BASIC DESIGN STUDY REPORT
ON
EDUCATIONAL EQUIPMENTS PROVISION PROJECT
FOR
THE REGIONAL MARITIME ACADEMY
IN
THE REPUBLIC OF IVORY COAST

March, 1984

Japan International Cooperation Agency

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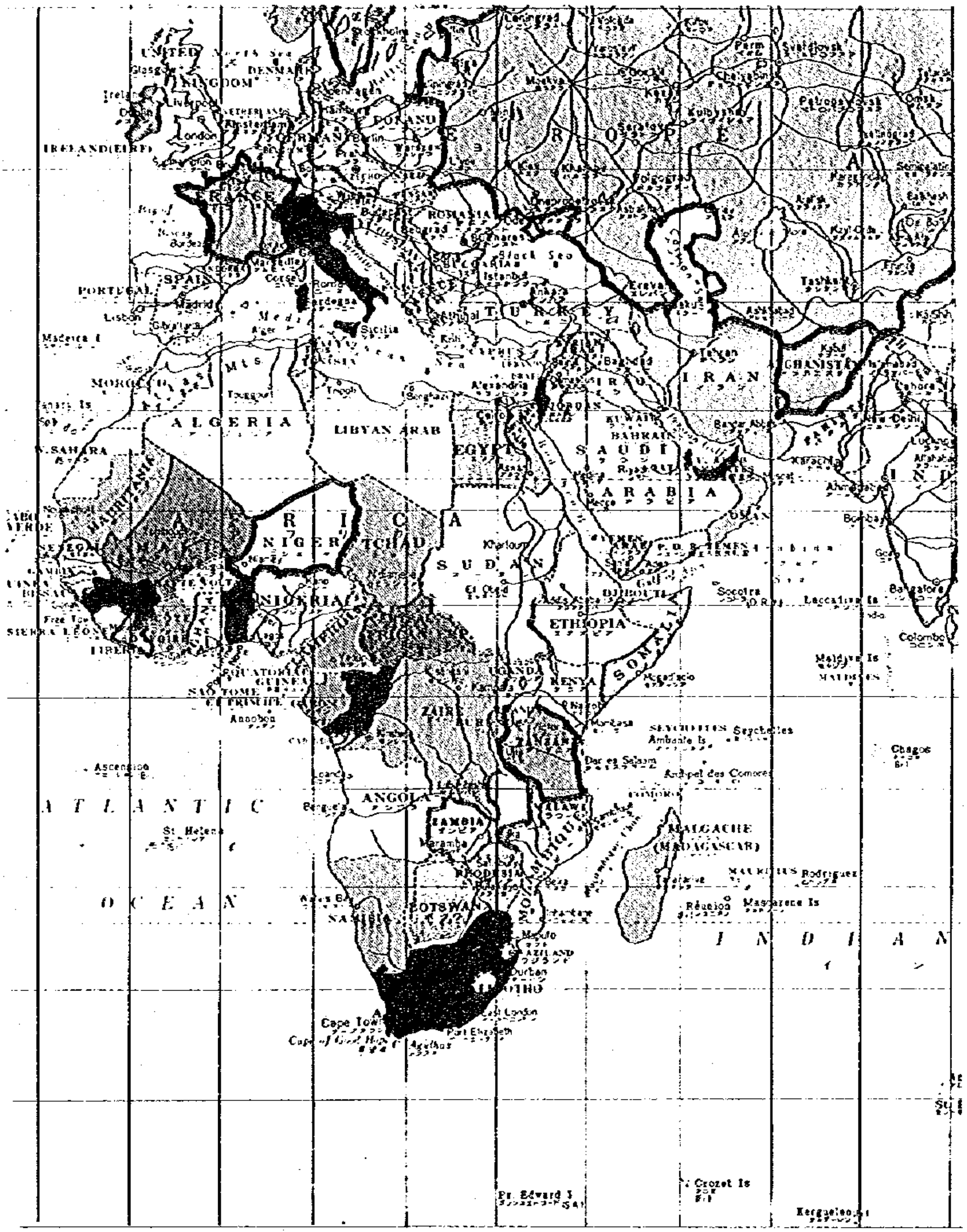

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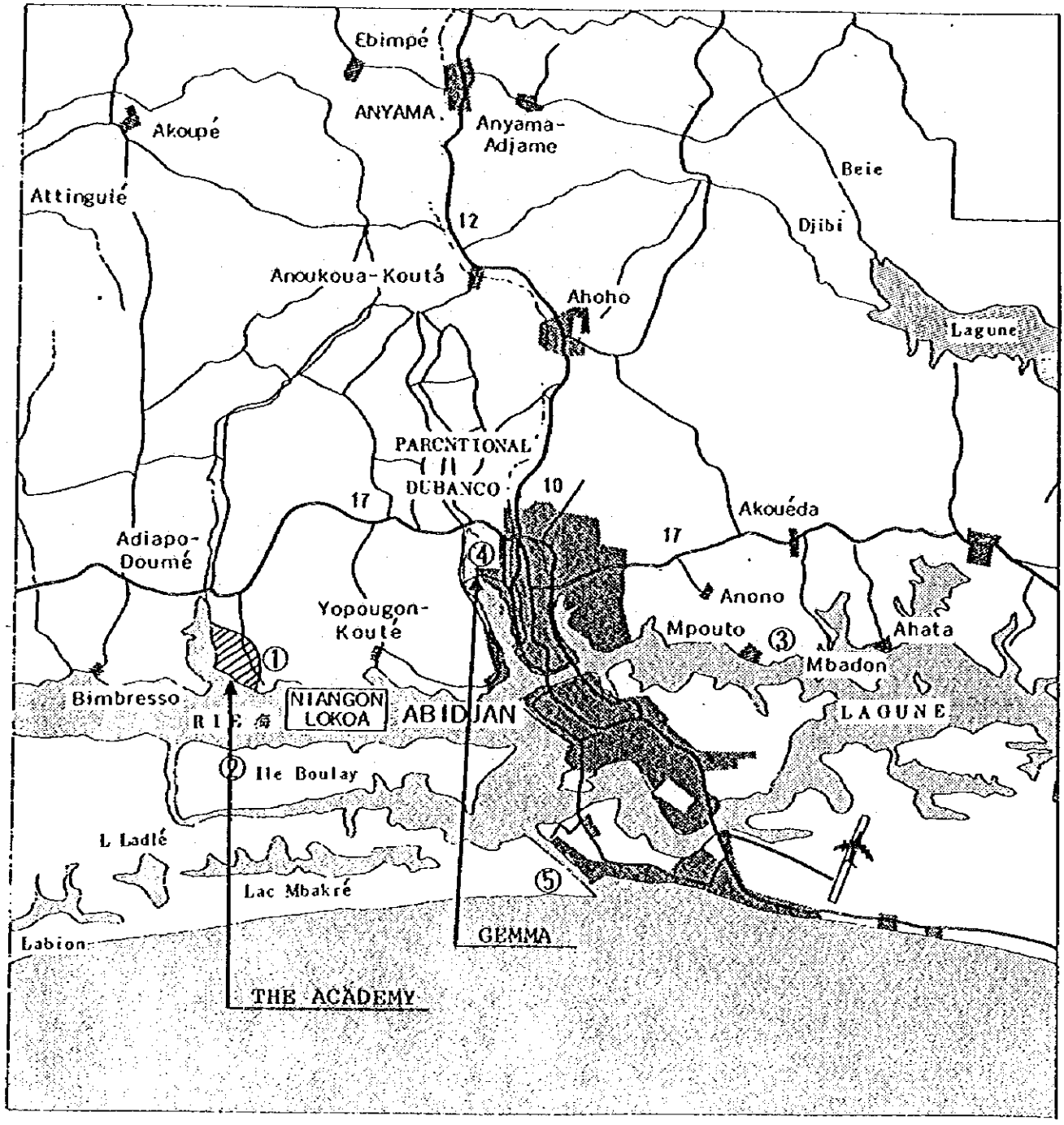

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PREFACE

In response to the request of the Government of the Republic of Ivory Coast, the Government of Japan decided to conduct a study on Educational Equipment Provision Project for the Regional Maritime Academy and entrusted the study to the Japan International Cooperation Agency. The J.I.C.A. sent to Ivory Coast a study team headed by Mr. Kanji Kitazawa, Second Economic Cooperation Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, from Oct. 29 to Nov. 17, 1983.

The team had discussions with the officials concerned of the Government of the Republic of Ivory Coast and collected data and information related to the Project. On the basis of the results of the study in Ivory Coast, 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 Republic of Ivory Coast for their close cooperation extended to the team.

March, 1984

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency

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In the Republic of Ivory Coast (hereinafter to be referred to as the "Ivory Coast" or "Ivory"), the merchant shipping, plays an important roll to keep a share of 90% in the field of cargo transport. But, as more than 90% of these seaborne cargoes are transferred by foreign flag ships, the outflow of foreign currency paid as freight charges for the imported and exported goods has a considerable influence on its foreign exchange reserve.

In order to cope with this adverse circumstance, the Ivorian Government has been making efforts for the reinforcement of its merchant fleet and is encouraging, as one of its key notes, a project to establish a Regional Maritime Academy (hereinafter to be referred to as "the Academy") for training seamen. The intent of this Academy is to train seamen not only for the Ivory Coast but also for 14 countries forming the French language bloc. This is one of the resolution of the Conference of Ministers relating to merchant shipping of the Western and Central Africa.

From among the items of construction cost, the architectural and infrastructural portions will be cooperated by the finance of BAD (Banque Africaine de Development) while the educational equipment will be provided by the grant aid from the international organization for economic assistances, France, Japan, etc.

In compliance with the request from the Ivorian Government, Japanese Government has already cooperated under the grant aid, supplying equipment such as a training vessel, a set of radar simulator, a set of marine machinery for training, etc., between 1979 and 1983.

Afterwards, the Ivorian Government again requested the Japanese Government the grant aid for the second stage of the project of the Academy.

In response to this request, the Japan International Cooperation Agency (JICA) organized and despatched a preliminary survey team to the Ivory Coast in order to exchange opinions on the matter with the Ivorian party concerned and conduct a site survey. As the result of this survey, it was decided to conduct a basic design study for supply of the educational equipment under the grant aid.

The contents of these equipment required are necessary for execution of education and training in compliance with the subjects of the courses to various qualifications and of "International Convention for the Standards of Training, Certification and Watch-keeping for Seafarer, 1978", and taking into consideration the expectable technical and economic circumstances, basic designs were made.

Some of these equipment need fairly long time for design and manufacture and, as for the schedule of execution of the project, about 19.5 months will be needed from the date of the Exchange of Notes to their delivery after transport and completion of installation at the site.

After opening of the Academy, the operation and maintenance of the equipment will be taken care of by the personnel of the Academy. The appropriate guidances under a technical cooperation programme by the Japanese Government will be expected especially for the operation and maintenance of the engine simulator and the equipment of the automation laboratory.

CHAPTER 1 INTRODUCTION

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The Republic of Ivory Coast has been making great efforts for the development of national merchant shipping as the most important policy for improving the unbalance of international payments and, aiming at achieving a lifting ratio of 25% of international seaborn trade, the reinforcement of new merchant fleet centring on the national shipping company SITRAM (La Société Ivoirenne des Transports Maritimes) has been energetically promoted.

Besides, the Government is promoting a project of establishing the new Regional Maritime Academy having a larger scale and a higher level of education than the present seamen's school for the purpose of reinforcement of training of Ivorian crew. Also according to the resolution of the Conference of ministers relative to merchant shipping of the Western and Central Africa, this Academy will become the seamen's training centre for the neighbouring 14 countries.

In 1979, that the fund programme for this project was decided to be made with the financial assistances from the European Development Fund (FED), the United Nations Development Programme (UNDP), France, Japan, and other countries, whereas the Ifory Coast was playing a roll of the promoter of this project. Meanwhile the preparation of estate, construction of some part of schoolhouses and installation of educational equipment were taken in hand. Afterwards, the progress of work was obstructed by the depression of world economy and the deterioration of international payments of the Ivory Coast and the review of the financing plan became unavoidable. In the period of the first stage, Japan had cooperated under the grant aid supplying equipment such as a training vessel and various educational and training equipment, which were finally delivered in 1983. In the course of the above-mentioned review of financing plan, Ivorian Government addressed to Japanese Covernment a request for an assistance by grant aid in relations to the second stage.

In compliance with this request, Japanese Government dispatched a preliminary survey team, leader is Mr. Kanji Kitazawa, Second Economic Cooperation Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, organized by the Japan International Cooperation Agency (JICA) for the purpose of exchanging opinions with the personnel concerned

of Ivorian Government and related organizations of assistance from Oct. 29 to Nov. 17, 1983. After discussion about the contents of the request, it was decided to promote a basic design study relating to the ten items of educational equipment. The present report was worked out on the basis of data collected by the preliminary survey team and preliminary survey report.

CHAPTER 2 BACKGROUND OF PROJECT

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2-1 Present Economic Situation

Though the economy of Ivory Coast had enjoyed a very long growth, its power is being gradually deteriorated in the recent years. Though the growth of the gross domestic production compared with the year before, was as high as 11.3% in 1978 and 7% in 1979, this figure dropped to 2.4% in 1980 and 1.4% in 1981. So weakened economy of the 1980's is still facing the following problems, which are considered to be the causes of such a deterioration:

1) Depression of the world's economy.

2) Worldwide fall of the prices of cocoa and coffee which are the main products of the Ivorian export.

3) Fall of production of the agriculture and the forestry, due to superannuation of facility of farms, drought, and forest fire. The agricultural and forestrial products are the main sources of trade income of this country.

4) Fall of CFA Franc automatically linked with the fall of French Franc, resulting in relative substantial augmentation of loan from foreign countries outside of Franc zone. (French Franc = 50 CFA Franc)

Balance of trade of Ivory Coast became deficit since 1979 due to the depression of economy.

The balances of trade of the Republic from 1976 to 1981 are shown in the table below:

Table 2-1 Balance of Trade (in Million CFA Franc)

Item	1976	1977	1978	1979	1980*	1981*
(1) Export	414.6	592.5	590.3	579.1	657.0	743.0
(2) Import	308.2	429.7	528.4	475.0	550.0	563.0
(3) Balance of trade (1)-(2)	+106.4	+162.8	+61.9	+104.1	+107.0	+180.0
(4) Freight, etc.	- 98.4	-118.1	-41.9	-241.3	-277.0	-332.0
(5) Balance	+ 8.0	+ 44.7	+20.0	-137.2	-170.0	-152.0

(Source: "Bangue Centrale des Etats de l'Afrique d'Ouest" et Comite de la balance de paiments statistiques économiques et monétaires. estimations au March 11th 1983).

And foreign debt of 32.68 billion franc in 1975 increased to 126.51 billion franc in 1980.

As one of counter-measures against this depression, the 5th economic development plan with a budget of 293.5 billion francs (1981 ∿ 1985) was established.

Main purposes of the plan are modernization of agriculture, promotion of education, development of communication and transport, etc., and the World Bank agreed to two loans, each amounting US$ 250,000,000.

2-2 Present Situation of Merchant Shipping

The marine transport of this country is operated by two companies, one national and the other private. The national company SITRAM (Société Ivoirenne des Transports Maritimes) is having new eight cargo ships of 15,600 DWT (five of which were built in Japan), while the private one is operating many chartered ships including two cargo ships of 16,000 DWT each. The share of loading held by these Ivorian fleets cannot attain to 10% at the present stage.

As for large ports, two trade ports - Abidjan and San Pedro - are important. The port of Abidjan is naturally formed good harbour placed in a lagoon. Among all the ports in the West and Cnetral Africa, this port handles the greatest quantity of cargoes. It has about 20 moving berths and is handling a number of containers also. The container terminal has already been completed except the installation of container cranes.

Shore cranes are rarely found even on other berths and cargoes are handled by the ship's cargo gears.

Besides, in compliance with the offshore oil exploitation, the refinary plant has its exclusive berth, forming the oil terminal of the harbour. Because of the slowdown of development of this oil exploitation, the refinery plant is not in full operation and, accordingly, the berths of the terminal are not so frequently used. Plenty of dredging have been done for accepting large ships. The port of San Pedro has 16 mooring berths, 12 berths are for general cargo and 4 berths are for timber. Most of cargoes handled in this port is timber.

As for shipbuilding facilities, Carena Shipyard in Abidjan is the largest one, while there are some smaller yards. Carena yard has a floating dock of a lifting capacity of 2,000 tons, a smaller floating dock and five slipways, which are used mainly for repair works and rarely for new building.

The maximum lifting capacity of the floating dock of 2,000 tons may correspond to an upper limit of deadweight of 5,000 tons, and ships having greater deadweight will have to be docked in Dakar, Durban, Las Palmas or France.

2-3 Present Situations of Seamen's Training

In 1970, the project was worked out by Ivory Coast and neighbouring four French-speaking countries to establish a school for training seamen to be on board of ships of these countries.

This project was executed in 1974, when CREAM (Centre Regional de l'Enseignement et l'Apprentissage Maritime) was established in Abidjan for training of deck and engine crew and fishing boat crew.

In 1975, the ESN (Ecole Supérieure de Navigation) was established for the purpose of training deck officers and engineers of higher class. The facilities of CREAM are commonly used by ESN, and these two schools are now named GEMMA (Groupe des Ecoles de la Marine Merchande).

In 1975, the Conference of Ministers of countries in the West and Central Africa decided to establish as soon as possible the Academy (L'Academie Regionale des Sciences et Techniques de la Mer).

The second conference in 1976 decided to establish the Academy in Abidjan for the countries of French language bloc and another in Accra, Ghana, for the countries of English language bloc. In addition, it was decided to re-organize the above-mentioned GEMMA to the Academy.

That is to say, present ESN and CREAM are taken in to the Academy.

The students of GEMMA come from various countries in Western and Central Africa in addition to Ivory Coast. The numbers of students classified by native countries of each year are as shown in the table below:

Table 2-2 Students of CREAM, 1976-1983

Country	1976 /77	1977 /78	1978 /79	1979 /80	1980 /81	1981 /82	1982 /83
Bénin	3	-	-	-	-	3	1
Cameroun	2	2	2	-	-	6	-
Centrafrique	-	1	-	12	8	-	1
Congo	-	-	-	-	2	3	3
Côte d'Ivoire	123	141	87	63	60	68	73
Gabon	2	-	2	1	-	-	-
Mali	-	-	6	6	5	2	-
Niger	7	5	1	-	-	-	-
Togo	40	50	63	35	15	6	1
Total	177	199	160	117	90	88	79

Table 2-3 Students of ESN, 1976-1983

Country	1976 /77	1977 /78	1978 /79	1979 /80	1980 /81	1981 /82	1982 /83
Cameroun	3	-	-	2	5	5	5
Centrafrique	-	-	-	-	2	2	1
Congo	-	-	1	-	-	-	-
Côte d'Ivoire	18	22	29	34	48	56	39
Guinee	-	-	-	-	-	4	8
Mauritanie	-	-	-	5	1	1	5
Senegal	-	-	-	-	-	-	2
Togo	4	14	15	17	11	7	2
Zaire	-	-	-	-	-	3	3
Total	25	36	45	58	67	78	65

The educational equipment owned by GEMMA are listed in the next page.

For training in navigation, GEMMA has a training ship of about 80 G.T. which has fishing equipment. This ship is mostly used for a day's trip rather than long continuous voyages. In addition, two of cargo ships owned by the national shipping company SITRAM have facilities for accepting the students of ESN on board. The professorate consists

of many French and a few Americans.

Qualification for admission is as follows.

ESN: The school is to educate students for senior class crew such as navigation officers or engine officers. Qualification for admission is the same as university requirements.

CREAM: The school is to educate students for junior class crew of merchant ships and fishing vessels and has many courses. Qualification for admission varies; e.g., the first grade of middle school requirements or more.

Educational Equipment of GEMMA

1. Erection workshop

   Workbenches, tables for practice, etc.

2. Lathe shop

   Lathes, etc.

3. Forging shop

   Furnace, etc.

4. Sheet plate shop

   Workbenches for 6 persons, etc.

5. Welding shop

   (1) Oxy-acetylene welding equipment
   (2) Electric welding equipment

6. Machine shop

   (1) Engines for operational training

      i) BAUDOUIN 200 PS engine
         A.C. generator 27 KVA
      ii) BAUDOUIN DK6 engine
      iii) DEUTZ 70 PS engine

   (2) Engines for demonstration

      i) ALSTHOM 2-cycle engine
      ii) BAUDOUIN 350 PS diesel engine
      iii) CHUACH 4-cycle engine
      iv) Automobile (Renault & Peugeot) engines
      v) Crane, 500 Kg & 3,000 Kg, 1 set each

   (3) Controlable pitch propeller (with driving engine and water tank)

7. Electric workshop

   List of cables, switchbard, etc.

8. Carpenter shop

   Workbench, etc.

9. Boatswain's shop

   Workbench

10. Navigation Instruments

    Sextants, etc.

Principal Particulars of Training Ship of GEMMA

Training Ship

Length, overall	18.0 m
Length between perpendiculars	15.8 m
Displacement	80.0 t
Main engine	Baudouin DNP6L 215 PS.
Radio equipment	400 W
Radar	
Decca navigator	
Built in 1974-1975, by Carena Shipyard, Abidjan, Ivory Coast	
Classification	B.V.

Others

Trawl net	
Motorboat	2
Small boat, with oars and sail	1
Drifter	1

2-4 Outline of Regional Maritime Academy Construction Project

2-4-1 Circumstances

Most products of the Western and Central Africa around the Republic of Ivory Coast are primary products, much being exported to France and other European Countries. More than 90% of these exported goods are transported by sea, and these seaborne cargoes are mostly transported by foreign ships and foreign crew. The share of the Ivorian ships cannot attain to 10%, about 90% of freight being paid in foreign currencies.

The rapid rise of ocean freight in the recent years is exerting considerable influences on the balance of international accounts and, in addition, the whole national economy and, accordingly, it is an urgent and pressing problem to lighten such adverse circumstances.

The Ivorian Government is holding up, as one of the most important policies, the development of merchant shipping, aiming at raising the share of loading up to 40%, and is making every effort to reinforce the power of marine transport by the reinforcement of shipping enterprises for the final goal of acquiring the share of 40% by 1990.

The Ivorian Government set up a working group for study and preparation of the basic plan of construction of the Academy and, at the same time, confirmed the re-organization of the existing GEMMA to the Academy.

In regard to the establishment of the Academy, the UNDP (United Nations Development Programme) has promised to afford assistances and the IMO (International Maritime Organization) is also ready to give support.

Regarding the resolution of the Ministerial Conference to attain 40% share of loading seaborne cargo by 1990, the above-mentioned working group passed a judgement that, taking into consideration the economic backgrounds, etc., the most appropriate plan would be to raise the share of each country to 25%. For the execution of this policy, 57 ships will be needed in 1990. The average complement of each ship may consist of 1 captain, 3 deck officers, 3 engineers, 1 radio operator and 22 ratings, totaling 30 members per group. For two ships, three groups of 30 members including a group in reserve will be needed and the total number of seamen to be prepared in 1990 will be as shown in the table below:

Captains	85
Deck officers	265
Chief engineers	85
Engineers	171
Radio operators	85
Ratings	1,870
Total	2,561

Now, the number of African captains employed by the countries agreed to establishment of the Academy is less than 15 and the number of Chief engineer even smaller. But, for the development of the countries in agreement to the project and for the prevention of outflow of foreign currency from these countries, the foreign officers and engineers will have to be replaced by Africans.

2-4-2 Basic idea

The Academy to be established in Abidjan in compliance with the resolution of the Conference of ministers relative to merchant shipping of Western and Central Africa has a purpose of providing a sufficient number of seamen for ships of the 14 countries of French language bloc. The organization, schedule, etc., of the Academy are as stated below:

(1) Organization of the Academy

The Academy will consist of courses for lower grade seamen for merchant ships and fishing boats, courses for uppergrade officers, engineers and radio operators, etc. Other courses for training. administration personnel for shipping enterprises, harbour authorities, etc., will be added in future. The total number of students will be about 750 in the final stage.

(2) Schedule of opening

The initially settled schedule of opening in October 1981 could not be kept because of financial difficulties, etc. The present schedule of opening is October, 1986.

(3) Sharing of construction cost

The costs relating to the schoolhouses and infrastructure will be financed by BAD, etc., and the educational equipment, etc., will be

provided by the international organization for economical assistance, France, Japan, etc. by grant aid.

2-4-3 Outline of the Academy

An estate of 150 hectares in Niangon Lokoa, about 17 Kilometres west of Abidjan, is prepared for the Academy. The south-west part of the estate is an area gently sloping towards Lagune Ebrie, where the building work of the first stage has already completed in November, 1983 and the work of the second stage is about to be commenced.

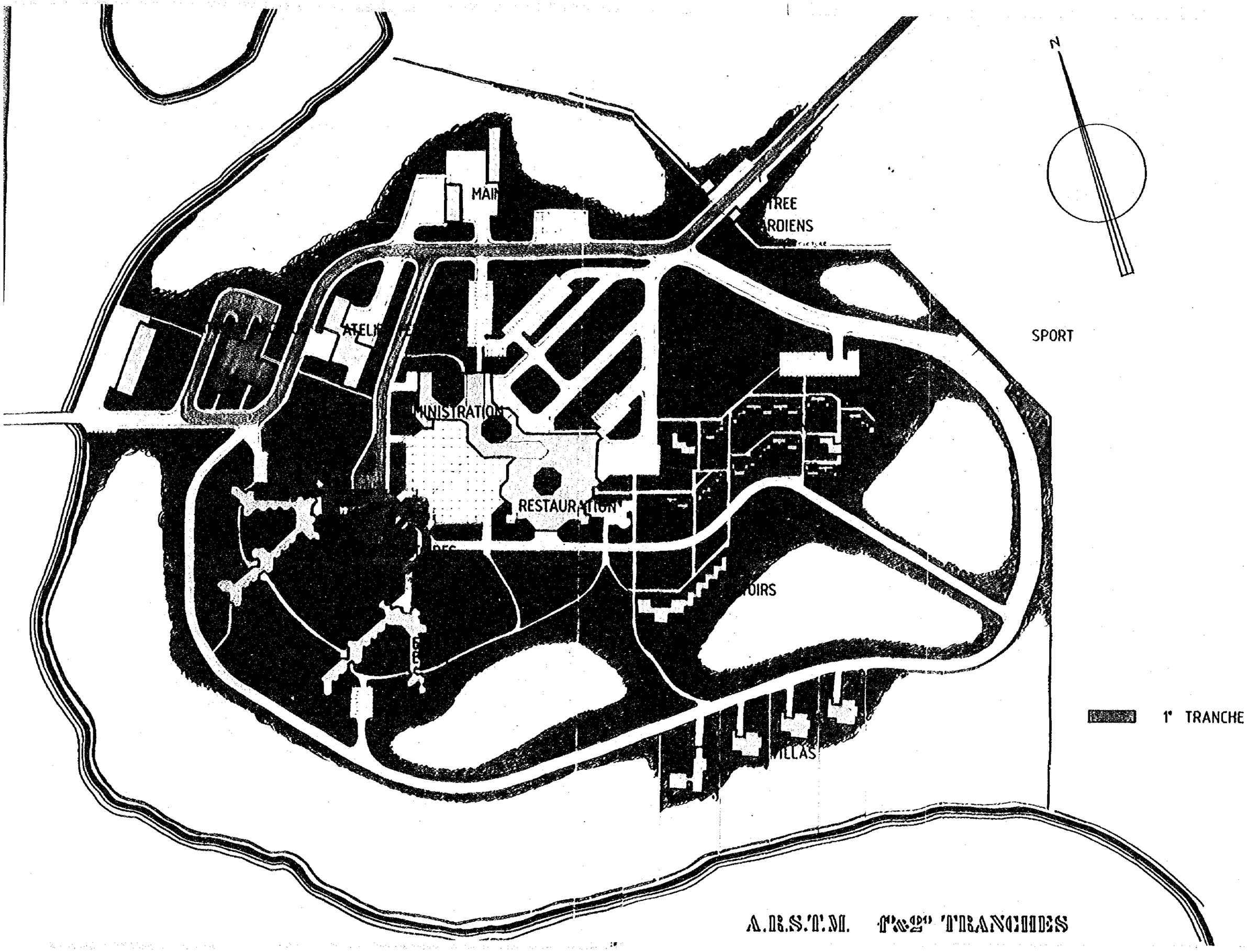
The schoolhouses of the Academy is designed to accommodate, in future, about 750 students so that the teaching staff and important administrative personnel can live in a same area. The headquarters of the Academy, the library, the conference hall and the mess space are arranged in the central area and the students' and teaching staff's lodging spaces and sports spaces are in the eastern part. Further, the southern part is allocated ror classrooms, the western part for buildings of exercise and training and the quay for the training ship and the northern part for medical facilities.

The revised general arrangement of the Academy is shown in Fig. 2-1.

The soil in the Academy's area is red clay with small saud mixture. It resembles loam of Kanto, but is so harder and more adhesive that it is considered to be suitable as the bases of buildings.

Having just finished the first stage, the building work is at the point of transit to its second stage, which must realize the completion of the following items:

Central building (incl. headquarters and mess space)		
Classrooms		about 1,890 m^2
Buildings of laboratories, etc.		about 2,240 m^2
Lodgings	Academy's personnel's use	4 buildings
	Students' private rooms	140 rooms
	Boarding house	120 beds
Engineering works	Sports ground	
	Quay	
	Dredging	
	Fence	



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Educational equipment

Other equipment ..... General school equipment, automobiles.

2-4-4 Administrative organization

(1) Sharing of construction costs.

In the course of the first stage of construction, Japan cooperated under the grant aid, supplying a training ship and some of educational and training equipment. At the stage of entering the second stage, the Government of Ivory Coast addressed demands for cooperations again to Japan, France, BAD (Banque Africaine de développement), FED (Fonds Européen de Développement) and Norway. The sharing schedule in the mind of the Ivorian Government was as shown in the table below:

Table 2-4 Shares of Expenses
(classified into shares and items of expenses)

(in Million UCB)

Item	BAD		Japan		FED	Norway	Ivory coast	Sum
	Foreign	Local	Foreign	Local	Foreign	Foreign	Local	
Supervision	-	-	-	-	-	-	0.285	0.285
Construction	5.219	2.235	5.118	2.192	-	-	-	14.764
Educational equipment	-	-	2.027	-	1.748	0.051	-	3.826
Gen. equipment & automobiles	1.558	-	-	-	-	-	0.122	1.680
Composition of curricula	0.402	-	-	-	-	-	0.063	0.465
Cost of project bureau	0.016	-	-	-	-	-	0.623	0.639
Sum	7.195	2.235	7.145	2.192	1.748	0.051	1.093	21.659

Remarks: 1 UCB = Unit of amount of "Banque africaine de développement"

= 392.0695 FCFA ≒ 1 US $

Foreign: Foreign currency

Local : Local currency

Table 2-5 Yearly Expenditures (in Million UCB)

Item	1984	1985	1986	1987	Sum
Supervision	0.082	0.135	0.068		0.285
Construction		8.132	6.632		14.764
Teaching materials		1.888	1.938		3.826
Gen. equipment & automobiles			1.680		1.680
Composition of curricula	0.014	0.042	0.042	0.367	0.465
Cost of project bureau	0.128	0.320	0.191	-	0.639
Sum	0.224	10.517	10.551	0.367	21.659
Ratio (%)	1.00	48.58	58.72	1.70	100

Table 2-6 Shares (in Million UCB)

Name	Foreign currency	Local currency	Sum	Ratio(%)
BAD	7.195	2.235	9.430	43.54
JAPAN	7.145	2.192	9.237	43.11
FED	1.748	-	1.748	8.08
Norway	0.051	-	0.051	0.24
Ivory Coast	-	1.093	1.093	5.04
Sum	16.139	5.520	21.659	100
Ratio (%)	74.5	25.5	100	

(2) Sharing of operating expenses.

The operation of the Academy having 260 students and 69 professors will need 1.168 million CFA Franc (2.979 million UCB ≒ US$).
The contents of the expenses are as follows:

Operating Expenses of the Academy

(in Million CFA franc)

1)	Personnel expenses	
	Administrative	100,000
	Professoriate	300,000
	Social	50,000
	Sum	450,000
2)	Expenses for students	
	Clothing	50,000
	Lodging	150,000
	Others	100,000
	Sum	300,000
3)	Repairs	44,500
4)	Replacement of materials	173,500
5)	Miscellaneous expenses	200,000
	Total	1,168,000

Remarks: 1CFA Franc ≒ Yen 0.6

Among the items of expenses, the fixed cost is those for maintenance and repair of the buildings and equipment, telephone and telex charges, office charges and social charges for individuals and are independent of the number of students, while the variable cost is those of students clothing and lodging, medical services, replacement of small equipment, etc.

According to the resolution of the Conference of Ministers, the fixed cost is to be borne by the participant countries of the Conference and the variable ones by the countries dispatching students to the Academy in proportion to their numbers.

(3) Scope of cooperation of Japan

For the financial cooperation by grant aid requested to Japan for the second stage of construction, a part of the building of the headquarters and supply of some equipment were studied first.

Some difficulties were expected to arise if a house would be built partly by a credit and partly by a grant aid.

The Japanese preliminary survey team discussed with the personnel concerned of the Ivorian Government, BAD and UNDP, and arrived at a conclusion that Japanese financial cooperation in grant form for the second stage of construction should be concentrated on the supply of educational equipment only. It was also decided that, with the exception of those installed outside, these equipment to be supplied should be installed in the buildings already completed in the first stage and not in those to be constructed in the second stage.

(4) Educational equipment requested to Japan

As it was decided to limit the subjects of cooperation to the educational equipment, a formal demand for the equipment in detail was made by the Academy. These equipment under demand are those required for the training in compliance with the International Convention for the Standards of Training, Certification and Watch-keeping for Seafarers, 1978, and also with the curricula of various courses established recently.

These educational equipments are as follows.

1) Life saving appliances
2) Fire-fighting equipment and cabin model for fire fighting training
3) Cargo handling training equipment
4) Hull model
5) Radar equipment
6) Electronic navigation instruments
7) Equipment for automation laboratory
8) Engine room simulator
9) Equipment for electronic laboratory
10) Equipment for radio-communication laboratory

2-5 Present Situation of the Academy

The original plan for the establishment of the Academy was prepared by the working group of the Ivorian Government and the professors of GEMMA and studied by the experts of IMCO. In addition, the costs on 1978 basis were likewise estimated by IMCO. A discussion on the sharing of these costs worked out a scheme of basic principle that the cost for preparing the estate, the constructions and access roads would be borne by the Ivory Coast and the educational equipment would be provided under cooperation on grant aid by FED, UNDP, France, Japan, etc. The following table shows the costs primarily estimated and their sharing to various cooperators. The tenders for the laboratories and training building (ATELIER) were held in October 1981 and these buildings were completed in November 1983.

Table 2-7 Primary Estimation of Costs and Their Shares

(million US$)

Item	Total	Ivory coast	FED	UNDP	France etc.	Japan
Estate, school-houses & roads	34.07	34.07	-	-	-	-
General materials & equipment	1.96	0.96	-	-	1.00	-
Educational and Training equipment	12.10	-	2.50	0.58	5.62	3.40
Teaching materials	4.34	1.82	-	1.42	1.10	-
Total	52.47	36.85	2.50	2.00	7.72	3.40

In the course of the first stage of construction, the following ship and equipment were supplied under grant aid of Japanese Government at the request of the Ivorian Government.

(1) Training Ship

Gross tonnage	about 220 tons
Length between perpendiculars	28.00 M
Breadth, moulded	7.60 M
Depth, moulded	3.50 M
Design draught, moulded	2.80 M

Complement:	Officers	2
	Crew	4
	Teachers	4
	Cadets	16
	Total	26

Speed, cruising, under full load — about 10 knots

Cruising range — about 2,300 nautical miles

(2) Radar simulator

Capable of simultaneous training of 4 groups of students

(3) Diesel generator set — 130 KVA × 2 sets

(4) Refrigerating plant — about 2,000 Kcal/hr × 1 set

(5) Electro-hydraulic steering gear — 8.5 ton-m — 1 set

(6) Various machineries for training:

a) Diesel engine — 180 PS × 2 sets

b) Gasoline engine — 12 PS × 2 sets

c) Fuel injection pump — 1 set

d) Water pumps & oil pumps (different types) — 4 sets

(7) Cooling water system — 1 set

(8) Machinery (added afterwards)

a) Small steam turbine plant for laboratory use — 1 set

b) Oily water separator — 1 set

c) Air-conditioning plant for laboratory use — 1 set

d) Controllable-pitch propeller

e) Monitoring and alarming system for diesel engine

f) Gyroscopic compass (for practice in overhauling and assembling)

g) Logs, three kinds

h) Movie projector

i) Spare parts of radar simulator

Among these items, the radar and its relating parts, the gyro-compass and the logs are to be placed in the laboratories and others in the training building. (ATELIER)

The maintenance and care of these educational equipments are being carried out by the teachers in charge to keep them in good order.

And the training ship is engaged in navigation training for students as a new excellent training ship which has superior training facilities.

CHAPTER 3 CONTENTS OF THE PROJECT

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3-1 Policy of Educational Equipment to be Prepared

The educational equipment shall be planeed on the following conditions:

(1) Compliance with STCW Convention, 1978.

The Republic of Ivory Coast has already ratified the International Convention for the Standards of Training, Certification and Watch-Keeping for Seafarers, 1978. Educational equipment to be prepared must be sufficient for the practical training in compliance with this Convention.

(2) Compliance with curricula for different training courses

Different training courses are as follows.

1) Training of ordinary seamen (Foremen)
2) Training for licence for coastal navigation
3) Training of fishing boat driver
4) Training for licenced driver of engines up to 350PS.
5) Training of deck officer (Chief of watch and captain of coastal service ships)
6) Training of fishing boat officer (Officer and captain of fishing boat)
7) Training of engineer of 3rd class
8) Training of licenced driver of engines up to 500KW
9) Training of port master
10) Training of port surveyor
11) Training of engineer of 2nd class
12) Training of engineer of 1st class
13) Training of captain for ocean navigation
14) Training of port officer

The equipment under the present request for Japanese supply contain no item in overlap with or in contradiction to any of items of supply along with the first stage of construction work.

3-2 Contents of Education and Training

At the Academy, the practical trainings required by the STCW convention are carried out in accordance with the curricula for different training courses, and educational equipment under the present request for the cooperation of Japan for supplying under grant aid are those necessary for such practical trainings. The contents of trainings to be carried out with these equipment are described below:

(1) Life saving appliances

Necessary life saving appliances such as motor lifeboat, liferaft, lifejackets, signals, small boats, etc., are to be prepared for training students in the techniques of handling them and of survival at sea. The boat davits are to be exempted from the present equipment as they cannot be installed until after the Ivorian Government will have completed the construction of the quay.

(2) Fire fighting system and cabin model for fire fighting training

Students will be trained in getting better understanding of and in handling of fire alarm system, CO_2 fire-smothering system, form fire-smothering system, water fire-fighting system, fire-proof cloths, etc. In addition a steel cabin model in two stories will be constructed on a concrete foundation and the training in fire fighting will be carried out by means of water.

(3) Cargo handling training equipment

A pair of derrick booms of 3 tons each and a deck crane of 3 tons are installed opposite to each other at the ends of a hatch coaming on a concrete foundation for training student in handling the cargo gear.

(4) Hull model

The following models are to be prepared for the students' good understanding of ships:

Longitudinal section model, transverse section model, bow model and stern model of:

Cargo ship,
Container ship,
Roll-on/roll-off ship,
Tanker,
OBO

Models of various cargo gears.

(5) Radar equipment

A radar simulator has already been installed as a part of construction of the first stage. In addition to this, however, the deck officers will have to be trained for practical use of radars and, for this purpose, radars of 3cm wave and 10cm wave are to be added so that the students can understand the differences of blips on the screens depending on the band used. Further, an additional radar unit is to be supplied for training in maintenance work.

The radar simulator already installed in the Academy contains a teacher's radar and four student's radars so that these four student's can be treated as four different ships capable of taking different course independent of others for training, but it does not contain a system for prevention of collision (ARPA) which should form one of its important parts. Accordingly, an ARPA system is to be added to the already existing radar simulator for realizing a more efficient training.

(6) Electronic navigation instruments

A Decca navigator and a Satellite navigator are to be installed in each of the navigation lecture room and the navigational laboratory.

The navigators in the lecture room will be used for the student's training in navigation, while those in the laboratory are for training in maintenance.

(7) Equipment for automation laboratory

Various control systems, such as pneumatic control system, electronic control system, etc., and their components, such as measuring

instruments, adjusting apparutuses, manoeuvring apparatuses, etc. are to be provided for training students in control technology.

(8) Engine room simulator

a) Similar to the ship's engine room and engine control room, a graphic panel and a control panel are to be installed for training in manoeuvring and monitoring the main diesel engine and auxiliary machinery.

b) In addition, a teacher's state set-up panel is to be installed so that he can set up troubles and send indications to the graphic panel and the engine control panel.

c) Imitation sound generator

d) Computor and peripheral equipment.

The teacher will input various troubles into these units for training the student.

(9) Equipment for electronic laboratory

Circuit trainer, measuring instruments for electronic circuits, etc. are to be provided so that the students can understand the basic theories and get the application techniques.

(10) Equipment for radio communication laboratory

Various transmitters and receivers are to be installed for training of radio operators. In addition, circuit trainers are to be provided for better understanding of circuit theories and oscilloscopes and other measuring and controlling instruments for students' training in measurement, maintenance control, etc.

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Basic Policy of the Basic Design

The basic design of the educational equipment required were carried out according to the following conditions and based on the data obtained from the preliminary survey.

(1) Educational objective to be attained

The standard of technique and knowledge required for seaman is specified in the STCW treaty (International/Convention the Standards of Training, Certification and Watch-keeping for Seafarers, 1978) and in accordance with the purpose of construction of the Academy, and it was decided that the educational equipment shall conform to the minimum compulsory requirements as given in the STCW treaty for obtaining the qualification certificate and technical certificate as captain, chief engineer and radio operator.

Moreover, this minimum compulsory requirements have wide range of items and quality of the training, so that it will cover that of other training course. Therefore, these equipment will be possible to apply for all typesof seamen training courses.

(2) Conformity with the educational curriculum

Educational training equipment, being necessary to improve the educational effect is a supplemental aid in carrying out the curriculum. The curriculum is found sufficiently conforming to the STCW Treaty.

The curriculum is found sufficiently conforming to the STCW Treaty.

It is planned, firstly, to extend general basic knowledge, application technique, and practical skill required for a perfect seaman to those who have neither knowledge nor experience as a seaman at all to become eventually ship operation professionals.

It, secondly, aims at providing up-to-date technique to the experts.

Accordingly, the contents of the educational equipment should cover a wide range from general basic techniques to application techniques and practical knowledge of experts.

Also the educational equipment should enable easy acquisition of basic techniques required to perform maintenance duties in addition to operational duties.

(3) Relation between the first stage construction and FED

The ARPA equipment for radar simulator is an additional provision to the radar simulator already installed at the first stage construction. There is no confliction to each other. Educational equipment required for FED due to the data which obtained at the preliminary study, were studied and it was confirmed that there was no duplication or confliction of equipment required for Japan.

(4) Elimination of duplication in the supply of requested equipment

The requested equipment are classified by curriculum:
There are some items of equipment in duplication among the curricula, like the case of the radar for maintenance training.

The items in duplication are integrated into the most important sections and studies have been conducted to eliminate unnecessary duplications in installation.

However, for those equipment which must be used by a limited number of persons to attain the required educational effect, or those with structural factors which necessitate duplicate installation in view of their application and assignment, installation will be duplicated.

(5) Location of the Educational Equipment

The equipment will be installed in the previously arranged section within the Laboratory and training building (ATELIER) completed during the first stage construction.

However, the following special cases are the exceptions:

1) The engine room simulator will be installed in a re-modelled hydraulic experiment section and warehouse in the training building. (ATELIER)

2) The model of the hull will be installed in the patio of the laboratory.

3) The location for installation of the training equipment for cargo handling will be determined at a later date by the Ivory Coast side.

4) The location for the installation of the cabin model to be used for fire-fighting training will be determined at a later date by the Ivory coast side.

5) The place of installation of the life boat and emergency boats will be determined at a later date by the Ivory Coast side.

(6) Installation

All operations to be carried out at site such as transportation, installation, wiring, piping and test runs for the machinery and equipment contracted for by Japan will be carried out by the Japanese side as if on a Full Turn Key basis.

However, all equipment and machinery, except those that are to be installed outdoors, viz. machinery for cargo handling training, cabin model for fire-fighting training, lifeboat and emergency boat, will all be installed in the building constructed in the first stage.

Constructional work on the sectional re-modelling of the training building (ATELIER) expected to be used as the engine room simulator area will be carried out by the Japanese side, including air conditioning equipment, construction of the ceiling, etc., but for the other equipment, it is assumed that such locations will not necessitate re-modelling work on buildings.

The Government of Ivory Coast have to take the following measures:

1) Construction of the foundation for building for fire fighting training except concrete work, with water supply, treatment of drainage, and laying work of electric wires.

2) Construction of the foundation for cargo handling training equipment except concrete work, which bear to equipment for concentration of load, and laying work of electric wires.

3) Necessary electric supply and lighting should be installed for each room of labatory and training building (ATELIER) on appropriate positions.

4-2 Basic Design

The requested educational equipment were classified as given below and a basic design was formed after conducting studies as to their suitability on such points as the reason for installation, outline content of the equipment, number of equipment and principal items.

(1) Life saving equipment
(2) Fire fighting equipment and cabin model for fire fighting training
(3) Cargo handling training equipment
(4) Hull model
(5) Radar equipment
(6) Electronic navigation instruments
(7) Equipment for automation laboratory
(8) Engine room simulator
(9) Equipment for electronic laboratory
(10) Equipment for radio-commucation laboratory

4-2-1 Life saving equipment

(1) Reason for installation

The installation of training equipment, which will enable actual training to be carried out for obtaining qualification to use lifeboats (including the technique of survival at sea) as regulated by International Law, will be required.

(2) Outline of the equipment

Lifeboat with engine, emergency boat, life raft, lifejacket, signalling devices, life buoy and other material necessary as life saving equipment should be installed, to enable training to be carried out operation of these equipment and to aquire technique of survival at sea.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Item
(1)	Life Boat	1 boat	Capacity 45 - 50 persons with Class 1 Engine
(2)	Emergency Boat	2 boats	For rescue training - with Engine - Sails and Oars
(3)	Life Raft	1 raft	A Grade inflation type for 15 persons - with launching equipment
(4)	Signalling & communicating devices, life jacket, life buoy, etc.	1 set	

Note: Boat davits will be constructed together with the pier construction work by the Ivory Coast side.
The life boat will be installed on a setting stand.

4-2-2 Fire fighting equipment and cabin model for fire fighting training

(1) Reason for installation

As regulated by International Law, the installation of material for understanding the various equipment and to carry out training in actual extinguishing operations will be required.

(2) Outline of the equipment

1) Fire fighting equipment

Fire alarm device, carbon dioxide gas extinguishing device, foam extinguishing device, water extinguishing equipment, fire protection apparatus, etc. should be installed. Training should be carried out in the handling of these equipment and devices.

2) Cabin model for fire fighting training

A 2-stories cabin model constructed of welded steel plate, in duplication of a cabin on the deck of a vessel, will be constructed on a concrete foundation. All rooms will be partitioned, by steel bulkhead and a safe emergency exit to the ground will be provided. Fire hydrants will be installed in the building, and to enable actual extinguishing training to be carried out, provision will be made to burn oil in a steel tank, etc. The water used for this purpose will be discharged after undergoing water treatment to prevent contamination of the environment.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
1)	Fire fighting equipment		
(1)	Fire extinguishing equipment	1 set	Water, Carbon dioxide, Foam extinguishing device
(2)	Fire and gas detectors	1 set	
(3)	Fire fighting outfit, etc.	1 set	
2)	Cabin model for fire fighting training	1 unit	Steel construction, 2 stories, with fire hydrants, fire fighting pump

Note: A rough drawing of the Cabin Model for fire fighting training is given in the attached Fig. 4-1.

4-2-3 Cargo handling training equipment

(1) Reasons for installation

Cargo handling equipment (including winches) of many types and forms are installed on a vessel, and a correct knowledge of these equipment is indispensable to ensure safety and to carry out cargo handling operations efficiently.

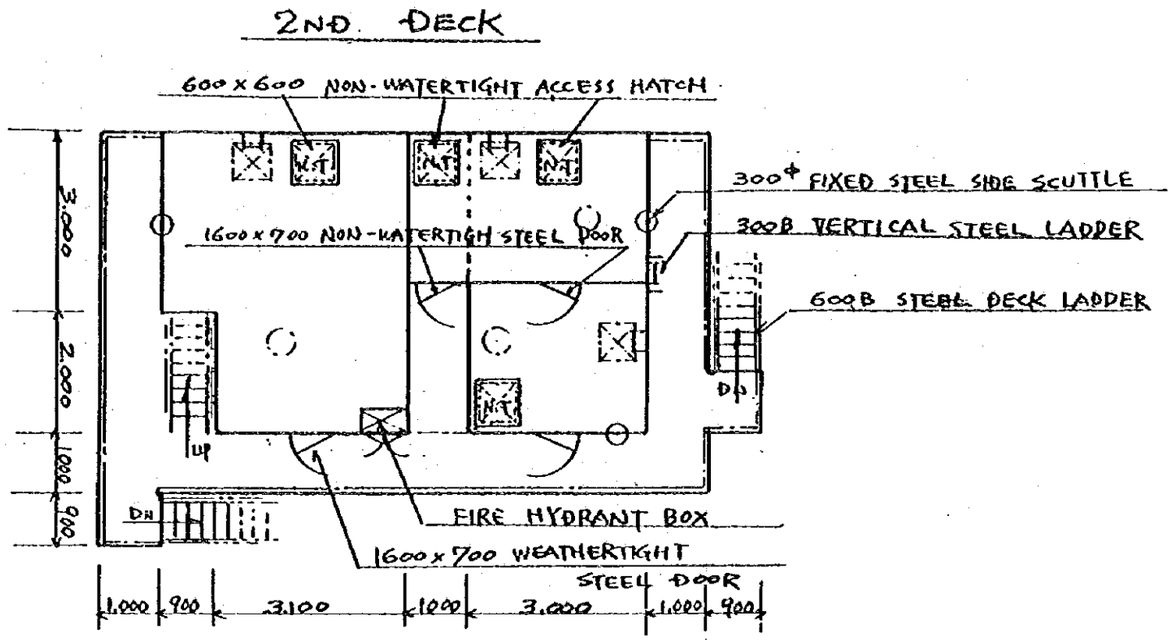
Knowledge of the constructions and theory of operation of the many different types and forms of cargo handling equipment can be obtained through models, but to use the actual equipment, and to handle the loads is not only effective in training the personnel in the actual operation and maintenance of the equipment, but will enable the user to experience the feel of the tension on the cables, variations in operating noise, and the effects of the load, which will be of great assistance in the training program.

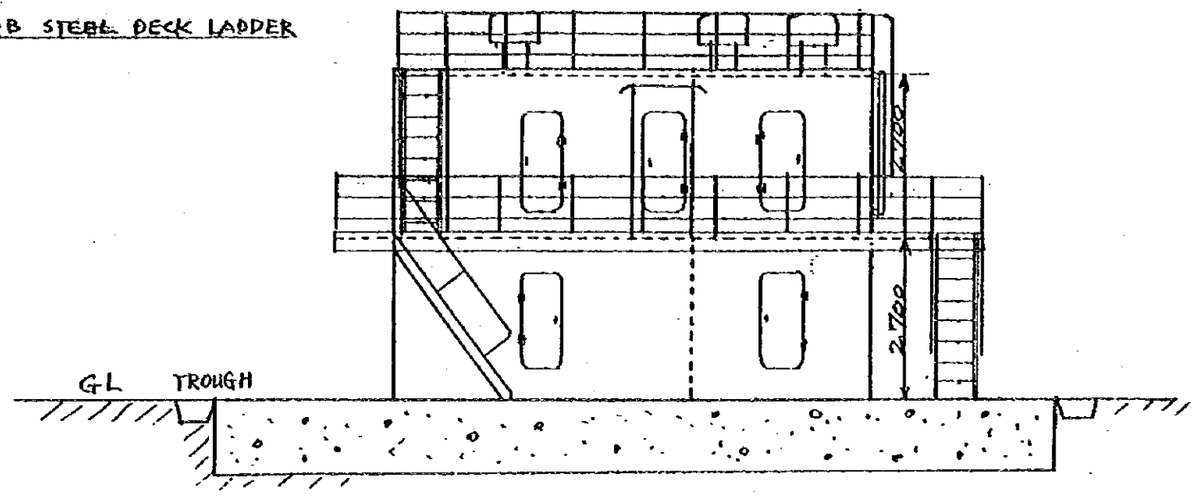
(2) Outline of the equipment

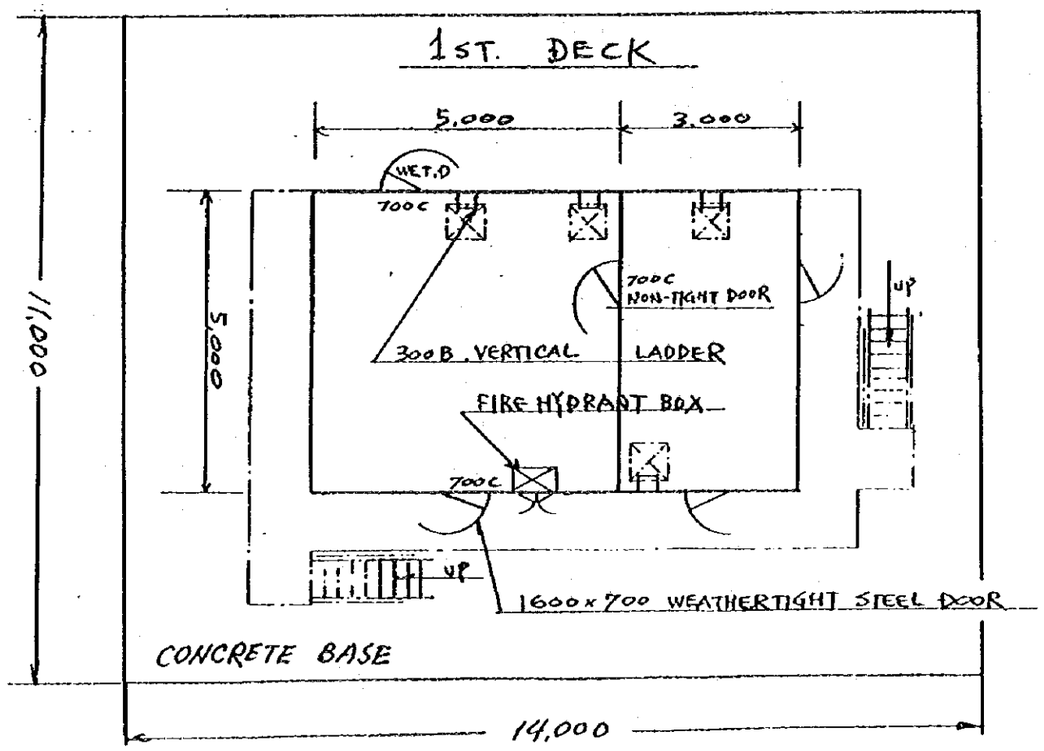
One set of a general 2 boom type cargo handling equipment and one deck crane will be installed as representative types. A concrete surface on the ground will represent the upper deck of the vessel, and a steel hatch coaming will be formed at the central part of this foundation. A winch platform will be constructed adjacent to and on one side of the hatch coaming, on top of which will be installed 2 derrick post, 2x3-ton derrick booms and an electrical hydraulic oil type winches, through which swing boom system and married fall system of cargo handling can be carried out. The winch platform will be made of steel, while a hydraulic oil pressure pump room and warehouse will be constructed in the interior.

On the side opposite the winch platform, a steel crane post will be erected, on top of which a 3-ton rotating type electric hydraulic-oil pressure deck crane will be installed.

The operator will suspend concrete blocks of different weights and transfer them to specified positions within and without the hatch coaming through which he will be able to learn the manner of







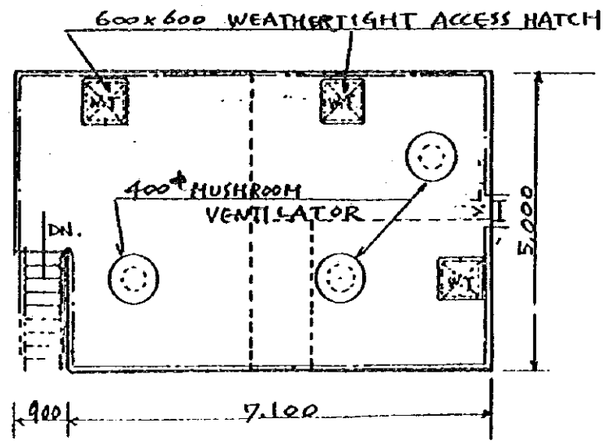


Fig. 4-] Model for fire fighting training

operating winches and the effects of the load. In addition, part of the equipment should be disassembled and restored to carry out actual training in correct maintenance technique.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
(1)	Deck crane	1 unit	Type: Electrical hydraulic-oil type Capacity x lifting speed: 3t x 25 m/min Maximum radious: 10m
(2)	Boom type cargo handling equipment	2 units	Capacity: 3t (Swing boom and married fall systems) Boom length: 9m Cargo winch Type: Electrical hydraulic-oil Capacity: 3.6t x 30 m/min
(3)	Hatch coaming	1 unit	5m x 5m x 1.2mH
(4)	Winch platform, etc.	1 set	

Note: Rough drawings of the Actual Training Cargo Handling Equipment are given in the attached Fig. 4-2 and Fig. 4-3.

4-2-4 Hull model

(1) Reason for installation

Knowledge of the construction of the hull and deck machinery is indispensable for the safe operation of the vessel. To use the actual hull or equipment for training purposes is not practical due to restrictions imposed by space and time limitations, and moreover it will be difficult to attain good educational effects.

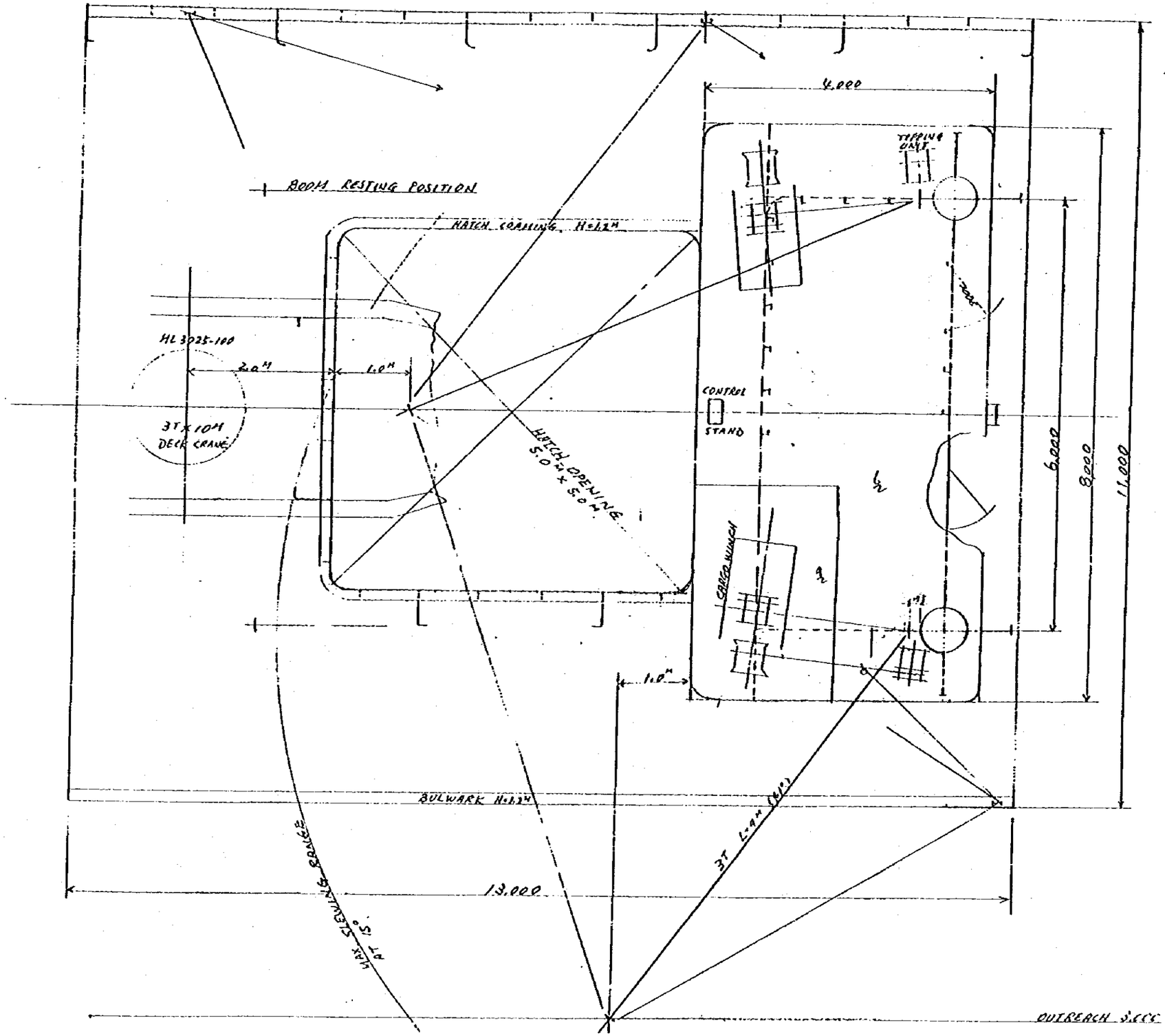


Fig. 4-2 The actual training cargo handling equipment (Plan)

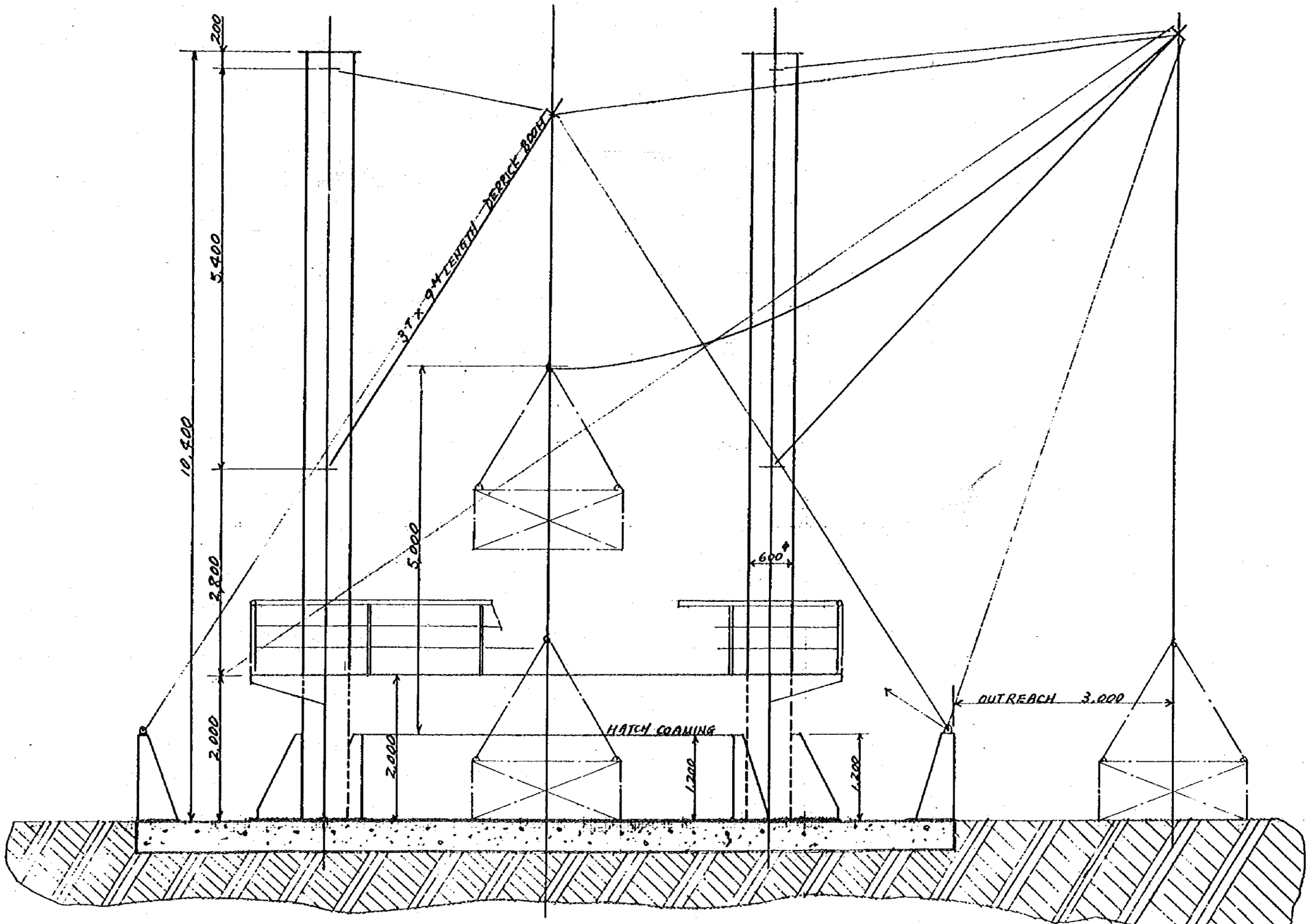


Fig. 4-3 The actual training cargo handling equipment (Section)

The most effective education method will be to install a model which will clearly indicate the principal parts, which should be used in parallel with the lectures to deepen the knowledge of these parts. For this reason, models of all parts will be required.

(2) Outline of the equipment

The following models will be installed. An understanding of the construction of the hull and operation of the equipment can be easily understood through these models.

1) Model of cross-section of the hull

Models of 5 types of vessels, viz., general cargo, container, Ro-Ro ship, tanker, and OBO will be made, which will enable a knowledge to be obtained of the entire vessel. A part of such sections as the cargo hold will be cut off to demonstrate the difference in the cross-sections of the hulls.

2) Model of hull construction

These will be models of the transverse sections of the hull of the vessels given in Section 1), which will enable an understanding to be made of the hull construction of the vessels at the center part of the hulls.

3) Model of the bow section

Models of the bow part of the vessels will be provided with anchoring and mooring mechanisms in order to demonstrate their operating procedures.

4) Model of the stern section

The model will be of the stern section of a single shaft vessel, and will be models which will explain the mutual relations between the propeller shaft, propeller, rudder, and steering gear.

5) Model of the cargo handling equipment

2 models of 2 holds on the upper deck of a cargo vessel will be made. A Stülcken type cargo handling equipment and a Velle type cargo handling equipment will be installed on one model,

while 1 set of Heavy Derrick type cargo handling equipment and 1 set of 2 derrick conventional cargo handling equipment will be installed on the other.

All cargo handling equipment will be of the movable type, so that the wiring method, performance, operation, etc. will be clearly understood.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items	
1)	VERTICAL CROSS-SECTION OF HULL MODEL			
(1)	General cargo vessel	1	Total length Dead-weight Scale 1/100	140m 14,000t
(2)	Container vessel	1	Total length Dead-weight Scale 1/100 (2 Shafts - 1 Rudder)	260m 30,000t
(3)	Ro/Ro vessel	1	Total length Dead-weight Scale 1/100 (Ramp door stern type, 2 shaft - 2 rudder)	120m 3,500t
(4)	Tanker	1	Total length Dead-weight Scale 1/200	330m 300,000t
(5)	OBO Combination vessel	1	Total length Dead-weight Scale 1/200	300m 150,000t
2)	HULL CONSTRUCTION MODEL	(Central part of above vessels)		
(1)	General Cargo vessel	1	Scale 1/50	
(2)	Container vessel	1	Scale 1/50	
(3)	Ro/Ro vessel	1	Scale 1/50	
(4)	Tanker	1	Scale 1/50	
(5)	OBO combination vessel	1	Scale 1/50	
3)	BOW PART MODEL	1	Total length Dead-weight Bow part of cargo vessel Scale 1/25 - 1/30	140m 13,000t

(Total length and dead weight are of approximate values)

No.	Name	Quantity	Principal Items
4)	STERN PART MODEL	1	Vessel in Section 3) Stern part Scale 1/25 - 1/30
5)	MODEL OF CARGO HANDLING EQUIPMENT		
(1)	Stülcken and Velle	1	Stülcken: 120t, Velle 20t Model as mounted on vessel as given in Section 3) Scale 1/25 - 1/30
(2)	Heavy Derrick and Married fall system	1	Heavy derrick: 60t, Velle 20t Married fall system: 3t Model as mounted on vessel as given in Section 3) Scale 1/25 - 1/30)

4-2-5 Radar equipment

(1) Reason for Installation

Radars are installed on all vessels sailing on the open seas in order to ascertain the position of the vessel itself and of other vessels and targets. A thorough knowledge and method of handling of these radar equipments are indispensable to captains and navigators, and training in their use is enforced even by International Law. Consequently, it is necessary that the actual radar be installed for training purposes.

When navigating through radar, it is of outmost importance that a correct judgment be made on the information obtained on the radar in order to ensure a safe voyage. For this reason, it would be most effective to use a radar simulator for training purposes which is capable of simulating all types of vessels, targets, etc., The radar simulation equipment for enabling 4 vessels to take independent courses have been installed, and the Automatic Radar Plotting Aids (ARPA) is additionally equipped in this study.

The Automatic Radar Plotting Aids (ARPA) tracks the vessels or targets which pose the danger of collision with its own vessel, as based on information obtained through the radar and indicates the mutual relative positions as against the vessel itself and moreover, sounds an alarm in case of danger. The installation of this APRA has already been made obligatory in the U.S., and it is also being made progressively obligatory by the IMO (International Maritime Organization).

It will therefore be necessary to add this ARPA to the already existing radar simulation equipment and to carry out training in its handling method.

(2) Outline of the equipment

1) Radar

One radar of 3 cm waves (X-band) and 10 cm waves (S-band) for training in operation will be installed. The radar for training purposes, in addition to the transmission and reception of actual waves through the individual scanners, is

equipped for connection to VTR equipment through which images actually recorded on vessels under different environmental conditions which would affect radar images, such as meteorological and marine conditions, geographical conditions, etc., can be displayed. Through this, it will be possible to conduct training in recognizing the differences in the images according to the band used, training in handling the radar to obtain images that are correct and easy to view under varying conditions, and in making correct judgments from the images.

2) Automatic Radar Plotting Aids (ARPA)

This equipment consists of the CRT display unit and data processing unit, and processes the signals from the vessels, targets, etc. which normally are displayed on the radar indicator, and displays the course together with the speed, etc., as a vector on the CRT.

It also displays the course, speed, etc. of own vessel on the CRT, and in case there are vessels, targets, etc. on the course of the vessel which may pose a danger, it will sound an alarm and displays such factors as the mutual relative positions.

In the existing radar simulator, the track is only recorded by the instructors, the student only recording by hand on the radar screen from time to time, but by mounting this equipment, not only will training on the handling of ARPA be made possible, but practice in making a correct judgment against obstacles can be made, and training in safe navigational methods can be carried out with greater effect.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
1)	RADAR		
(1)	3 cm wave Radar (Without ARPA Equipment)	1 unit	Antenna width : Over 7 ft Peak transmitting power : Over 25 kW Range : Over 48 miles CRT Diameter : 16"
(2)	10 cm wave Radar (Without ARPA Equipment)	1 unit	Antenna width : Over 12 ft Peak transmitting power : Over 30 kW Range : Over 48 miles CRT Diameter : 16"
(3)	VTR Equipment for Radar and Radar/ VTR Interface unit	2 units	(for 3 cm wave x 1, for 10 cm wave x 1) Including recordings of data from actual vessels
2)	ARPA EQUIPMENT	4 units	Acquisition : Automatic/ Manual Tracking : Automatic tracking of target CRT Diameter : 16" Range : 24 miles

4-2-6 Navigation instruments

(1) Reason for installation

In order to navigate the vessel safely and efficiently, the position of the vessel at any moment, the course, speed, etc. should always be accurately known. For this purpose, all types of navigational instruments are installed, and training must be carried out on the method of handling these instruments, the analysis of data and maintenance. The installation of the actual instruments alone will not be sufficient for training purposes as there is a limit in the volume of data received. Therefore, the installation of a simulation system of navigational instruments through which previously prepared data of all types can be reproduced on the actual instruments will be required.

(2) Outline of the equipment

One each of a Decca navigator receiving unit and a receiver for the navigation satellite will be installed in both the navigation classroom and experiment room. The units installed in the classroom are for operational training and those in the experiment room are for maintenance training.

The receivers, in addition to the reception of actual signals through the antenna, will also be able to receive signals under various conditions from the pseudo-signal generating equipment through the simulator system. By use of this equipment, the analysis of the received data can be performed as on actual vessels, and training can be carried out on the handling and maintenance of the instruments.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
(1)	Decca Receiver and Pseudo-signal Generating Equipment	2 units	(For operation x 1, For maintenance x 1) Type & Form: MK-21 With Course Recorder and Antenna equipment
(2)	Navigation satellite receiver and Pseudo-signal Generating Equipment	2 units	(For operation x 1, For maintenance x 1) With course indicator and Antenna equipment

4-2-7 Equipment for automation laboratory

(1) Reason for installation

Many types of instrumentation and control techniques are applied in vessels. In marine engines, the objectives of control are temperature, pressure, flow rate and fluid level, that is, the majority concern the so-called process control. The starting and stopping sequence of the main and auxiliary machinery is also an objective of control, and without a knowledge of instrumentation and control, the efficiency and performance of the main and auxiliary machinery cannot be fully utilized.

The installation of educational equipment will be necessary to learn effectively the method of adjusting and maintaining these machinery. Both controlling techniques through theory and actual practice, for these purpose, the installation will be required of pneumatic and electronic control systems used for marine purposes in a considerable number, and centering around these systems, a typical control system and component parts such as measuring and metering instruments, process controller, operating equipment etc. are necessary.

(2) Outline of the equipment

Simulator systems will be provided for various control systems, to enable a grasp to be obtained of the theory of control and operating techniques through the use of actual equipment.

Moreover, typical equipment which are used in the control system will be exhibited as individual units in order that the construction of the equipment, its operation and method of maintenance can be studied.

1) Simulator

For carrying out actual training in process control, a process simulator and recorder capable of PID control (proportional, integral, differential) through pneumatic pressure and electronic type controllers with fluid level control and other constant value control systems as the subjects, will be installed, in order to enable a grasp to be obtained of the input and output relations, i.e., the manner in which variat-

ions occur in control efficiency when changes take place in set values, controller constants, load characteristics, etc.

To enable actual practice in sequence control to be carried out, a diesel engine starting simulator with a pneumatic type operating mechanism will be installed. A micro-computer is used in this simulator, through which the starting sequence can be set, and control of engine speed can be carried out. It can also be used for training in signal transmission, processing, operation of the machinery, etc.

Also, a hydraulic-oil circuits trainer consisting of oil pressure source, actuator and various types of valves attached to the hydraulic-oil circuits, will be installed to enable training courses to be held on the circuit configuration, operation and maintenance.

2) Control equipment

Individual units of devices which are used in great number in vessels, such as detectors for temperature, pressure, fluid level, flow rate, speed of rotation etc., signal transduction equipment, adjusters, control valves, parts used on pneumatic and hydraulic-oil circuits, operating mechanisms of the cylinders, and recorders will be exhibited, which can be disassembled and assembled, to enable training to be carried out in the techniques relating to the equipment mechanism, their operation, method of handling and of maintenance.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
1)	SIMULATOR EQUIPMENT		
(1)	Pneumatic simulator	1	For basic experiments on the pneumatic circuits
(2)	Hydraulic circuit simulator	1	For basic experiments on the oil circuits
(3)	Electronic circuit simulator	1	For basic experiments on electronic control circuits
(4)	Process simulator	1	Grasp of control performance tendency as the basis for automatic control
(5)	Boiler simulator	1	Grasp of control performance tendency with objective of actual control
(6)	Process control simulator	1	With the objective of level control actual vessels, pneumatic and electronic control equipment are used to obtain theoretical solutions on control characteristics, for comparison with actual control characteristics in order to carry out a comprehensive survey of the process control theory.
(7)	Engine start simulator	1	Grasp of sequence control and program control
2)	CONTROLLING EQUIPMENT	1 set	Pneumatic, electronic, electrical, mechanical, hydraulic and other control equipment are classified into detectors, signal converters, signal processing equipment (adjusters, etc.), operating machinery (valves, cylinders, etc.), recorders, circuit parts (valves, accumulators, etc.) and exhibited.
3)	MAINTENANCE DEVICES, TOOLS, ETC.	1 set	

4-2-8 Engine room simulator

(1) Reason for installation

In the navigation of a vessel, the duty of the personnel on watch in the engine section mainly concerns the running operation and supervision of the engine, and centering around the main engine, all auxiliary machinery related to the propulsion engine system and general auxiliary engine system should be fully understood by them, together with the ability to operate the machinery and to possess supervisory techniques. For this purpose, it will be necessary to install an engine room simulator which will enable the required training to be given to the personnel who will have the duty of keeping watch in the engine room, by creating an atmosphere identical to that in the engine room and engine control room of an actual vessel.

(2) Outline of the equipment

This equipment is a simulation of the main machinery in the engine room of a general cargo vessel in which a diesel is mounted as the main engine, and consists of the following:

1) Graphic panel:

The engine room is shown as a flat panel, in order that a grasp can be obtained of the overall mutual relations between the machinery, and the system configuration of the machinery within the engine room.

2) Engine control panel:

In order to enable an overall sueprvision and operation to be carried out in the same manner as in an engine control room, instruments, handles, switches, centralized supervisory equipment, etc. will be installed.

3) Conditions setting panel:

This is command device to the graphic panel, and engine control panel, and is used to set the operation of the main engine and control mode, and failure conditions. In addition, supervision can also be carried out of the operating conditions

of the engine control panel.

4) Noise simulating equipment:

In order to create an atmosphere of reality, engine room noise conforming to the operating mode is generated.

5) Computer and peripheral equipment:

This is a key station for reproducing in the various equipment the conditions as they would be in actual vessels, and processes data conforming to the various information on operating conditions and their variations.
The instructor operates the condition setting panel and inputs the various conditions on which training is to be carried out. These input data are displayed on the graphic panel and engine control panel, and are output in the form of alarms. The student supervise these conditions, and operate the handles, switches, etc. as required by changes in operating conditions and to make restoration from abnormal conditions, so that training can be carried in the necessary techniques regarding processing procedures, operation, supervision, etc. under conditions which exactly duplicate those that will be encountered in the actual operation of a vessel.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Item
(1)	Graphic Panel	1	Self-standing type
(2)	Engine Control Panel	1	Console type
(3)	Conditions Setting Panel	1	Console type
(4)	Pseudo-noise Generating Equipment	1	
(5)	Computer and Peripheral Equipment	1 set	Computer x 1 A/D, D/A Converter x 1 set CRT Indicator, Printer, Keyboard x 2 sets Signal Generating Equipment x 1 set

4-2-9 Equipment for the electronic laboratory

(1) Reason for Installation

Due to the advances made in the application of semi-conductor techniques, as represented by the transistor, IC, etc., the vacuum tubes used in wireless navigational and other electronic equipment on vessels are now being replaced by semi-conductors, and moreover, electronic devices are replacing all or part of such systems as mechanical, pneumatic and electric measuring and metering control equipment, signal transmitting equipment, alarm equipment, etc. at a rapid pace.

These electronic equipment are the brains and nervous system for the transmission and processing of the various data required in the navigation of a vessel, but without a knowledge and method of application of the electronic circuits, they will only become a 'black box', making it difficult to detect failures, and maintain the circuits in working order which are essential to the navigation of a vessel.

The installation of educational equipment is necessary to acquire control working knowledge on the theory of the circuit of semi-conductors, method of operation and maintenance and measuring techniques.

(2) Outline of the equipment

By using texts and assembly type experimental panels, a circuit trainer will be designed, through which a thorough knolwedge can be obtained, through theory and experiments, of the electronic circuits from the basics to all types of circuits in actual use.

Oscilloscopes, function generators, and other measuring equipment for the electronic circuits will be installed, and by carrying out such operations as the measurement of the input and output signals through the circuit trainer, it will be made possible to obtain a knowledge of the measuring techniques of electronic circuits.

By using these equipment, the student will not only become familiar with the electronic circuits, but will acquire a thorough knowledge from basic theory to the applicable techniques, and by preventing the electronic devices in the vessel from turning into a 'black

box', will be trained in the techniques required to carry out the procedures indispensable in navigation.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
(1)	Transistor Circuit Trainer	12 units	For training in basic and applied circuits
(2)	IC Circuit Trainer	12 units	do.
(3)	Demonstration Board	1 set	For lectures on basic circuits
(4)	Various types of Measuring Equipment	1 set	12 units each of Oscilloscope, Function Generator, and others
(5)	Constant voltage Electric Power Source, etc.	1 set	
(6)	Soldering tools, All types of Cords	1 set	

Note: Tables and Resistance Boxes to be supplied by FED are not included.

4-2-10 Equipment for radio-communication laboratory (Including those for use in the wireless experiment room)

(1) Reason for installation

Radio communication equipment are indispensable facilities in the navigation of a vessel, and their installation and the presence of a radio operator on board are made obligatory by SOLAS (Treaty on Safety of Life at Sea).

The radio operator should be qualified as stipulated through international treaty. In order to train personnel in circuit theory, operation and maintenance techniques and measuring techniques, the installation of educational equipment will be necessary.

(2) Outline of equipment

A circuit trainer consisting of text and assembly type experiment panel will be installed, so that the basics of the circuit theory and the various operating circuits will be thoroughly understood through theory and actual practice.

All types of transmitting and receiving devices, actual electronic applied devices used on vessels, and model sets for educational purposes will be installed, to enable knowledge to be obtained of the circuit configuration, the operation of the parts to be understood, and training carried out in operating technique.
Oscilloscopes and other measuring and controlling devices will be installed through which input and output signals to and from the various equipment and circuits mentioned above can be measured to enable training sessions to be carried out for acquiring measuring techniques, and maintenance and adjusting techniques.

The student, through the experience gained by using these equipment and devices, will be able to obtain a thorough knowledge, effectively, of the theory and actual operation of equipment necessary to become a radio operator.

(3) Number of equipment and principal items

No.	Name	Quantity	Principal Items
(1)	Training equipment for Basic Theory	1 set	Basic circuit experimental equipment, Transmitting and receiving circuit trainer, etc. 6 units each
(2)	Equipment for vessels (for training in operation)	1 set	Various types of transmitters and receivers, teleprinters, etc.
(3)	Equipment for vessels (for training in maintenance)	1 set	Various type of transmitters and receivers, radar, oscilloscope, echo-sounder, television, etc.
(4)	Measuring equipment	1 set	Standard signal generator, function generator, all types of measuring devices, 6 units each
(5)	Work table, Constant voltage power source equipment, All types of circuit parts, etc.	1 set	

CHAPTER 5 IMPLIMENTATION SYSTEM

CHAPTER 5 IMPLEMENTATION SYSTEM

5-1 Work Plan

The present plan for providing training equipment will be implemented through the following procedures, but as it involves the procurement of complex and varied equipment and installation at site, detailed consultations must be carried out in advance with the related personnel on the Ivory Coast side.

5-1-1 Implementation of detailed plans for the equipment and facilities

The consultant will draft a detailed design of the machinery and equipment in conformity with the Basic Design, and will prepare Bid Invitation Documents consisting of documents listed below, and obtain the approval of the agencies concerned.

BID INSTRUCTION
BID FORM (Including capability evaluation sheet)
CONTRACT FORM
EQUIPMENT & FACILITIES SPECIFICATIONS, DRAWINGS

5-1-2 Tender

These educational equipments are to educate and train the student important part of ship in detail and in total system of ship operation. Bid will be invited to such companies which have full knowledge of the mutal relations between equipment and are capable of organizing the ship into a total system, and also have sufficient ability to undertake after service work on the delivered equipment.

Japanese shipyards will be invited to the tender which can comply with these conditions, above mentioned.

5-1-3 Evaluation of tender results

The consultant will evaluate the capacity for implementation, cost, performance, etc. of the bidders, report the results of the tender to the authority, and determine the successful bidder.

5-1-4 Implementation of the work

The successful bidder, through the consultant, shall obtain approval on the drawings, and after the equipment has passed witness inspections, shall make shipment to the Ivory Coast.

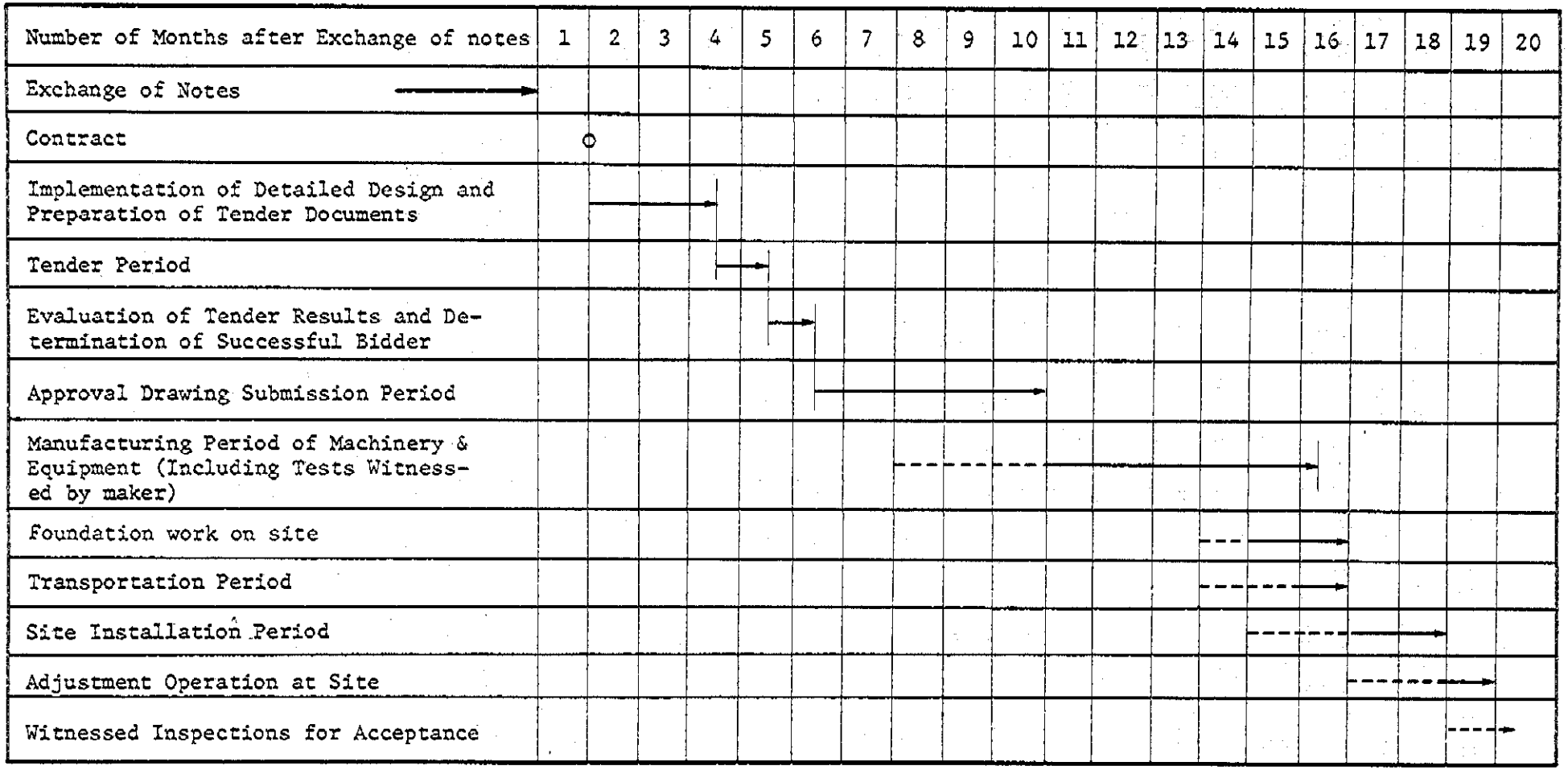
The successful bidder shall carry out construction work in the Ivory Coast similar to a Full Turn Key system.

5-1-5 Completion of the work

After completion of the installation work, the educational equipment shall be tested, inspected, and operated by the consultant in the presence of personnel from the Ivory Coast side, and after confirmation is made that such educational equipment conform to specifications, the work shall be regarded as having been completed.

5-2 Implementation Schedule

(---- Indicates Period of Advance Work)



5-3 Maintenance Program

The Academy has a lot of educational equipment already provided along with the first stage of construction and, a great additional lot will join in the course of the progress of the second stage. Accordingly great efforts will be needed for maintenance and care of these provided equipment.

As the general policy of the Academy, these maintenance and care will be carried out by the teachers in charge without the aid of personnel specially introduced for such purposes. For ensuring perfectness in this regard, however, the teachers in charge will have to be trained so that they can have knowledges necessary for handling and maintenance of such provided equipment. Particularly for simulators and other electronic units in new modes, such arrangements seem to be indispensable by means of technical cooperation by the Japanese Government.

For long-term maintenance of these equipment in good condition, the following concrete measures will be needed:

(1) Preparation of manuals of operation and maintenance.

(2) Preparation of manuals of inspection and checking.

(3) Strict observance of inspection program for maintenance (when and where to inspect).

(4) Nomination of persons in charge and establishment of clear lines of responsibility.

(5) Control of spare parts

  (a) Clear grasp of places and quantities of storages.
  (b) Stable resupply.
  (c) Forming of budget for resupply of spare parts.

CHAPTER 6 EVALUATION OF PROJECT

CHAPTER 6 EVALUATION OF PROJECT

In view of the industry structure, the Republic of Ivory Coast is in principle an agricultural and forestrial country having little natural resources. Its economic development has been suffering from a number of difficulties. In the recent years, particularly, its economic state is declining towards worse conditions, because of a long-term drought, forest first, and low agricultural production heavily influences by the world-widely prevailing economic depression. In addition, the devaluation of Franc to which CFA Franc is linked has truned to be minus factor, and the balance of its international trade has been worsening year by year.

Having landlocked countries as hinterland, the Republic of Ivory Coast has the port of Abidjan - an important port in the Western Africa - and the merchant shipping has a great importance in this country. It is obvious that the development of the shipping business forms a most important policy in this country and the Government is concentrating efforts for its promotion. The policy of development of shipping business will not only contribute directly to the improvement of international payments but also increase the chances of employment and make much for the stabilization of the people's livelihood, by the reinforcement of the training for increasing the number of native seamen.

The shipping business in the world is in heavy competition. It seems very hard to promote the marine transport business with home-owned ships operated by native seamen in this serious environmental conditions. It is therefore urgent to reinforce the own merchant fleet by introducing modernized ships and to train highly skilled seamen, to say nothing of the political assistance. In this circumstnace, the earliest completion of the Academy is a most important matter for the Ivory Coast and other related countries in the Western and Central Africa.

CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS

Among the countries in the Western and Central Africa, the Republic of Ivory Coast is very stable both in political and economic aspects. It is a newly independent country based on a monocultural structure of economy with agriculture and forestry. The policy of development of shipping business established by the Government is considered valuable. The same is true in the other countries in the Western and Central Africa and it is considered quite reasonable that the Conference of Ministers from these fourteen countries decided to establish the Regional Maritime Academy in Abidjan as the institution in common for training seamen. As for the execution of this project, it is forecasted that its considerable portions in the technical and financial aspect will rely on the international cooperations and assistances and accordingly, the work was not able to progress so rapidly as had been envisioned in the initial diagrams of construction and financial schedules. It is particularly due to the world-wide economic depression during the past several years. The economic burdens derived from the present work flow have grown heavier and heavier for the European countries and the Republic of Ivory Coast. In order to cope with such disturbances in the progress of work, the Ivorian Government made a re-examination on the overall construction plan and decided to readjust the work schedule and financing program. As a result, the second request for the grant aid was submitted to the Japanese Government. In compliance with the request, Japanese Government made a preliminary survey. The basic design study based on the results of the preliminary survey has proven that the supply of educational equipment at the above-mentioned request is appropriate for the establishment of the Academy.

The Ivorian authorities are convinced of the Japanese side's ability disclosed in the supply under grant aid of a training vessel and educational equipment in the first stage project execution. In addition, the qualities of the equipment provided were of very high class and it is strongly hoped that the equipment involved in the present basic design study is to be supplied from Japan again. Accordinly, the execution of the educational

equipment from Japan will strongly push forward the realization of the plan of the Academy and, at the same time, largely contribute to widening of friendship between Japan and the fourteen countries in the Western and Central Africa including Ivory Coast.

In providing the educational equipment, it is necessary to take appropriate measures:

(1) It is extremely important to ensure that the work to be done by the Ivorian side in connection with the installation of the equipment be made strictly in accordance with the pre-arranged schedule and take account of the nature of such equipment.

(2) The Ivorian side will have to take appropriate arrangement regarding the security and maintenance of such equipment after installation until the Academy is opened.

(3) It is desirable to establish a technical cooperation scheme for providing guidance in the running and maintenance of such "high technology equipment" as engine room simulator, electronic equipment.

APPENDIX

APPENDIX 1-(1)

Composition of Survey Team

Preliminary Survey Team

Mr. Kanji KITAZAWA	Team Leader Second Economic Cooperation Division Economic Cooperation Bureau Ministry of Foreign Affiars
Mr. Nobumochi SHIOTA	Training Programme Education Division, Bureau of Seafares Ministry of Transport
Mr. Norio SHIMOMURA	Project Coordinator Basic Design Division, Grant Aid Department Japan International Cooperation Agency
Mr. Minoru ISHIDA	Equipment Overseas Shipbuilding Cooperation Centre
Mr. Hidefumi INOUE	Architect Matsuda Consultants International Co., Ltd.
Mr. Shoichi KOBAYASHI	Interpreter Matsuda Consultants International Co., Ltd.

Appendix 1-(2)

Schedule of Preliminary Survey Team

29 Oct.	Star. Narita
30 Oct.	Arr. Paris
31 Oct.	Star. Paris
	Arr. Abidjan
2 Nov.	Meeting with Ivorian Ministry of Marine
	On-site survey (of the Academy)
	Meeting with DCGTX
	Courtesy call for Minister of Marine
	Courtesy call for Japanese Embassy
3 Nov.	Meeting with Ministry of Finance site survey on
	GEMMA Meeting with BAD
	Meeting with Ministry of Marine
4 Nov.	Conference of Japanese Team, UNDP, FED, Norway
	and Ivory Coast
	Discussion on Minutes at Ministry of Marine.
5 Nov.	Discussion on Minutes at Ministry of Marine
7 Nov.	Scheduling of educational equipment at GEMMA
	Survey of Port Abidjan by training ship"GOLFE DE GUINEE"
8 Nov.	Minutes was signed
	Discussion on cargo handling equipment
9 Nov.	Discussion on life saving and fire fighting
	equipment
10 Nov.	Discussion on automation and radio equipment

11 Nov.	Discussion on radar equipment
14 Nov.	Discussion on model of cargo handling
15 Nov.	Star. Abidjan .Arr. Paris
16 Nov.	Star. Paris
17 Nov.	Arr. Narita

APPENDIX-2

MINUTES OF DISCUSSIONS BETWEEN JAPANESE STUDY TEAM AND IVORIAN MARITIME DELEGATION

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1. In order to study in details the participation of the Government of Japan to the realisation of the project phase II of the "Académie Régionale des Sciences et Techniques de la Mer d'Abidjan" (hereinafter referred to as "the Project"), following the request made by the Government of the Republic of Ivory Coast, Japanese study team organized by the Japan International Cooperation Agency (JICA), in charge of this study, stayed at Abidjan from 30th October to 15th November, 1983.

The Japanese study team was composed of :

- Mr. Kanji KITAZAWA	Team Leader, Ministry of Foreign Affairs
- Mr. Nobumochi SHIOTA	Training Programme, Ministry of Transport
- Mr. Norio SHIMOMURA	Project Coordinator, JICA
- Mr. Minoru ISHIDA	Equipment, Overseas Shipping Cooperation Centre
- Mr. Hidefumi INOUE	Architect, Matsuda Consultants International Co., Ltd.
- Mr. Shoichi KOBAYASHI	Interpreter

The Ivorian Maritime delegation was composed of :

- Mr. SOGODOGO Souléimane	Chief of the Ivorian maritime delegation, General Manager of "Groupe Ecoles de la Marine Marchande"
- Mr. RABE SERI Alphonse	Director of administrative and financial affairs, "Groupe Ecoles de la Marine Marchande"
- Mr. FROGET	Technical adviser, Ministry of Marine

.../...

- Mr. GBETIBOUO Jules	Chief of administrative and financial division, "Institut de Documentation de Recherches et d'Etudes Maritimes"
- Mr. DOSSO Moussa	Chief of infrastructure division, "Institut de Documentation de la Recherche et Etudes Maritimes"
- Mr. KONE Karim	Director of regulation and human affairs, Ministry of Marine
- Mr. BLAVEC	Inspector of maritime education, Ministry of Marine

2. The discussions were held between both parties during the stay of the Japanese study team at Abidjan and the Japanese study team made contacts with the Ministry of Marine, Ministry of Economy and Finance, "Direction et Contrôle des Grands Travaux (D.C.G.T.)" and African Development Bank (A.D.B.). A meeting of donors with respect to the Project was organized. The meeting was attended by the Japanese study team, the Ministry of Marine, Ministry of Economy and Finance, A.D.B., European Fund for Development (F.E.D.), United Nations Development Programme (U.N.D.P.) and Norway.

3. The technical discussions concerning the specifications of educational equipment was held between the experts of the Japanese study team and the Ivorian experts.

4. The items relating to the educational equipment submitted to the Japanese study team, at the end of all discussions, are as follows :

(1) SECURITY
- Life Saving
- Fire fighting
- Boats
- Others

(2) SHIP CONSTRUCTION AND CARGO HANDLING

(3) RADAR

.../...

(4) NAVIGATION SYSTEM

(5) LABORATORY FOR AUTOMATION

(6) SIMULATOR FOR ENGINE ROOM

(7) RADIO ROOM

(8) ELECTRONIC ROOM

(9) OTHERS (FOR EXEMPLE, VEHICLES)

Details of the educational equipment mentioned above are attached hereto for reference purpose.

5. The Japanese study team explained to the Ivorian maritime delegation that when the Japanese grant aid is extended to the Project, the Government of the Republic of Ivory Coast will take necessary measures to :

(1) coordinate donating agencies for the smooth implementation of the Project ;

(2) ensure prompt unloading and custums clearance in the Ivory Coast of imported educational equipment for the Project ;

(3) exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Ivory Coast with respect to the supply of the educational equipment and services to be provided under the Japanese grant aid ;

(4) accord Japanese nationals whose services may be required in connection with the supply of the educational equipment and services under the Japanese grant aid such facilities as may be necessary for their entry into the Republic of Ivory Coast and stay therein for the performance of their work ;

.../...

(5) bear an advising commission of authorization to pay and a payment commission to the japanese foreign exchange bank for the banking services based upon the banking arrangement ;

(6) carry out, if necessary, civil works such as the construction of the foundation for the educational equipment. (Japanese side will prepare the drawings) ;

(7) maintain and use properly and effectively the educational equipment provided under the Japanese grant aid.

6. The Japanese study team will convey to the Government of Japan the desire of the Governmenttof the Republic of Ivory Coast that the former takes necessary measures to provide the educational equipment for the "Académie Régionale des Sciences et Techniques de la Mer d'Abidjan" within the scope of the Japanese grant aid.

7. The Japanese side will select the educational equipment based on the careful evaluation of the results of the study made by the Japanese study team with respect to the Project, taking into consideration the budget to be allocated to the Project by the Government of Japan.

8. The educational equipment selected will be provided for the Académie. However; it shall be utilized for the "Groupe des Ecoles de la Marine Marchande (GEMMA)" until the opening of the Académie.

At the conclusion of their discussions, the two parties enjoyed the spirit of mutual understanding and sincere collaboration which had dominated their work.

8th November 1983, Abidjan

Mr. Kanji KITAZAWA
Leader of the Japanese Study Team.

Mr. SOGODOGO Souléimane
General Manager of "Groupe des Ecoles de la Marine Marchande", Ministry of Marine.

République de Côte d'Ivoire

Ministère de la Marine

Groupe Ecoles de la Marine Marchande

Direction des Etudes

NOTE
SUR LA LISTE D'EQUIPEMENTS REQUIS POUR L'ACADEMIE REGIONALE DES SCIENCES ET TECHNIQUES DE LA MER DU JAPON 1983

1. SECURITE

1.1. Sauvetage:

- Canot de sauvetage à moteur complètement équipé selon les caractéristiques suivantes.

* Embarcation à moteur, en stratifié, ouverte.
* Dimensions: 7,93 × 2,59 × 1,07 (environ)
* Maximum de personnes: 48
* Poids lège: 2413 kg (environ)
* Poids des personnes embarquées: 2586 kg (environ)
* Charge totale sous bossoirs: 5999 kg (environ)
* Forme de coque conventionnelle
* Bonne stabilité - bonne manoeuvrabilité
* Flottabilité assurée par des caissons étanches contenant un matériau agrée
* Système de largage des crocs et commande moteur commandés par le timonier
* Equipement conforme à la convention SOLAS
* Moteur à combustion interne - vitesse minimum 6 noeuds - Autonomie 24 H - Système de marche arrière.

- 2 Combinaisons de Survie en mer
- 12 Gilets de sauvetage.

BUT: Promouvoir la formation des élèves en sauvetage et permettre l'entraînement pratique indispensable pour l'obtention du Brevet d'Aptitude à l'exploitation des embarcations de sauvetage conformément aux exigences des conventions internationales.

1.2. Lutte contre l'incendie

La construction de trois bâtiments est prévue, à savoir:

a) salle de classe, magasin, vestiaire et bureau
b) salle de démonstration des feux
c) modèle d'une partie d'un navire.

1.2.2. Le bâtiment (c) se compose de trois étages en acier soudé 8 m × 5 m sur une base de beton au minimum 14 × 11 m. La structure représente seulement pour les exercices en lutte contre l'incendie les différents compartiments d'un navire, à savoir:

1) à l'étage supérieur deux cales d'un navire avec d'en haut par les trappes et des échelles verticales; deux portes étanchées qui donnent sur un pont extérieur.

2) à l'étage du milieu une partie de local d'habitation avec hubolts en entourée d'une passerelle d'environ 1 m de largeur.

3) A l'étage inferieur une représentation d'une salle de mechines.

La structure est dotée de trois bouches d'eau, deux au niveau des locaux d'habitation et une à terre. Les trous de drainage se trouvent partout. Les dispositifs de recupération de l'eau et de son traitement dans un séparateur eau-huile avant son évacuation vers la lagune sont à prévoir.

La construction de ce bâtiment et la fourniture des équipements est demandée (voir annexe 5).

BUT : Promouvoir la formation des élèves en lutte contre l'incendie et permettre l'entrainement pratique en plein air ainsi que la démonstration des différents types de détecteurs, d'extincteurs et d'appareils respiratoires.

1.3. Des embarcations selon les caractéristiques suivantes:

* Un bateau à moteur, ouvert
  longueur environ 8 m. 10 chevaux avec rames, barre à main.

* Un bateau à rames
  12 rames
  mât avec foc et grand voile quille escamotable barre à main plus emplacement pour aviron de gouverne.

1.4. Lutte contre l'incendie

Liste d'équipements

Pincipalement, constitué par une section de navire grandeur nature, sur 2 étaques avec échelles, coursives et cabines cet ensemble de lutte contre l'incendie comprendr en outre:

1 - Unité modulaire de détection (flamme, gaz, fumies) et d'extinction automatique.

4 Détecteurs de flammes

4 Détecteurs de fumée

4 Détecteurs de gaz de combustion

1 Batterie de 4 bouteilles de Co2 de 50 kg avecbouteille pilote, Circuit et 6 becs diffuseurs.

1 Générateur de mousse physique, bas foisonnement avec lance (2 m^3, à 7 bars).

1 Générateur de mousse physique haut foisonnement avec lance (200 m^3 minimum à 10 bars)

1 Motopompe 60 m^3/heure, 15 bars pour alimentation tuyaux 70 mm (motopompe remorquable).

1 Collecteur d'aspiration ϕ70 mm, longuer 40 + crépine (en plusieurs tronçons).

4 Manches de refoulement ϕ70 mm
(20 m de chaque)

8 Manches de refoulement ϕ45 mm
(20 m de chaque)

2 Raccords de réduction en Y 70 de 2 × 45ϕ

4 Lances d'incendie "type robinet DUBOIS"

1 Canne à brouillard

Sécurité/Incendie

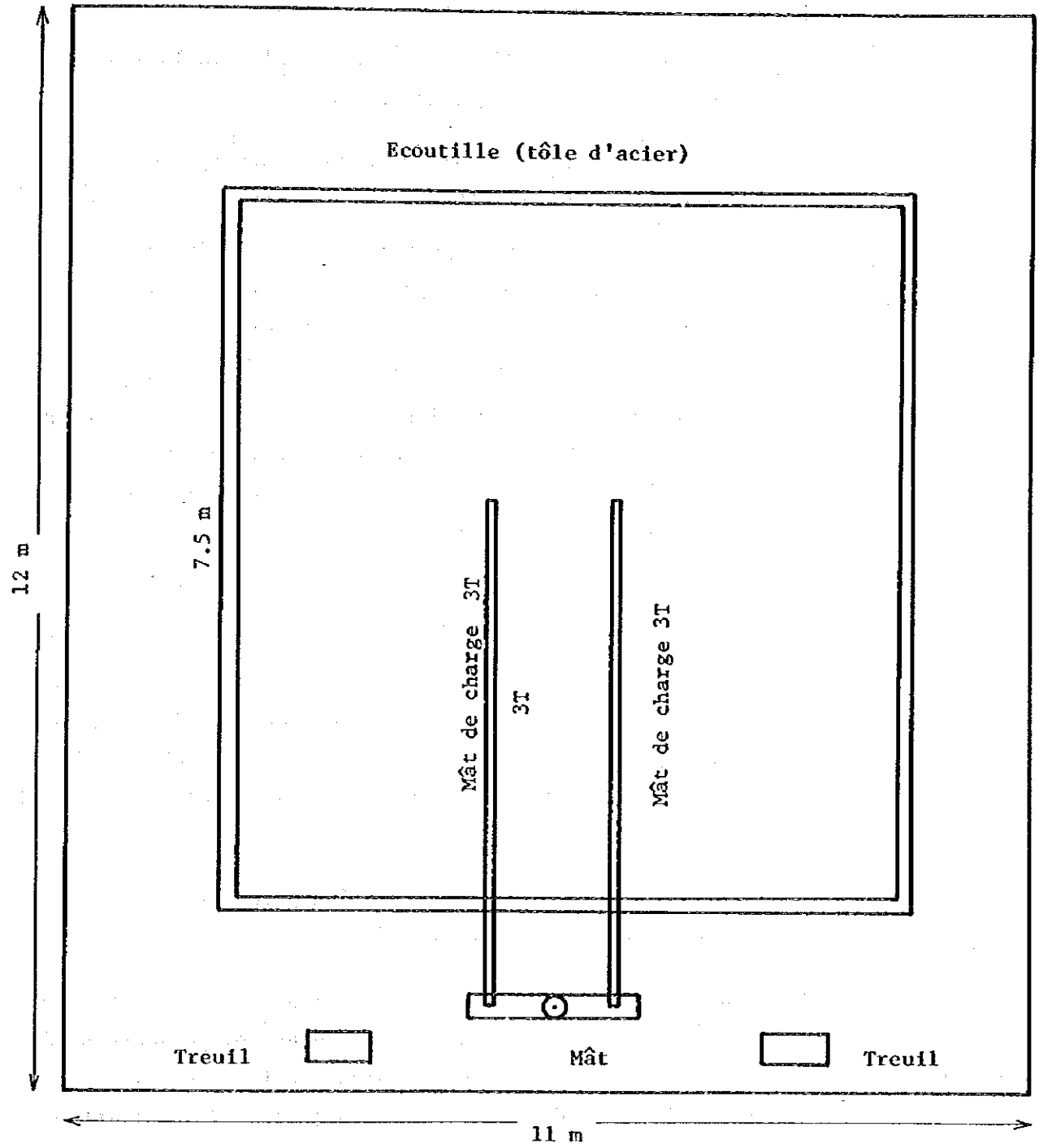
- 2 raccords internationaux
- 3 appareils respiratoires à oygène
- 4 appareils respiratoires à air comprimé
- 15 tenues d'approche du feu (grande et moyenne taille), avec cagoule et casques.
- 15 paires de bottes (du 44 au 46)
- 15 paires de lunettes anti-feu.
- 15 paires de gants isolants (400 V), résistant au feu.
- 3 lignes de vie.
- 15 lampes securite frontale (montee sur casque) pour reconnaissance feu.
- 4 extincteurs portatifs à poudre.
- 4 systèmes "microphone-écouteurs" pour liaison entre équipe reconnaissance et P.C.
- 4 bacs en tôle d'acier 2 m × 2 m × 0,40 avec poignées pour manutention. (pour démonstration fuex de combustible).

2. Construction du navire et manutention des cargaisons.

2.1. Manutention de cargaison

- Mât avec deux mâts de charge 3 tonnes et deux treuils (grandeur nature) pour opération de chargement/déchargement, à être installés auprès d'une écoutille en tôle d'acier.

Voir schéma suivant:



Manutention des cargaisons

2.2. Modèles et sections des navires:

2.2.1. Modèle de gaillard d'avant, montrant l'installation de mouillage et d'amarrage, hauteur environ 120 cm.

2.2.2. Modèles réduits avec équipement de manutention de cargaison, longueur 1,50 cm, comme suit:

- 1 modèle comportant 2 écoutilles avec milieu un mât Stülcken, à l'avant une grue, à l'arrière un mât Velle. Les deux mâts de charge devraient être opérationnels manuellement.
- 1 modèle avec 2 écoutilles, l'une avec 2 mâts de charge conventionnels, l'autre avec un bigue (pour montrer aux élèves le gréement et le fonctionnement de ces différents équipements).

Les deux modèles doivent avoir un couvercle de protection transparent.

2.2.3. Section longitudinale le long de la guille de 5 navires differénts montrant les éléments de construction (cargo général, porte-conteneurs, Ro-Ro, pétrolier, OBO); échelle 1: 100, sauf pétrolier et OBO qui doivent être a l'échelle 1: 200.

2.2.4. Sections transversales montrant les éléments de construction des 5 types du n°3 (échelle 1: 50)

2.2.5. Modèle de l'arrière des navires a 1 hélice et à 2 hélices montrant la construction de ligne d'arbre, le gouvernail et la machine à gouverner, hauteur environ 100 cm (pour disposer des aides à l'enseignement de description de navire).

3. RADAR:

3.1. Automatic Radar Plotting Aid (ARPA) à coupler avec le simulateur radar modele JPZ-204-1 construit par le J.R.C. et que le Japon à fourni en 1983.

Specifications:

* Le système doit être conforme avec les règlements de l'OMI et des Gardes Cotes des Etats Unies.
* Au moins 10 cibles doivent être sélectionnees automatiquement et/ou manuellement et doivent être "plottées" sur l'écran.
* Le système doit prévoir mouvement vrai et relatif.

3.2. Equipement d'entretien radar

3.2.1. Un radar 10 cm
Puissance 30 Kw
Portée 48 milles
Ecran 40 cm ϕ
Avec tous le matériel et les composants nécessaires pour le dépistage et le dépannage des défectuosites.

3.3. Appareils radar opérationnels:

3.3.1. Un radar 3 cm avec ARPA (integre) en accord avec les spécifications de l'MOI et le Garde des Côtes des Etats Unies et celles mentionnés en 3.1.

Puissance 25 Kw
Portée 48 milles
Ecran 40 cms
Antenna et guide d'ondes adaptés au laboratoire.

3.3.2. Un radar 10 cm
Puissance 30 Kw
Portée 48 milles
Ecran 40 cm
Antenna et guide d'ondes adaptés au laboratoire
(voir annexe 1)

4. Atelier et classe de navigation:

L'Académie comprend quelques classes et ateliers de navigation. La demande actuelle ne conerne qu'une de ces classes et un atelier.

L'objectif de l'atelier est de permettre de former les élèves en tout ce qui concerne l'entretien des équipements de navigation. L'atelier est déjà équipé d'un récepteur Loran C et un récepteur Omega.

L'objectif de la classe de navigation est de former les élèves sur l'emploi des équipements divers. La classe de navigation est déjà équipée avec un récepteur et un simulateur Loran C et un récepteur Omega avec simulateur, desquels le Japon Radio Cooperation est le fournisseur.

Les équipements qui manquent comprennent:

4.1. Pour l'atelier

* Récepteur de navigation Decca avec simulateur et cartes
* Récepteur de navigation par satellite avec simulateur. (voir annexe 2 pour spécifications)

4.2. Pour l'atelier

* un système de navigation Decca avec similateur
* un récepteur de navigation par satellite
* tous les matériels et les composants nécessaires pour le dépistage et le dépannage des défectuosités
* manuels de l'instructeur
* manuels des étudiants.
* Pièces de rechange pour OMEGA et LORAN C (JRC) déjà librés (matériel Japonais).

5. Laboratoire d'automatique

La demande comprend tous les équipements aptes de bien aménager ce laboratoire, les meubles et de tels aménagements non compris.

Capacité du laboratoire - 24 élèves max.
Nombre d'élèves/banc d'essai - 2 élèves max.
Niveau des élèves - Bac C, D, ou E
Durée du cours d'automatique 180 heures
(120 H théorie, 60Tr. pratiques)

Objectifs du cours:

* Etudier le fonctionnement des appareils de contrôle des measures et les différents régulateurs automatiques.
* Contrôler les conditions du fonctionnement et l'entretien des systèmes asservis de types électrique, électronique, pneumatique ou hydraulique à bord.

Contenu du cours:

* Définition et role d'un automatisme, classification Représentations graphiques. Stabilité, précision, relage, corrections.

* Différentes techniques: électrique, électronique, pneumatique, hydraulique.
* Appareillage de contrôle et de mesures
* Régulation: systèmes asservis, action proportionnelle, integrale, dérivee
* Applications: poste de distillation d'eau, installation frigorifique, chaudières ...
* Automatismes à séquences, algèbre logique, circuits à séquences, différentes techniques Les processus calculateur numérique.
* Applications: commande des machines propulsives; moteur diésel, turbines, production et distribution d'énergie électrique.

Propositions de matériel:

5.1. Simulateurs pneumatiques pour l'étude des fonctions logiques avec 6 postes de distribution pneumatique.

5.2. Simulateur hydraulique pour l'étude des schémas hydrauliques (voir annexe 3 "Bosh hydraulique")

5.3. Simulateur électronique pour l'étude des circuits logiques (voir annexe 4 "MTI")

5.4. Simulateur pneumatique de démarrage automatique à l'air d'un moteur diesel.

5.5. Simulateur de regulation de chaudière: niveau d'eau, pression vapeur, pression mazout, débit d'air.
Remarque: ce simulateur doit être un systeme asservi et non un système séquentiel.

5.6. Divers régulateurs pour démontage et etude: régulateurs pneumatiques, régulateurs hydrauliques, régulateurs mécaniques, régulateur de vitesse de groupe électrogène.

5.7. Simulateurs pneumatiques pour l'etude des asservissement (actions proportionnelle, intégrale et dérivee) avec enregistreur.

5.8. Divers appareils faisant partie des systèmes asservis: amplificateurs, servomoteurs, vérins, soupapes pneumatiques, détendeurs, débimetres, capteurs (pression, température, vitesse ...) etc.

5.9. Notices d'utilisation des différents materiéls en français.

5.10. Outils spéciaux pour les raccordements des différents matériels.

5.11. Appareils de mesure: manomètre, débimetres, contrôleurs universels, thermomètres, etc)

5.12. Petit materiel dans le genre: tube souples, raccords pneumatiques et hydrauliques, fils électriques de raccordement, etc ... pour les différents simulateurs.

5.13. Outillsage ordinaire pour l'utilisation, les réglages et la maintenance des simulateurs (tournevis, petites clefs, etc ...)

6. Simulateur de Salle des Machines

Composantes:

1 - commandes de l'instructeur
2 - Salle de contrôle
3 - Salle des Machines

LISTE DU MATERIEL
POUR L'EQUIPEMENT D'UNE SALLE DE RADIO

Les marques ou types sont donnés à titre indicatif.

- 6 table de manipulations conçue spécialement pour les laboratoires d'électronique avec prises de courant (avec terre).

- 6 émetteur-récepteur réalise sous forme modulaire (chaque chassis se raccordant au précédant pour former un ensemble soit émetteur soit récepteur). Sur chaque chassis on devra pouvoir placer des composants aliser un circuit. Enfichables pour x L'appareil devra petre livré avec tous les éléments enfichables: R.L.C. transfo etc... cordons et cavaliers de liaison.
  Marque: PHILIPS (Hollande), PHYWE (Allemagne) ou PHILCO (Montréal Canada)

- 6 maquette multifonctions pour pouvoir réaliser les circuits de base avec boîte de composants enfichables.
  Marque: PHILIPS SG/FEE ou PHYWE.

- 6 générateur HF. AM. FM.
  Marque: METRIX GX 933

- 6 générateur de fonctions: sinus, carrés, triangles
  Marque: METRIX 299 AO Hz à 1 MHz

- 6 oscilloscope bicourbe 50 MHz avec 2 sondes et adaptateurs B.N.C
  Marque: TECKTRONIC

-12 contrôleurs universels
  Marque: METRIX MX 222

-12 multimètres électroniques
  Marque: PHILIPS PM 2503

- 6 multimètre digital
  Marque: METRIX MW 747

-12 alimentations stabilisées = 0 à 60 volts 2 ampères avec dispositif de protection.
  Marque: SODILEC SDRI 602

- 1 transistormètre
  Marque: METRIX TX 302

- 6 autotransformateur 0 à 260 volts 2 a pères
  Marque: METRIX CX 502

- des cordons de liaison SECME fiches OZE ϕ 4mm. 25 cm, 50 cm, 1 m (10 de chaque)

- 6 alimentation stabilisée continue 2 fois 350 volts
  Marque: JEULIN (France)

- 1 générateur VHF/UHF 80 ∿ 500 MHz/1 sec
- 1 wattmètre pour émetteur (27 à 1000 MHz) "BIRD"
- 1 fréquencemètre 0 ∿ 500 MHz/sec
- 1 émetteur-récepteur BLU bandes marines
- 1 radar
- 1 sondeur
- 1 émetteur-récepteur pédagogique modulaire modèle professeur (voir PHILIPS).
- 1 émetteur-récepteur VHF bandes marines
- 4 émetteurs et 4 récepteurs déclassés pour dépannage (avec schémas).
- 2 oscilloscopes déclassés pour dépannage (avec/schémas)
- 1 radar pédagogique livrè sous forme modulaire (RAYTHEON Marseille fabrique ce genre de materiel). Cet appareil permet l'étude des circuits fondamentaux du radar et sert egalement à faire du dépannage
- 1 pont de mesures R.L.C.
- 1 téléviseur noir et blanc
- 1 téléviseur couleur
- 1 caméra de télévision

- 1 wobulateur

- 1 téleimprimeur

- 1 récepteur universel: AM-BLU-CW- RTTY, couvrant de 100 KHz à affichage digital (comme sur le golfe de guinnée ou équivalent: par exemple R7 de DRAKE)

- 1 TOS- mètre (Reflected Power meter)

- 1 mesureurs de champs (RF field meter)

- 1 récepteur VHF-UHF avec les modes de réception AM-FM BLU - CW à affichage digital

- 1 convertisseur Emission et Réception pour radio radio-téleimprimeur (50 à 100 bauds - déplacement de fréquence 170 HZ et 850 HZ) connectable a l'un des émetteurs-recepteurs ainsi qu'au téléimprimeur fourni.

- 1 bloc régulateur de tension pour l'ensemble de la salle.

- 1 boîte de décades de résistances

- 1 boîte de décades de condensateurs

- 1 boîte de décades d'inductances

LABO RADIOELECTRICITE

Additif:

6 alimentation stabilité donnant:

+ 5 V + 12 V

et 24 V

- 5 V - 12 V

6 pompe à déssouder
6 fer à souder
6 bobine de soudure a létain 60/40
6 panneau de montage type DEC

Pour l'ensemble de la salle

1 poste émetteur de secours à manivelle
1 perceuse sensitive
1 recepteur automatique de détresse
1 pendule ou horloge avec les secteurs réglementaires
1 lot de matériel comprenant:

condensateur fixes et variables
résistances
bobines
diodes
transistors
plaques cosses à relais, etc ...

1 chargeur de batterie + batteries.

LISTE DU MATERIEL
POUR L'EQUIPEMENT D'UNE SALLE D'ELECTRONIQUE

Les marques et types sont donnés à titre indicatif.

Par poste de travail

- 1 maquette d'étude de circuits à transistors. Cette maquette multi-fonctions comprendra un chassis sur lequel l'élève pourra réaliser un grand nombre de manipulations d'électronique à l'aide de composants enfichables R,L,C, transfo, transistor etc ... Elle sera livrée avec une boîte d'éléments enfichables (la plus fournie possible).

  Marque: PHYWE (Allemagne) steckbaustein-système. SAPRANO (France) initiation au montages électroniques. PHILIPS (Holande) SG/FEE

- 1 maquette d'étude des circuits intégrés avec composants enfichables
  marque: PHYWE (IC. Fassung 16 polig)

- 2 alimentations continues stabilisées 0 à 60 volts 2 ampères avec dispositif de protection.
  Marque: SODILEC (France) SDRI 602.

- 1 oscilloscope bicourbe 15 MHz avec sondes (2) et adaptateurs B.N.C (2)
  Marque: METRIX (France) OX 712. PHILIPS P.M. 3232

- 2 générateurs de fonctions sinus, triangles, carés: 0,1 Hz à 20 MHz 20 volts crête a crête.
  Marque: schlumberger 4430.

- 2 contrôleurs universels pour électronicien.
  Marque: METRIX MX 202 B ou 222.

- 2 multimètres électroniques.
  Marque: PHILIPS PM 2503

- 1 multimètre à affichage digital
  Marque: METRIX MX 747

- 1 autotransformateur (alternostat) 0, 260 volts 2 ampères.
  Marque: ATOMS FERRIX CX 502. (France).

- des cordons de liaison avec fiches adaptées aux bornes de la maquette fournie; long. 1m, 50 cm, 25 cm (10 de chaque).

- 1 trousee à outils d'électronicien avec fer à souder de 30 watts.

Pour compléter l'équipement du labo. d'électronique

- 1 fréquencemètre
  Marque: METRIX FX 456B

- 1 pont de mesure R.L.C
  Marque: METRIX IX 307

- 1 analyseur de fonctions analogiques
  Marque: METRIX TX 909

- 1 mégohmmètre
  Marque: METRIX MX 504

- 1 transistormètre
  Marque: METRIX TX 302

- 1 pupitre professeur sur lequel celui-ci pourra faire des démonstrations du circuit à réaliser par l'élève, avec composants enfichables et livré avec des appareils de mesure (voltmètre, ampèremètre) de grandes dimensions.

CORRECTIF A APPORTER A LA NOTE
SUR LA LISTE D'EQUIPEMENTS REQUIS
POUR L'ARSTM, DU JAPON 1983

Page 1 : Paragraphe 1-1 sauvetage
à supprimer à partir de :

- BOSSOIRS à installer.....
jusqu'au bas de la page.

Page 2 : à supprimer
1 ligne : 2 combinaisons de survie en mer.

à supprimer :
le paragraphe 1-2-1 en entier.

Page 3 : à supprimer : le paragraphe 4.
depuis pour assurer.....
jusqu'à..... l'eau lagunaire).

Page 4 : 1 appareil lance-amarre SPEEDLINE international avec les quatre unités complètes de lancement.

1 pistoler signaleur - signalisation de détresse aéronautique et marine - avec cartouches blanches, rouges, vertes.

1 radeau pneumatique de sauvetage de 15 places avec appareil hydrostatique de largage.

1 poste de radio de secours pour embarcation de sauvetage.

1 radio-balise de détresse.

2 projecteurs de signalisation Aldis.

Page 5 : Paragraphe 2-1 Manutention cargaison : à rajouter : une grue capacité 5 T.

Page 6 : 3 - RADAR -

Paragraphe 3 - 1

Spécifications :

3 ème ligne : lire : 10 cibles
suffisent - l'équipement J R S
ARPA. JAS. 850 est acceptable.
Tout le texte qui suit jusqu'au paragraphe 3-2 -
Page 7 est supprimé.

Page 7 : Paragraphe 3-2 - Equipement d'entretien radar :

Lire : Modèle pour formation tel que :
JMA-650/850
avec un jeu complet
de pièces de rechanges conformément aux normes
utilisées pour la formation des techniciens au Japon.

Suite Paragraphe 7 : Paragraphe 3-3 lire :

Appareils radar opérationnels avec simulateurs de signaux pour 2 radars suivant spécifications du gouvernement Japonais.

Les paragraphes 3-3-1 et 3-3-2 restent inchangés.

On ajoutera le paragraphe

3.3.3 :
1 guide d'ondes rotatif
1 guide d'ondes droit
1 guide d'ondes coudé
1 magnetron
1 klystron
1 ATR
1 TR
1 cavité mélangeuse
1 synchromoteur (selsyn) ordinaire
1 synchromoteur (selsyn) différentiel
1 jeu de bobines de déflexion
1 circulateur
1 antenne
1 limiteur de tension d'entrée de récepteur.

Page 8 : 4-1 pour la classe : lire :

* Récepteur de navigation Decca avec simulateur et cartes

* Récepteur de navigation par satellite avec simulateur.
(voir annexe 2 pour spécifications)

Modèle FURUNO
FSN-80 acceptable

4-2 - 7ème ligne lire :

* Pièces de rechange pour OMEGA et LORAN C (JRC) déjà livrés (matériel Japonais). Jeu complet de cartes de rechange et cartes d'extension.

Page 8 : Paragraphe 5 -

Lire : laboratoire d'automatique : 12 postes de travail.

Page 9 : Paragraphe 5-1, 3 ème ligne

supprimer : + compresseur d'air.

Page 10: Paragraphe - 6 -

Ajouter : 4 - stabilisateur de tension - pour la salle.

Pages 11 - 12 - 13 : seront remplacées par les suivantes

Les marques ou types sont donnés à titre indicatif.

L'ensemble comprendra 6 postes de travail.

- 6 tables de manipulations conçue spécialement pour les laboratoires d'électronique avec prises de courant (avec terre).

- 6 émetteur-récepteur réalisé sous forme modulaire (chaque chassis se raccordant au précédent pour former un ensemble soit émetteur soit récepteur). Sur chaque chassis on devra pouvoir placer des composants enfichables. pour x l'appareil devra etre livré avec tous les éléments enfichables : R.L.C transfo etc... cordons et cavaliers de liaison.

xréaliser un circuit.

  Marque : PHILIPS (Hollande), PHYWE (Allemagne) ou PHILCO (Montréal Canada).

- 6 maquette multifonctions pour pouvoir réaliser les circuits de base avec boîte de composants enfichables.

  Marque : PHILIPS SG/FEE ou PHYWE.

- 6 générateur HF. AM. FM.
  Marque : METRIX GX 933

- 6 générateur de fonctions : sinus, carrés, triangles
  Marque : METRIX 229 AO Hz 1MHz

- 6 oscilloscope bicourbe 50 MHz avec 2 sondes et adapteurs B.N.C
  Marque : TECKTRONIC

- 12 controleurs universels
  Marque : METRIX MX 222

- 12 multimètres électroniques
  Marque : PHILIPS PM 2503

- 6 multimètre digital
  Marque : METRIX MW 747

- 12 alimentations stabilisées = 0 à 60 volts 2 ampères avec dispositif de protection.
  Marque : SODILEC SDRI 602 .

- 6 alimentation stabilisées donnant :

  + 5 V + 12 V et 24 V
  - 5 V - 12 V

- 6 pompes à déssouder
- 6 fers à souder
- 6 bobines de soudure à l'étain 60/40
- 6 panneuaux de montage type DEC

- 1 poste émetteur de secours à manivelle règlementaire pour embarcation de sauvetage
- 1 perceuse sensitive
- 1 récepteur automatique de détresse (Auto-Alarme)
- 1 pendule ou horloge avec les secteurs règlementaires
- 1 lot de matériel comprenant :

  condensateur fixes et variables

  résistances

  bobines

  diodes

  transistors

  plaques cosses à relais, etc...

Pour la réalisation rapide de petits montages dans le cas de circuits imprimés.

1 chargeur de batterie + batteries.

- 6 boîtes de décades de résistances
- 1 boîtes de décades de condensateurs
- 1 boîtes de décades d'inductances.

- 6 autotransformateur 0 à 260 volts 2 ampères
  Marque : METRIX CX 502
- des cordons de laison SECME fiches OZE Ø 4 mm. 25 cm, 50 cm, 1 m (60 de chaque)
- 6 alimentations stabilisées conitinue 2 fois 350 volts avec 6,3 v
  Marque : JEULIN (France)
- 1 transistormètre
  Marque : METRIX TX 502
- 1 générateur VHF/UHF 80 à 500 MHz
- 1 wattmètre pour émetteur (27 à 1000 MHz) équivalent
  Marque "BIRD"
- 1 fréquencemètre de 0 à 500 MHz
- 1 émetteur-récepteur BLU bandes marines
- 1 radar J R C didactique
- 1 sondeur didactique
- 1 émetteur-récepteur pédagogique modulaire modèle professeur (voir PHILIPS).
- 1 émetteur-récepteur VHF bandes marines
- 4 émetteurs et 4 récepteurs déclassés pour dépannage (avec schémas).
- 6 oscilloscopes déclassés pour dépannage (avec schémas)
- 1 radar pédagogique livré sous forme modulaire (RAYTHEON Marseille fabrique ce genre de matériel). Cet appareil permet l'étude des circuits fondamentaux du radar et sert également à faire du dépannage
- 1 pont de mesures R.L.C.
- 1 noir et blanc - moniteur - vidéo noir et blanc
- 1 caméra de télévision
- 1 wobulateur
- 1 récepteur universel AM-BLU-CW-RTTY, couvrant de 100 KHz à affichage digital (comme sur le golfe de guinée ou équivalent : par exemple R7 de DRAKE)
- 1 TOS-mètre (Reflected Power meter)
- 1 mesureurs de champs (RF field meter)
- 1 récepteur VHF-UHF avec les modes de réception AM-FM BLU - CW à affiche digital
- 1 téleimprimeur 50 à 100 bauds
- 1 convertisseur Emission et Réception pour radio-téleimprimeur (50 à 100 bauds - déplacement de fréquence 170 HZ et 850 HZ) connectable à l'un des émetteurs-récepteurs ainsi qu'au téleimprimeur fourni.
- 1 bloc régulateur de tension pour l'ensemble de la salle.