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NO. 3

THE REPUBLIC OF INDONESIA

FINAL REPORT FOR THE STUDY ON MARITIME SAFETY PLAN CONCERNING SEARCH AND RESCUE

SHORT-TERM DEVELOPMENT PLAN

FEBRUARY 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

THE REPUBLIC OF INDONESIA

FINAL REPORT
FOR
THE STUDY ON MARITIME SAFETY PLAN
CONCERNING
SEARCH AND RESCUE

SHORT-TERM DEVELOPMENT PLAN

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JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Japanese Government decided to conduct a study on the Maritime Safety Plan concerning Search and Rescue in the Republic of Indonesia and entrusted the survey to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a survey team headed by Mr. Reijiro Shiobara from October to December, 1987 and Mr. Inehiko Yoshino of the Japan Association for Preventing Marine Accidents from July to September, 1988.

The team held discussions with concerned officials of the Government of Indonesia, and conducted field surveys.

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

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

I wish to express my sincerest appreciation to the concerned officials of the Government of the Republic of Indonesia for their close cooperation extended to the team.

February, 1989

Kensuke Yanagiya
President
Japan International Cooperation Agency

February 21, 1989

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency

Dear Mr. Yanagiya:

We have the honor to submit to you our final report for the Study on Maritime Safety Plan Concerning Search and Rescue in the Republic of Indonesia. It is a great pleasure for us that this Study has been completed under the close cooperation of two governments of Japan and Indonesia.

The final report was prepared during the past 18 months by the Study Team organized by members of Japan Association for Preventing Marine Accidents in association with Japan Life Boat Institution and Yachiyo Engineering Co., Ltd., and headed by Mr. Inehiko Yoshino. It comprises Summary, Long- and Short-term Development Plan, and Supporting Reports.

In preparing this Report, our Team benefited a great deal of the cooperation from officials and experts of Japan International Cooperation Agency and other authorities concerned of the Government of Japan.

On behalf of the study team, I would like to express my deepest appreciation to the officials concerned and other related agencies of the Republic of Indonesia for their enormous cooperation, assistance and warm hospitality extended to the study team members.

We sincerely hope that this Report will contribute to the further development of the Republic of Indonesia.

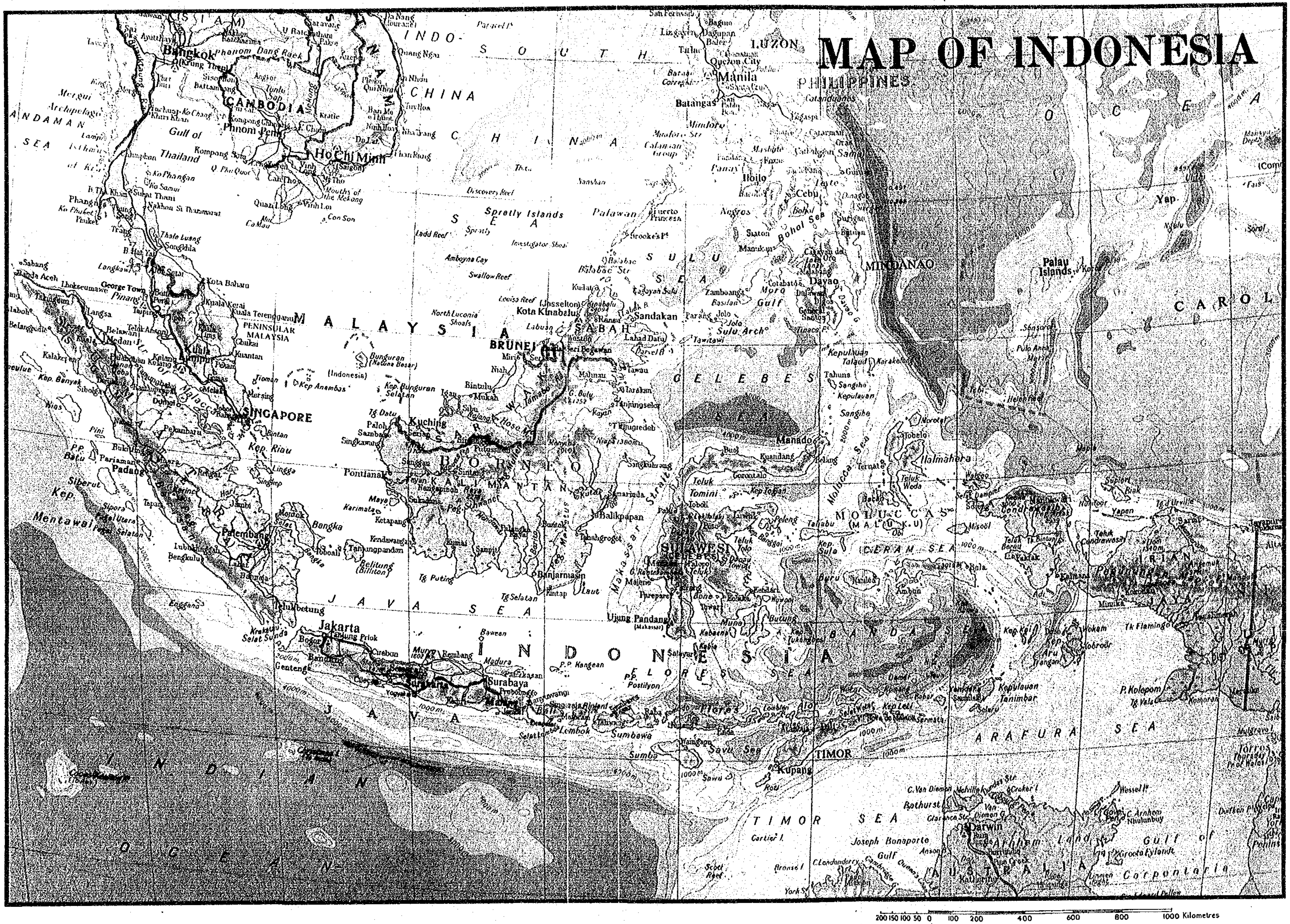
Sincerely yours,

Tadayasu Kodama

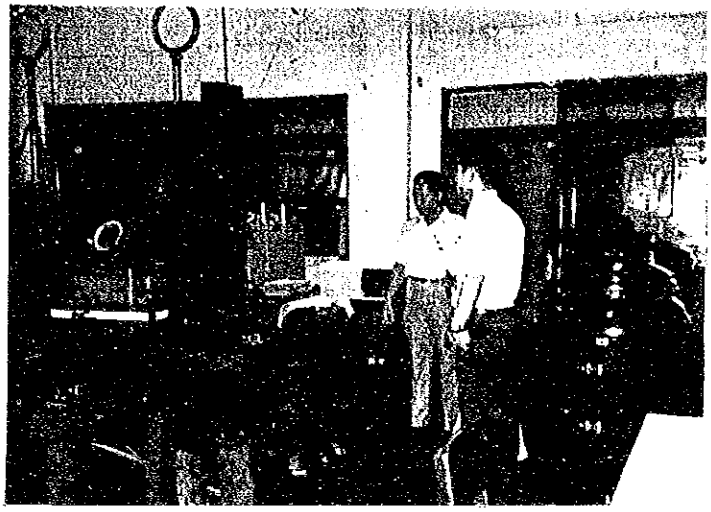
Tadayasu Kodama
President
Japan Association
for Preventing Marine Accidents

TK/ma

MAP OF INDONESIA

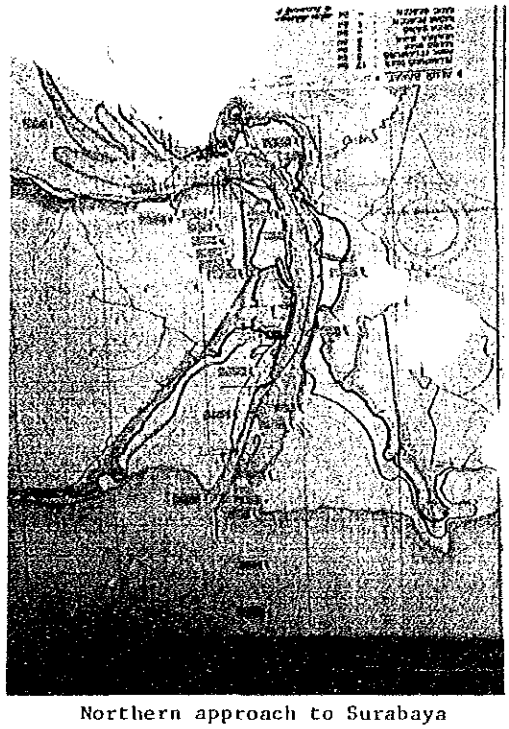


Discussion with the Indonesian counterpart personnel on the Draft Final Report



Field survey at a marine educational institute

Rescue equipment



Northern approach to Surabaya

SHORT-TERM DEVELOPMENT PLAN

[FINAL REPORT]

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ABBREVIATIONS

A		
	ADPEL	Port Administrator Office (Administrasi Pelabuhan)
	ARMADA KPLP	KPLP Fleet
B		
	BAG. UMUM	General Affair Division
	BASARNAS	National SAR Agency
	BPS	Central Bureau of Statistics (Biro Pusat Statistik)
D		
	DISNAV	District of Navigation
	Dit.	Directorate
	DGSC	Directorate General of Sea Communication
	DWT	Deadweight Tonnage
E		
	EIRR	Economic Internal Rate of Return
	EPIRB	Emergency Position Indicating Radio Beacon
	E & T Dept.	Equipment & Technology Dept.
F		
	FKSD	Regional SAR Coordination Forum
	F/S	Feasibility Study
G		
	GDP	Gross Domestic Product
	GHz	Giga Hertz
	G & R Dept.	Guard and Rescue Dept.
	G/T	Gross Tonnage
H		
	HB/ADPEL	Harbour Master Office
	HF	High Frequency
	HUKUM	Legal Division
I		
	ITV	Industrial Television
J		
	JASMAR	Directorate of Marine Service
	JICA	Japan International Cooperation Agency

K		
	KANWIL	Maritime District Office
	KAPPEL	Shipping and Marine Safety
	KEPEGAWAIAN	Personnel Division
	KKR	Rescue Coordination Center
	KPLP	Directorate of Sea and Coast Guard
	KPLP/ADPEL	Sea and Coast Guard Unit
L		
	LALA/ADPEL	Sea Transportation Unit
M		
	MES	Message Exchange System
	METEO	Meteorology
	MF	Medium Frequency
	MIS	Management Information System
	MSA	Maritime Safety Agency
	MSTC	Maritime Safety Training Center
N		
	NAVIGASI	Directorate of Navigation
	NAV/ADPEL	Navigation Unit
	NBDP	Narrow Band Direct Printing
	NM	Nautical Mile
O		
	O & M	Operation and Maintenance
P		
	Pelita/Repelita	Five-year Development Plan
	PELPENG	Port Dredging Division
	PERENCANAAN	Planning Division
	Pertamina	State-Owned Oil Company
	Perumpel	Public Port Corporation
	Perumpen	Public Dredging Corporation
	PUSDIKLAT	Education & Training Agency
R		
	R&D	Research and Development
	RDP	Radar Data Processor
	Rp	Rupiah

S

SAR	Search and Rescue
SAR Convention	International Convention on Maritime Search and Rescue, 1979
SKR	Rescue Coordination Sub-Center
SOLAS 1974	International Convention for the Safety of Life at Sea, 1974
SSB	Single Side Band
STCW 1978	International Convention on Standards of Training, Certification and Watchkeeping for Seafares of 1978

T

TDMA	Time Division Multiple Access
TDP	Traffic Data Processor
TTY	Teletypewriter

V

VHF	Very High Frequency

1 Introduction

1.1 Objective of the Study
1.2 Organization of the Study
1.3 General Work Flow

Section 1 Introduction

1.1 Objective of the Study

The objective of this study is to formulate a short-term development plan (hereinafter called the short-term plan) of selected urgent improvement projects as a supplemental study, based on the long-term development plan (until the year 2005) related to the Maritime Safety Plan concerning Search and Rescue in the Republic of Indonesia (hereinafter called "Indonesia"), which is an archipelago nation.

The purpose of the short-term plan is to establish the following through detailed analysis of the marine environment, marine accidents, etc.

- a setup to cope immediately and properly with situations if there should be an increase in marine accidents occurring in remote and widely dispersed locations
- a setup to educate and train personnel that could efficiently handle the diversified administrative affairs necessary for maritime safety

1.2 Organization of the Study

The Japanese members dispatched by Japan International Cooperation Agency (JICA) and the Indonesian counterpart personnel are listed in Tables 1.2.1 through 1.2.7.

Table 1.2.1 Study Team Members Dispatched (Phase I; Oct.-Dec., 1987)

Name	Assignment	Position
Mr. R. Shiobara	Team leader Forecast of marine accidents	Japan Association for Preventing Marine Accidents
Mr. H. Manabe	Development plan	Yachiyo Engineering Co., Ltd.
Mr. O. Hosokawa	Analysis of marine accidents	Japan Association for Preventing Marine Accidents
Mr. Takahashi	Maritime activities	Yachiyo Engineering Co., Ltd.
Mr. T. Onda	Organizational System	Japan Life Boat Institution

(cont'd)

Name	Assignment	Position
Mr. M. Kida	Rescue system	Japan Life Boat Institution
Mr. M. Sakamoto	Prevention of marine disasters	"
Mr. T. Chiba	Education and training	Japan Association for Preventing Marine Accidents
Mr. M. Katayama	Communications and information	"
Mr. S. Tokieda	Harbour traffic control (plan)	"
Mr. M. Danno	Economic evaluation	Yachiyo Engineering Co., Ltd.

Table 1.2.2 Study Team Members Dispatched
(Phase II; Jul.-Sept., 1988)

Name	Assignment	Position
Mr. I. Yoshino	Team leader	Japan Association for Preventing Marine Accidents
Mr. H. Manabe	Development plan	Yachiyo Engineering Co., Ltd.
Mr. T. Onda	Organizational system	Japan Life Boat Institution
Mr. T. Noma	Rescue system	"
Mr. M. Sakamoto	Prevention of marine disasters	"
Mr. M. Saito	Education and training (plan)	Japan Association for Preventing Marine Accidents
Mr. T. Chiba	Education and training (facility)	"
Mr. K. Watano	Communications and information	"
Mr. S. Tokieda	Harbour traffic control (plan)	"
Mr. K. Naohara	Harbour traffic control (facility)	"
Mr. M. Danno	Economic evaluation	Yachiyo Engineering Co., Ltd.

Table 1.2.3 Study Team Members Dispatched (Phase II; Dec., 1988)

Name	Assignment	Position
Mr. I. Yoshino	Team leader	Japan Association for Preventing Marine Accidents
Mr. T. Noma	Rescue system	Japan Life Boat Institution
Mr. M. Saito	Education and training (plan)	Japan Association for Preventing Marine Accidents
Mr. T. Chiba	Education and training (facility)	"
Mr. K. Watano	Communications and information	"
Mr. S. Tokieda	Harbour traffic control (plan)	"
Mr. M. Danno	Economic evaluation	Yachiyo Engineering Co., Ltd.

Table 1.2.4 Advisory Committee Members Dispatched (Phase I; Oct.-Nov., 1987)

Name	Position
Mr. T. Ozawa	Committee Chairman Director of Rescue Division, Guard & Rescue (G & R) Dept. Maritime Safety Agency (MSA)
Mr. Y. Hayafune	Special Assistant to the Director Rescue Division, G & R Dept., MSA
Mr. M. Yokoyama	Special Assistant to the Director Communications Management Div, Equipment & Technology (E & T) Dept., MSA
Mr. A. Kobayashi	Special Assistant to the Director Navigation Safety Division, G & R Dept., MSA
Mr. T. Toyokura	Administration Division, G & R Dept., MSA
Mr. S. Teramoto	Assistant Professor Maritime Safety Academy
Project Coordinator: Mr. S. Matsu-ura	Deputy Head, Social Development Cooperation Dept., Japan International Cooperation Agency

Table 1.2.5 Advisory Committee Members Dispatched
(Phase II; Jul.-Dec. 1988)

Name	Position
Mr. H. Kawabata	Chairman Director of Rescue Division G & R Dept., MSA
Mr. T. Suzuki	Deputy Director, Rescue Div. G & R Dept., MSA
Mr. S. Teramoto	Professor of Maritime Safety Academy
Mr. M. Yokoyama	Deputy Director, Comm. Div. E & T Dept., MSA
Mr. Y. Hayafune	Hydrographic Dept., MSA
Mr. A. Kobayashi	Special Assistant to the Director Navigation Safety Division, G & R Dept., MSA
Project Coordinator:	
Mr. S. Matsu-ura	Japan International Cooperation Agency

Table 1.2.6 Indonesian Counterpart Personnel (Phase I; Oct.-Nov., 1987)

Name	Position
Captain H.M.J. Lumentah	Directorate of KPLP
Mr. Ch. Paath	Directorate of Navigation
Capt. Albert Lapian	Directorate of KPLP
Capt. Conrad Siahaan	Directorate of KPLP
Mrs. Juliana, S.H.	Directorate of KPLP
Mr. W.H. Simorangkir	Directorate of KPLP
Mr. Hartono	Directorate of KPLP
Capt. Ronny Beaupain	Directorate of Shipping and Marine Safety
Mr. Judistar	Personnel Division
Drs. J. Soepardi	Personnel Division
Mr. Triyuswoyo	Education & Training Center

Table 1.2.7 Indonesian Counterpart Personnel

(Phase II; Jul.-Dec., 1988)

	Name	Assignment
	Soenardyo (DIR. KPLP)	Chief of Counterpart Group
1.	* H. Nelwan (DIT. KPLP)	Introduction, Socio-economic study, Maritime Activities and Marine Accidents
2.	Drs. Hamid Hasan (DIT. KPLP)	
3.	Soenoro (DIT. KPLP)	
4.	Drs. Wahyudi (BAG. UMUM)	
5.	Morton Panggabean (DIT. LALA)	
6.	Drs. H. Pangaribuan (DIT. KPLP)	
1.	* Capt. H. M. J. Lumentah (KPLP)	Maritime Safety and Search and Rescue
2.	Saman Abdullah (JASMAR)	
3.	A. Said (KPLP)	
4.	Kol. Manurung (BASARNAS)	
5.	Soemadi (BASARNAS)	
1.	* Muhdin Sslim S. H. (HUKUM)	Prevention of Marine Disasters
2.	Drs. C. Soetikno (KPLP)	
3.	Madiono (KPLP)	
4.	W. H. Simorangkir (KPLP)	
1.	* CH. Paath (NAVIGASI)	Maritime Safety and SAR Communications and Information System
2.	Hartono (KPLP)	
3.	Syamsu Wijaya (NAVIGASI)	
4.	Ir. Wahyudi (KPLP)	
1.	* R. Beaupain (DITKAPPEL)	Harbour Traffic Control System
2.	S. Djunaid (PELPENG)	
3.	Soeharyanto (DITKAPPEL)	
1.	* Capt. I. Sinambela (PUSDIKLAT)	Education and Training System for Maritime Safety and SAR Personnel
2.	Yudistar (KEPEGAWAIAN)	
3.	Edison Simanjuntak (KPLP)	
1.	* Dewata (NAVIGASI)	Organizational System
2.	Hotman Pangaribuan (PERENCANAAN)	
3.	Drs. J. Soepardi (KEPEGAWAIAN)	
4.	Drs. Eko Hadi Rumekso (KEPEGAWAIAN)	
1.	* H. Supit (KPLP)	Cost Estimate, Development Plan and Selection of Priority Projects
2.	Adolf Richard T. (PERENCANAAN)	
3.	J. Palambang (PUSDIKLAT)	
4.	Drs. Syamsuddin Riyadi (ARMADA KPLP)	
5.	Israhadi B. P. (KPLP)	
6.	Drs. Haryanto (KPLP)	
7.	Nugroho (KPLP)	

* Group leader

1.3 General Work Flow

The general work flow for Short-term Plan is shown in Fig. 1.3.1.

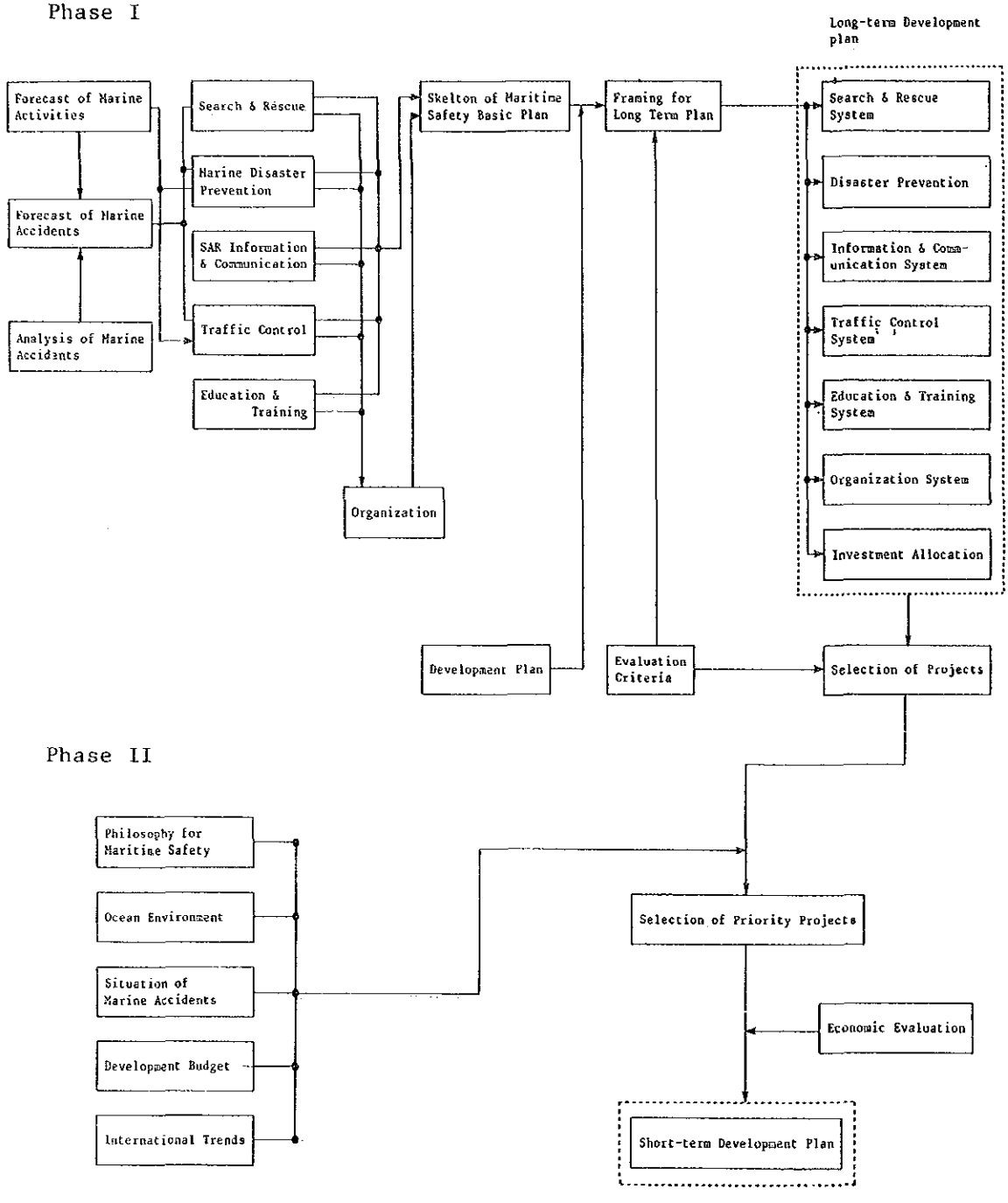

Fig. 1.3.1 General Work Flow (Short-term Plan)

2 Background of Short-term Plan

2. 1 Philosophy for Maritime Safety
2. 2 Ocean Environment
2. 3 Marine Accidents
2. 4 Basic Idea of Short-term Plan

Section 2 Background of Short-term Plan

2.1 Philosophy for Maritime Safety

Based on the Nusantara Outlook (outlook of the Indonesian archipelago), Indonesia has been devoting itself to the development of its socio-economy and various resources, in order to improve the living standard of its people and increase national prosperity.

A foundation of such exploitation, in this nation consisting of numerous islands, depends on the large scale sea, land and air transportation of cargoes and passengers. Considering especially geographic conditions of Indonesia, the role of sea transport is extraordinarily influential.

Therefore, it is the very important duty of the nation to secure the safety of such activities at sea as transport, fishing and so forth.

However, many lives and properties have been lost every year owing to marine accidents involving general ships, sailing ships, fishing boats, etc., because the maritime safety policy in the country is insufficient.

In view of the above situation, it is necessary to establish a maritime safety system in Indonesian waters, that is, a system which assures safe and efficient routes for marine transport and safe marine activities based on a philosophy for marine safety in harmony with the nation's socio-economic and resource development.

Subsequently, the philosophy for maritime safety in Indonesia as described in APPENDIX II is proposed by the DGSC. The main purpose of this philosophy is to take countermeasures for preventing marine accidents by ships and fishing boats, to take prompt and proper actions in the event of marine accidents, to promote maritime safety administration (e.g., improved sea routes), and to assure effective and safe routes of marine transport and safe marine activities.

2.2 Ocean Environment

Indonesia is the largest archipelago nation, and consists of about 13,700 large and small islands. The Indonesian archipelago extends 5,500 km from east to west and 1,800 km from north to south in the equatorial area. Indonesia's population on about 3,500 islands was 164 million (as of 1985). The ocean environment encompassing these islands is extremely complicated.

2.2.1 Sea Condition

Indonesia is located within the sea area of the Indian and Pacific oceans, and the South China and Jawa Seas. The Jawa Sea is most active in marine traffic and fishery activities.

The tropical monsoon climate in the Jawa Sea is typically characterized by rainy and dry seasons. The rainy season lasts from November to March during the prevalence of the north-west monsoon. Wind force during the prevalence of the north-west monsoon is in the range of 2 to 4 (Beafort scale). However, squalls frequently attack during that period, with wind force reaching 6 to 7 (Beafort scale). Thus, wind direction tends to change suddenly, endangering small vessels. Generally, shallow sea areas tend to have high waves in spite of the small force of the wind.

The precipitation during the rainy season is three times that during the dry season, and the water level at ports and rivers changes greatly.

The dry season is from June to September during the prevalence of the south-east monsoon. The wind force during the prevalence of the south-east monsoon is in the range of 2 to 4 (Beafort scale), and is more stable than that during the north-west monsoon. In particular, the wind force from July to September is most stable.

2.2.2 Condition of Ports

Many major cities in Indonesia are located along rivers and coastlines, and naturally function as port cities. About 300 large and small ports are distributed centering around the Jawa Sea throughout Indonesia.

Roles of these ports are more and more important to transport personnel and necessary commodities in this archipelago nation with an expansive water area.

In particular, as several Five-year Development Plan proceeds, domestic distribution of commodities and trade amount have increased and the improvement of domestic and international sea routes is promoted. In recent years the importance of improving and developing ports is being recognized in harmony with the promotion of regional development, transmigration policy, and so on. On the other hand, in order to cope with the increasing amount of marine transport, improvement of a nationwide network of sea routes is planned to elevate the efficiency of marine transport in parallel with the improvement of the merchant fleet, and also the improvement of the function of each port is planned. In order to rationalize the complicated system of domestic sea routes and improve the efficiency of marine transport, a gateway system is used in the Fourth Five-year Development Plan. The four large ports of Belawan, Tanjung Priok, Surabaya (Tanjung Perak) and Ujung Pandang (Makassar) are selected as gateways to Indonesia to promote exports of commodities except oil. In addition to the above ports, 14 ports are selected as collector ports and 25 ports as trunk ports. Thus, 43 major ports are improved and developed.

2.2.3 Situation of Marine Transport

The shipping industry in Indonesia, especially domestic shipping, plays a vital role as the means of marine transport of daily necessities, foods and other products necessary for improving the living standard of the nation. In light of the importance of shipping policy, both domestic and international shipping sectors are strengthened. As a result, the quantity of freight transported is on the increase as a whole. The DGSC

has introduced a management information system (MIS) to correctly understand the situation of commodities' transportation, and provides centralized management of data on the movement of cargoes at each port.

(1) International Shipping

There are the following two types of international shipping service in Indonesia:

- Special international shipping: Transport of crude oil, cement, fertilizer and lumber by carriers
- General international shipping: Transport of other cargoes

(2) Domestic shipping

Domestic shipping in Indonesia is classified into the following five forms of services according to role, operation form, etc.

Regular Liner Service (RLS)
Local Service
Traditional Service
Pioneer Service
Special Service

These services link about 300 ports throughout the entire area of Indonesia, and play a vital role as means of transporting people as well as commodities.

2.2.4 Maritime Fishing Activities

Fishing industries in Indonesia are operated in the inner sea area and the surrounding sea areas of the Indian Ocean, etc.

(1) Fishing Boats

The number of fishing boats engaged in fishing industry in 1984 was 313,000. Out of this, the number of non-powered boats was 220,000, and the number of powered boats was only 93,000. The majority of such boats are small boats. Modernization of fishing boats and improvement of fishing methods, etc., are promoted to improve their performance.

As for the regional distribution of fishing boats, the percentage of powered fishing boats in the Surabaya and Jawa regions is high, and there are many large fishing boats in Bali, Maluku (Moluccas) and Irian Jaya which function as a base for inshore fishery.

(2) Fishing Grounds

Important sea areas as fishing grounds are the north coast of Jawa Island, northeast coast of Sumatra and southwest coast of Selawesi. These areas account for about 75% of both total catch and total production price. In particular, the Sumatra sea area is first, accounting for 30% of the total.

2.2.5 Other Marine Activities

(1) Marine Development

Other marine activities include development of ocean resources, e.g., oil-drilling activities at sea in this oil-producing country. Oil and gas fields are widely distributed over the entire area of Indonesia. The sea of central Sumatra and east Kalimantan, and the Jawa Sea are the most important oil-producing areas. The construction of numerous oil rigs and boring facilities in these sea areas is now underway.

Although these facilities have a bad influence on marine traffic, lights for these facilities play an important role in helping safe navigation of large and small vessels which navigate the sea area.

(2) Marine Leisure

Indonesia has a high potential for tourism and leisure development from the viewpoint of geographic and natural conditions. Facilities for yachts, motorboats, trawling boats, etc., will be improved through tourism-attracting policies and investment activity for the future. Further development of marine leisure is forecast.

2.2.6 Change in Ocean Environment and Problems

Marine transport, fishery and other marine activities in the archipelago nation play a vital role in maintaining and improving the living standard of the people. With the socio-economic development and advance of science and technology for the future, drastic changes in marine transport and fishing activities, ocean environment, etc., are considered.

(1) Marine Transport

Socio-economic development in the future will lead to an improved living standard of the people, and the amount of transporting commodities and people between islands will be increased, and strengthening of marine transport will become indispensable. For this reason, although construction of large-sized ships and their speedup are required, replacement of deteriorated ships for domestic service with new ones and modernization of sailing vessels are considered to be promoted urgently.

(2) Fishing Activities

As demand for fishing production increases in the future, the following are considered:

- Increase of construction of powered small fishing boats and large-sized boats
- Introduction of modern refrigerating technology
- Improvement of fishing grounds

The range of coastal fishery activity will become larger, and inshore tuna fishery in the sea 100 miles off the Indian Ocean will advance further into the ocean. These fishing activities are forecast to be more and more expansive.

(3) Other Marine Activities

As stated above, oil-drilling activity at sea is performed in the water area centering around the Jawa Sea, and this activity will continue. Also, further development of marine leisure is forecast from the aspect of geographic and natural conditions.

2.3 Marine Accidents

As for the situation of the occurrence of marine accidents, marine accidents tend to occur frequently mainly in the Jawa Sea where marine traffic is congested and the fishing industry is active. This can be summarized as follows:

(1) Occurrence of Marine Accidents by Type of Ship

According to the DGSC log books from 1982 to 1986, the total number of marine accidents which occurred during these five years was 1,781, and the cause of marine accidents was in order of 'sunk', 'collision' and 'stranding' if viewed from both category of ship and kind of marine accidents. The number of accidents by these three causes was 984, occupying the majority of the total. By category of ship, accidents happened in order of motorized sailing vessels, motor ships and cargo ships. The total number of marine accidents involving fishing boats during these five years was 142.

(2) Occurrence of Marine Accidents by Tonnage

As for the occurrence of marine accidents by tonnage from 1982 to 1986, the number of accidents by 100 G/T or less was 702, which was the highest. The number of accidents by 100 to 500 G/T was 693. Marine accidents by 500 G/T or less accounted for 78.3% of the total.

(3) Distribution of Marine Accidents

The marine accident-prone areas include the north coast of Jawa Island centering on the Jawa Sea, the sea area from around Jakarta Port to the Strait of Sunda, Surabaya Port and its environs, west Sumatra Island and Bangka Island, the Strait of Singapore and environs, Belawan Port and environs, east and south coasts of Kalimantan Island, and Ujung Pandang Port and environs. The tendency of marine accidents each year is nearly the same.

(4) Marine Accidents Involving Death and Missing Persons

The number of marine accidents involving death and missing persons during the past five years, which resulted from collision, stranding, flooding and capsizing, was 231, accounting for 13% of all accidents. The number of death and missing persons during the same period was 804. Death and missing persons caused by sinking and capsizing were conspicuous among them.

(5) Human Accidents, etc.

The term 'human accidents' means death or injuries resulting from falling into the sea, missing persons and accidents inside of ships. The number of human accidents during the past five years was 201. The number of such accidents by 500 G/T or less small ships was 155, accounting for 77.1% of the total.

The characteristic of human accidents is that human accidents by fishing boats accounted for 25% of the total human accidents, although accidents by fishing boats occupied only 8% of the total number of marine accidents. The number of marine accidents caused by fishing boats and motor ships has tended to increase during the past five years (in particular, this number sharply increased between 1985 to 1986).

The human accident-prone areas include Belawan Port and environs, the Strait of Singapore, the south coast of Bangka Island, Jakarta Port and environs, the north coast of Jawa Island, Surabaya Port, the central area of the Jawa Sea, and the east coast of Kalimantan Island.

(6) Marine Accident Forecast

Under the Indonesian geographic position, marine accidents tend to increase. In particular, marine accidents caused by 500 G/T or less small ships accounted for 78.3% of the total marine accidents. Human accidents by small ships occupied 77.1% of the total human accidents, which was an extremely high percentage.

By kind of marine accidents, the order of accident was sunk, collision, stranding, engine trouble, etc. Therefore, as the development plan proceeds for the future, replacement of deteriorated ships for domestic service with new ones and modernization of sailing vessels will be promoted to meet the increasing need of marine transport. In this case, the increase in the following accidents are forecast.

- Causing damage to hull parts and sinking through conversion of conventional sailing vessels to motorized ones

- Engine trouble, etc., which result from alternative replacement of sailing vessels to steel ones

On the other hand, if fishing boats are modernized and the range of fishing activity is expanded, it is forecast that marine accidents inevitably increase, and occur in more remotely and more widely dispersed places. In addition, it is foreseen that the increase in marine traffic causes a high possibility of increasing marine accidents and pollution caused by collisions involving ships and marine structures. The increase in human accidents resulting from activation of marine leisure is also forecast.

Accordingly, in order to provide for the security of human lives and ships on sea, the ocean environment related to these marine accidents should be thoroughly analyzed and examined, and necessary counterplans should be considered.

2.4 Basic Idea of Short-term Plan

The short-term plan is formulated considering the philosophy for marine safety, the ocean environment, the situation of marine accidents, socio-economic development and national policy, and international trends, based on the long-term plan.

The following items are proposed for the basic idea of short-term plan.

2.4.1 Collection and Processing of Marine Accident Information

The following are required to quickly and appropriately collect and process information on marine accidents caused by small vessels, which account for about 80% of the total.

(1) Setting up a system that enables disaster information from wrecked ships to be reported to coastal radio stations, etc.

(2) Developing a means to promptly report and process distress information

2.4.2 Rescue and Disaster Prevention

The following are needed to prevent ships and cargoes from disasters, as well as to save precious lives in the event of a marine accident.

(1) Setting up measures for promptly and surely saving lives, ships and cargoes involving marine accidents

(2) Setting up emergency procedures for the disaster caused by volcanic eruptions or high tide

(3) Establishing effective ways to prevent oil fires on ships and environmental pollution and ways for oil recovery in the event of such marine disasters

(4) Strengthening operations, control methods, and connections between organizations

2.4.3 Prevention of Marine Accidents

A harbour traffic control system should be established to assure safe entry into and departure of ships from major ports and harbours where marine accidents frequently occur. This system would provide effective shipping service and improve the function of ports and harbours.

2.4.4 Improvement of Efficiency for Processing Tasks

In order to cope with the diversified tasks, especially prompt processing of information on marine accidents, and to take proper countermeasures for rescue, it is necessary to establish a maritime safety training center (MSTC). In the training center, training should be conducted for relevant personnel, and research and development (R&D) in technologies of rescue and marine disaster prevention should be made.

(1) Training of newly recruited personnel and re-training of present personnel

(2) Training of special technologies related to rescue and disaster prevention

(3) R&D in special technologies and methodology related to rescue and disaster prevention

3 Search and Rescue System

3. 1 Development of Maritime Safety Rescue Ships

3. 2 Organizing of Special Rescue Teams and Research and Development for Rescue Technology

3. 3 Prevention of Marine Disasters

3. 4 Cost Estimation

Section 3 Search and Rescue System

As for the occurrence of marine accidents in Indonesia, marine accidents involving small vessels frequently occur, especially since Indonesia is an archipelago country, and a great number of human lives are lost. As the socio-economic situation develops in the future, accidents caused by domestic service ships and fishing vessels will occur more frequently, and the occurrence of marine accidents is forecast to expand and scatter.

Also, small and large oil tankers and LPG tankers frequently run through the sea area in Indonesia; an oil-producing country. It is said that the potential for marine accidents involving tankers is high. In addition, it may be necessary to tackle international SAR tasks in the future.

In view of the above, a SAR system in Indonesia should be immediately developed and strengthened. Taking into account the present situation of the existing insurance system, private salvage services, small business shipowners and so forth, it may be appropriate that SAR services for domestic service ships and fishing vessels are carried out under the responsibility of the Government of the Republic of Indonesia (hereinafter called the "Indonesian Government") to the possible extent.

As for disaster prevention at sea, natural disasters caused by volcanic eruptions or high waves, and fires at sea occurring as a result of the development of submarine oil fields and gas fields are forecast. Subsequently, an effective setup for the prevention of such disasters should be immediately improved.

In this respect, there is no doubt that lives, ships and cargoes involved in marine accidents and disasters should be quickly and surely saved. In order to assure security at sea in the sea area of Indonesia, the following are needed.

- Establishment of SAR system and marine disaster relief operation system
- Construction of maritime safety rescue ships
- Organizing of special rescue teams
- Promotion of R&D related to rescue technology

3.1 Development of Maritime Safety Rescue Ships

3.1.1 Maritime Safety Rescue Ships

Maritime safety rescue ships with long cruising range are required, because the occurrence of marine accidents will expand and widely scatter, the water area within each KANWIL is expansive, and the distance between an office and a neighboring office is very far.

The purpose of maritime safety rescue ships is to perform KPLP's duties. Therefore, it goes without saying that maritime safety rescue ships should save victims involved in marine accidents, in case that wrecked ships are capsized or sunk before a private salvage vessel arrives, and that they should also take emergency measures and offer first-aid rescue (lowering of stranded ships, prevention of ships from sinking, towing, etc.).

In the event that disasters such as drought, high tide, volcanic eruption, etc., occur on islands where are hard of access, maritime safety rescue ships should discharge such duties as marine transport of rescue teams and victims, and emergency transport of commodities for rescue.

In view of this, it would be desirable that maritime safety rescue ships be used for a variety of purposes, i.e., extinguishing fires on other ships, oil recovery work at sea, as well as saving of human lives from wrecked ships, towing of ships which become inoperative, lowering of stranded ships, etc. Maritime safety rescue ships should also be used for practice at sea in training courses of the maritime safety training center.

In particular, in headquarters locations that are within the jurisdiction of marine accident-prone sea areas, more than one maritime safety rescue ship could be dispatched at all times. The always ready system in this case is shown in Data 3.1 and Fig. A.3.1 of APPENDIX III. A development plan of maritime safety rescue ships is as follows:

Table 3.1.1 Number of Ships by Class to be Newly Constructed and Planned Base

Class	Number of Ships	Planned Base
Class I-A	3	Tg.Priok, Surabaya, Ujung Pandang
Class I-B	2	Tg.Uban, Belawan
Class II	2	Tg.Priok, Surabaya

Table 3.1.2 Particulars by Type of Ship

Particulars	Class		
	I-A	I-B	II
Operation area	All sea area	All sea area	All sea area
Cruising range	5,000 NM	3,000 NM	520 NM
Length	74 m	59 m	35 m
Width	10 m	8 m	6.3 m
Depth	5 m	4.5 m	3.4 m
Gross tonnage	1,000 ton	500 ton	100 ton
Main engine	1,500 PSx2	1,300 PSx2	2,400 PSx2
Speed	15 KT	15 KT	26 KT
Main equipment			
. Anti-rolling tank	Equipped	-	-
. Heliport	Equipped	-	-
. Chemical fire fighting equipment	Equipped	Equipped	-
. Towing equipment	Equipped	Equipped	-
Salvage tools	Equipped	Equipped	-
. Oil chemical dispersion equipment and material	Equipped	Equipped	Equipped

(i) Allocation plan of ships by class and planned bases is shown in Fig. 3.1.1.

(ii) Conceptual design of class of ship is shown in Figs. A.3.2 and A.3.3 of APPENDIX III.

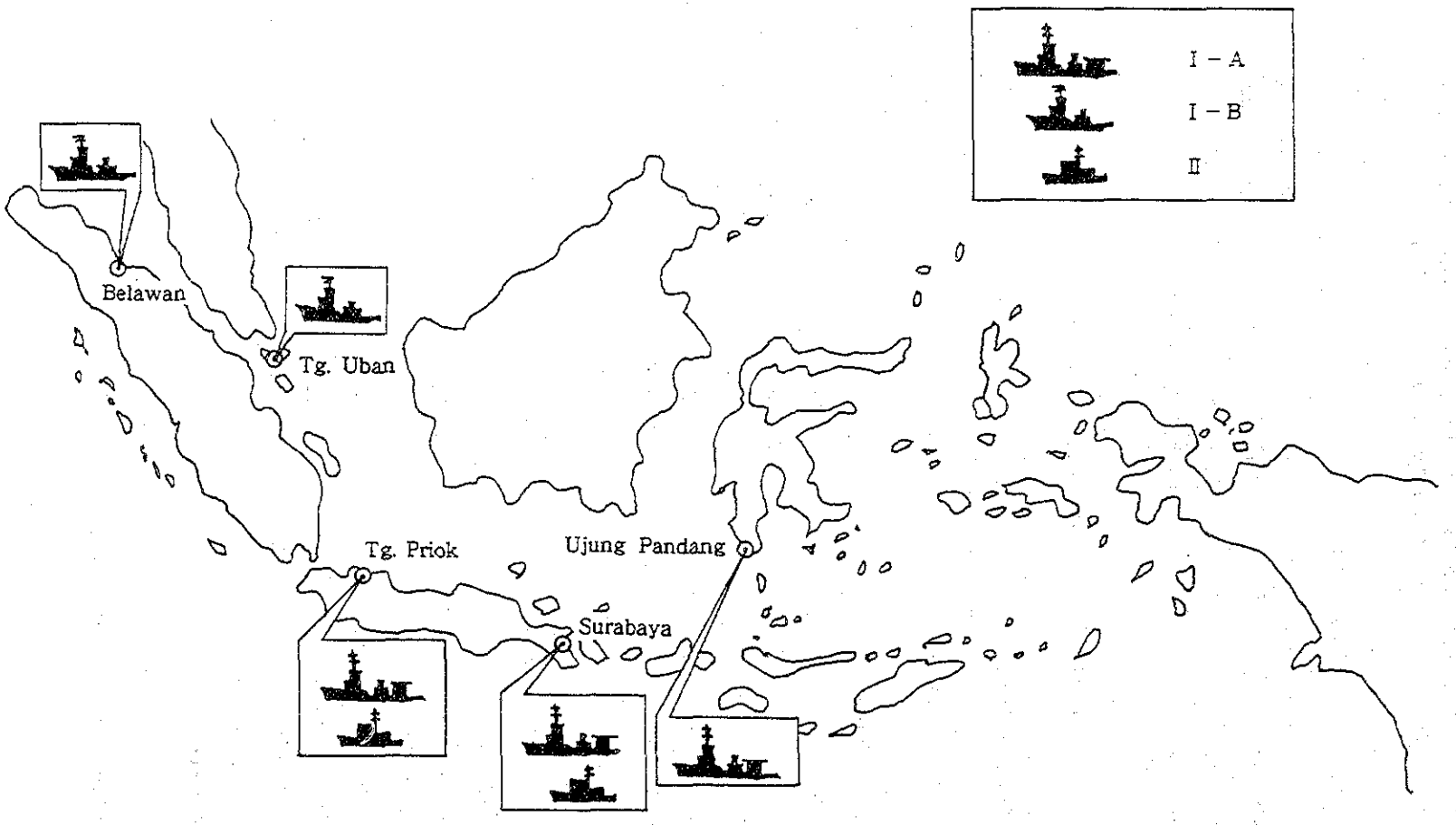

Fig. 3.1.1 Allocation Plan of Maritime Safety Rescue Ships and Planned Bases

3.1.2 Piers for Exclusive Use of Maritime Safety Rescue Ships

Each fleet uses a dedicated pier or public pier, however, each pier is located at the inner area within a port. Water depth around the piers is shallow, and the area around the piers is crowded with small vessels or barges. This is not suitable for mooring Class I-A and I-B ships. Subsequently, the following piers should be newly constructed at Tg.Priok, Surabaya, etc., where Class I-A and I-B ships are to be allocated.

Table 3.1.3 Dimensions of Piers and Planned Base of their Installation

Class	Length (m)	Width (m)	Deck Thickness (m)	Planned Base for Installation of Pier
I-A	95	6	0.25	Tg.Priok, Surabaya, Ujung Pandang
I-B	75	5	0.20	Tg.Uban, Belawan

3.2 Organizing of Special Rescue Teams and Research and Development for Rescue Technology

Considering characteristics of marine accidents occurring in Indonesia and in order to surely and effectively rescue from marine accidents as responsibility of the Indonesian Government, special rescue teams should be organized and the setup should be established in parallel with new construction of maritime safety rescue ships in such a way that teams could take immediate actions for the always ready system.

Considering the actual status of ships' passage, occurrence of major marine accidents, etc., bases for special rescue teams should be provided in Jakarta and Surabaya. Four teams (one team: five members) should be organized on each of the bases.

Because marine accidents by small vessels occur in number more than large vessel frequently and there are many accidents by capsizing and sinking, etc., causes for the occurrence of marine accidents should be analyzed, rescue methods and conduct of drills should be improved, and a prudent policy for rescue from marine accidents should be adopted. Special rescue

teams should be professionally trained at a specific training facility. An outline of special rescue team is as follows:

(1) Location of Allocation

Two locations of Jakarta and Surabaya

(2) Composition of Team

One team should consist of five members (one chief and four staff members) and four teams (20 persons) should be provided in one base, so that such team could take immediate actions for the always ready system.

(3) Arrangement Plan of Team Office

It is shown in Fig. A.3.4 of APPENDIX III.

3.3 Prevention of Marine Disasters

3.3.1 Base with Capacity for Disaster Prevention

To cope with marine disasters, bases with the capacity for disaster prevention should be allocated in the five places of Belawan, Tg.Uban, Tg.Priok, Surabaya and Ujung Pandang, considering bases where maritime safety rescue ships are to be allocated.

It is desirable that a marine disaster prevention unit consisting of maritime safety rescue ships, and equipment and materials for disaster prevention be installed in each of the above five bases.

3.3.2 Equipment and Materials for Disaster Prevention to be Provided on the Maritime Safety Rescue Ships

To cope with such situations as oil outflows from ships, fires on ships and natural disasters occurring in Indonesia, the following equipment and

materials should be provided on the maritime safety rescue ships. Marine disaster prevention personnel for maritime safety rescue ships should be professionally trained at a specific training facility to enable them to use the safety equipment provided.

Table 3.3.1 Equipment and Materials to be Provided by Class of Ship

Equipment and materials	Class		
	I-A	I-B	II
Oil boom	400 m	200 m	-
Chemical dispersant	2 kℓ	2 kℓ	-
Foam concentrate	2 kℓ	2 kℓ	-
Fire-fighting devices	30 sets	30 sets	10 sets
Handy oil recovery devices	10 sets	10 sets	5 sets
Safety devices for dangerous chemicals	3 sets	3 sets	2 sets
Gas indicators	2 sets	2 sets	2 sets

3.3.3 On-Shore Facilities

The following equipment and materials should be provided in each of the bases on shore.

Table 3.3.2 Equipment and Material to be Provided by Base

Equipment and materials for disaster prevention	Base				
	Belawan	Tg.Uban	Tg.Priok	Surabaya	Uj.Pandang
Oil boom	1,600 m	1,600 m	1,400 m	1,400 m	1,400 m
Oil skimmer	100 kℓ/hr x 1 unit 30 kℓ/hr x 1 unit	100 kℓ/hr x 1 unit 30 kℓ/hr x 1 unit	100 kℓ/hr x 1 unit 30 kℓ/hr x 1 unit	100 kℓ/hr x 1 unit 30 kℓ/hr x 1 unit	100 kℓ/hr x 1 unit 30 kℓ/hr x 1 unit
Chemical dispersant	68 kℓ	68 kℓ	68 kℓ	68 kℓ	68 kℓ

To store the equipment and materials, warehouses for equipment and materials used for disaster prevention should be constructed in each of bases. The outline of the warehouse is as follows:

- Wood prefabricated structure
- One-story
- Floorspace 80 m^2

3.4 Cost Estimation

Expenses required for improvement as the short-term plan are as follows:

Ships	Rp. 154,200 million
Piers	Rp. 492 million
Special rescue teams	Rp. 7,848 million
Equipment and materials for disaster prevention	Rp. 10,665 million

The breakdown of required expenses is presented in Data 3.2 of APPENDIX III.

4 Maritime Safety and SAR Communications and Information System

4. 1 System Proposed for Transmitting Rescue Information from Ships in Distress to Coastal Radio Stations

4. 2 System of Prompt Distribution and Processing of SAR Information by Coastal Radio Stations for Transmission of the Relevant SAR Organizations

4. 3 Network Links with Newly Planned Organizations

4. 4 Cost Estimation

Section 4 Maritime Safety and SAR Communications and Information System

Information on and communications for marine accidents, public communications and communications of other relevant services at DGSC, which is in charge of the maritime safety activities in the archipelago nation, are processed through the communications networks by high frequency and other frequencies.

However, the spread of radiocommunications installations on ships for domestic service among Indonesian flag ships except the International Convention ships is not sufficient, and therefore marine accidents of such ships occupy about 80% of the total number of marine accidents in Indonesia, and a great number of human lives and properties at sea are lost.

In light of this situation, it is effective and necessary that inexpensive and battery-operated EPIRBs (emergency position indicating radio beacons) as emergency communication equipment are to be installed on board such ships for domestic service. This is because the above ships are mostly owned by small shipowners, and it is difficult to secure power sources necessary for radiocommunications facility. An outline of the EPIRB is described in 4.1.1.

Presently, the DGSC's main coastal radio stations maintain watches on the international distress frequency of 2,182 kHz and have already been equipped with the direction finders, and therefore 2,182 kHz EPIRB will be suitable.

On the other hand, in order to promptly and effectively execute SAR operations upon receiving the information on marine accidents, and the information and the instruction on command and control should be promptly and punctually processed and distributed to the SAR organizations concerned. For this purpose, information processing capacity should be improved through introduction of a TTY message exchange system (MES) that is capable of transmitting written information, considering the existing facilities.

At the time when the new communications system is to be introduced, necessary training related to its maintenance and operation needs to be conducted appropriately to meet the requirements of new technology.

4.1 System Proposed for Transmitting Rescue Information from Ships in Distress to Coastal Radio Stations

4.1.1 Outline of System

An EPIRB, in case of an accident, is automatically floated free from a ship in distress to transmit distress alert signals. The DGSC's coastal radio stations and SAR ships receive the distress signals, identify the ships name and locate the position by direction finders. The EPIRB is proposed to install on ships to execute promptly and effectively SAR operations.

Basically shipowners should install EPIRBs to secure the safety of crew, hull and cargoes. However, it is proposed that the Indonesian Government promote for their wide use and provides collective management for installation of EPIRBs on ships due to the following reasons:

(1) There are many small and petty shipowners especially in domestic shipping.

(2) The name of a ship in distress may be promptly identified through the collective control and registration of the call sign of the EPIRB and name of the ship equipped with the EPIRB.

(3) The EPIRB should be periodically inspected so that it is surely operated in case of an emergency.

It is necessary in the system that the coastal radio stations, KPLP ships at sea, Navigasi ships and ships navigating Indonesian waters keep continuous watches on 2,182 kHz, and locate the position by direction finders in case where distress signals would be transmitted from the EPIRB so that SAR operation activities may be appropriately carried out.

4.1.2 Installation of EPIRB on Board

According to the DGSC data in 1984, the number of ships for domestic service that contributed to marine transportation between islands of Indonesia was 8,120. As regards the ships of 100 m^3 up to 850 m^3 out of these ships, the Decree of the Ministry of Communication of Indonesia (No. 18/AL.405/PHB-82 dated Dec. 16, 1982) stipulates that it is obligatory to install radiocommunications equipment covering the minimum range of 100 miles. However, the ships fitted on board with such radio equipment number only 1,555, according to the DGSC data in 1984.

Considering a great number of the accidents by ships for domestic service, the first priority needs to be given to the installation of the EPIRBs on board the ships as mentioned above. Radiocommunications facilities are not installed on 6,565 out of 8,120 domestic cargo ships.

Consequently, it is proposed that 6,600 EPIRBs be installed on such ships.

4.2 System of Prompt Distribution and Processing of SAR Information by Coastal Radio Stations for Transmission to Relevant SAR Organizations

4.2.1 Outline of System

The TTY message exchange system (MES) for promptly and accurately transmitting SAR information to SAR-related organizations consists of the main information exchange equipment and a number of TTY terminal equipment installed at the relevant offices.

The main information exchange equipment is an automatic exchange system that automatically receives data input through the TTY terminal equipment, and transmits them to the designated destinations by reading the destination data contained in the information.

In case of multiple destinations of a single message, the system is to simultaneously transmit data to the relevant destinations, and also has functions of data storage and automatic re-transmission of previous data upon request from terminal equipment, as well as notification of the operation to other terminals, display and notification of the number of data processed and so forth. The data will also be output in letter at the terminal equipment.

Automatic exchange of information with the radio networks will also become available through addition of optional devices to the transmitters and transceivers at coastal radio stations. The terminal equipment will be installed respectively at each KANWIL and KPLP/ADPEL, coastal radio stations, Meteo, KKR, and SKR in the individual KANWIL areas. The existing communications networks will be co-used for the links.

4.2.2 Establishment Plan of the MES

The MES will be established in eight KANWILs except KANWIL III in Jakarta, where the MES has already been planned at DGSC for the Jakarta area in the Maritime SAR Telecommunications System Project (F-TA-193).

The MES will be installed at either receiving stations or more suitable other places within the networks of a Command and Control System at all the KANWILs except the KANWIL in Jakarta to ensure more rapid flow of the Command, Control, Communication and Information system operation in the future.

4.3 Network Links with Newly Planned Organizations

The network links with the newly planned organizations, which is made in the short-term plan for organizational structure of the maritime safety and SAR, are described below:

4.3.1 Operations Office

SAR Operation Consoles will be installed at the operations offices, which are to be newly planned respectively at DGSC, KANWIL and KPLP/ADPEL, in order that they directly communicate by radio telephony with ships in distress, DGSC ships and other ships navigating nearby.

Reference should be made to "7.7 Cost Estimation" for the cost estimation.

4.3.2 Special Rescue Bases

The following communications facilities will be provided at the newly planned special rescue stations to secure firm and effective rescue operations.

Telephone device and TTY terminal equipment will be installed at each station to exchange information through the automatic direct dial telephones and TTY terminals. The cost estimation is given in "3.4 Cost Estimation."

4.3.3 Harbour Traffic Control System

The following communications function will be provided at newly planned harbour traffic control center in Surabaya area to effectively execute the control services.

Telephone device and TTY terminal equipment will be installed at the harbour traffic control center to exchange information through automatic direct dial telephone and TTY terminal.

The cost estimation is given in "5.7 Cost Estimation."

4.4 Cost Estimation

EPIRB	Rp. 1.9275 million x 6,600 units = Rp. 12,722 million
MES	Rp. 1,092.25 million x 8 areas = Rp. 8,738 million

5 Harbour Traffic Control System

5. 1 Necessity of Harbour Traffic Control in Surabaya

5. 2 Outline of Harbour Traffic Control System in Surabaya

5. 3 Organization

5. 4 Legal Measures and Others

5. 5 Design for Harbour Traffic Control System in Surabaya

5. 6 Site Selection

5. 7 Cost Estimation

Section 5 Harbour Traffic Control System

5.1 Necessity of Harbour Traffic Control in Surabaya

In order to meet the increasing demand of marine transport, transport efficiency is improved and the function of ports and harbours is improved. Furthermore, it is proposed that the introduction of a traffic control system suitable for each port of Surabaya, Belawan and Tg. Priok is necessary, as a result of the consideration of long-term measures to prevent marine accidents caused by the incoming and outgoing ships and to secure safe traffic in these major ports where the traffic volume of ships is large and marine accidents frequently occur.

Surabaya Port, among the above three ports, has been prosperous since ancient times as a gateway to the sea of east Indonesia. Incoming ships to Surabaya Port including 60,000 DWT class ships or larger ships numbered 9,169 per year as of 1986. In addition to that number, there are incoming and outgoing navy fleet, so that Surabaya Port is extremely congested. Because the West Channel, which is the only main route to enter or leave Surabaya Port, is very narrow and long (length: approx. 10 miles, minimum width: approx. 100 m), it is a dangerous spot for navigation, and the number of marine accidents occurring in Surabaya Port in the five years from 1982 to 1986 was 32. These accidents included collisions and strandings in the West Channel. In light of the present condition and future situation of Surabaya Port, a Harbour Traffic Control System should be urgently provided for centralized traffic control in the West Channel, so that safe traffic and smooth flow of marine traffic could be secured.

5.2 Outline of Harbour Traffic Control System in Surabaya

5.2.1 Traffic Control in the West Channel

The route from No. 5 buoy to No. 13 buoy in the West Channel will be designated as the controlling lane, because the possibility of the occurrence of accidents by collision and stranding is high at places where large ships pass each other in the West Channel. The expected time and date for entry into the channel should be previously notified from ships

of more than a specified tonnage to a harbour traffic control center, and a traffic control plan should be formulated in order that ships do not pass each other in the channel. Signals on entrance and exit of the controlling lane will be operated according to this plan. The traffic control center will give instructions to ships to go or stop in the controlling lane by use of these signals.

5.2.2 Information Services

(1) For safe and smooth flow of marine traffic in the congested Surabaya Port, the motion of ships will be surveilled by using radar and the following safety information will be provided to ships, shipping companies, shipping agents, pilots, etc., by means of VHF and SSB radios, pilot radios, public telephones, and the like, in parallel with 5.2.1 Traffic Control as described above.

A position-reporting line will be set up around the entrance of the West Channel, and the names of ships of more than a specified tonnage will be reported at the time such ships enter the West Channel. The names, tonnage, draft, etc. of ships will be registered in connection with the radar images.

- Present condition and pre-notice of signal board
- Present condition of ships navigating in the West Channel
- Present condition of dredging work in the West Channel
- Current depth of water in the West Channel and draft of ships that are able to navigate the West Channel
- Current status of anchored ships and indication of proper anchoring position.
- Giving warning to ships which are in dangerous conditions, to prevent collisions, strandings, etc.
- Situation of marine accidents
- Other information

(2) To take steps necessary for ships entering and leaving Surabaya Port and make arrangements, the following items will be relayed through VHF and SSB radios, pilot radios, and public telephones in such a way to communicate among ships, Perumpel, customshouse, immigration office, quarantine office, shipping companies/agents, etc.

- Making arrangements for pilots
- Making preparations for tugboats, supply of water and oil, etc.
- Making arrangements for berths
- Formalities related to customs, immigration and quarantine
- Other duties related to Port Administrator's jurisdiction

5.3 Organization

It may be appropriate that the traffic control center be organized under the direct control of the Port Administrator.

The following organization may be appropriate as a minimum.

Head	1 person	
Deputy Head	1 person	
Operations officers	12 persons	
(Traffic control planner	1 person	x 3 shifts = 3 persons
(Operations officer)	3 persons	x 3 shifts = 9 persons
Reserve personnel	3 persons	
Maintenance and repair staff	4 persons	
Total	21 persons	

5.4 Legal Measures and Others

(1) It is necessary to revise present laws, regulations and notifications related to traffic control. The following items are proposed to be included in the revision.

- Ships should report prescribed items to the traffic control center.
- Ships should follow instructions from the control center.

(2) For smooth operation of the traffic control center, specific training should be conducted for operations officers.

5.5 Design for Harbour Traffic Control System in Surabaya

(1) Radar Network

In order to discharge the duties of traffic control as described in 5.2, the motion of ships in the sea area sailing from the north side of the West Channel to Tg.Perak should be displayed in a high resolution radar to understand present conditions should be understood. A radar network consisting of the following is required.

- Radar facilities to be installed within the traffic control center
- Two radar facilities to be installed, one on the the Karang Jamuang Island and the other on the Madura Island
- A display unit that is capable of processing video information obtained through the above three radar facilities by using a radar data processor (RDP)
- Multiplex radio equipment that links each of the radar stations

The display unit will be installed in the center, and each radar station will be remotely controlled from the display unit. The high resolution radar should be installed as an on-land radar for controlling and monitoring marine traffic. Radar equipment should be equipped with a traffic data processor (TDP) and radar data processor (RDP), and an operations console having graphic display (GD) and character display (CD) should be used.

(2) Industrial Television (ITV)

It may be more effective in Tg.Perak, taking into account high traffic density presently available in the areas, that traffic situation be surveilled through obtaining information on the movements of incoming and outgoing ships in the anchorage areas and surrounding area.

An ITV camera will be installed on top of the traffic control center to monitor and surveille the traffic situations through a display in an operations room.

(3) Traffic Control Signal Boards

Signal boards for controlling the route from No. 5 buoy through No. 13 buoy in the West Channel will be provided around Karang Jamuang Island and Ug. Slempit Lighthouse on Madura Island, and marine traffic flow will be remotely controlled in the center through a link line.

The size of signal boards should be decided considering the visible distance from the sea area suitable for ships waiting to come to a stop.

(4) Links with Ships, Pilot Stations, Surabaya Radio Station, etc.

- VHF and SSB transceivers will be installed as the means of radiocommunications with ships. Transceivers and antenna will be provided in a radar station on Madura Island to control traffic flow in all areas of Surabaya Port. Traffic flow will be remotely controlled in the control center.

  VHF : channels 6, 8, 12, 14 and 16
  SSB : 2,182 kHz, 6,215.5 kHz
  and one working frequency

- A cable direct line will be provided among the control center, pilot station, prumpel, customshouse, immigration office and quarantine office to exchange information related to traffic control plans. The pilot station on Karang Jamuang Island will be linked via cable both with radar and signal stations.

- A communications cable line will be provided between the control center and Surabaya Radio Station to keep in touch with relative organizations.

- Subscribers telephone and FAX equipment will be used to link with shipping companies, agents, etc.

(5) Power Source

Commercial power source will be used for the control center, and uninterruptive power supply system (UPS) will be provided in the control center. Power sources for unmanned radar stations will be supplied by an UPS which is to be monitored and remotely controlled in the control center.

(6) Other Facilities

The following other facilities will be provided in the control center.

- Small-capacity private branch exchange
- Air-conditioning facility

5.6 Site Selection

(1) Traffic Control Center

Since the control center should have a close connection with pilots and port-related organizations as the nucleus for port traffic control, it may be appropriate to select the site for the control center around port administrator office in Tg. Perak. However, the site should be selected considering the following points:

- No hindrance to the propagation path of the existing micro line in the Surabaya Radio Station
- Securing of visibility to the West Channel from the site

The following rooms necessary for the control center are considered.

Directors room
Office room
Conference room
Operations room
Traffic control planning room
Machine room
Maintenance room

Sleeping room (three rooms)
Resting room (with kichenette)
Shower room
Room for coordination with relevant organizations
Waiting room
Air-conditioning room
Power supply room
Lavatory
Warehouse (including fuel)

Total floorspace required will be a minimum of 1,000 m^2.

(2) Radar and Signal Stations

(i) Karang Jamuang Radar and Signal Stations

The circumference of Karang Jamuang Island is approx. 1 km. The existing facilities on this small island include a steel tower lighthouse (height: 43 m), an antenna pole for a pilot VHF (height: 25m), a beacon station antenna (height: 45 m) and an attached station house. The location of the radar and signal station should be decided considering the following points:

- No interruption to the lighthouse coverage
- Minimizing of the influence on the function of the beacon station
- The visibility in the north-south direction in the West Channel should not be hindered by the existing buildings if the signal boards are installed.

Site area required is about 400 m^2.

(ii) Madura Radar and Signal Station

It may be appropriate to select the candidate site for this station around the Ug. Slempit Lighthouse on Madura Island, because there is no access road on the Jawa Island around the middle of the West Channel.

The site location should be decided considering the following points:

- No interruption to the lighthouse coverage
- Signal boards to be installed are not hindered by a lighthouse and trees when viewed from the navigation route.

5.7 Cost Estimation

Table 5.7.1 Cost Estimation of Surabaya Harbour Traffic Control Center

(Unit: Rp. million)

	Center	Radar St. (x2)	Total
Site	400 m^2 771	400 m^2 x 2 1,028	1,799
Facility	1,000 m^2 4,305	72 m^2 x 2 1,285	5,590
Equipment	12,940	10,190	23,130
Installation, Adjustment & Test	1,927	1,748	3,675
Spare Parts, Training & Miscellaneous	2,827	-	2,827
Total	22,770	14,251	37,021

6 Training System for Maritime Safety and SAR Personnel

6. 1 Tasks and Necessity for Training Maritime Safety Personnel

6. 2 Function of the Maritime Safety Training Center (MSTC)

6. 3 Training

6. 4 Plan of Facilities

6. 5 Administration and Management of the MSTC

6. 6 Time Schedule for Cultivating Maritime Safety Personnel

Section 6 Training System for Maritime Safety and SAR Personnel

6.1 Tasks and Necessity for Training Maritime Safety Personnel

In order to cope with the diversifying situation of society and changing marine environment in Indonesia with its expansive waters and precisely perform administrative affairs of the DGSC on the basis of the philosophy for maritime safety as described in 2.1, personnel who are engaged in these activities shall be secured and cultivated. Therefore, the necessity of improving the education and training system is recognized to cultivate DGSC-related personnel from the long-term viewpoint. Considering the present situation of cultivating seamen of the merchant marine institute, the trend of marine transport, social development plans and so on, those who received fundamental education (such as seamen education) shall be recruited and personnel suitable for DGSC's administrative affairs shall be trained. Also, the present personnel shall be re-trained to handle diversifying duties.

In order to perform rescue activities under severe conditions, special training shall be conducted for personnel engaged in these activities and Research and Development (R&D) of rescue technology shall be carried out in line with Sea Communication Manpower and Training Master Plan.

In view of this situation, it is suggested that a Maritime Safety Training Center (MSTC) having the following functions be urgently established in the DGSC and training be strongly promoted.

- Training of newly recruited personnel
- Re-training of present personnel
- Training of special technologies
- R&D related to special technology and methodology

6.2 Function of the MSTC

As the function of the MSTC is to secure and effectively cultivate well-qualified personnel for the posts of maritime safety personnel, the training of maritime safety personnel and special rescue teams and the R&D of rescue technology shall be the main object of the Center.

(1) Training for Developing and Improving Abilities in Conducting the Duties of Maritime Safety Personnel (General Training)

To cope with the complication and diversification of marine accidents in recent years and properly perform the international and expansive duties of maritime safety, it is necessary to cultivate the expertise and skill of newly recruited personnel and the present personnel, and develop and improve abilities for performing their duties.

(2) Special Technical Training for Special Rescue Teams, etc. (Special Training)

In addition to cultivating special rescue teams who are immediately dispatched to the accident spots, making full use of their highly developed knowledge and technology and performing rescue duties at the time of rescue when special rescue accidents such as flooding, capsizing, sinking, etc., occur, it is necessary to cultivate special technical personnel in each field related to SAR.

(3) R&D in the Technology of Maritime Safety (e.g., technology for SAR at sea)

To perform safely and effectively activities in SAR, cases of various marine accidents are investigated, and studies of rescue technology, improvement and development of required materials and equipment for rescue will be done.

6.3 Training

6.3.1 Outline of Training System

To improve the abilities of maritime safety personnel, both intensive training at the MSTC and on-the-job training at their work places will be performed. It is necessary to perform systematic training conforming to the practical front line administration.

In light of the present situation in Indonesia, the training system courses at the MSTC as shown in Table A.6.1 of APPENDIX VI may be appropriate.

(1) General Training

General training which aims at improving the abilities of maritime safety personnel to perform their duties is broadly divided into training of newly recruited personnel and re-training of the present personnel.

(i) Training of Newly Recruited Personnel

Fundamental training will be given to all newly recruited personnel of the DGSC for purposes that they can learn from experience the correct attitude as public service personnel, have proper knowledge of their obligations, and master the basic knowledge, skills, etc. necessary for performing the duties of maritime safety personnel.

(ii) Re-training

Re-training will be conducted for selected personnel for purposes that they can master a higher level of expertise and skill as maritime safety personnel. Re-trainees will be selected after they have finished the training course for newly recruited personnel and then have finished practical experience in the DGSC for several years.

(2) Special Training

Special training will be conducted for selected personnel in order to cultivate specially skilled personnel (e.g, technical knowledge of special rescue). Such personnel will be selected in consideration of their aptitude for the duties when occasions arise.

(3) R&D in Technology of Maritime Safety

The maritime safety duties cover widely specialized fields, and R&D in technology of maritime safety are indispensable to the improvement of efficiency and safety in performing duties. In particular, special cases

of marine accidents which have occurred so far will be analyzed, research will be done to identify the causes of accidents, and oil pollution, etc. will be analyzed. Incorporation of the results of research on rescue technology into the training courses will be useful for the maritime safety personnel to properly perform their duties.

(4) Life in the MSTC

As the duties performed at the DGSC are mostly related to shipping service, it is necessary to build up a closer relation with each section of the DGSC and develop their leadership, cooperativeness and positiveness necessary to serve as maritime safety personnel. In order to develop their abilities, all trainees are required to live in the dormitory of the MSTC during the training period. Further, practices on board a ship will be conducted by using rescue boats of directorate of Sea and Coast Guard. (Daily routine plan at the MSTC's dormitory is shown on Table A.6.2 of APPENDIX VI.)

6.3.2 Training Courses

At present, basic training courses to be conducted at the MSTC are suggested as follows:

(1) Training of Newly Recruited Personnel

(i)	Qualified personnel (Qualified personnel mean those with licenses as merchant marine officers, etc.)	(I)
(ii)	Unqualified personnel (This means unqualified personnel such as senior high school graduates without licenses as merchant marine officers, etc.)	(II)

(2) Re-training

(i)	Senior officer candidates	(III)

(3) Special Training

(i)	Special rescue	(IV-1)
(ii)	Rescue diving	(IV-2)
(iii)	Disaster prevention	(IV-3)
(iv)	Information communications	(IV-4)
(v)	Navigation aids	(IV-5)
(vi)	Harbour traffic control	(IV-6)

An outline of each training course is as follows:

(1) Newly Recruited Personnel Training

(i) Qualified personnel (I)

The newly recruited personnel with more than a senior high school diploma, a license as merchant marine officers, etc., will undergo this training course to master basic knowledge and skills necessary for performing the duties of maritime safety personnel. The training period is about six months.

The newly recruited university graduate personnel will also receive this training course for six months.

(ii) Unqualified personnel (II) (Refer to Table A.6.3 of APPENDIX VI for curricula.)

This training program will be conducted for the newly recruited personnel with senior high school diplomas to master the fundamental knowledge and skills necessary to perform duties as maritime safety personnel, and the specialized training will also be carried out for six months. The training period is one year.

The training, which was conducted so far at the DGSC, is systematized in this course. Specialized training related to information communications and navigation aids, etc., will be carried out. This training course will provide for a constant supply of maritime safety junior officers.

(2) Re-training

The re-training is divided into executive officer candidate training and senior officer candidate training for mastering a higher level of expertise and technical knowledge. However, now is the time to solidify the foundation of the maritime safety and rescue system, so it may be appropriate to select well-qualified personnel from each section of the DGSC and conduct a short-term training course for learning basic knowledge and skills related to the duties of maritime safety personnel.

(i) Senior Officer Candidate (III) (Refer to Table A.6.4 of APPENDIX VI for curricula.)

This tentative three-month training course will be designed for present personnel with more than senior high school education to learn fundamental knowledge and skills necessary for performing duties of the maritime safety personnel. This training period will be extended from about six months to one year in the future for the purpose of gaining more expertise and skill that are the base for promotion to a higher post.

(3) Special Training

This special training will be conducted to cultivate special technical personnel such as special rescue teams, etc. Well-qualified personnel will be selected from present personnel, and they will learn the latest and various kinds of special technology and technical knowledge within a short period.

(i) Special Rescue (IV-1) (Refer to Table A.6.5 of APPENDIX VI for curricula.)

This training course is provided to cultivate personnel requiring a high level of expertise and technology to cope with emergencies such as rescue of dangerous cargo-loaded ships, life saving from flooded or capsized ships or ships on fire. Various types of training related to being a ranger, diving, fire fighting, leakage prevention, handling of dangerous articles, and the like, are included in this training course.

(ii) Rescue Diving (IV-2)

The purpose of this training course is to develop personnel who are capable of coping with underwater rescue such as life saving, underwater SAR of wrecked ships, and investigation of the causes of marine accidents. Various types of training related to scuba diving, ship hull structure, ocean conditions, etc., will be conducted.

(iii) Disaster Prevention (IV-3)

The purpose of this course is to cultivate knowledge and skill about disaster prevention and specialized technical knowledge such as fire fighting on a ship on fire, prevention of and protection from oil spills and noxious liquid substances, as well as learning to cope with natural disasters such as tidal waves, volcanic eruptions, and disasters at sea such as collisions, stranding and fire of oil or chemical-tankers. Training related to disaster prevention setup, handling of equipment, fire fighting, oil recovery, etc., will be conducted. Analysis and experiments of spilled oil and the like will be carried out.

(iv) Information Communications (IV-4)

This training course is intended to cope with global trends such as establishment of distress and safety communications at sea especially since communications technology is making such rapid progress, and to cultivate specialized technical knowledge and skill about the collection of information on SAR and inter-communications with related organizations. Training related to communications technology, handling and maintenance of communications equipment, etc., will be conducted.

(v) Navigation Aids (IV-5)

This training course is designed to cultivate specialized knowledge and skills such as control and operation of navigation aids, development and construction of new navigation aids for acquiring knowledge about securing the safe navigation of ships and improved efficiency of shipping service. Training in various areas related to structure, mechanism, maintenance, design and production of navigation aids, etc., will be conducted.

(vi) Harbour Traffic Control (IV-6)

The purpose of this training course is to cultivate knowledge and skill about maritime traffic control in such a way as to guarantee safety and efficient operation of ships in a port area which is congested with ships. Various types of training related to maneuverability of ships, traffic laws and regulations, navigational equipment, port traffic control equipment, etc., will be given.

However, the training courses to be conducted at the MSTC are subject to change according to demands on the administration.

Therefore, it is recommended that training courses at the MSTC are not to be limited to the above mentioned courses but to open for all personnel of the DGSC according to the needs for the mission in the future.

6.3.3 Number of Trainees

The number of trainees is calculated on the basis of the number of employees of the DGSC employed in the past five years, the estimated number of employees to be recruited in the future, and the present number of employees. This calculation is made on condition that the total number of trainees is in the range of 200 to 250 and each class has classes of 20 to 40 trainees. However, a substantial number of trainees will be determined considering the number of personnel by occupation as annually required by the DGSC, and training period, etc.

Table 6.3.1 Number of Trainees

Training Course		Number of Trainees (persons)	Training Period (month)	Time of Training (time/ year)	Number of Personnel to be Trained (persons/ year)
Newly recruited personnel training	Qualified personnel (I)	40	6	1	40
	Unqualified personnel (II)	40	12	1	40