief interval of time.

The Socialist Republic of the Union of Burma, still less than half a century after the commencement of the government-operated shipping industry, is employing an education and training system of Burmese seafarers, enroling those who have completed the second year of science or engineering universities, giving them concentrative special education for 1 year at IMT, then assigning them to ships of BFSSC for a considerable period of training onboard ship and thus nurturing the primary ship officers. This is a system effectively utilizing the existing facilities of the country, and commendable as a transitional system.

As a desirable educational system, however, it will be more effective, as is contemplated in IMT's reformation scheme to an academy, to admit the persons having completed the courses of high school, educate them on the fundamental courses, special fundamental courses and special courses which are required for the ship operating engineers for a period of about 3 years and, at the same time, cultivate their quality as ship officers through the school life. Thereafter they should be trained onboard ship. Then, the training onboard ship may be reduced to about 2 years maximum, but a substantial effect will be maintained.

This is why many shipping countries employ the academy system. Though the academy system requires substantial expansion of the teaching staff as well as the facilities and equipment, it is greatly meritorius for both teachers and students as well as in terms of effectiveness.

2) Improvement of Educational Equipment

The curriculums of the navigation and engineering departments of IMT have the necessary courses arranged properly. But the necessary equipment to perform the curriculums is meager.

With implementation of the project, the equipment of the navigation department will be improved greatly. But it is an important problem for IMT to further introduce the educational equipment and teaching materials of the following.

- o Fundamental training equipment - Fire fighting and physical training equipment.
- o Equipment for special education - Equipment related to meteorology; equipment concerned with the engineering department.
- o Others - Books

IMT should, therefore, exert efforts for arrangement of the various conditions including acquisition of the maintenance expense and the space for installation and introduction of the foregoing equipment so far as practicable.

3) Construction of New Training Building

For the construction of the new building housing the radar simulator and other equipment described in paragraph 3-3-4 (Equipment Layout Plan) in Chapter 3, there is no problem for the acquisition of land, but in

order for the project to be carried out in a smooth manner, it is important to secure the budgetary appropriation and complete the building before arrival of the equipment.

ANNEX

ANNEX

I.

MINUTES OF DISCUSSIONS
ON
THE MARITIME EDUCATION AND TRAINING PROJECT
IN
THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

In response to the request of the Government of the Socialist Republic of the Union of Burma, the Government of Japan decided to conduct a Basic Design Study on the Maritime Education and Training Project (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA"). JICA sent to Burma the Study team headed by Capt. Hirohisa MATSUDA, Maritime Technological Officer, Education Division, Seafarers Department, Maritime Technology and Safety Bureau, Ministry of Transport from December 7th to 19th, 1986.

The team had a series of discussions on the Project with the officials concerned of the Government of the Socialist Republic of the Union of Burma, headed by Dr. Tin Hlaing, Principal, Institute of Marine Technology, and conducted a field survey in Rangoon Area.

As a result of the study, both parties agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Rangoon, December 17th, 1986

Capt. H. Matsuda

Capt. Hirohisa MATSUDA
Team Leader
Japanese Study Team
JICA

Dr. Tin Hlaing
Principal
Institute of Marine Technology

ATTACHMENTS

1. Objective of the project.

The objective of the project is to contribute to the development of merchant navy personnel in the Socialist Republic of the Union of Burma, by providing the Institute of Marine Technology with the equipment necessary to meet the STCW Convention requirements as well as to upgrade the present training courses of the Institute.

2. Implementing Organization.

The Institute of Marine Technology under the Ministry of Transport and Communications of the Government of the Socialist Republic of the Union of Burma is the implementing organization of the project and responsible for the operation and maintenance of the equipment supplied by the Project.

The Burmese side ensured that it will provide the necessary budget for the construction of the appropriate building, installing the equipment and for its operation and maintenance.,

3. Project Site.

Among the equipment requested by the Government of the Socialist Republic of the Union of Burma, the Radar simulator with the automatic radar plotting aid, the navigational aids simulator, and the astronomy instructional projector set are proposed to be installed in the new building which the Institute of Marine Technology will prepare and the rest in the existing facilities of the Institute. The location of the Institute is shown in Annex - 1 and the layout plan of new and existing buildings of the Institute in Annex - 2.

H. M.

4. Equipment requested by the Burmese Side.

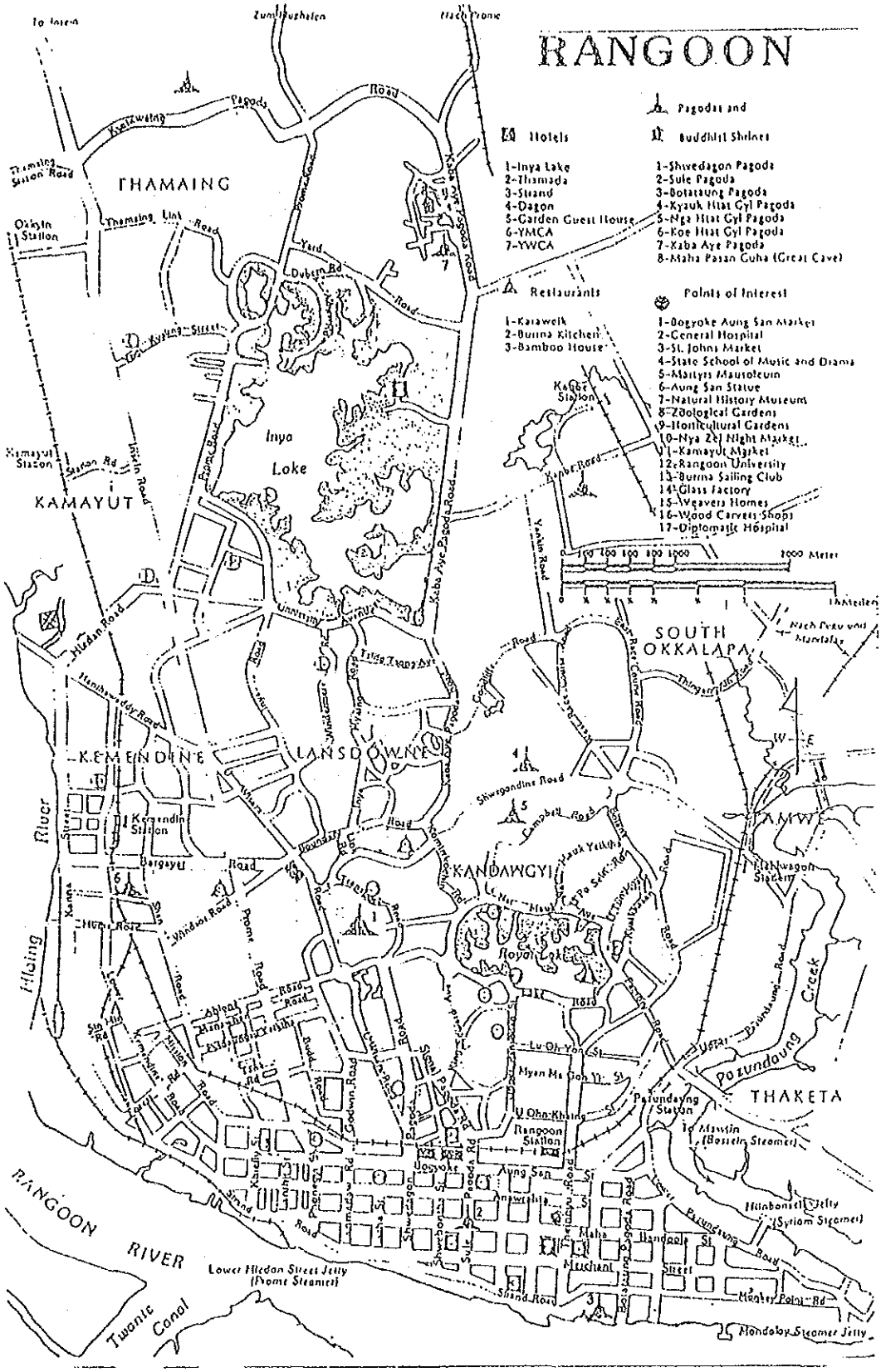
The Japanese Study Team will convey to the Government of Japan the desire of the Government of the Socialist Republic of the Union of Burma that the former will take necessary measures to cooperate in implementing the Project and provide necessary equipment as listed in Annex-3 within the scope of Japanese economic cooperation in grant form.

5. Japanese Grant Aid System.

The Government of the Socialist Republic of the Union of Burma understood the Japanese Grant Aid system explained by the Team.

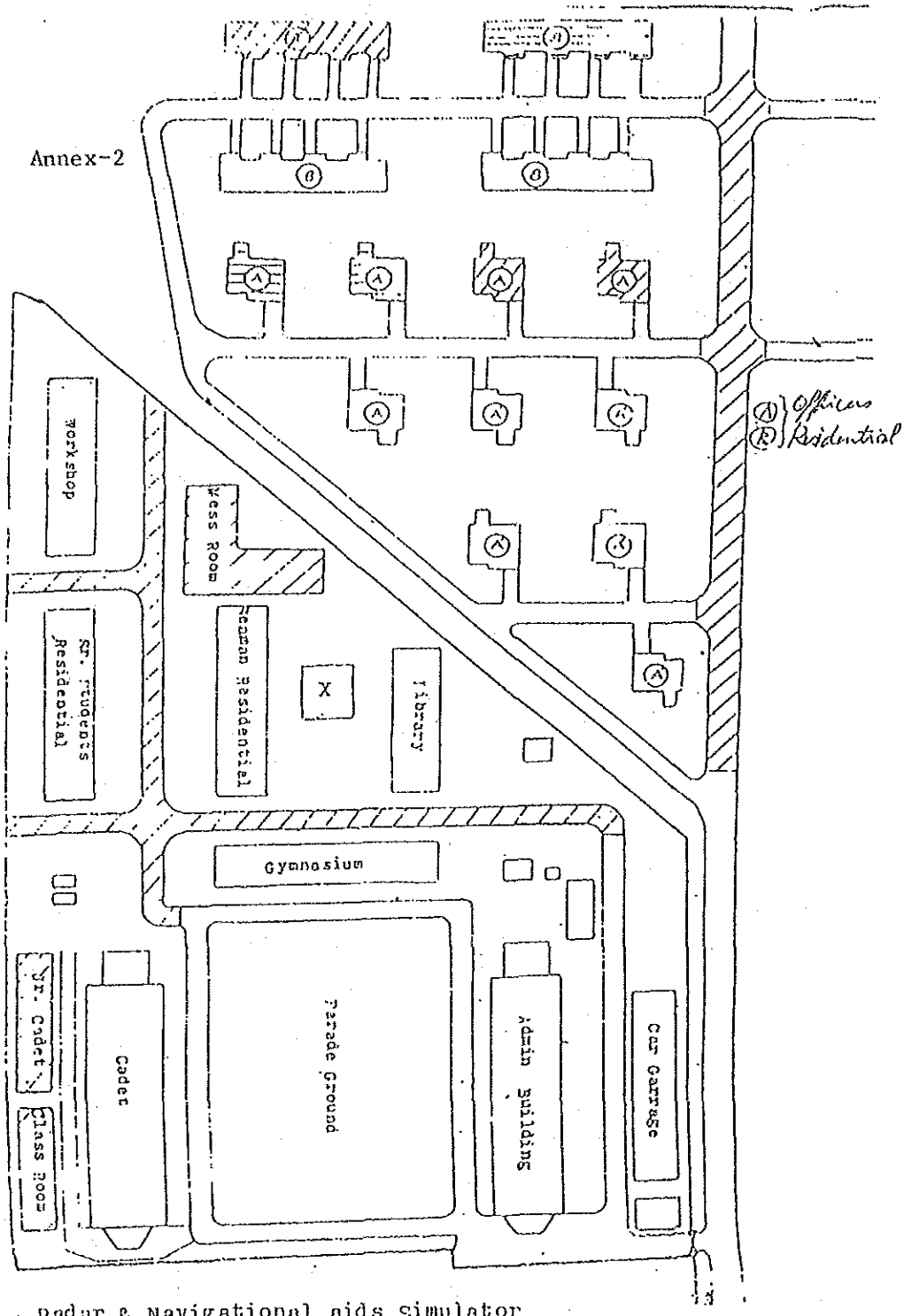
6. Measures to be taken by the Burmese Side.

The Government of the Socialist Republic of the Union of Burma will take necessary measures as listed in Annex-4 on condition that Grant Assistance by the Government of Japan is extended to the Project.


RANGOON
Hotels
1-Inya Lake
2-Thamada
3-Strand
4-Dagon
5-Garden Guest House
6-YMCA
7-YWCA
Pagodas and
Buddhist Shrines
1-Shwedagon Pagoda
2-Sule Pagoda
3-Botataung Pagoda
4-Kyauk Htat Gyi Pagoda
5-Nga Htat Gyi Pagoda
6-Koe Htat Gyi Pagoda
7-Kaba Aye Pagoda
8-Maha Pasan Guha (Great Cave)
Restaurants
1-Karaweik
2-Burma Kitchen
3-Bamboo House
Points of Interest
1-Bogyoke Aung San Market
2-General Hospital
3-St. Johns Market
4-State School of Music and Drama
5-Martyrs Mausoleum
6-Aung San Statue
7-Natural History Museum
8-Zoological Gardens
9-Horticultural Gardens
10-Nya Zei Night Market
11-Kamayut Market
12-Rangoon University
13-Burma Sailing Club
14-Glass Factory
15-Weavers Homes
16-Wood Carvers Shops
17-Diplomatic Hospital
1000 Meter
THAMAING
KAMAYUT
Inya Lake
KEMENDINE
LANSDOWNE
KANDAWGYI
SOUTH OKKALAPA
THAKETA
Pazundaung Creek
Hlaing River
RANGOON RIVER
Twante Canal
Lower Hledan Street Jetty (Prome Steamer)
Mandalay Steamer Jetty

H. M. 17/4/86

Annex-2



X = Radar & Navigational aids Simulator
and Astronomy Instructional Projector Set

Annex-3

Items required by the Government of the Socialist Republic of the Union of Burma whose cost will be borne by the Government of Japan.

1. Radar Simulator with Automatic Radar Plotting Aid
2. Navigation Aids Simulator
3. Astronomy Instructional Projector Set
4. Science Laboratory Equipment:
   - Light Reflection and Refraction Set
   - Heat Transfer Demonstration Set
   - Sound Wave Demonstration Set
   - Mechanics and Control System Demonstation Set
   - Flume Tank
   - Electricity and Electonic Demonstration Set
   - Computer System

Annex-4

The following arrangements will be required to be taken by the Govenment of the Socialist Republic of the Union of Burma.

1. To construct a new building with facilities for distribution of electricity, air conditioning and other incidental facilities in the Institute of Marine Technology for installing the radar simulator with the automatic radar plotting aid, the navigational aids simulator and the astronomy instructional projector set and arrange the existing buildings of the institute for the other equipment supplied under the grant, before the installation work of the Japanese side, according to the layout plan of the equipment and the facilities plan of the buildings proposed in the final report of the Basic Design Study by the Japanese side.

2. To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation in Burma and prompt internal transportation therein of the products purchased under the grant.

3. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Burma with respect to the supply of the products and services under the verified contracts.

4. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Burma and stay therein for the performance of their work.

5. To maintain and use properly and effectively the equipment purchased under the grant.

II. Composition of Study Team

Tasks	Names	Assignments
Head	Hirohisa Matsuda	Marine Technology Planning Officer, Education Division, Seafarers Department, Marine Technology and Safety Bureau, Ministry of Transport
Equipment planning	Shoichi Kitamura	Ship Inspection Officer, Marine Technology and Safety Bureau, Ministry of Transport
Planning control	Nobuko Kayashima	Second Basic Design Study Division Grant Aid Planning and Survey Department Japan International Cooperation Agency
Education and training planning	Nobuaki Kojima	The Maritime International Cooperation Center of Japan
Equipment planning	Tsutomu Okajima	The Maritime International Cooperation Center of Japan

III. Itinerary of Study Team

Dec. 7 (Sun)	From Tokyo To Bangkok
Dec. 8 (Mon)	From Bangkok To Rangoon
Dec. 9 (Tue)	Courtesy visit to Japanese Embassy in Burma
	Arrangement at JICA Burma Office
	Courtesy visit to H.E. U Tin Tun, Undersecretary, Ministry of Transportation
	Courtesy visit to Overseas Economic Cooperation Bureau
Dec. 10 (Wed)	Courtesy visit to and consultation with IMT Arrangement with respect to itinerary, and survey of IMT equipment
	Explanation of Inception Report
	Consultation on the contents of requested equipment
Dec. 11 (Thu)	Visit to BFSSC Sagaing (G/T 9778; Built in 1985)
	Consultation at IMT
	Interim report to JICA Burma Office
Dec. 12 (Fri)	Consultation at IMT with respect to the contents of the request
	Courtesy visit to DMA
	Interim report to JICA Burma Office
Dec. 13 (Sat)	Arrangement within the Team
Dec. 15 (Mon)	Consultation with IMT
	Questions with respect to partial answers to questionnaire
	Consultation with respect to building, housing new equipment
	Explanation in detail of grant aid systems

Dec. 16 (Tue)	Consultation on Minutes at IMT
	Questions with respect to additional answers to questionnaire
	Survey of the place of installation of equipment
	Report to JICA Burma Office
Dec. 17 (Wed)	Exchange of signatures to Minutes at IMT
Dec. 18 (Thu)	Depart Rangoon (official mission)
	(Consultant) Discussion in detail of the contents of equipment at IMT
	Report of the proceedings to JICA Burma Office
Dec. 19 (Fri)	Discussion in detail of the contents of equipment at IMT
Dec. 20 (Sat)	Preparation of equipment layout plan
	Preparation of detailed list of equipment
Dec. 21 (Sun)	Arrangement of data
Dec. 22 (Mon)	Discussion in detail of the equipment at IMT
	Collection of field information and data at JICA Burma Office
	Preparation of the data of explanation on equipment
Dec. 23 (Tue)	Consultation and adjustment of detailed list of equipment at IMT
	Report to Japanese Embassy in Burma and JICA Burma Office
Dec. 24 (Wed)	Resurvey of facilities in IMT
Dec. 25 (Thu)	(Consultant) From Rangoon To Bangkok
Dec. 26 (Fri)	From Bangkok To Tokyo

IV. Courtesy Visits and Conferees

1 Ministry of Transport & Communications

H. E. U Tin Tun	Dy. Minister
Khin Yi Myist	Head of Officer

2 Ministry of Transport & Communications
Department of Marine Administration

U Maung Maung lay	Director General
Capt. K. W. Shane	Nautical Division D.
U Myint Thein	Seamen Eployment Control D.
U Sein Maung	Engineering Division D.
U Tin Shwe	Plans & Accounts D.
U Kyaw Shein	Administration D.
Dr. Aung Kyan	Dockyard Manager

3 IMT

Dr. Tin Hlaing	Principal
Capt. Htin Kyaw	Head of Nautical Dep't
U Htay Aung	Head of Engineering Dep't
U Win	In Charge of Cadets Dep't
U Maung Maung	Liaison Officer

4 BFSSC

Win Maung	SAGAING	Captain
Sein Tun		Chief Engineer

5 FERD

U Myint Aung	Director General
U Than Myint	Assist. Director

6 Construction Corporation

U Pe Aye	Architect
Daw Tin Nu	Architect
Mr. Bhushanam	Quantity Surveyor

7 Japanese Embassy in Burma

Tsukamoto	Ambassdor
Matsuura	First Secretary

8 JICA Rangoon Office

Shinoura	Chief
Kitamura	Officer

V. INSTUTE OF Maine Technology Summary of Curriculum

Name of Course: Nautical Cadets

Outline of Subject to be Taught	Periods
1. Principle of Navigation	140
2. Practical Navigation & Chart Work	220
3. Radio Electronic Aids to Navigation	80
4. Seamanship	300
5. General Ship Knowledge	220
6. Communication	80
7. Meteorology	80
8. Mathematics	120
9. Physics	120
10. Engineering Knowledge	120
11. Common Course	160
12. Boat Sailing	88
13. Swimming/Excursion	80
14. Sea Cruising	40
Total	1,848

Name of Course: Second Mate (Foreign Going)

Outline of Subject to be Taught	Periods
1. Mathematics	148
2. Principles of Navigation	45
3. Practical Navigation and Chartwork	180
4. General Shipknowledge	90
5. Orals and Practical	127
6. Radar Observer	135
7. Signals	45
8. First Aid	45
Total	810

Name of Course: First Mate (Foreign Going)

Outline of Subject to be Taught	Periods
1. Practical Navigation	90
2. Chartwork	90
3. Ship Construction	32
4. Stability	32
5. Meteorology	32
6. Ship Maintenance Routine and Cargo Work	32
7. Magnetism	16
8. Electricity	32
9. Gyro Compass	16
10. Seamanship Orals	112
11. Signals	32
12. Toutorial	300
Total	816

Name of Course: Master (Foreign Going)

Outline of Subject to be Taught	Periods
1. Practical Navigation, and Chartwork and Pilotage	208
2. Magnetic and Gyro Compass	104
3. Ship Construction and Stability	156
4. Shipmaster's Business	104
5. Elementary Engineering and Electricity Including Electronic Navigational Aids	156
6. Meteorology	52
7. Orals and Signals	104
Total	884

VI. Marine Technology Certification System in Burma

Present Marine Technology Certificates

(1) Master of a foreign-going ship
(2) First Mate of a foreign-going ship
(3) Second Mate of a foreign-going ship
(4) Master of a home-trade ship
(5) Mate of a home-trade ship
(6) First Class Engineer
(7) Second Class Engineer
(8) Engine Driver

Planned System (*added)

(1) Master of a foreign-going ship
(2) First Mate of a foreign-going ship
(3) Second Mate of a foreign-going ship
(4) * Third Mate of a foreign-going ship
(5) Master of a home-trade ship
(6) Mate of a home-trade ship
(7) * Chief Engineer
(8) First Class Engineer
(9) Second Class Engineer
(10) Third Class Engineer
(11) Engine Driver

Non-Statutory Certificates

(1) Third Mate foreign-going
(2) Third Engineer
(3) Fourth Engineer

Watch Cerficication under Plan

(1) Bridge
(2) Engine Room

Grades of examinations

Deck Department

(1) Master foreign-going

(a) Candidate must be not less than twenty three years of age

(b) Candidate must have served at sea for seven years on foreign-going ships or equivalent. This period must include two years as watch-keeping officer whilst holding a Second Mate Certificate and eighteen months as watch-keeping officer whilst holding First Mate Certificate.

(2) First Mate foreign-going

(a) Candidate must be not less than twenty one years and six months of age.

(b) Condidate must have served at sea for five years and six months on foreign-going ships or equivalent. This period must include not less than eighteen months as watch-keeping officer whilst holding Second Mate Certificate.

(3) Second Mate foreign-going

(a) Candidate must be not less than twenty years of age.

(b) must have served at sea four years on foreign-going ships or equivalent.

(4) Master Home-Trade

(a) Candidate must be not less than twenty three years of age.

(b) Candidate must have served five years at sea of which one year must have been in a capacity not lower than that of first Mate of a home trade or coasting vessel, whilst holding a Mate's Certificate for home trade passenger ships or a Second Mate's Certificate for foreign-going vessel or equivalent.

(5) Mate Home Trade

(a) Candidate must be not less than twenty years of age.

(b) Candidate must have served four years at sea. He must produce official proof that he has actually served three years two months and twelve days of this time at sea.

Engine Department

(1) First Class Engineer

(a) Candidate must hold Second Class Engineer Certificate.

(b) Candidate must have for MOTOR or STEAM Certificate twenty one months sea service as Wach-keeping engineer, on engines of not less than 99 NHP or 560 BHP.

(c) Candidate must have for STEAM and MOTOR (combined) Certificat twenty four months sea service as Wach-keeiping engineer as appropriate.

NHP = Norminal Hourse Power
BHP = Brake Horse Power

(2) Second Class Engineer Certificate

(a) Candidate must be not less than twenty one years of age.

(b) Candidate must have approved type of workshop service for four years or equivalent.

(c) Candidate must have for MOTOR or STEAM Certificate twenty one months sea service or for MOTOR and STEAM (combines) Certificate twenty four months sea service as watch-keeping engineer on engines of not less than 66 NHP or 373 BHP.

Subject for examinations

Navigation Depertment

(1) Master (Foreign-going)

(a) Written

1) Practical Navigation	3 hrs
2) Magnetic Compass	3 hrs
3) Ship Construction	3 hrs

4) Shipmaster's business 2 hrs

5) Engineering, radio aids 3 hrs

6) Meteorology 2 hrs

A candidate must obtain general verage of 70% of total marks given to pass the written portion.

(b) Orals

(c) Signalling

(2) First Mate (Foreign-going)

(a) Written

1) Practical Navigation 3 hrs

2) Chart Work + Pilotage 2 hrs

3) Ship Construction 3 hrs

4) Meteorology 2 hrs

5) Ship Maintenance 3 hrs

6) Magnetism and Electricity 2 hrs

A candidate must obtain general average of 70% of total marks given to pass the written portion.

(b) Orals

(c) Signalling

(3) Second Mate (Foreign-going)

(a) Written

1) General Ship knowledge 3 hrs

2) Chart Work + Pilotage 2 hrs

3) Practical Navigation 3 hrs

4) Mathematics 2 hrs

5) Principles of Navigation 2 hrs

6) Essay (English and Burmese) 3 hrs

A candidate must obtain general average of 70% of total marks given to pass the written postion.

(b) Orals

(c) Signalling

(4) Master (Home-Trade)

(a) Written

1) Chart Work 2 hrs

2) Practical Navigation 2 hrs

3) Stability and Sea worthiness 2 hrs

4) Compass deviation 2 hrs

5) Essay (English) 1 1/2 hrs

A candidate must obtain general average of 70% of total marks to pass the written portion.

(b) Orals

(c) Signalling

(5) Mate (Home-Trade)

(a) Written

1) Chart Work 2 hrs

2) Practical Navigation 3 hrs

3) Elementary Ship Knowledge 2 hrs

4) Essay (English) 1 1/2 hrs

A candidate must obtain general average of 70% of total marks to pass the written portion.

(b) Orals

(c) Signalling

Engine Department

(1) First Class Engineer

(Part A ... Land)

1) Applied Mechanics 3 hrs

2) Heat and Heat Engines 3 hrs

3) Mathematics 3 hrs

(Part B ... Ship)

4) Electrotechnology 3 hrs

5) Elementary Naval Architecture and ship construction 3 hrs

6) Engineering Knowledge (General) 3 hrs

7) Engineering Knowledge (Motor/Steam) 3 hrs

8) Orals

(2) Second Class Engineer

(Part A ... Land)

1)	Applied Mechanics	3 hrs
2)	Heat and Heat Engines	3 hrs
3)	Mathematics	3 hrs
4)	Drawing	6 hrs

(Part B ... Ship)

5)	Electrotechnology	3 hrs
6)	Elementary Naval Architecture	3 hrs
7)	Engineering Knowledge (General)	3 hrs
8)	Engineering Knowledge (Motor/Steam)	3 hrs
9)	Orals	

VII. Related STCW Regulation

CHAPTER II
MASTER-DECK DEPARTMENT
Regulation II/I

BASIC PRINCIPLES TO BE OBSERVED IN KEEPING A NAVIGATIONAL WATCH

1. Parties shall direct the attention of shipowners, ship operators, masters and watchkeeping personnel to the following principles which shall be observed to ensure that a safe navigational watch is maintained at all times.

2. The master of every ship is bound to ensure that watchkeeping arrangements are adequate for maintaining a safe navigational watch. Under the master's general direction, the officers of the watch are responsible for navigating the ship safely during their periods of duty when they will be particularly concerned with avoiding collision and stranding.

3. The basic principles, including but not limited to the following, shall be taken into account on all ships.

4. Watch arrangements

(a) The composition of the watch shall at all times be adequate and appropriate to the prevailing circumstances and conditions and shall take into account the need for maintaining a proper look-out.

(b) When deciding the composition of the watch on the bridge which may include appropriate deck ratings, the following factors, inter alia, shall be taken into account:

(i) at no time shall the bridge be left unattended;

(ii) weather conditions, visibility and whether there is daylight or darkness;

(iii) proximity of navigational hazards which may make it necessary

for the officer in charge of the watch to carry out additional navigational duties;

(iv) use and operational condition of navigational aids such as radar or electronic position-indicating devices and any other equipment affecting the safe navigation of the ship;

(v) whether the ship is fitted with automatic steering;

(vi) any unusual demands on the navigational watch that may arise as a result of special operational circumstances.

5. Fitness for duty

The watch system shall be such that the efficiency of watchkeeping officers and watchkeeping ratings is not impaired by fatigue. Duties shall be so organized that the first watch at the commencement of a voyage and the subsequent relieving watches are sufficiently rested and otherwise fit for duty.

4. Radar equipment

Demonstrate in conjunction with the use of radar simulator or, when not available, maneuvering board, knowledge of the fundamentals of radar and ability in the operation and use of radar, and in the interpretation and analysis of information obtained from this equipment, including:

(a) factors affecting performance and accuracy;

(b) setting up and maintaining displays;

(c) detection of misrepresentation of information, false echoes, sea return, etc;

(d) range and bearing;

(e) identification of critical echoes;

(f) course and speed of other ships;

(g) time and distance of closest approach of crossing, meeting or overtaking ships;

(h) detecting course and speed changes of other ships;

(i) effect of changes in own ship's course or speed or both;

(j) Application of the International Regulations for Preventing Collisions at Sea.

5. Compasses-magnetic and gyro

Ability to determine and correct the errors of the magnetic and gyro-compasses and knowledge of the means for correcting such errors.

6. Meteorology and oceanography

(a) Demonstrate the ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions.

(b) Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centers and the dangerous quadrants.

(c) Knowlede of ocean current systems.

(d) Ability to use all appropriate navigational publications on tides and currents, including those in the English language.

(e) Ability to calculate tidal conditions.

7. Ship maneuvering and handling

Maneuvering and handling of a ship in all conditions, including the following:

(a) maneuvers when approaching pilot vessels or stations with due regard to weather, tide, headreach and stopping distances;

(b) handling a ship in rivers, estuaries, etc., having regard to the effects of current, wind and restricted water on the response to the helm;

6. Navigation

(a) The intended voyage shall be planned in advance taking into consideration all pertinent information and any course laid down shall be checked before the voyage commences.

(b) During the watch the course steered, position and speed shall be checked at sufficiently frequent intervals, using any available navigational aids necessary, to ensure that the ship follows the planned course.

(c) The officer of the watch shall have full knowledge of the location and operation of all safety and navigational equipment on board the ship and shall be aware and take account of the operating limitations of such equipment.

(d) The officer in charge of a navigational watch shall not be assigned or undertake any duties which would interfere with the safe navigation of the ship.

7. Navigational equipment

(a) The officer of the watch shall make the most effective use of all navigational equipment at his disposal.

(b) When using radar, the officer of the watch shall bear in mind the neccessity to comply at all times with the provisions on the use of radar contained in the applicable regulations for preventing collisions at sea.

(c) In cases of need the officer of the watch shall not hesitate to use the helm, engines and sound signalling apparatus.

8. Navigational duties and responsibilities

(a) The officer in charge of the watch shall:

(i) keep his watch on the bridge which he shall in no circumstances leave until properly relieved;

(ii) continue to be responsible for the safe navigation of the ship, despite the presence of the master on the bridge, until the master informs him specifically that the has assumed that responsibility and this is mutually understood;

(iii) notify the master when in any doubt as to what action to take in the interest of safety;

(iv) not hand over the watch to the relieving officer if he has reason to believe that the latter is obviously not capable of carrying out his duties effectively, in which case he shall notify the master accordingly.

(b) On taking over the watch the relieving officer shall satisfy himself as to the ship's estimated or true position and confirm its intended track, course and speed and shall note any dangers to navigation expected to be encountered during his watch.

(c) A proper record shall be kept of the movements and activities during the watch relating to the navigation of the ship.

9. Look-out

In addition to maintaining a proper look-out for the purpose of fully appraising the situation and the risk of collision, stranding and other dangers to navigation, the duties of the look-out shall include the detection of ships or aircraft in distress, shipwrecked persons, wrecks and debris.

VIII. Standard Educational Equipment for Navigation Department

Curriculum	Equipment	
I. Navigation		
(I) Nautical instruments		
1. Magnetic compass	Liquid magnetic compass	1
	Dry compass	1
		1 set
	Deviation table and deviation curve diagram	1 set
	Compass adjusting tools	1 set
	Deflector	1
2. Log	Hand log (sector board, sand-glass, log line)	1 set
	Tow log (indicator, rotor, regulating ring, towing rope)	1 set
	Pressure log (transmitter, distance recorder, speed indicator, speed/distance indicator)	1 set
	Electromagnetic log (speed/distance indicator, distance receiver, speed receiver)	1 set
3. Depth sounder	Hand sounding lead (lead, lead line)	1 set
	Sounder (lead line, weight, chemical tube)	1 set
	Echo sounder (recorder, wave transmitter/receiver)	1 set

Curriculum	Equipment	
4. Gyrocompass	Gyroscope	1
	Sperry gyrocompass (repeater)	1 set
	Hokushin plateau gyrocompass (C-1A) Gyroscope (2), repeater (1)	1 set
	Course recorder	1
	Pelorus	1
	Azimuth compass	1
	Shadow pin	5
5. Auto-pilot	Hokushin auto-pilot Functional chart	1 set
6. Radar	Rader (indicator, transmitter/ receiver, scanner)	1 set
7. Automatic radar plotting aid	APRA	1 set
8. Sextant	Sextant	25
9. Marine crystal clock	Marine crystal clock (master, slave)	1 set
(II) Navigational aids	Model of buoy type (IALA "B")	1 set
	Model of current signal	1 set
	List of lights, or model	2
(III) Hydrographic map and book		
1. Chart	Nautical chart	1 set
	Special chart	1 set
	Hydrographic diagram	2 sets
	Hydrographic implements	
	Inoue's triangle	45 sets
	Divider	45
	Bruch	45
	Magnifying glass (82 mm)	2

Curriculum	Equipment	
2. Sailing directions	Sailing directions (those of the country and other than the country)	1 set
	Coasting line directions	2 set
	Ocean line directions	2
	Table of lights (1-3 volumes)	2 sets
	Tide table (volumes 1 & 2)	2 sets
	Index of sailing directions	2
	Hydrographic reports	Some
(IV) Tide and current	Current chart around Japan	1
	Current chart of the world	1
(V) Physiographic navigation	Distance tables	2
	Nautical tables	5
	Great circle chart	5
(VI) Celestial navigation	Astronomical observation chart	45
	Astronomical observation calendar	5
	Astronomical observation calculation table	45
	Position entry map	45
	Celestial globe	1
	Terrestrial globe	1
	Celestial navigation computer	2
(VII) Radio navigation	Direction finder (loop antenna, receiver, etc.)	1 set
	Radar plotting sheet	45
	Radar simulator	1 set
	Loran receiver	1 set
	Loran table	Some
	Decca receiver	1 set

Curriculum	Equipment	
	Decca chart	1 set
	Omega receiver	1 set
	Navy navigation satellite system	1 set
(VIII) Navigation plan	Pilot chart	1 set
	Sailing directions	1 set
II. Operation		
(I) Ship structure and equipment	Model of freighter	1
1. Hull structure	Bow model	1
	Stern model	1
	Midship model	1
2. Main equipment	Anchor (stock & stockless)	1 set
	Hawser	1
	Shackle	1
	Hooks	1 set
	Model of anchor	1
	Sample of steel wire rope	1
	Sample of fiber	1
	Sample of tackle	1
	Pulleys (wood & steel)	1 set
3. Main equipment	Rudder	1 set
	Steering gear	1 set
	Sample of steering gear	1
	Windlass	1
	Bollard & bit	1 set
	Stopper (chain & rope)	1 set
	Fender (large & small)	1 set

Curriculum	Equipment	
	Heaving line	1
	Rat guard	1
	Model of thruster	1
	Derrick	1 set
	Model of deck crane	1
	Model of control stand	1 set
	Engine telegraph	1
4. Hull maintenance	Sample of paint	1 set
	Paint brushes	25 sets
	Scraper	10
	Chipping hammer	10
	Wire brush	10
	Boatswain chair	1
	Work implements	25 sets
	Sample of rope work	1
	Articles carried for work (safety belt, safety goggles, protective cloth, protective gloves, respirator, helmet, safety shoes, life jacket for work)	
(II) Ship stability & damage control	Sample of wall chart of load line mark	1
	Diagrams of displacement, etc.	25
	Charts and tables on stress	Some
	Stress computer	1
	Stowage computer	1

Curriculum	Equipment	
(III) Meteorology & sea phenomena	Anemometer	1
	Portable anemometer	1
	Marine aneroid barometer	1
	Mercury manometer	1
	Recording air gauge	1
	Maximum-minimum thermometer	1
	Water temperature indicator	1
	Hygrometer	1
	Chart of cloud forms	1
	Chart of weather forecast and alarm signs	1
	Samples of ground and upper weather maps	1 set
	Facsimile receiver	1
	Marine meteorology observation guide	2
(IV) Steering	Mobility measurement instruments [azimuth compass (2), marker buoy (1), stop watch (1)]	1 set
	Range finder	1
	Marine glass (7 x 50)	5
	Transceiver	5
(V) Ship propulsion machinery	Models of B & W, Sulzer and MAN engines	1 set
	Model of ancillary equipment to marine large 2-cycle diesel engine	1
	Model of remote controller	1
	Synchronous motor and induction motor	1 set
	Models of propellers	1 set

Curriculum	Equipment	
(VI) Cargo handling and stowage	Wall chart of stowage plan	1
	Model of hatch cover	1
	Structural model of tanker	1
	Safety manual of tanker	2
	Safety light	1
	Gas detector	1
	Petrol pycnometer	2
	Brine pycnometer	2
(VII) Emergency measures	Sample of waterproof mat	1
	Sample of emergency station bill	1
	Liquid fire extinguisher	1
	Foam fire extinguisher	1
	CO_2 fire extinguisher	1
	Powder fire extinguisher	1
	Fire-fighting Suits complete (respirator, life line, safety light)	1 set
	Fire alarm and fire detector, or fire control plan	1

Curriculum	Equipment	
	Combustible gas detector	1
	Gravity davit and model	1 set
	Life boat with engine	1
	Cutter (oars, boat anchor, boat compass, mast and sail included)	3
	Lifeboat fittings	1 set
	Class A inflatable life raft	1 set
	Buoyant apparatus	1
	Life buoy	3
	Life line throwing apparatus	1
	Life jacket	50
III. Duties		
(I) Watch	Official logbook	2
	Ship's logbook	2
(II) Crew administration and training	Sample of indication of piping system, etc.	1
	Sample of safety sign	1
	Detectors	1 set
(III) Medical	Ship medical Handbook	1
	Medical & sanitary implements	1 set
	First aid manual	1
(IV) Search and rescue	IMD search and rescue manual	2
(V) Communication	Time bell (400 mm)	1
	Telegraph keys	45
	Signal flag	50 sets
	Flash signal	2
	Flag signalling mast	2 sets

Curriculum	Equipment	
	International Signal Flag	2 sets
	International Code of signals	25
	(Radio telegram transmitter/receiver) or wall chart	1 set
	Radiotelephony transmitter/ receiver	1 set
	Whistle signal	1
(VI) Rules	Navigation light simulator	1 set
	Navigation light complete	1 set
	Navigation practice apparatus	1 set
	Brochure of International Agreements	2
	Brochure of Maritime Bules	2

IX. Country Data

Data for Burma

1. Area: 678,000 square kilometers
2. Population, population density and population increase rate:
   36,392,000; 54 persons/square kilometer; and 2.0% (estimated)
   (Source: Statistics of the Government of Burma, end of March, 1985)
3. Major economic indexes:

	1980/81	1981/82	1982/83	1983/84	1984/85
GDP (million dollars)	5,904	5,889	6,394	6,196	6,445
GDP per capita (dollars)	173	172	172	174	177
Real economic growth rate (%)	7.8	6.3	5.7	4.8	6.6
Unemployment rate	n.a.	n.a.	n.a.	n.a.	n.a.
Foreign currency reserve (million dollars)	254	260	204	77	104
Debt service ratio (%)	19.7	28.2	31.3	34.1	38.9

(Source: Report to People's Congress; market prices)

4. Education

Schools	Number of Pupils or Students	Number of Schools
Elementary education (elementary schools)	4,855,964	27,499
Secondary education (secondary and high schools)	1,251,482	2,238
Higher education (vocational training institute, university and university preparatory courses)	197,586	131

(1984/85 Tentative; Source; Report to People's Congress)

X. Rangoon Meteorological Data

MAXIMUM TEMPERATURE (IN °C) RANGOON

YEARS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
1976	31.4	34.4	36.0	36.6	30.9	30.5	29.1	29.1	30.1	31.7	32.0	31.6
1977	31.1	34.0	36.2	37.4	33.7	31.2	29.9	29.6	30.4	31.6	32.3	31.7
1978	33.0	35.0	36.0	38.0	33.0	31.0	30.0	29.0	30.0	32.0	33.0	33.0
1979	34.1	35.9	37.1	37.4	33.8	30.4	30.4	30.0	31.4	31.8	33.2	32.6
1980	33.6	33.3	37.0	38.0	35.0	29.0	29.2	29.5	30.0	31.8	32.8	32.9
1981	32.5	34.3	36.8	37.8	34.2	30.3	29.7	29.5	31.1	31.2	31.3	29.3
1982	31.9	34.8	37.5	37.4	34.4	29.3	30.2	29.1	30.1	32.3	33.3	31.6
1983	32.0	35.0	37.0	38.7	36.4	30.8	30.9	29.9	30.5	30.6	30.0	31.1
1984	32.4	35.7	36.0	36.7	34.2	30.1	29.4	29.5	30.6	33.4	30.7	33.0
1985	34.3	35.1	37.2	37.9	34.0	29.0	29.5	30.0	30.5	31.7	31.2	32.2

MINIMUM TEMPERATURE (IN °C) RANGOON

YEARS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1976	16.1	17.5	21.0	24.4	24.3	24.2	24.4	23.7	24.0	24.1	22.0	18.7
1977	16.8	18.0	22.9	24.2	24.1	24.6	24.5	24.0	24.6	24.3	21.7	18.8
1978	17.0	19.0	21.0	24.0	25.0	25.0	24.0	24.0	24.0	24.0	22.0	19.0
1979	18.4	18.7	21.3	24.8	26.0	25.1	24.2	23.6	24.2	23.6	20.8	18.5
1980	16.4	23.1	21.9	25.3	25.0	24.0	24.0	24.2	24.5	24.3	23.3	20.4
1981	17.8	18.2	21.3	24.0	25.4	24.3	24.4	23.7	24.7	24.8	23.5	19.1
1982	17.4	18.6	21.4	24.6	25.3	24.4	24.2	24.3	24.5	24.0	22.6	17.3
1983	15.8	19.0	21.4	24.8	26.0	24.9	24.9	24.7	24.5	24.3	21.8	17.9
1984	17.3	21.6	21.3	24.8	25.2	24.6	24.3	27.4	24.4	22.0	24.0	18.9
1985	18.6	18.2	21.1	24.5	24.9	24.6	24.0	24.5	24.3	24.4	22.4	19.2

RAINFALL IN (MM) RANGOON

YEARS	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
1976	000	000	000	036	641	375	439	605	619	188	005	006	2914
1977	025	001	000	011	210	318	591	686	282	139	000	016	2279
1978	002	022	000	000	398	369	381	685	344	144	007	000	2352
1979	000	000	000	035	288	542	423	580	273	126	000	000	2267
1980	000	000	000	000	509	486	601	506	469	123	006	015	2715
1981	000	007	006	020	228	452	586	634	382	244	077	000	2636
1982	000	000	000	000	228	653	614	717	391	156	008	000	2767
1983	000	000	000	000	179	380	690	604	377	406	171	009	2816
1984	000	000	000	034	211	738	499	471	226	198	002	000	2379
1985	002	000	000	003	317	673	773	562	380	265	316	000	3291

*/Thein Hla.
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RELATIVE HUMIDITY % RANGOON

YEARS	JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEP		OCT		NOV		DEC	
	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830	0930	1830
1976	67	51	67	49	66	55	66	56	82	83	83	86	88	89	88	87	84	90	81	80	70	73	70	62
1977	72	60	60	49	68	56	60	56	72	75	83	84	89	87	88	91	87	87	81	82	71	68	64	60
1978	68	53	63	51	68	51	63	56	68	73	84	83	87	88	90	91	85	86	79	80	67	68	63	57
1979	60	50	65	50	64	56	66	60	77	78	87	86	86	87	87	89	82	81	80	78	67	65	64	56
1980	67	50	58	42	68	55	66	61	71	71	87	85	89	91	87	89	86	88	79	81	75	74	70	65
1981	69	57	63	51	63	51	62	57	74	78	84	88	88	90	87	91	85	84	84	85	82	81	73	71
1982	71	59	69	53	61	51	62	56	75	73	90	89	86	88	89	90	85	89	80	79	70	72	68	61
1983	63	51	68	52	67	55	64	57	66	70	85	88	85	85	85	90	85	86	83	87	75	80	67	66
1984	65	59	60	56	63	55	66	61	72	73	86	89	86	89	88	90	82	85	65	67	80	81	66	61
1985	60	53	51	48	63	47	63	59	73	77	87	91	89	88	87	89	84	87	81	82	76	80	66	64