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NO. 7

THE MASTER PLAN ON THE DEVELOPMENT OF AIDS TO NAVIGATION SYSTEM IN THE REPUBLIC OF INDONESIA

OCTOBER 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

THE MASTER PLAN ON THE DEVELOPMENT OF AIDS TO NAVIGATION SYSTEM IN THE REPUBLIC OF INDONESIA OCTOBER 1985 (JICA)

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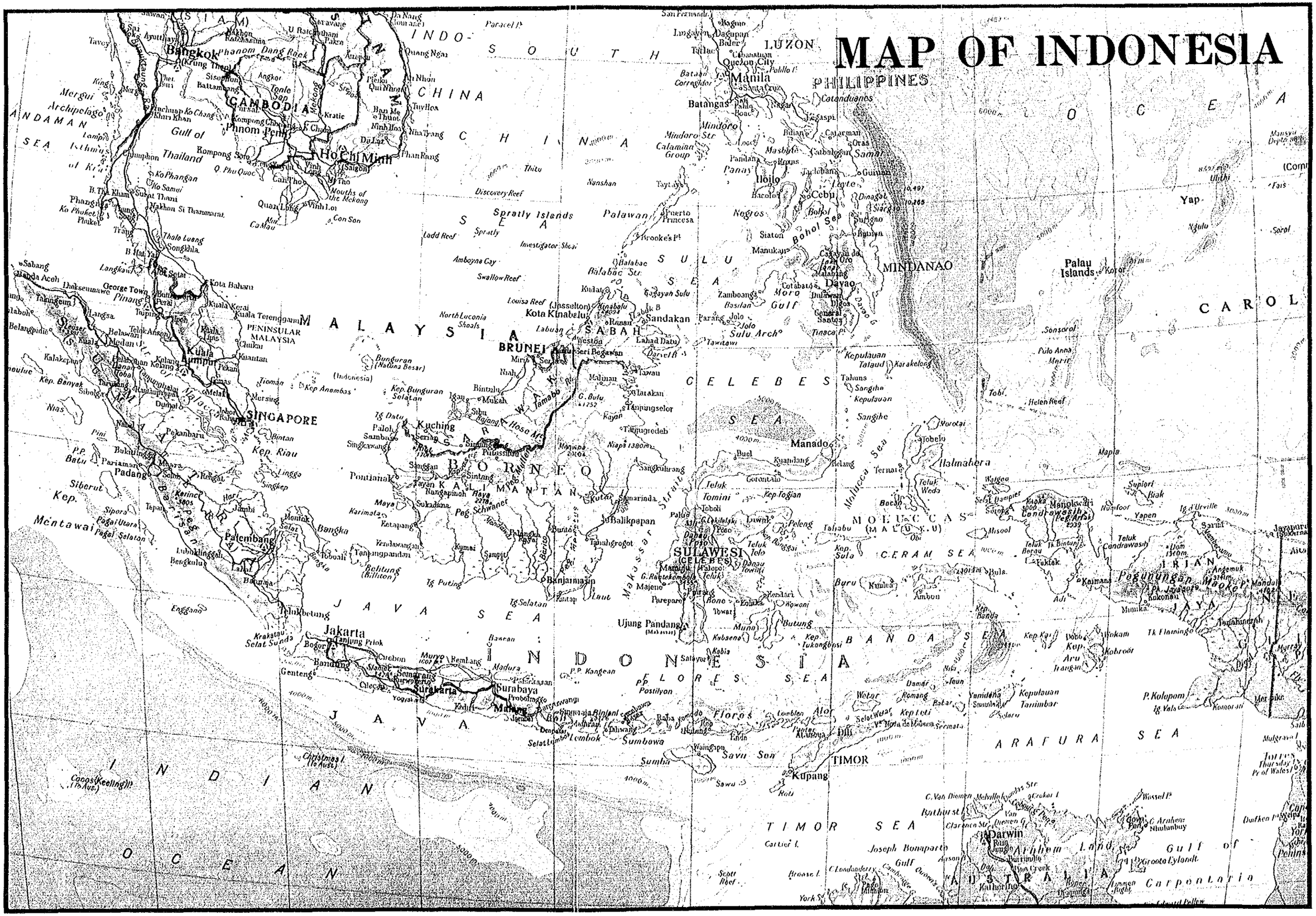
JAPAN INTERNATIONAL COOPERATION AGENCY

MAP OF INDONESIA



PREFACE

In response to the request of the Government of the Republic of Indonesia, the Japanese Government decided to conduct a study for the Master Plan on the Development of Aids to Navigation System in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Toshimasa Hitomi, Chief Director, Japan Association for Aids to Navigation four times in the period from 6 February, 1984 to 31 March, 1985 including the site survey carried out twice.

The team exchanged views on the Project with the officials concerned of the Government of Indonesia, and conducted a field survey throughout the country. After the team returned to Japan, further studies were made and the present report has been prepared.

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

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

October, 1985

Keisuke Arita

Keisuke Arita
President
Japan International
Cooperation Agency

October, 1985

Mr. Keisuke Arita
President
Japan International Cooperation
Agency
Tokyo, Japan

Dear Sir,

LETTER OF TRANSMITTAL

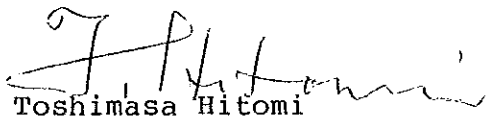
We have the pleasure of submitting to you herewith the final report on the Master Plan on the Development of Aids to Navigation System in the Republic of Indonesia.

The Study was conducted during the period from February 1984 to September 1985, including the field and site surveys carried out twice firstly from February to March 1984 and secondly in September, 1984.

The Study formulated the overall plan up to the year 2000 both for visual aids to navigation and for electronic aids to navigation, namely medium-wave radiobeacon and radar beacon stations, followed by the short term plan with the target year of 1988/89. We hope that the Study will serve as the base for future implementation of the project and accordingly contribute to further development of overall maritime sector projects in the Republic of Indonesia.

We wish to express our sincere gratitude to the officials of your Agency, Advisory Committee, the Embassy of Japan in Indonesia as well as to those concerned of the Government of the Republic of Indonesia for their kind assistance and cooperation extended to the Study Team.

Very truly yours,



Toshimasa Hitomi
Chief Director
Japan Association for Aids to
Navigation

Abbreviations

A:	A/C	Advisory Committee (MOT + MSA)
	A/T	Aids Tender
	ATN	Aids to Navigation
B:	BASARI	National Search and Rescue Board
	BASARNAS	National Search and Rescue Agency, Ministry of Communications
	BTKP	Maritime Safety Technological Center, DGSC
	BPLP	Port Education Training Center, DGSC
	BRT	Gross Registered Ton
	B/T	Buoy Tender
C:	C-C	Collector-Collector Ports
	C-T	Collector-Trunk Ports
D:	DF	Direction Finding or Direction Finder
	DGSC	Directorate General of Sea Communication
	DWT	Deadweight Ton
E:	E-G or EG	Engine Generator
F:	FRP	Fiberglass Reinforced Plastic
G:	G-C	Gateway-Collector Ports
	GDP	Gross Domestic Product
	G-G	Gateway-Gateway Ports
I:	IALA	International Association of Lighthouse Authorities
	I/B	Inspection Boat
	ILS	Integrated Liner Service

I:	ISTS	Integrated Sea Transport Study
	IW	Important Waters
J:	JANA	Japan Association for Aids to Navigation
K:	KANWIL	Regional Headquarters of Sea Communication
	KKR	Rescue Co-ordination Center, BASARNAS
	KPLP	Directorate of Sea and Coast Guard, DGSC
M:	MF	Medium Frequency
	MLL	Lighthouse (off shore)
	MOH	Sub-directorate of Maritime Occupational Health, DGSC
	MOT	Ministry of Transport, Government of Japan
	MS	Lighthouse (on land)
	MSA	Maritime Safety Agency, Japan
	MSTC	Maritime Safety Technological Center, DGSC
	MTBF	Mean Time Between Failures
	MW	Main Waters
N:	NAVAREA	World-wide Navigational Warning Service Areas
P:	P-P	Point to Point
	pp	Peak to Peak
R:	REPELITA	Five Year Development Plan
	RLB	Resilient Light Beacon
	RLS	Regular Liner Service
	ROS	Radio Operation Station
	RS	Light Beacon
	RX	Receiving or Receiver
S:	SAR	Search and Rescue
	SKR	Sub-rescue Co-ordination Center, BASARNAS

S:	SOLAS	International Convention for the Safety of Life at Sea
	ST	Study Team for JICA Study (JANA)
	S/V	Survey Vessel
T:	TX	Transmitting or Transmitter
V:	VHF	Very High Frequency
	VIW	Very Important Waters
	VTS	Vessel Traffic Services
W:	WAG	Wave Activated Generator
Y:	Y/V	Survey Vessel

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SUMMARY

SUMMARY

1. Background

Indonesia is a maritime nation comprising a large number of small to large islands scattered in the vast sea areas, and the shipping sector in the Republic of Indonesia plays a vital role for the development of national economy as well as social and industrial sectors.

The Government of the Republic of Indonesia has been proceeding with the development of maritime sector projects like port development, development of inter insular traffic routes and so forth on the basis of the long-term development plan established. Reflecting such implementation, the maritime activities in the waters have recently been on their remarkable increase.

For this reason, securing the navigation safety at sea is an urgent matter, and the materialization has already been underway, as a part of the overall maritime sector development, in the establishment of coastal radio stations network recently implemented and also in that of maritime search and rescue telecommunication system being implemented in the near future.

While on the other hand, SOLAS Convention 1974 to ensure the safety of life at sea came into force on May 25, 1980. In particular, it refers to undertaking of the establishment and maintenance of aids to navigation, including radiobeacons and other electronic aids as the volume of traffic justifies and the degree of risk requires.

The development of aids to navigation in Indonesia in the

past was carried out rather on a case demand basis. For the purpose of positioning it as an integral part of the maritime sector development plan, the Government of the Republic of Indonesia requested the Government of Japan to formulate a Masterplan on the Development of the Aids to Navigation in the Republic of Indonesia and the Short-term Plan based thereupon, and Japan International Cooperation Agency in response to the request, despatched a preliminary study team in July, 1983 to Indonesia. As a result, this Masterplan has now been prepared.

2. Field and Site Surveys and Meetings

The site and field surveys were carried out respectively for about one month firstly from 15th February to 14th March, 1984 and secondly from 2nd to 29th September, 1984. The former survey aimed at formulating a Master Plan with the latter for the purpose mainly of supplementing the first survey to establish the Short-term Plan.

Meetings, 1st and 2nd Interim and Final, were held between the study team and the officials concerned of the Government of the Republic of Indonesia to discuss the report.

3. Conclusion

3-1 Development and Improvement Plan

The development and improvement plan consists of the long-term and short-term plans. The long-term plan is targeted at the year of 2,000 and the short-term plan at 1988/89.

(1) Development Plan

1) Visual Aids to Navigation

The visual aids to navigation are planned according to the following:

- Lighthouses (on land) at landfalls, isolated islands, important sea traffic turning points, entrances to ports, etc. requiring the covering range of 20 nautical miles or over.

- Lighthouses (offshore) at critical navigation dangers in important traffic areas requiring long luminous range.

- Light beacons (on land) at similar locations to lighthouses except the locations where easy maintenance and control may be carried out from nearby Districts of Navigation, and also at breakwaters, jetties, islands, dangers, etc. within ports and harbours.

- Light beacons (dangers on land) at tiny islands, rocks in traffic routes or their vicinity.

- Light beacons (dangers offshore) at sunken dangers in traffic routes or their vicinity.

- Resilient light beacons at long approach channels to ports and entrances to narrow channels.

- Lighted buoys at entrances to approach channels and cardinal marks, dangers within port areas, etc.

The evaluation standards for priority implementation are established for the selection of visual aids to navigation to be projected in the short-term plan based on traffic routes, class of ports and so on, and the navaids having higher points evaluated are planned in the short-term.

The number of visual aids to navigation planned is as follows:

Development Plan for Visual Aids to Naviagation

(Unit: No. of Units)

Type of Aids \ Plan	Long-term Plan	Short-term Plan
Lighthouse (on land)	190 (35)	69 (35)
Lighthouse (offshore)	11	2
Light Beacon (including harbour lights)	335 (81)	131 (81)
Resilient Light Beacon	18	8
Lighted Buoy	350 (222)	249 (222)
Total	904 (338)	459 (338)

Notes: 1. The number of aids planned for short-term is included in that of long-term.
2. ( ) shows the on-going projects.

2) Electronic Aids to Navigation

The electronic aids to navigation are planned through general identification of the water areas defining Very Important Waters (VIW), Important Waters (IW) and Main Waters (MW) based primarily on the main

traffic routes, fishing grounds and records of marine casualties occurred.

Medium-wave radiobeacon stations are planned to provide the cross bearing coverages generally for VIW and the single bearing coverages for IW and MW with nearly 100% probability along main traffic routes. The implementation priority is given to provide the cross bearing in Jawa Sea and the singles in IW.

Rader beacon (Racon) stations are planned to be established to indicate main land falls, navigation dangers and turning points widely covering the whole VIW and IW areas, and the main landfalls and navigation dangers in the MW areas.

The short-term plan is established according to following:

The medium-wave radiobeacon stations are planned to provide the cross bearings over Jawa Sea, VIW and the single bearing coverages over IW like Makassar Strait, Flores Sea, etc. Radar beacon stations are planned primarily for Jawa Sea and its vicinity.

The number of electronic aids to navigation planned is as follows:

Development Plan for Electronic Aids to Navigation

(Unit: No. of Stations)

Type of Aids \ Plan	Long-term Plan	Short-term Plan
Medium-wave Radiobeacon Stations	39	17
Radar Beacon (Racon) Stations	67 (8)	28 (8)

Notes: 1. The number of aids planned for short-term is iucluded in that of long-term.

2. ( ) shows the on-going projects.

(2) Improvement Plan

The improvement plan is made for visual aids to navigation and supporting/logistic facilities.

1) Visual Aids to Navigation

The improvement plan for visual aids to navigation is made for the purpose of:

a. Improvement in luminous range
b. Group monitoring of buoys for improvement in maintenance
c. Electrification of navaids currently using propane gas as their energy source
d. Automatization of lighthouse

Improvement Plan for Visual Aids to Navigation

(Unit: No. of Navaids)

Plan / Type of Aids / Item	Long-term & Short-term Plans			
	Light-house	Light beacon	Lighted buoy	Total
a) Luminous Range Improvement	(3)* 14	(21)* 47	–	(24)* 61
b) Group Monitoring	–	–	(17)** 55	(17)* 55
c) Electrification	0	33	21	54
d) Automatization	3	–	–	3
Total	17	80	76	173

Notes: 1. The number of aids planned for short-term is included in that of long-term.

2. ( )* shows those included in the electrification plan.

2) Supporting/Logistic Facilities

The improvement plan for the supporting/logistic facilities is made for the Districts of Navigation for the purposes of:

a. Improvement in workshop, equipment, open storage, storehouse and jetty
b. Improvement in gas plan
c. Procurement of spare buoys and parts

The number of Districts of Navigation planned is as follows:

Improvement Plan for Supporting/Logistic Facilities

(Unit: No. of Districts of Navigation)

Type of Facility \ Plan	Long-term Plan	Short-term Plan
a) Workshop	17	11
Equipment	21	14
Open Storage	17	11
Storehouse	19	12
Jetty	16	7
Dry Dock	6	6
b) Gas Plant	1	1
c) Spare Buoys & Parts	4	4

Note: The number of aids planned for short-term is included in that of long-term.

(3) Cost Estimation

1) Long-term Plan

(Unit: US$ x 1,000)

Item \ Currency	Foreign Currency	Local Currency	Total Amount
(1) Development Plan	(46,462) 261,399	(8,408) 82,176	(54,870) 343,575
1) Visual Aids to Navigation	(44,707) 196,092	(8,207) 72,710	(52,914) 268,802
Lighthouse (on land)	(17,535) 95,190	(6,020) 32,880	(23,555) 127,870
Lighthouse (offshore)	18,282	27,577	45,859
Light Beacon	(13,608) 57,610	(2,187) 11,355	(15,795) 68,965
Resilient Light Beacon	3,510	1,098	4,808
Lighted Buoy	(13,564) 21,500	-	(13,564) 21,500
2) Electronic Aids to Navigation	(1,755) 65,307	(201) 9,466	(1,956) 74,773
MF Radiobeacon	50,698	7,797	58,495
Radar Beacon	(1,755) 14,609	(201) 1,669	(1,956) 16,278
(2) Improvement Plan	42,020	9,448	51,468
1) Visual Aids to Navigation	25,222	2,227	27,449
2) Supporting/Logistic	16,798	7,221	24,019
(3) Training	2,846	-	2,846
(4) Basic Design	2,750	-	2,750
(5) Consultancy	(2,788) 18,541	(504) 5,497	(3,292) 24,038
(6) Contingency	(4,646) 30,902	(841) 9,162	(5,487) 40,064
Total	(53,896) 358,458	(9,753) 106,283	(63,649) 464,741

Notes: 1. ( ) shows the on-going projects.

2. Exchange rate applied ... US$1 = ¥230.-

2) Short-term Plan

(Unit: US$ x 1,000)

Item \ Currency	Foreign Currency	Local Currency	Total Amount
(1) Development Plan	(46,462) 105,007	(8,408) 25,379	(54,870) 130,386
1) Visual Aids to Navigation	(44,707) 77,079	(8,207) 21,567	(52,914) 98,646
Lighthouse (on land)	(17,535) 34,569	(6,020) 11,868	(23,555) 46,437
Lighthouse (offshore)	3,324	5,014	8,338
Light Beacon	(13,608) 22,388	(2,187) 4,197	(15,795) 26,585
Resilient Light Beacon	1,560	488	2,048
Lighted Buoy	(13,564) 15,238	-	(13,564) 15,238
2) Electronic Aids to Navigation	(1,755) 27,928	(201) 3,812	(1,956) 31,740
MF Radiobeacon	22,049	3,151	25,200
Radar Beacon	(1,755) 5,879	(201) 661	(1,956) 6,540
(2) Improvement Plan	37,483	6,654	44,137
1) Visual Aids to Navigation	25,222	2,227	27,449
2) Supporting/Logistic	12,261	4,427	16,688
(3) Training	1,032	-	1,032
(4) Basic Design	500	-	500
(5) Consultancy (6%)	(2,788) 8,641	(504) 1,922	(3,292) 10,563
(6) Contingency (10%)	(4,646) 14,402	(841) 3,203	(5,487) 17,605
Total	(53,896) 167,065	(9,753) 37,158	(63,649) 204,223

Notes: 1. The short-term plan constitutes part of the long-term plan.

2. ( ) shows the on-going projects.

3. Exchange rate applied ... US$1 = ¥230.-

(4) Project Evaluation

The project evaluation is made for the Short-term Plan. The implementation of aids to navigation plans will provide a great number of small to large types of vessels, which will become increasingly active in Indonesian shipping and fishery in the future, with navigational guide for safe sea, and also with such primary effects as improvement in transportation capabilities due to efficiency in maritime traffic, improvement in fishery productivity, as well as decrease of human and cargo casualties and prevention of marine pollution due to possible decrease in marine accidents.

In addition, socio economic effects like development of national economy, equal leveling of social differences in local regions and so on will be indirectly brought about as a result of the development of navaids.

It is, however, difficult in general to make quantitative analysis on such effects. Accordingly, a trial estimate for 1988/89 is made in this report for the number of the strandings only, which are considered to be related to marine accidents caused possibly by aids to navigation, out of other casualties such as collisions, sunk, fire etc. based on the forecast in growth rate for GDP and fleet of both domestic and international shipping, making specific reference to the analyzed data on marine casualties recenty published by the Marine Accidents Inquiry Agencies, Ministry of Transport, Government of Japan.

According to the result obtained, it is estimated that the number each of strandings, human casualties of Indonesian flag vessels (powered) and loss of cargoes both in volume and value during the five years period up to the end of 1988 would increase about 53%, 52% and 53%

respectively, when the growth rate for both domestic and international shipping during the said period is assumed to be 8.9% with the understanding that the operational pattern of maritime activities in Indonesia may not be regarded some as that in Japan and also on the assumption that various factors constititing marine casualties would not vary in principle.

Prevention of marine casualties necessitates improvement in each factor concerned and their promotion on an overall basis. The development of aids to navigation is one of the important measures, and their suitable geographical allocation will make remarkable contribution to possible decrease in the number of strandings and play an important role in securing safe navigation, especially in preventing strandings among other accidents, although the effect to derive therefrom may not easily be evaluated in general way since the positioning of strandings in overall anti-accident countermeasures is considered to be difficult to assess.

Further to above, the development of aids to navigation will facilitate the most economical navigation during both day and night, and especially in the areas to be covered by electronic aids to navigation safe and effective navigation will become possible even under poor visibility conditions.

Thus, securing the navigational safety and safety of life together with improvement in traffic efficiency to be achieved as a result of the development of aids to navigation will be the most precious outcome beyond any other things.

3-2 Needs for Administrative and Maintenance Setup

The maintenance of the aids to navigation covering the vast sea areas of the Republic of Indonesia extending about 5,000 km east to west and about 2,000 km north to south is being carried out by the small number of twenty-four Districts of Navigation, giving the coasline length of 1,375 miles per each District of Navigation. This has caused to produce the present situations, under which efficient maintenance may not be conducted even for the routine services, and emergency services for immediate recovery of any failures are difficult to achieve.

For this reason, necessity exists for the establishment of effective administrative and maintenance setup as outlined below:

(1) 3rd Class District of Navigation and Operation Office

The establishment of twenty-seven (27) 3rd Class Districts of Navigation is proposed for the purposes of carring out quickest possible recovery of any failures of navaids and thus maintaining the reliable operation of aids to navigation.

Advice is also made that Operation Offices be established at main ports to function as support and supplementary sub-field units belonging to the 1st, 2nd and the proposed 3rd Districts of Navigation for the purpose of covering the maintenance of navaids in limited and navaids high density areas.

(2) Personnel Plan

The implementation of this study necessitates the increase in number of aids to navigation personnel, and

the personnel plan for every District of Navigation is worked out for the Short-term Plan taking into account the shift period, scheduled travel mintenance and assignment of expertise engineers. Mention is also made on the necessity of further building and improving the living quarters for aids to navigation personnel especially in local areas to implement the plan.

(3) Maintenance of Buoys

The deployment of the total buoy replacement maintenance system on a biannual basis is proposed to maintain the reliable and effective operational performances of lighted buoys.

A model study is made for the main bases located respecively at Dumai, Surabaya and Sorong detailing the buoy base associated facilities and work loads for buoy tenders and supply vessels.

3-3 Advice/Suggestions

(1) Aids to Navigation Service Vessels

The number of the aids to navigation service vessels to be required in 1988/1989 in calculated, as given below, based on the work loads and the proposed scrapping plan.

Approximate cost estimation is also made for the new buildings.

Item / Type of Vessel	No. of Vessels			Total No. of Vessels Required in 1988/89	No. of Vessels Required to be built by 1988/89
	Esist-ing	Setup by 1988/89	Balance in 1988/89		
Busy Tender	7	0	7	12	5
Supply Vessel	6	1	3	7	2
Aids Tender	50	27	23	31	8
Inspection Boat	22	22	0	9	9
Survey Vessel	1*	0	1	2	1
Survey Craft	4	0	4	4	0
Pile Pontoon	1	0	1	3	2
Total	91	50	41	68	27

(2) Training of Personnel

In order to cope with further development of aids to navigation and the modernization of equipment and facilities, a recommendation is made to establish a training center for the personnel to be in charge of the maintenance and operation of navaids. It is further recommended that consideration be given to set up educational facilities like the Maritime Safety School in Japan and that the above center be incorporated into the School at the time of the latter's implementation.

To meet the requirement for the personnel demands at least on a provisional basis, overseas training is proposed for the personnel currently in charge. At-site training by technical experts from overseas is also suggested,

(3) Management Maintenance, and Operation Setup

Suggestions are made on the reinforcement and improvement of management, maintenance and operation setup through:

a. Establishment of maintenance/checking standards and supply of spares
b. Shortening in itinerary maintenance intervals
c. Improvement in organizational setup and facilities installed at Districts of Navigation
d. Arrangement for monitoring of aids to navigation

(4) Distribution Plan for Medium-wave Radiobeacon Receivers

An advice is made that a subsidizing or loan system be adopted for possible maximum expansion of the users together with systmatically organized way of propagands.

1. INTRODUCTION

1. INTRODUCTION

1-1 General

In order to secure the safety of maritime navigation to meet the recent development in shipping and other maritime activities in Indonesia, the Government of the Republic of Indonesia has requested the Government of Japan to carry out the Study on a Master Plan for the Development plan of Aids to Navigation in Indonesia.

In response to the request, it was decided that Japan International Cooperation Agency, which is the official agency responsible for implementing technical cooperation program, would carry out the Study.

The Study has been carried out with understanding that these projects shall not affect the international navigation regime.

1-2 Objectives of Study

The objectives of study are to draw up a Master Plan for long term development of both visual aids to navigation and the radio navigation aids of medium-wave radiobeacon stations and microwave radar beacon (racon) stations in Indonesia with the target year of 2,000. The development plan will include the supporting sub-system.

On the basis of the above Master Plan, a Short Term Plan is to be formulated, making particular reference to the target year of 1988/89.

The plans are to secure safety of, in particular, inter-islands shipping and fishing activities in Indonesian waters.

1-3 Background of Study

Indonesia is a maritime country composed of five major islands and a large number of scattered islands in the vast sea areas extending approximately 5,000 km from east to west and approximately 2,000 km from north to south, and one of the largest maritime nations in the world lying between the two oceans and the two continents.

Reflecting the recent growth in economic, social and industrial sectors in the Republic of Indonesia, maritime traffic of large vessels passing through as well as inter-insular and local shipping are increasing conspicuously year by year, and thus uphill demand exists for provision of substantial coverages by visual and electronic aids to navigation.

SOLAS Convention of 1974 to ensure the safety of life at sea came into force on May 25, 1980. In particular, it refers to the establishment and maintenance of aids to navigation, including radiobeacons and other electronic aids as the volume of traffic justifies and the degree of risk requires.

SAR Convention providing for search and rescue in case of sea distress came into force in June, 1985.

The Government of Japan, in response to the request by the Government of Republic of Indonesia, dispatched a preliminary survey team to Indonesia in July, 1983. As a result, it was agreed the Study would be carried out to make the Master Plan referred to in Section 1-2 above as well as to formulate a Short Term implementation Plan being fitted in the frame of the fourth Five Year

Development Plan (REPELITA IV) including an analysis of project evaluation.

The first field and site surveys were carried out by the study team despatched from Japan for the period of about one and half months from 6th February through to 21st March 1984 covering nearly entire nation, in order to obtain the data and information required for formulating a Master Plan.

The second field and site surveys were also supplementarily conducted for the period of about a month from 1st to 29th September, 1984 to collect additional data and information necessary for establishing a Short Term Plan.

1-4 Basic Philosophy of Study

Indonesia is the world's largest maritime nation covering: -

Sea and water areas	3.64 million km^2
Land area	1.56 million km^2
Number of islands	13,579
Length of coast line	33,017 nautical miles

Hence, the strengthening of maritime transport power constitutes one of the urgent necessities. Especially for steady growth of Indonesian economy, the improvement of sea transport capability is the prime requisite. It depends a great deal upon development of ports and harbours along with the improvement in shipping sector, and also upon the development of the aids to navigation as well as maritime telecommunication network. As the maritime activities grow, the need for aids to navigation is bound to increase rapidly.

A Master Plan shall be formulated for the target year of 2000 covering the establishment of aids to navigation, aiming at securing the safety of life and property at sea and promoting the efficiency of sea transportation and other maritime activities in the Republic of Indonesia, from a long term stand point of inheriting the assets to the next generation.

The understanding of the vital necessity for developing the aids to navigation on a step-by-step basis directs us to consider that the period up to 2000 may not necessarily be long enough to be sufficed.

It is, therefore, in this point that the real necessity is found to examine the long-term vision to establish the Master Plan.

1-5 Geographical Area of Study

The geographical areas covered by the Study is the entire areas of the Republic of Indonesia including water areas.

1-6 Organization of Study Team

The Study Team despatched by the Government of Japan and the Indonesian counterpart personnel are respectively listed in **Table 1-6/1** and **Table 1-6/2.**

The composition of Japanese Study Team is summarized in **Table 1-6/3,** followed by a list of the Indonesian counterpart personnel participated in the field and site surveys as given in **Table 1-6/4.**

Table 1-6/1 Members of Japanese Study Team

Mr. Yoshio YAMAKOSHI	Director, Electronic Aids to Navigation Division, Aids to Navigation Department, Maritime Safety Agency (MSA)
Mr. Shojiro MIYANAGA	Senior Officer for International Shipping, International Transport and Tourism Bureau, Ministry of Transport (MOT)
Mr. Sadao SAITO	Deputy Director International Affairs Division Administration Department, MSA
Mr. Masamitsu KOBAYASHI	Senior Electronic Aids to Navigation Officer Electronic Aids to Navigation Division Aids to Navigation Department
Mr. Yasunobu FUKUDA	Chief, International Co-operation Section International Affairs Division Administration Department, MSA
Mr. Kunitoshi YAMAKOSHI	Chief, Research Section Administration Division Aids to Navigation Department, MSA
Mr. Hiroyuki KOSEKI	Chief, Operation Management Section Administration Division Aids to Navigation Department, MSA
Mr. Seishiro CHUJYO	Aids to Navigation Engineering Officer Engineering Division Aids to Navigation Department, MSA
Mr. Toshimasa HITOMI	Chief Director Japan Association for Aids to Navigation (JANA)
Mr. Ryozo KORA	Chief, Visual Aids Department, JANA
Mr. Junzo YOKOYAMA	Chief Researcher, Visual Aids Department, JANA

Mr. Yasuo SASAKI	Chief Researcher, Visual Aids Department, JANA
Mr. Ryoichi OTANI	Chief Researcher, Visual Aids Department, JANA
Mr. Kazuhiro WATANABE	Chief Researcher, Visual Aids Department, JANA
Mr. Makoto NIKAIDO	Deputy Chief, Electronic Aids Department, JANA
Mr. Minoru KUBOTA	Chief Researcher, Electronic Aids Department, JANA
Mr. Yasunobu YAMANE	Chief Researcher, Electronic Aids Department, JANA
Mr. Shozo KUWANO	Chief Researcher, Electronic Aids Department, JANA
Mr. Terushi KOYANAGI	Chief Researcher, Electronic Aids Department, JANA
Mr. Akira TAKAHASHI	Advisor Project Evaluation, JANA
Mr. Tadami HOSOMI	Advisor Shipping Economy, JANA
Mr. Kinjiro AOKI	Advisor Shipping Economy, JANA
Mr. Shoji SHIMBO	Director, First Development Survey Division, Social Development Cooperation Department, JICA
Mr. Susumu NARUSE	Coordinator Social Development Cooperation Department Japan International Cooperation Agency (JICA)
Mr. Osamu WAKATSUKI	Coordinator Social Development Cooperation Department, JICA
Mr. Hisamitsu NISHIO	JICA Jakarta Office

Table 1-6/2 Indonesian Counterpart Personnel

Captain SOEGIARTO	(Former) Head of Directorate of Navigation
Mr. S.H. SAMPELAN	Head of Directorate of Navigation
Mr. DEWATA	Secretary of Directorate of Navigation
Captain R. SOEMARJONO	Chief of Marine Safety Technological Center
Mr. R. SOEMARSONO	Sub Directorate of Maritime Telecommunication and Electronics
Mr. KATAMUSI NURRASA	Sub Directorate of Engineering and Maintenance of Vessels
Captain SOEMADI	Sub Directorate of State Vessels
Captain T. WALLA	Chief of Aids to Navigation, Operation Section
Mr. ROMZANA	Staff - Sub Directorate of Aids to Navigation and Coastal Lighting
Ir. RACHMAD	Staff - Sub Directorate of Engineering and Maintenance of Vessels
Dr. IRENE MANURUNG MPH	Sub Directorate of Maritime Occupational Health
Mr. NISFAN	Staff, Directorate of Navigation
Ir. MAKSUD MALEWA	Staff, Directorate of Navigation
Drs. SOENARDI B.	Staff - Secretary of Directorate of Navigation
Mr. D.J.M. MANUPUTTI	Staff
Mr. H. ROSYIDI	Staff
Mr. I. WAYAN KASTA	Staff
Mr. GDE RAI SUKANADI*	Staff
Captain A. SUBARI*	Staff
Mr. HIROSHI UMAYAHARA	JICA EXPERT

Mr. Sahidi	Survey Counterpart
Mr. D. Karel	Survey Counterpart
Mr. Mardowo	Survey Counterpart
Capt. M. Taslim	Survey Counterpart
Mr. Maksum	Survey Counterpart
Mr. Amin	Survey Counterpart
Drs. Ramly Darmawiredja	Survey Counterpart

Note : * also participated as Survey Counterpart

Table 1-6/3 Summary of Japanese Study Team Composition

Item / Name \ Period	1st Survey	2nd Survey & Interim Report (I)	Interim Report (II)	Final Draft Report
	Feb 6 - Mar 21, 84	Aug 22 - Oct 7, 84	Dec 18 - 26, 84	Mar 24 - 31, 85
Mr. Y. YAMAKOSHI	o *	o *		o
Mr. S. MIYANAGA	o **		o	
Mr. S. SAITO		o **		
Mr. M. KOBAYASHI	o I	o *		
Mr. Y. FUKUDA	o IV		o	o
Mr. K. YAMAKOSHI	o II			
Mr. H. KOSEKI		o II		
Mr. S. CHUJYO	o III	o I	o	
Mr. T. HITOMI	o * o **	o * o **	o	o
Mr. R. KORA	o III		o	o
Mr. J. YOKOYAMA	o II	o IV		
Mr. Y. SASAKI	o I	o III		
Mr. R. OTANI	o IV	o II		
Mr. K. WATANABE		o IV		
Mr. M. NIKAIDO	o IV	o III	o	o

Item / Name	1st Survey	2nd Survey & Interim Report (I)	Interim Report (II)	Final Draft Report
Period	Feb 6 - Mar 21, 84	Aug 22 - Oct 7, 84	Dec 18 - 26, 84	Mar 24 - 31, 85
Mr. M. KUBOTA	o I	o I		
Mr. Y. YAMANE	o III	o III	o	
Mr. S. KUWANO	o II			
Mr. T. KOYANAGI		o IV		
Mr. A. TAKAHASHI	o V	o **		o
Mr. T. HOSOMI	o V			
Mr. K. AOKI		o *	o	
Mr. S. NARUSE	o *, **			
Mr. O. WAKATSUKI		o *	o	o
Mr. S. SHIMBO				o
Mr. H. NISHIO		o	o	o

Notes 1) * participated during the early part of survey only
2) ** participated during the last part of survey only
3) I-V describe the group number of Field and Site Surveys,
i.e. 1st Survey comprised five groups.
2nd Survey comprised four groups.

Table 1-6/4 List of Indonesian Participants in Field and Site Surveys

Survey / Name	1st Survey	2nd Survey
Mr. Sahidi	o I	o IV
Mr. D. Karel	o I	o IV
Capt. A. Subari	o II	o I
Mr. Mardowo	o II	o II
Mr. Gde Rai Sukanadi	o III	o III
Capt. M. Taslim	o III	
Mr. Maksum	o IV	
Mr. Amin	o IV	
Drs. Ramly Darmawiredja	o V	

Notes: I - V describe the group number of Field and Site Surveys
i.e. 1st Survey composed five groups
2nd Survey composed four groups

1-7 Itinerary of Survey

The site and field surveys were carried out, firstly by the five groups aiming at formulating a Master Plan, and secondly for the four groups for the purpose mainly of supplementing the first survey in order to establish a Short Term Plan.

1-7-1 1st Field and Site Survey

In addition to a number of meetings held at the Headquarters of DGSC pertaining to the present status of aids to navigation and the proposed surveys therefor, the field and site surveys were carried out by the five groups in accordance with the pre-established schedule for the period of 15th February through to 14th March, 1984.

The overall itinerary of study team is as follows:

No.	Date	Day	Item	Description
1	Feb. 6	Mon	Tokyo Jakarta	
2	7	Tue	Meeting at Japanese Embassy and JICA office	Discussion
3	8	Wed	Meeting at DGSC	Presentation of Inception Report and Survey Schedule
4	9	Thu	Ditto	Meeting with counterpart personnel
5	10	Fri	AM Ditto PM A/C & ST Leaders to Ujung Pandang	Finalization of Survey Schedule
6	11	Sat	Survey at Tg. Priok (A/C & ST Leaders: field survey at Ujung Pandang)	Collection of general information

No.	Date	Day	Item	Description
7	12	Sun	(A/C & ST Leaders returns to Jakarta)	Collection of general information
8	13	Mon	Meeting	Collection of data
9	14	Tue	Meeting (A/C Leader returns to Tokyo)	Collection of data
10	15	Wed	Survey Groups I-IV depart for Site and Field Surveys (ST Leader joins Survey Goup I)	
11	16	Thu		
12	17	Fri		
13	18	Sat		
14	19	Sun	Members of Survey Group V Tokyo to Jakarta (ST Leader returns to Jakarta)	
15	20	Mon	(ST Leader returns to Tokyo)	
16	21	Tue		
17	22	Wed		
18	23	Thu		
19	24	Fri		
20	25	Sat		
21	26	Sun		
22	27	Mon		
23	28	Tue	Survey Group V departs for field survey	
24	29	Wed		
25	Mar. 1	Thu		
26	2	Fri		

No.	Date	Day	Item	Description
27	3	Sat		
28	4	Sun		
29	5	Mon		
30	6	Tue		
31	7	Wed		
32	8	Thu		
33	9	Fri	Survey Group V returns to Jakarta	
34	10	Sat		
35	11	Sun		
36	12	Mon	(Arrival of a A/C member)	
37	13	Tue	Survey Groups I-IV returns to Jakarta	
38	14	Wed	Study on the survey results	
39	15	Thu	Ditto	
40	16	Fri	Meeting with DGSC	
41	17	Sat	Study on the survey results	
42	18	Sun	Ditto	
43	19	Mon	Submission of the progress report	
44	20	Tue	Report to Japanese Embassy and JICA office	
45	21	Wed	Jakarta to Tokyo	

Notes:

A/C .....Advisory Committee (MOT + MSA)
ST ..... Study Team (JANA)

The local offices and facilities of DGSC and other places visited by the field and site survey groups are listed in **APPENDIX 1.**

1-7-2 1st Interim Meeting

Meetings were held in Jakarta from 24th to 27th August, 1984 between the Directorate General of Sea Communication and the Japanese Study Team, led by Mr. Y. YAMAKOSHI, to discuss the Interim Report (I), containing the Master Plan, prepared by the Japanese Study Team.

1-7-3 2nd Field and Site Survey

Further to the 1st field and site surveys carried out for formulating a master plan, supplemental field and site surveys were conducted by the four groups for the period of 1st to 29th September, 1984 subsequent to the meetings held at the Headquarters of Director General of Sea Communication on the survey schedule to collect additional data necessary for establishing a Short Term Development Plan.

The overall itinerary of 2nd survey team is as follows:

No.	Date	Day	Item	Description
1	Aug. 22	Wed	Tokyo to Jakarta (Arrival of A/C & ST Leaders)	
2	23	Thu	Meeting at Japanese Embassy and JICA office	
3	24	Fri	Meeting at DGSC	Submission of Interim Report (I)
4	25	Sat	Ditto	Discussions on Interim Report (I)

No.	Date	Day	Item	Description
5	26	Sun	Tokyo to Jakarta (Arrival of A/C & ST members)	
6	27	Mon	Meeting at DGSC	Discussions on Interim Report (I)
7	28	Tue	Meeting at DGSC	Discussions on Interim Report and Survey Schedule
8	29	Wed	Ditto (A/C & ST Leaders to Medan)	Meeting with Counterpart personnel
9	30	Thu	Ditto (A/C & ST Leaders: field survey at Belawan Port)	Meeting with Counterpart Personnel
10	31	Fri	Meeting at DGSC Survey at Tg. Priok (A/C & ST Leaders return to Jakarta)	Discussions on DGSC existing plans
11	Sep. 1	Sat	(A/C & ST Leaders and ST member return to Tokyo)	
12	2	Sun	Survey Groups III & IV depart for Site and Field Surveys	
13	3	Mon		
14	4	Tue	Survey Groups I & II depart for Field Survey	
15	5	Wed		
16	6	Thu		
17	7	Fri		
18	8	Sat		
19	9	Sun		
20	10	Mon		
21	11	Tue		

No.	Date	Day	Item	Description
22	12	Wed		
23	13	Thu		
24	14	Fri		
25	15	Sat		
26	16	Sun		
27	17	Mon		
28	18	Tue		
29	19	Wed		
30	20	Thu		
31	21	Fri		
32	22	Sat		
33	23	Sun		
34	24	Mon		
35	25	Tue		
36	26	Wed	Survey Group II return to Jakarta	
37	27	Thu		
38	28	Fri	Survey Group I & IV return to Jakarta	
39	29	Sat	Survey Group III return to Jakarta	
40	30	Sun	(Arrival of ST members)	
41	Oct. 1	Mon	Study on the survey results (Arrival of A/C members)	
42	2	Tue	Ditto	
43	3	Wed	Ditto	
44	4	Thu	Meeting at DGSC	
45	5	Fri	Submission of the Progress Report (II)	

No.	Date	Day	Item	Description
			(A/C & ST members return to Tokyo) Report to Japanese Embassy and JICA office	
46	6	Sat	(A/C & ST Leaders return to Tokyo)	
47	7	Sun	(ST members return to Tokyo)	

Notes: A/C: Advisory Committee (MOT + MSA)

ST: Study Team (JANA)

1-7-4 2nd Interim Meeting

Meetings were held in Jakarta from 19th to 24th December, 1984 between the Directorate General of Sea Communication and the Japanese Study Team, led by Mr. S. MIYANAGA, to discuss the Interim Report (II), containing the Short Term Plan, prepared by the Japanese Study Team.

1-7-5 Final Meeting

Meetings were held in Jakarta from 25th to 30th March, 1985 between the Directorate General of Sea Communication and the Japanese Study Team, led by Mr. Y. YAMAKOSHI, to discuss the Draft Final Report prepared by the Japanese Study Team.

1-8 Methodology of Survey

The methodology applied for the survey is summarized as follows:

1-8-1 Fact-finding through Discussions and Data Collection

Before and after the field and site surveys were carried out, the Study Team exchanged views with the competent staff of DGSC, and obtained through discussions the information and knowledge on the present status and on-going projects as well as existing plans relevant to the aids to navigation in Indonesia. Problematic points were also discussed.

Data collection was carried out on that pertaining to the factors of maritime safety, including socio economy, required for the forecast of future demands.

1-8-2 Fact-finding through Field and Site Surveys

In order to acquire the data and information on the locality and actual situations of navaids, site survey was carried out visiting some of the major existing navaids sites and buoy bases, proposed sites. Field survey was also carried out through visits to DGSC's Regional Headquarters, Districts of Navigasi, Harbour Masters and so forth.

1-8-3 Data Analysis

Analysis was carried out on the data and information collected, which included the following: -

- Socio-economy

- Maritime traffic and Ports and Harbours
- Ships
- Fishery
- Aids to Navigation
- Maritime Safety and Marine Casualties
- Institutions and Regulations

1-8-4 Forecast

The long term forecast was made to work out the needs for aids to navigation in terms mainly of overall national economic activities, maritime traffic and fishing activities.

Due consideration was also given in the forecast to marine accidents and future trend in the development of navigation aids.

Formulation of a Master Plan up to the year 2000 essentially requires the forecast on the growth of shipping and fishing activities up to the target year.

The forecast has been based mainly on the data published by DGSC, more specifically Annual Report (Tahun Laporan). It should be noted that there exist some differences between the statistical figures given respectively in the Tahun Laporan and Statistical Yearbook of Indonesia due seemingly to different approach employed for data acquisition and analysis.

The method applied to the forecast is described in Section 4-2-2.

1-8-5 Geographical Distribution of Sites

Preliminary coverage and effective range were estimated to geographically allocate the sites of visual and electronic aids to navigation. The site allocation was also examined by interpolation and/or parallel establishment of the systems.

1-8-6 Supporting Facilities and Logistical Sub-System

Examination was carried out for the following factors:

(a) Management, maintenance and operation
(b) Procurement of equipment and materials
(c) Manoeverability by buoy tenders, service vessels and cars

Study was made in the manner of cost effective and personnel-effective approach so as to secure the efficient and reliable operation and maintenance of navaids.

1-8-7 Facility Planning

Geographical and topographical factors were examined so as to estimate effective range and coverage angles for both visual and electronic aids.

Co-location or supplementary installations of microwave radar beacons have been planned for some of the lighted aids.

1-8-8 Equipment Planning

Types of equipment to be required in the relevant services were identified together with the projected per-

formances and characteristics including associated equipment.

During the course of planning, attention was paid to easiness of operation and maintenance, and reliability, mean time between failure (MTBF), etc.

1-8-9 Cost Estimation

Based on the facility and equipment planning studies above, projects costs for the Master Plan were estimated on an approximate basis.

The cost estimation is made for the Short Term Plan including that for supporting facilities based only on the current price quotation, without reference to future cost escalation.

The costs are devided into foreign and local portions.

1-8-10 Project Evaluation

Project evaluation is made in the Short Term Plan with reference to the impacts respectively on marine casualties, efficiency of navigation, fishery production and other related matters.

1-8-11 Advices/Suggestions

Advices and suggestions are provided with respect specifically to the administration and management, maintenance and operation, aids to navigation vessels, training of personnel and distribution plan for MF radiobeacon receiver.

2. PRESENT STATUS AND PROBLEMATIC POINTS

2. PRESENT STATUS AND PROBLEMATIC POINTS

2-1 Organization and Function

The Department of Communication is in charge of implementing this project.

The Decree of Minister of Communication, No. KM 164/OT, 002/PHB.80 provides for the organization and functions of Ministry of Communication, and **Fig. 2-1** shows the organization chart.

2-1-1 Directorate General of Sea Communication (DGSC)

Directorate General of Sea Communication (DGSC) consists of:

(a) Secretary to Directorate General
(b) Directorate of Sea Traffic
(c) Directorate of Marine Safety
(d) Directorate of Ports and Dredging
(e) Directorate of Navigation
(f) Directorate of Maritime Services
(g) Directorate of Sea and Coast Guard
(h) Maritime Safety Technology Center

The organization chart of Directorate General of Sea Communication is given in **Fig. 2-1-1/1** together with those of the relevant inter-organization as given in **Fig. 2-1-1/2** to **Fig. 2-1-1/9.**

Directorate General of Sea Communication has its administrative jurisdiction of the nine Districts over the country as shown in **Fig. 2-1-1/11,** each of which has its District Headquarters and local offices thereunder. The organization chart of District Headquarters

and other local-offices are given respectively in Fig 2-1-1/10, Fig. 2-1-1/12 and Fig. 2-1-1/13.

The Directorate of Navigation is directly in charge of navigational matter, to which the afore-mentioned Decree of Minister refers in its Article 116 providing for "the Directorate of Navigation has the duty to execute a part of the main duties of Directorate General of Sea Communication in the field of navigational matters in line with the policy of Directorate General of Sea Communication".

The Directorate of Navigation has the duty to execute a part of the main duties of Directorate General of Sea Communication in the field of navigational matters in line with the policy of Directorate General of Sea Communication, and more specifically, among those missions included in their main duties are:

a. to manage navigational aids and coastal light facilities in order to secure navigation safety at sea, off-shore and harbour,

b. to manage electronics and telecommunications between ship and coast station so as to secure safety of human life at sea and internal communication of Directorate General,

and so forth.

There are 1st and 2nd Class Districts of Navigation under the direct operational and administrative control of the Sea Communications District offices with the technical guidance of the Directorate of Navigation.

As for the maintenance and operation of aids to navigation, the whole nation is divided, as shown in **Fig. 2-1-1/14**, into the five divisions with some areas overlapping the administratively divided areas of KANWIL in order to carry out the most effective operation of navaids in remote areas and high seas. Those areas are respectively covered by 1st Class Districts of Navigation.

There are also 2nd Class Districts of Navigation and their areas are overlapped with those of 1st Class. The prime responsibility of 2nd Class Districts of Navigation is to carry out all necessary maintenance and operation of the navaids except major works for buoys.

A list of 1st and 2nd Districts of Navigation is given in **APPENDIX-16.**

Fig. 2-1 Organization Chart, Ministry of Communication

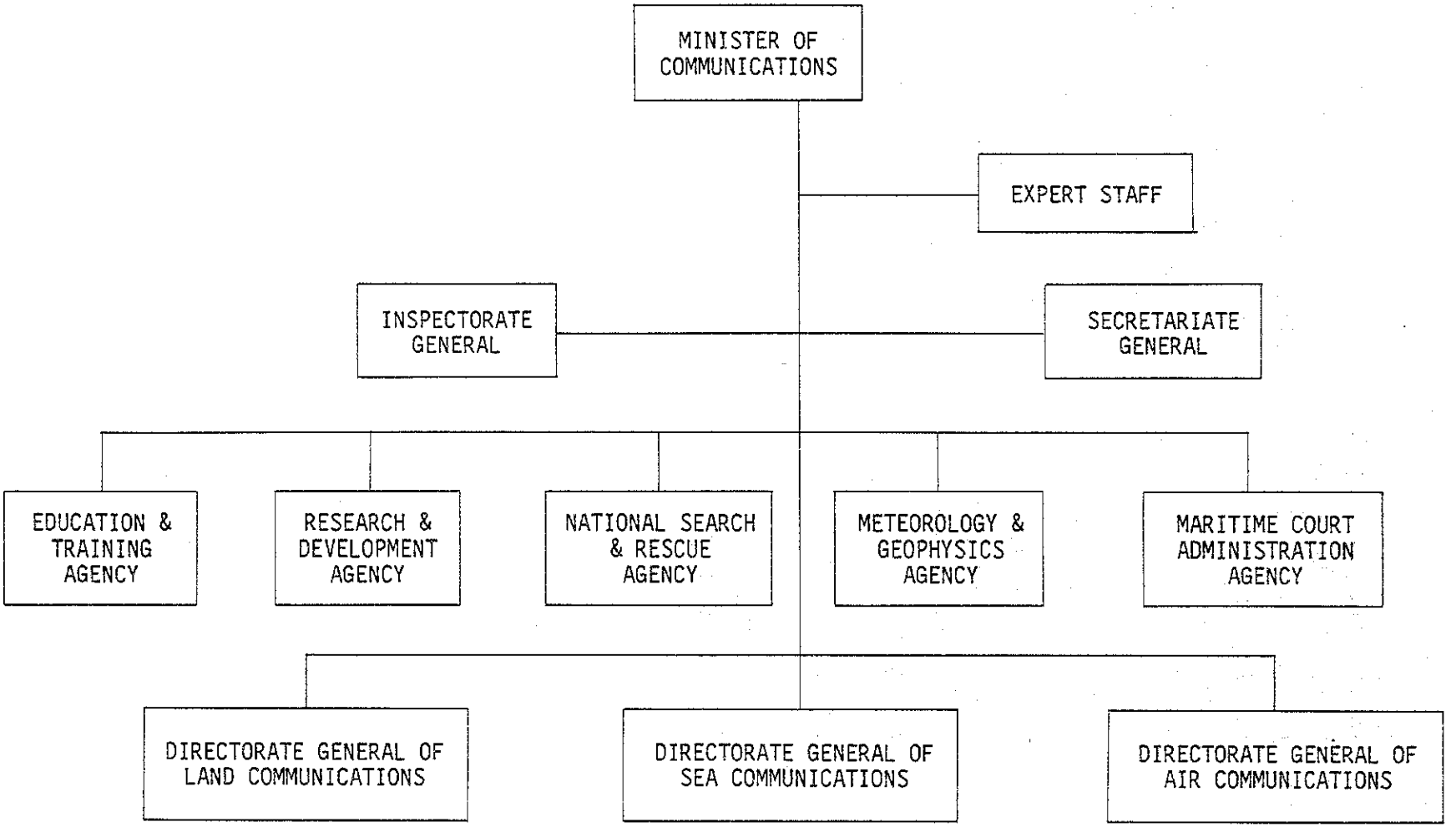


Fig. 2-1-1/1 Organization Chart, Directorate General of Sea Communication

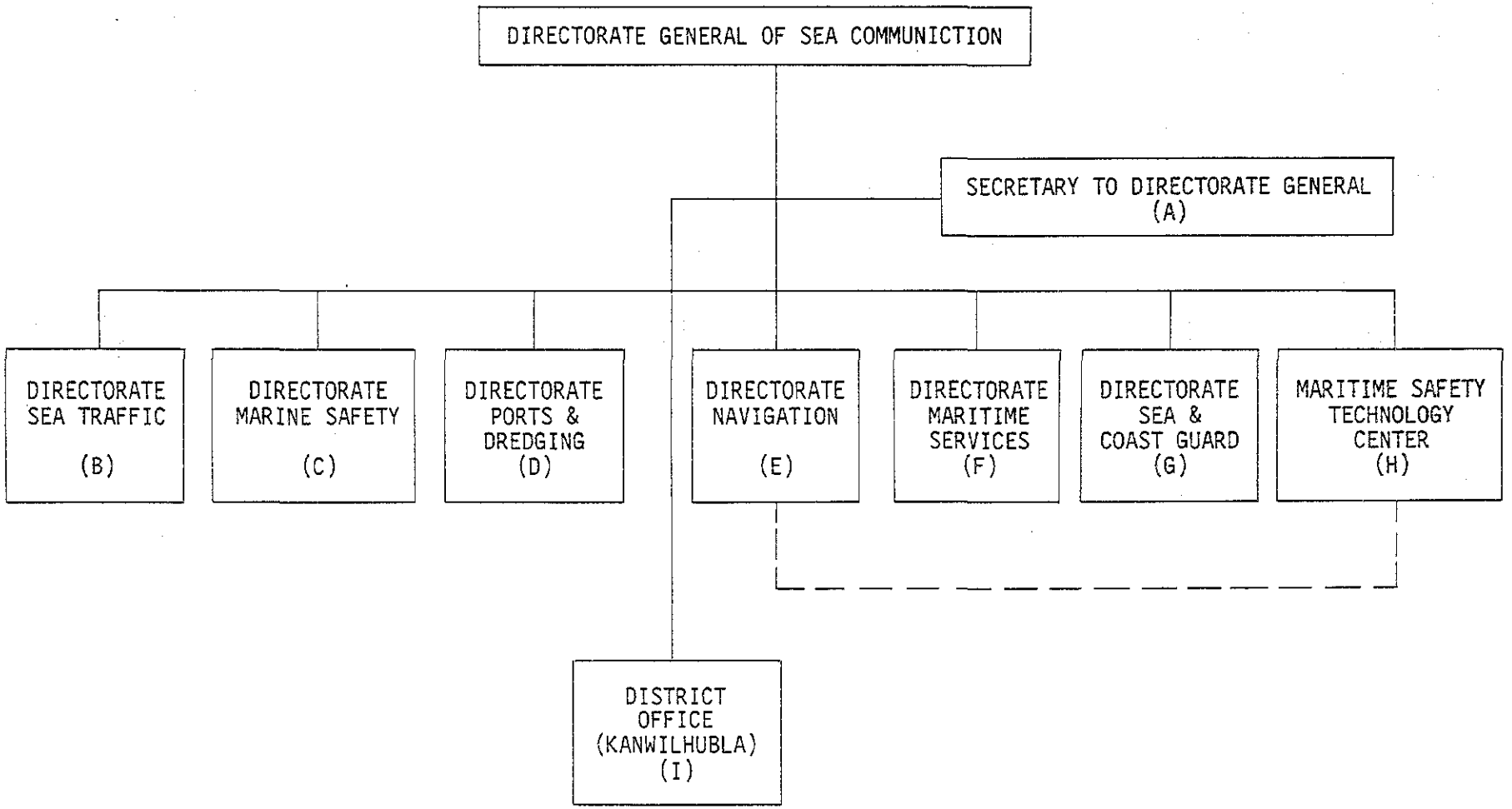


Fig. 2-1-1/2 Organization Chart, Secretariate DGSC

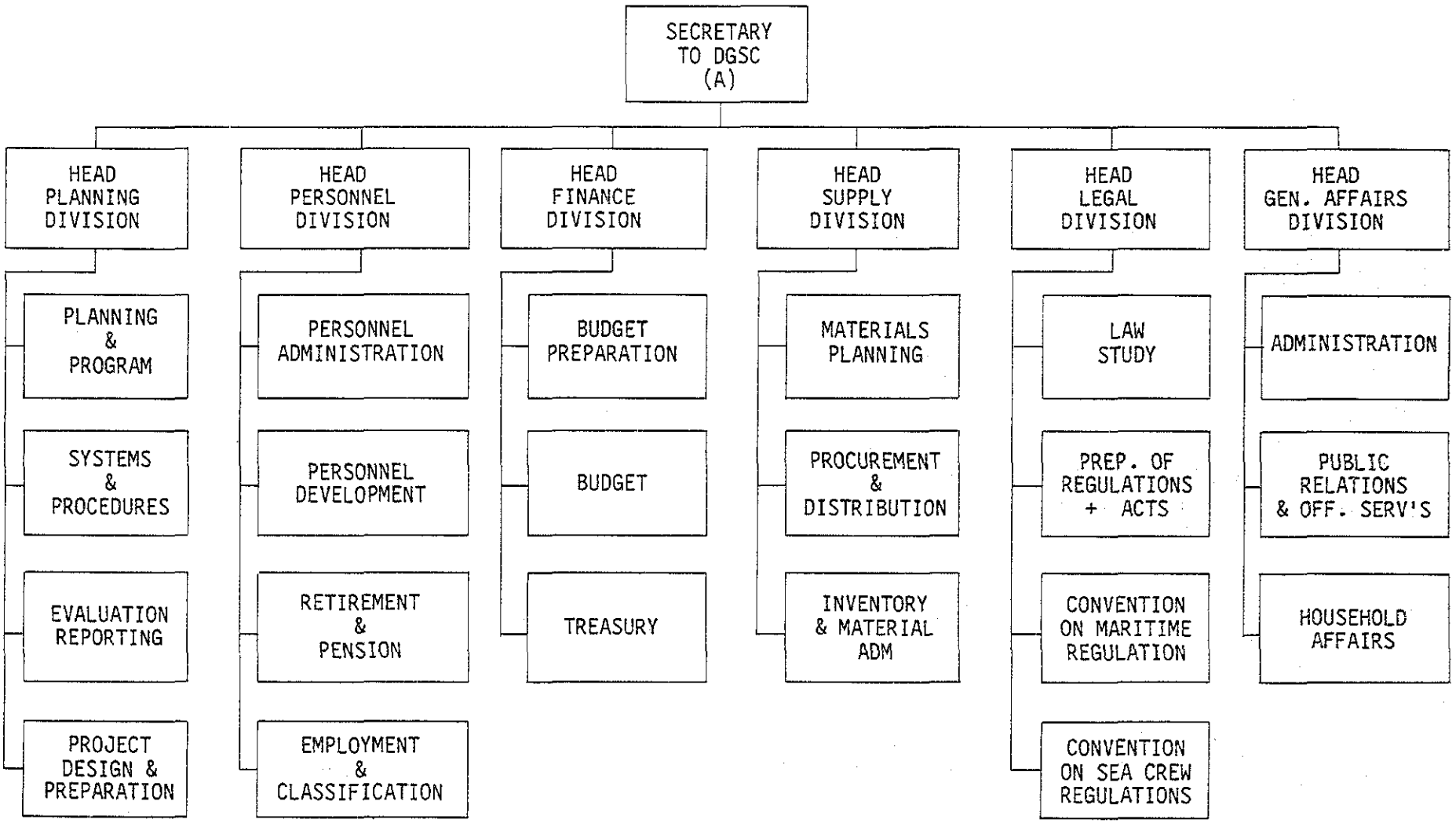


Fig. 2-1-1/3 Organization Chart, Directorate Sea Traffic

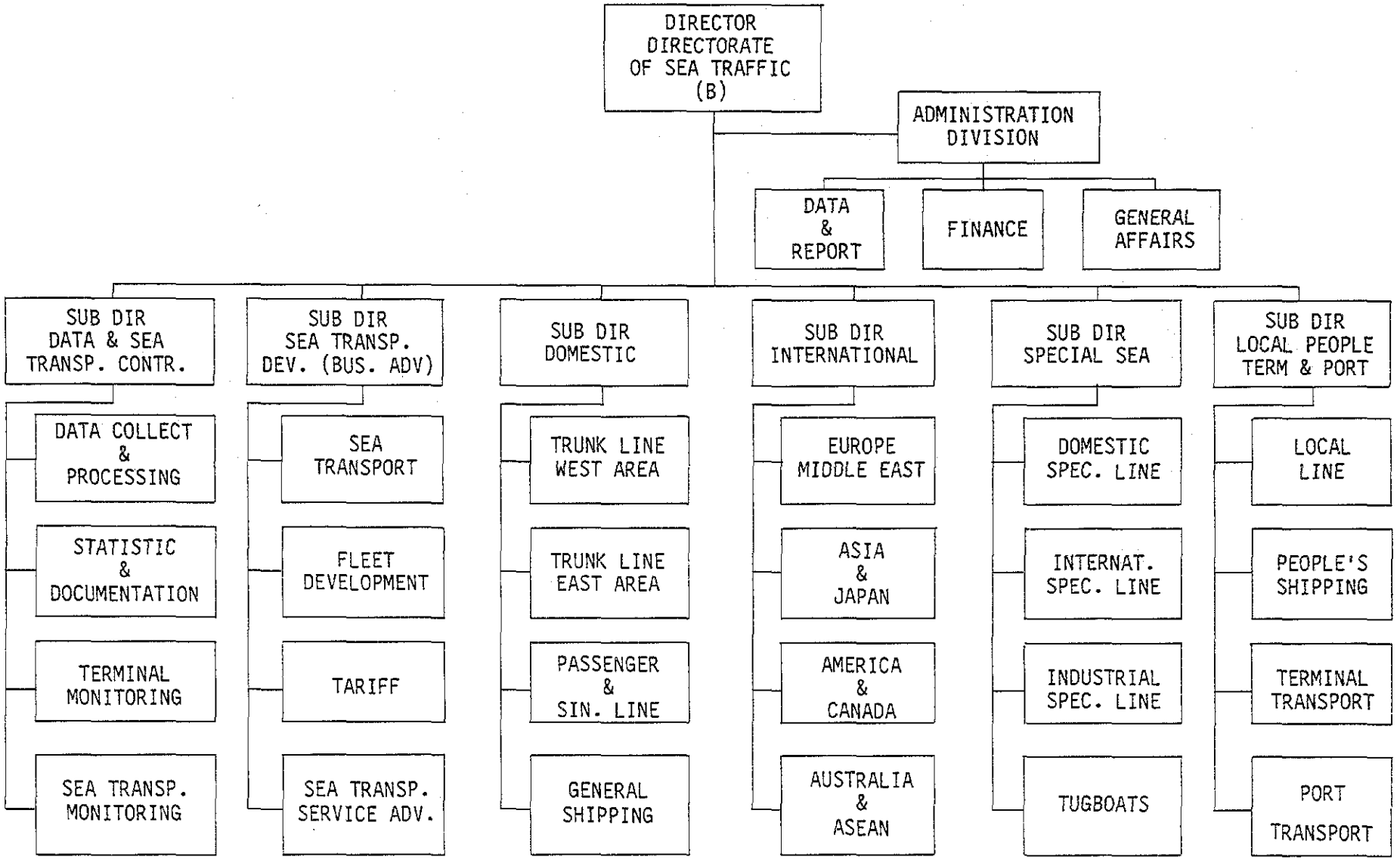


Fig. 2-1-1/4 Organization Chart, Directorate Marine Safety

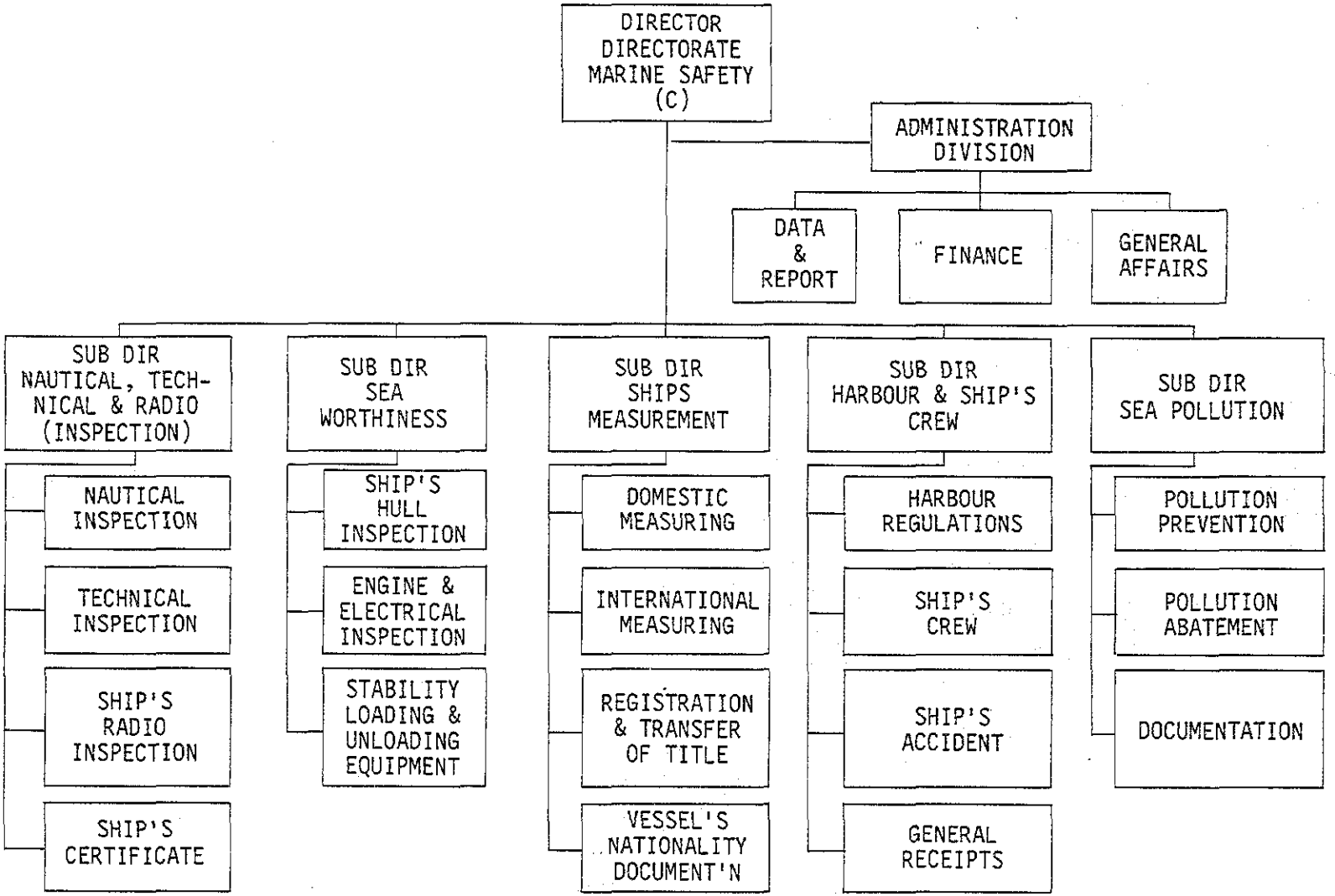


Fig. 2-1-1/5 Organization Chart, Directorate Port & Dredging

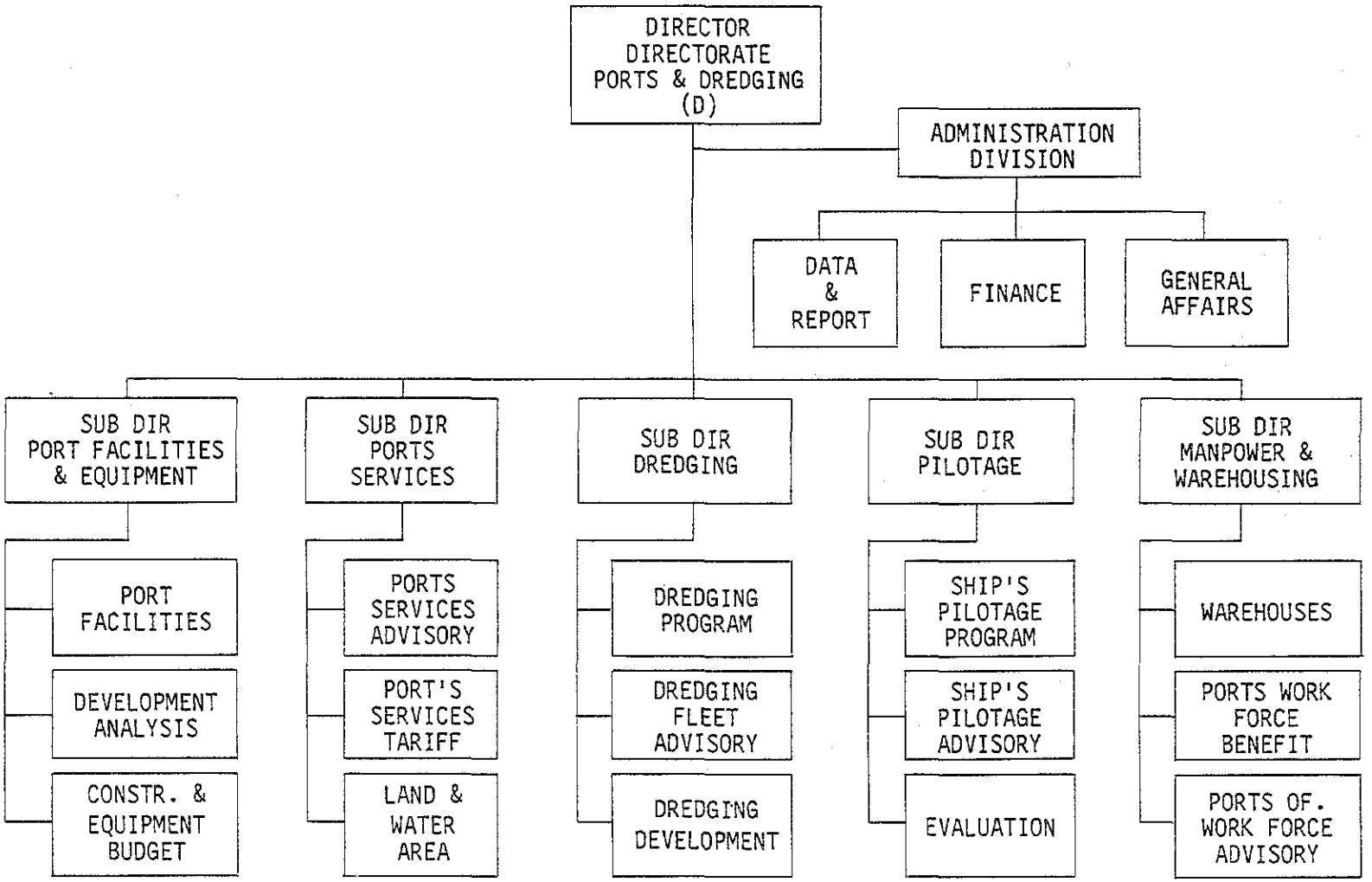


Fig. 2-1-1/6 Organization Chart, Directorate, Navigation

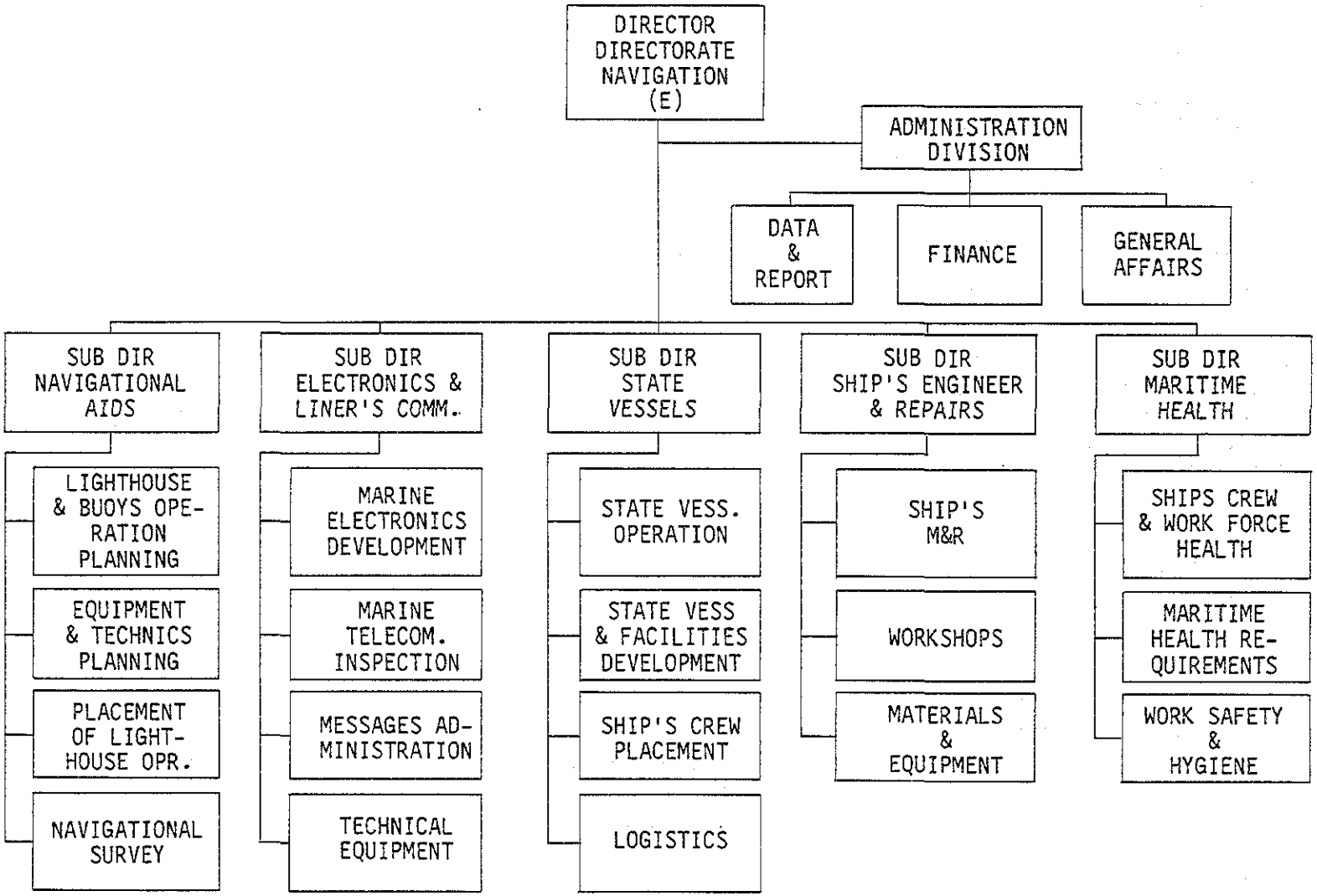


Fig. 2-1-1/7 Organization Chart, Directorate Maritime Services

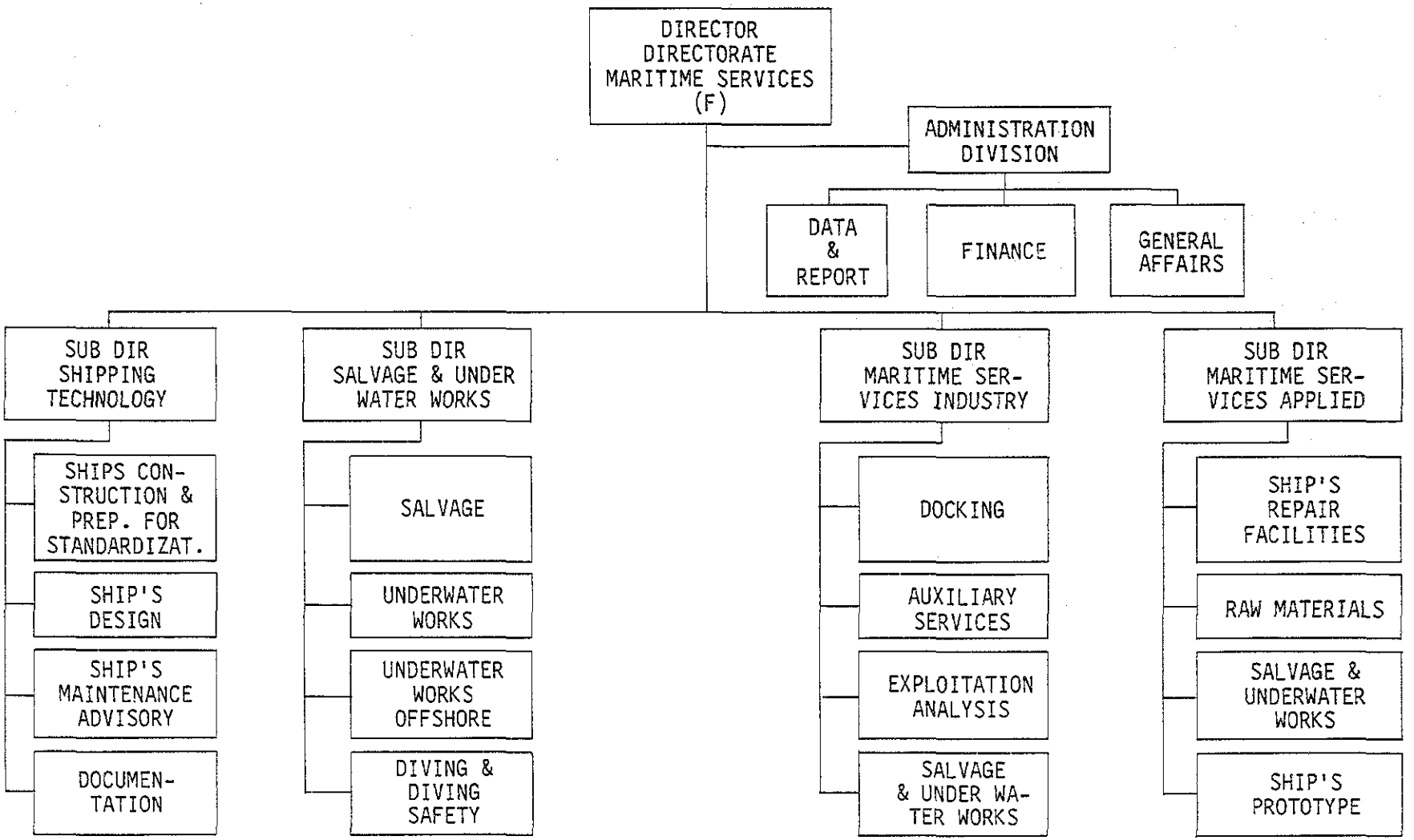


Fig. 2-1-1/8 Organization Chart, Directorate Coastguard & Security

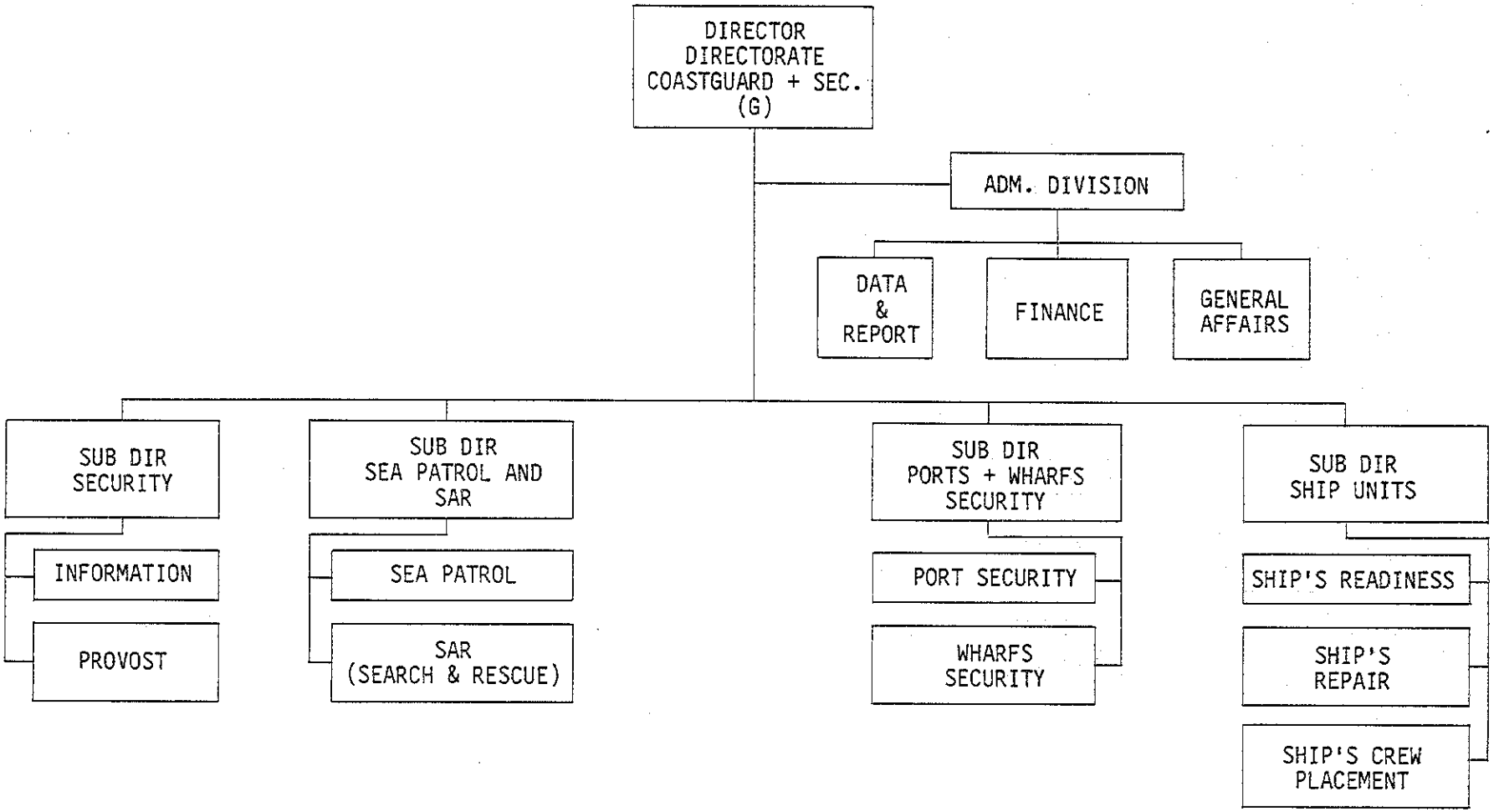


Fig. 2-1-1/9 Organization Chart, Maritime Safety Technological Center

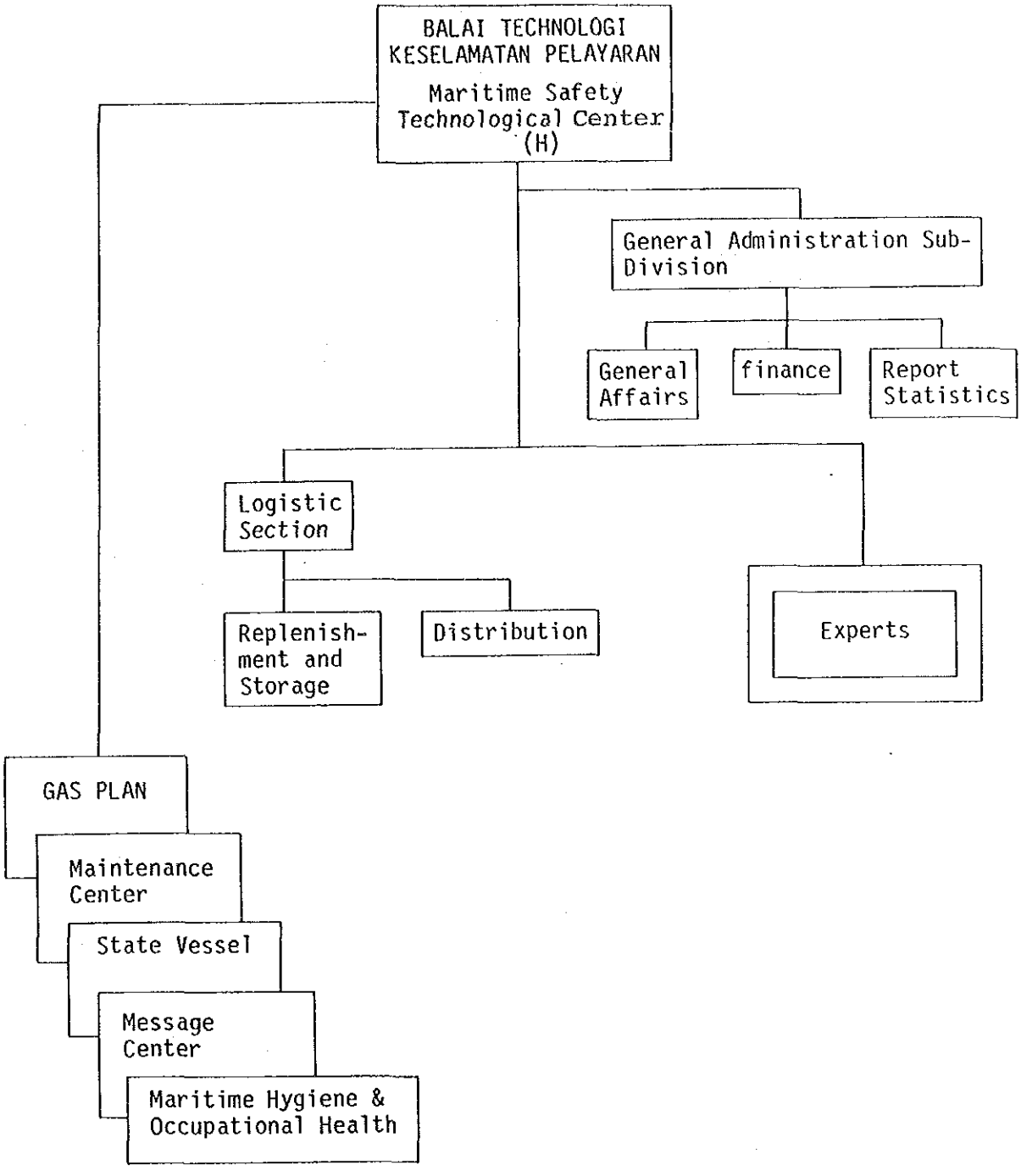


Fig. 2-1-1/10 Organization Chart, DGSC District Office

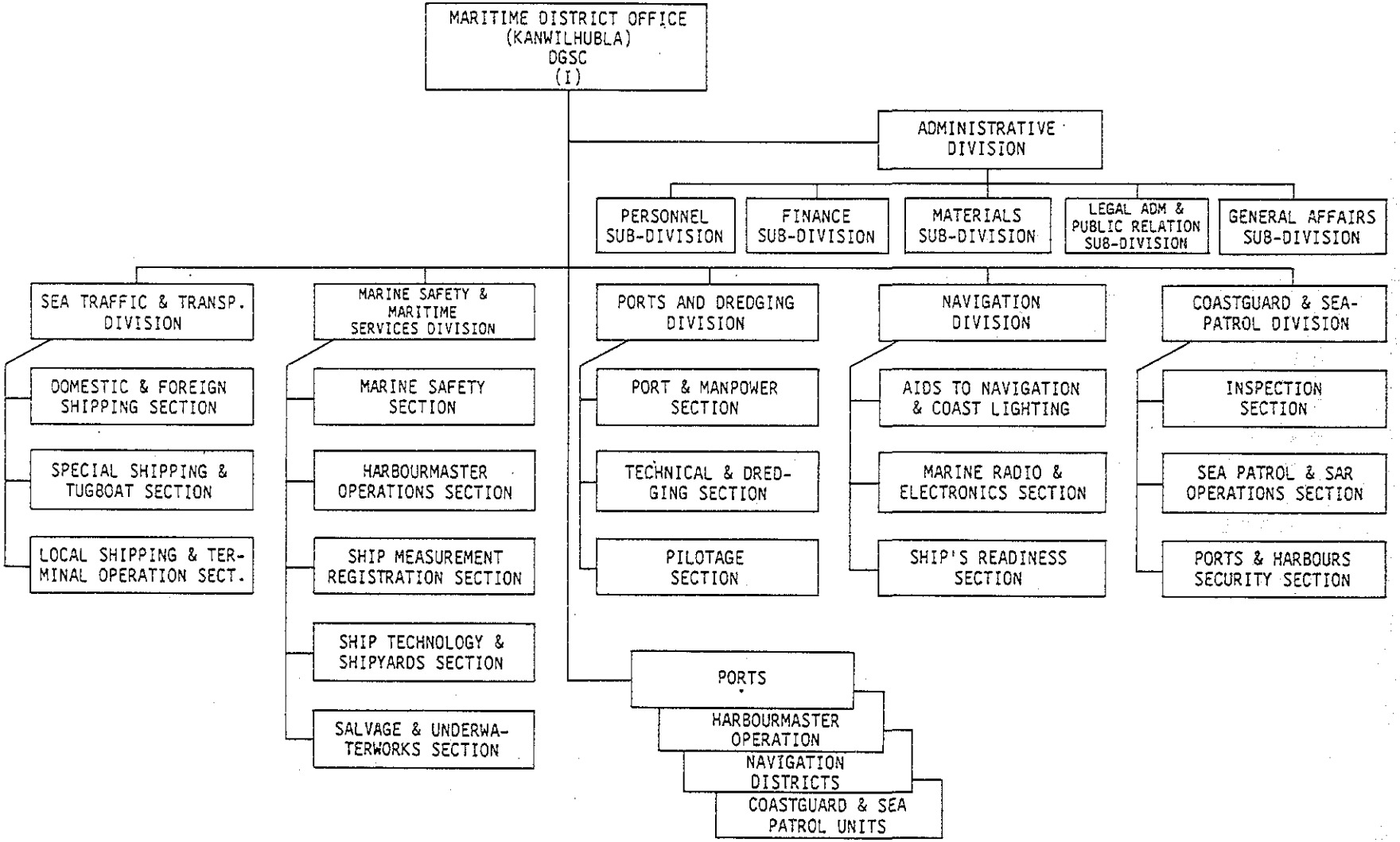
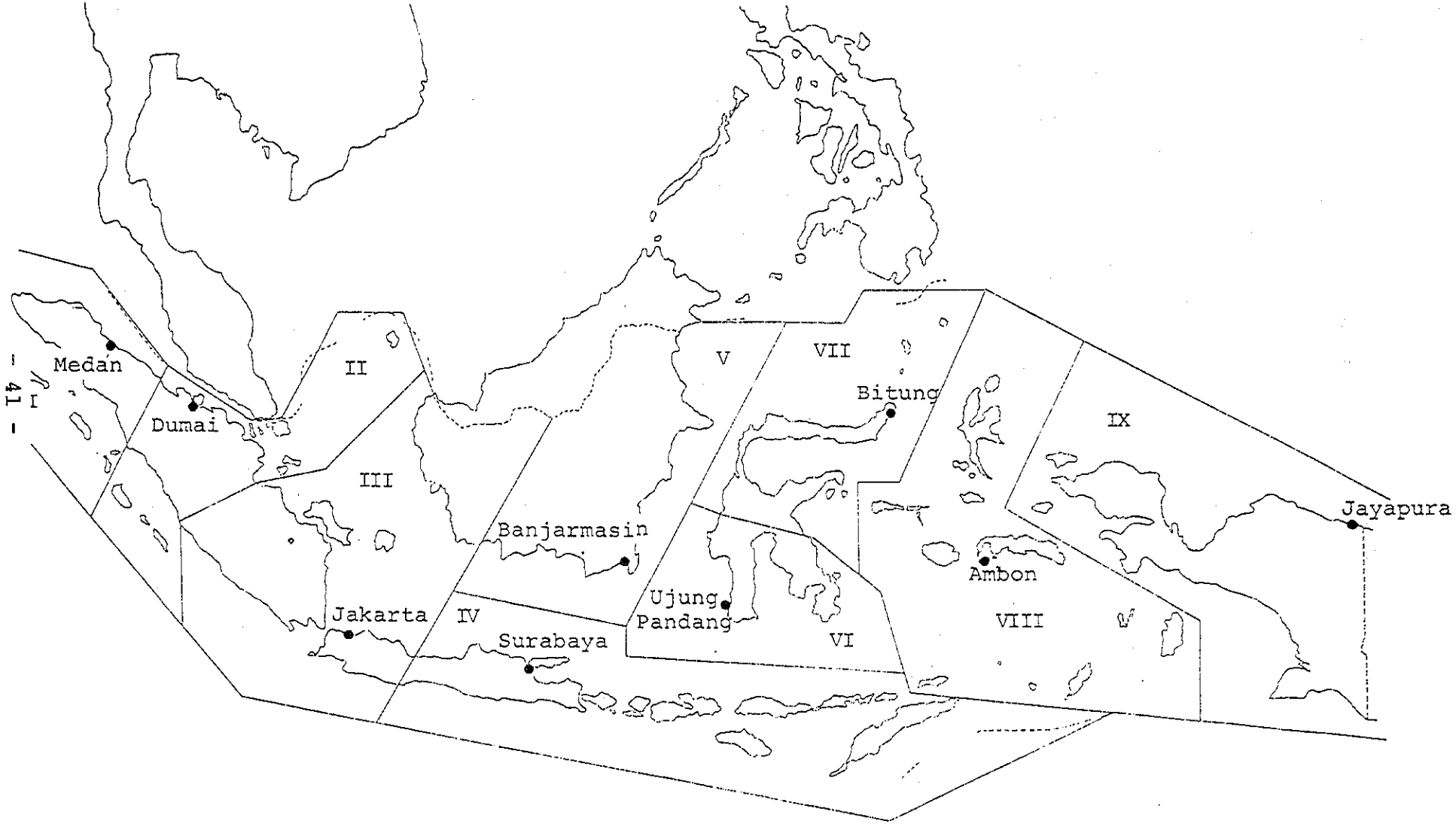
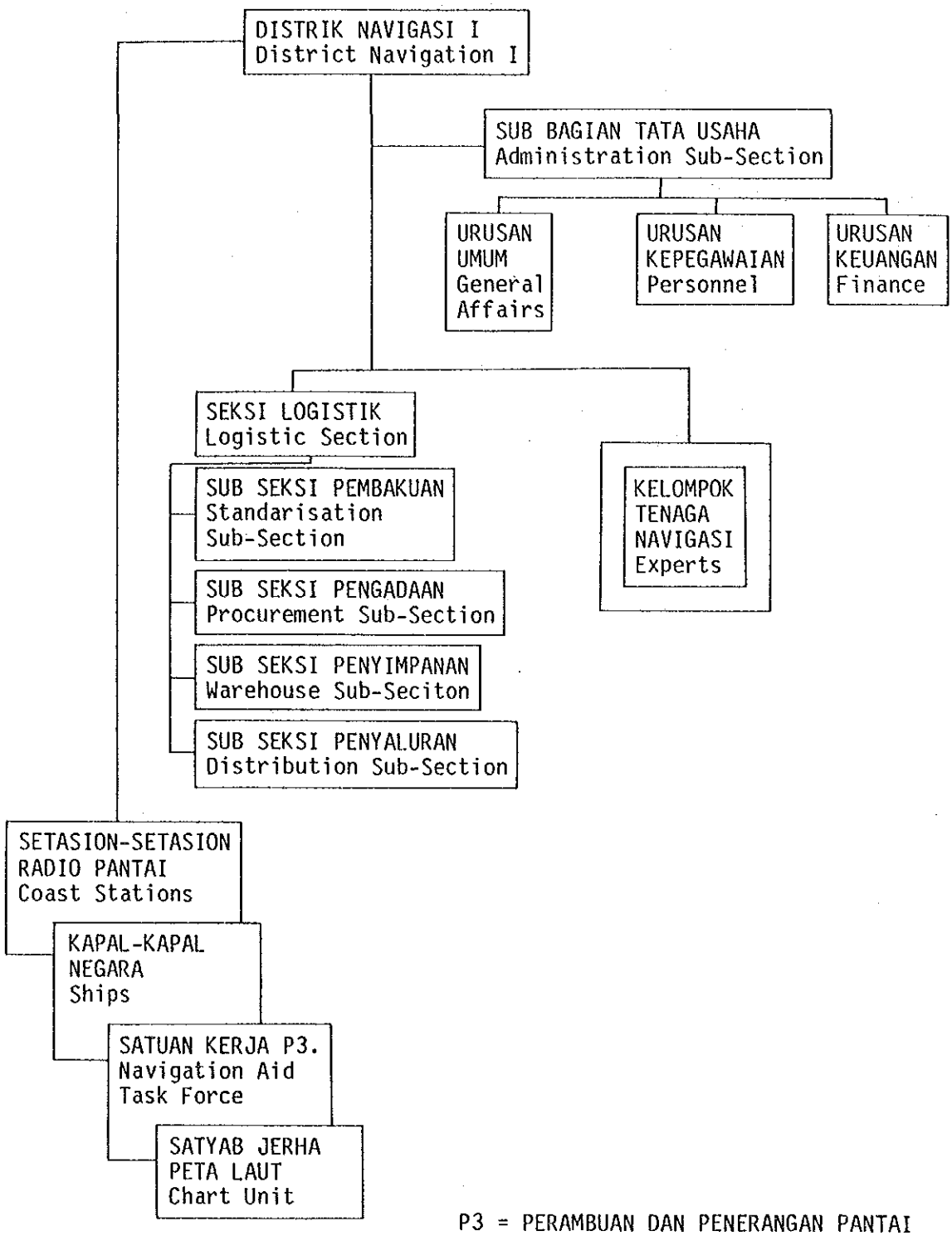


Fig. 2-1-1/11 DIVISIONS FOR DISTRICT SEA COMMUNICATION



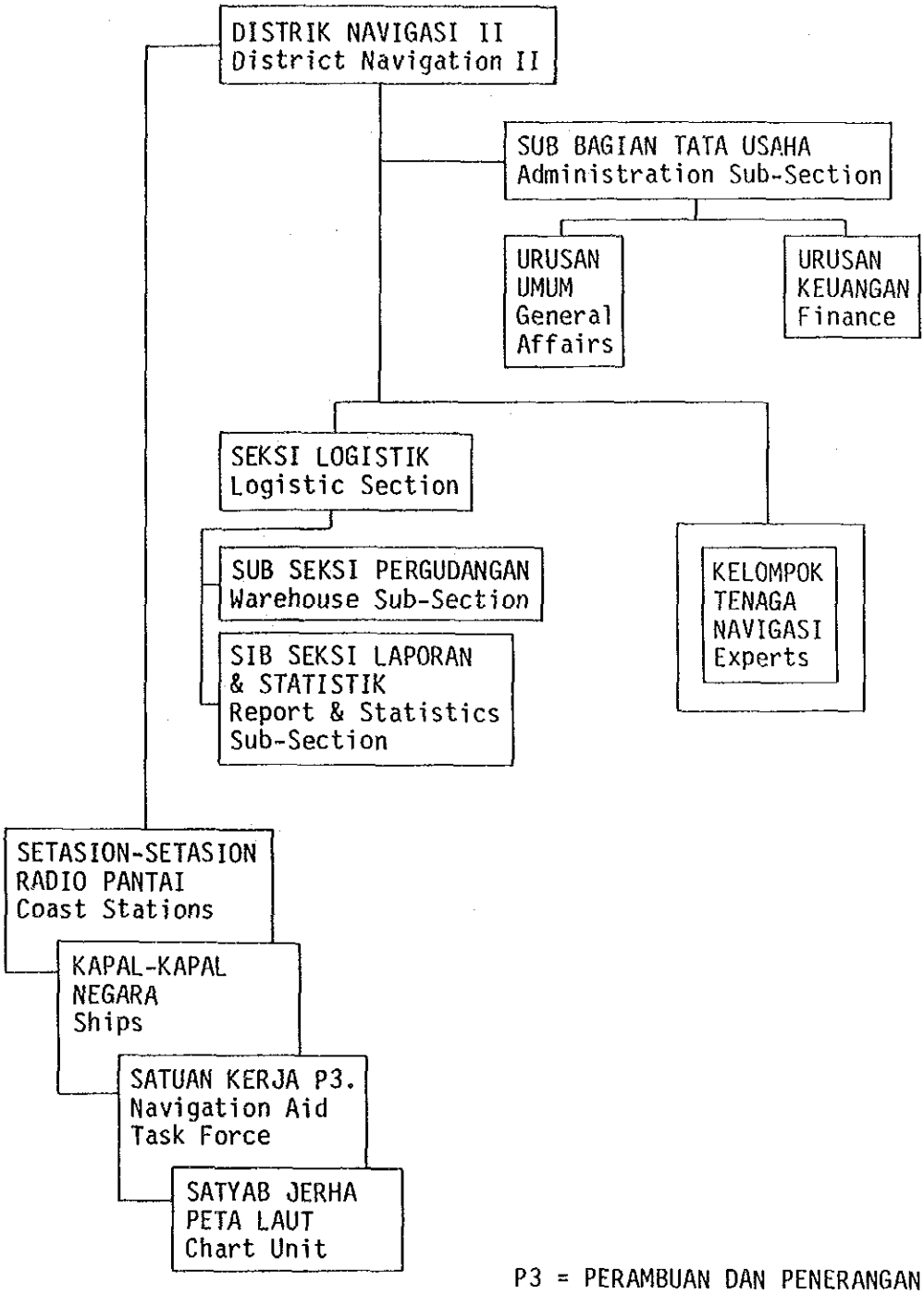
• show the District Headquarters

Fig. 2-1-1/12 Organization Chart,
District of Navigation Class I,
Directorate General of Sea Communication



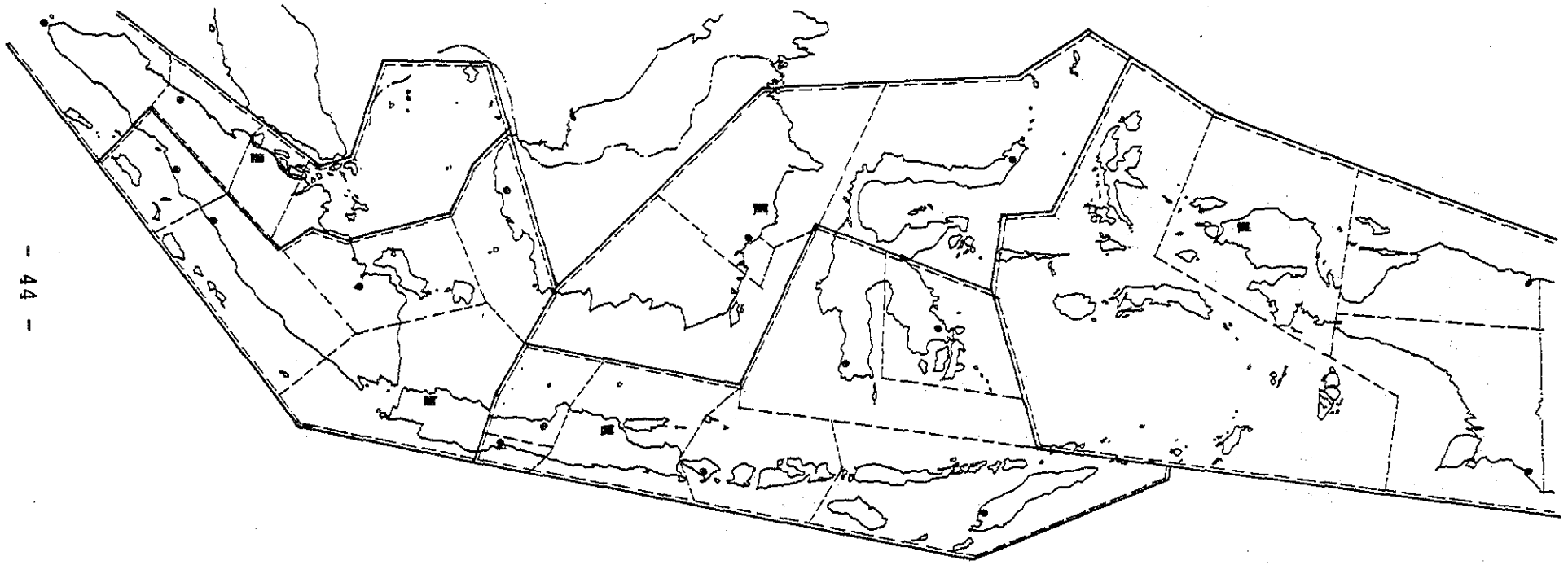
P3 = PERAMBUAN DAN PENERANGAN PANTAI
Navigation Aids & Coastal Lights

Fig. 2-1-1/13 Organization Chart,
District Navigation Class II, Directorate General of Sea Communication



P3 = PERAMBUAN DAN PENERANGAN PANTAI
Navigation Aids & Coastal Lights

Fig. 2-1-1/14 Divisions of 1st and 2nd Class Districts of Navigation



——— Coverage of District of Navigation 1st Class

- - - - - Coverage of District of Navigation 2nd Class

■ Location of District of Navigation 1st Class

● Location of District of Navigation 2nd Class

2-1-2 Other Relevant Organizations

(1) Directorate General of Air Communication

Directorate General of Air Communication has responsibilities for navigation aids to aircraft such as aeronautical radiobeacons, air traffic control, airport administration and other related affairs.

Directorate General of Air Communication has its administrative jurisdictions of District Air Communication divided into five, each of which has its District Headquarters.

The management, maintenance and operation of navigational aids like aeronautical beacons are under the responsibility of District Air Communication.

The organization charts of Air Communication and District Air Communication are given in **Fig. 2-1-2/1** and **Fig. 2-1-2/2**.

At present 108 aeronautical beacon stations are installed in Indonesia. However, they cannot be used for marine navigation for the following reasons:

1) The aeronautical beacon stations are located mainly on inner land, and therefore, due to the difference in propagation speed of radio waves between on land and at sea the accuracy of positioning may possibly and largely be affected to cause so-called "coastal effect" error since the radiation pattern should be directed to surface area.

2) Even in the limited areas where aeronautical beacons could possibly be used by ships at sea, the ships must be equipped with direction finders since aeronautical beacons are of omni-directional and especially it is impossible for sailing ships and other small boats which have no direction finders to use it.

3) In addition to the above, the aeronautical beacons could possibly operate for short time of a day and only relatively small number of those stations among 108 are in around-the-clock operation.

Fig. 2-1-2/1 ORGANIZATION OF AIR COMMUNICATION

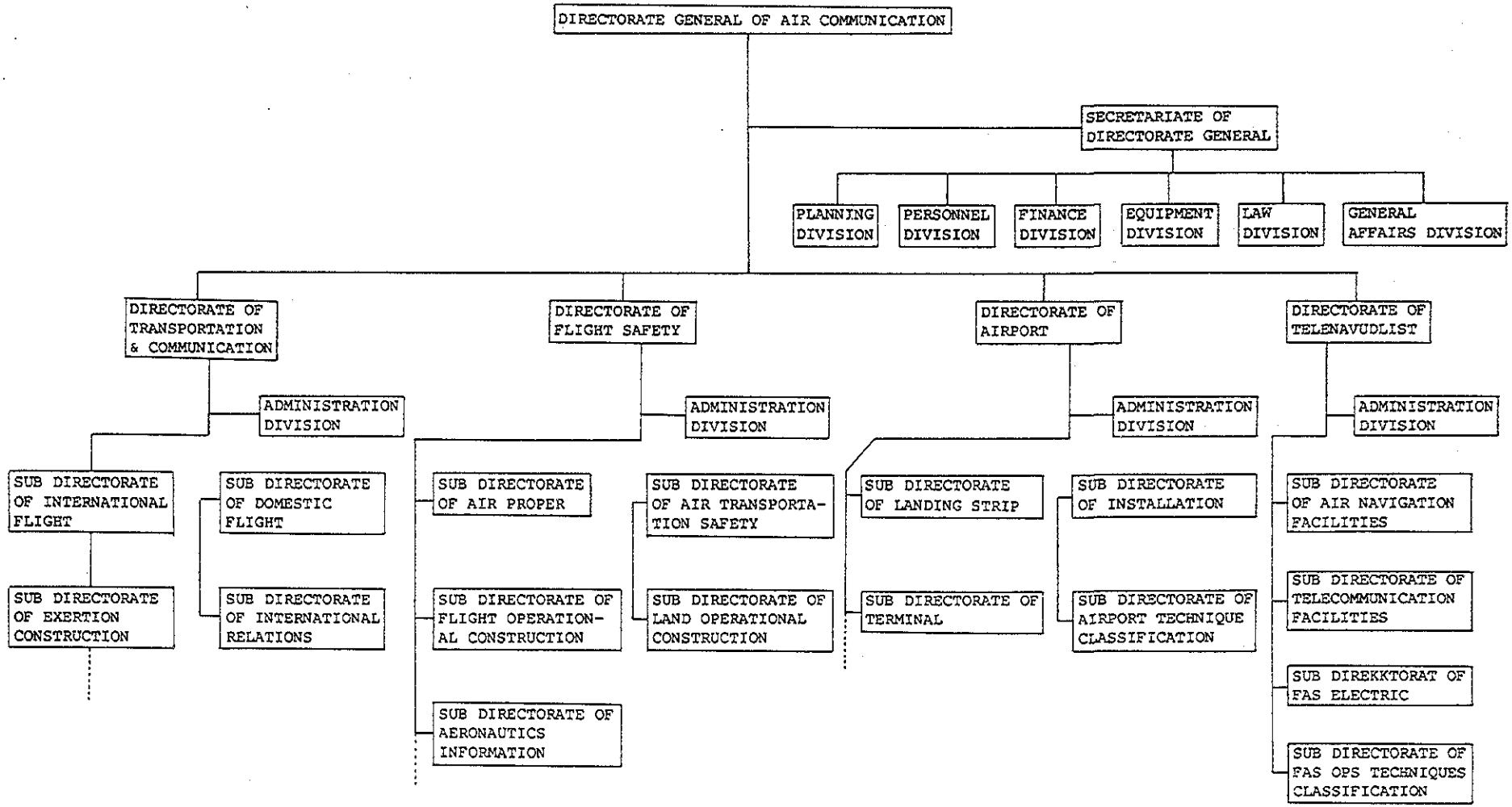
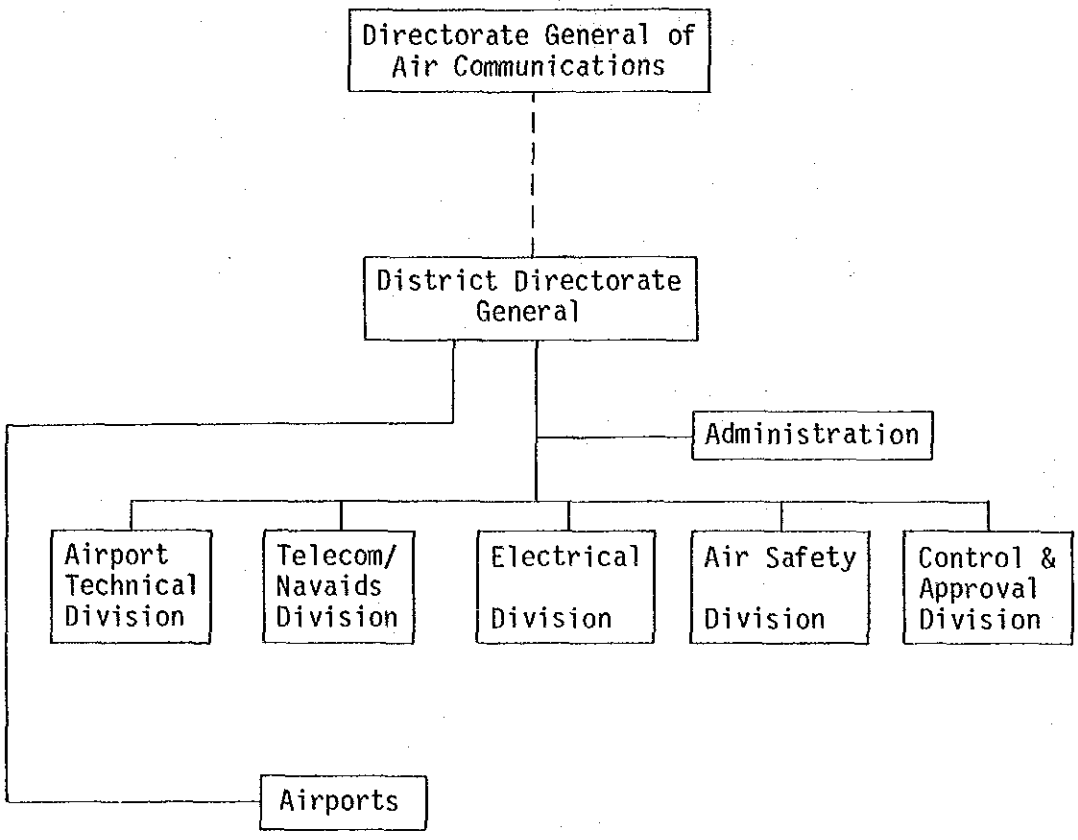


Fig. 2-1-2/2 ORGANIZATION CHART OF DISTRICT AIR COMMUNICATION



(2) National Search and Rescue Board (BASARI) and National Search and Rescue Agency (BASARNAS)

In 1972, through Presidential Decree No. 11, the Government of Indonesia enacted new legislation establishing the SAR Board, abbreviated as BASARI, to co-ordinate all SAR resources, whether public or private, and all SAR operations in respect of the safety of property and human life, and to ensure that the Government's obligations under prevailing national and international regulations for providing prompt assistance in cases of shipping or aviation accidents are fulfilled.

1) National Search and Rescue Board (BASARI)

BASARI gives overall direction and supervision to the SAR effort throughout Indonesia. Its membership comprises :

Minister of Communications	- as Chairman
Minister of Defence and Security	-as Vice Chairman
Minister of Home Affairs	- as Member
Minister of Foreign Affairs	- as Member
Minister of Finance	- as Member
Minister of Social Affairs	- as Member

If need be, the Ciefs-of-Staff of the Army, Navy and Air Force and the Chief of the Police can be invited to participate in the formulation of SAR policies.

The organizations under the co-orination of BASARI are the following :

The national Search and Rescue Agency (BASARNAS);
Rescue Co-ordinating Offices (KKR);
Rescue Co-Oridinating Sub-Offices (SKR);
Search and Rescue Units.

2) National Search and Rescue Agency (BASARNAS)

As the operational unit under BASARI belonging to the Ministry of Communications, BASARNAS has the practical task of marshalling and co-oridinating all SAR activities related to aviation and shipping accidents and natural disasters. Its responsibilities include :

a. outlining technical policies and giving guidance to Rescue Co-ordinating Offices and other SAR operational units;

b. supervising, monitoring and mobilising available SAR resources;

c. carrying out research and development into SAR methods and procedures and institutional arrangements;

d. ensuring that all relevant laws and international regulations regarding SAR activities are met.

The whole nation is divided into four Districts under BASARI, and each District has a Rescue Co-ordinating Center (KKR), under which Sub-Rescue Co-ordinating Center (SKR) are established.

Fig. 2-1-2/3 ORGANIZATION CHART OF SAR NATIONAL

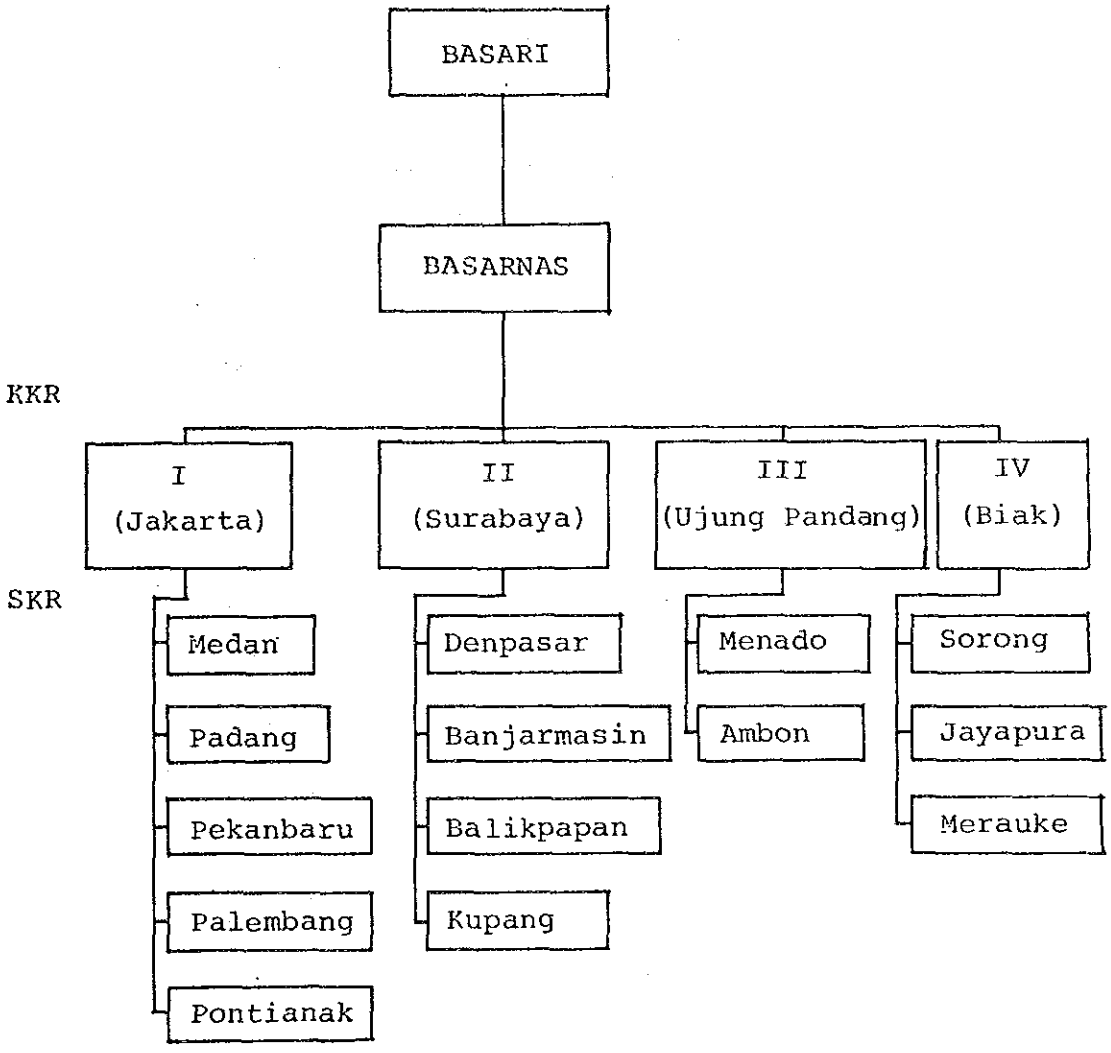
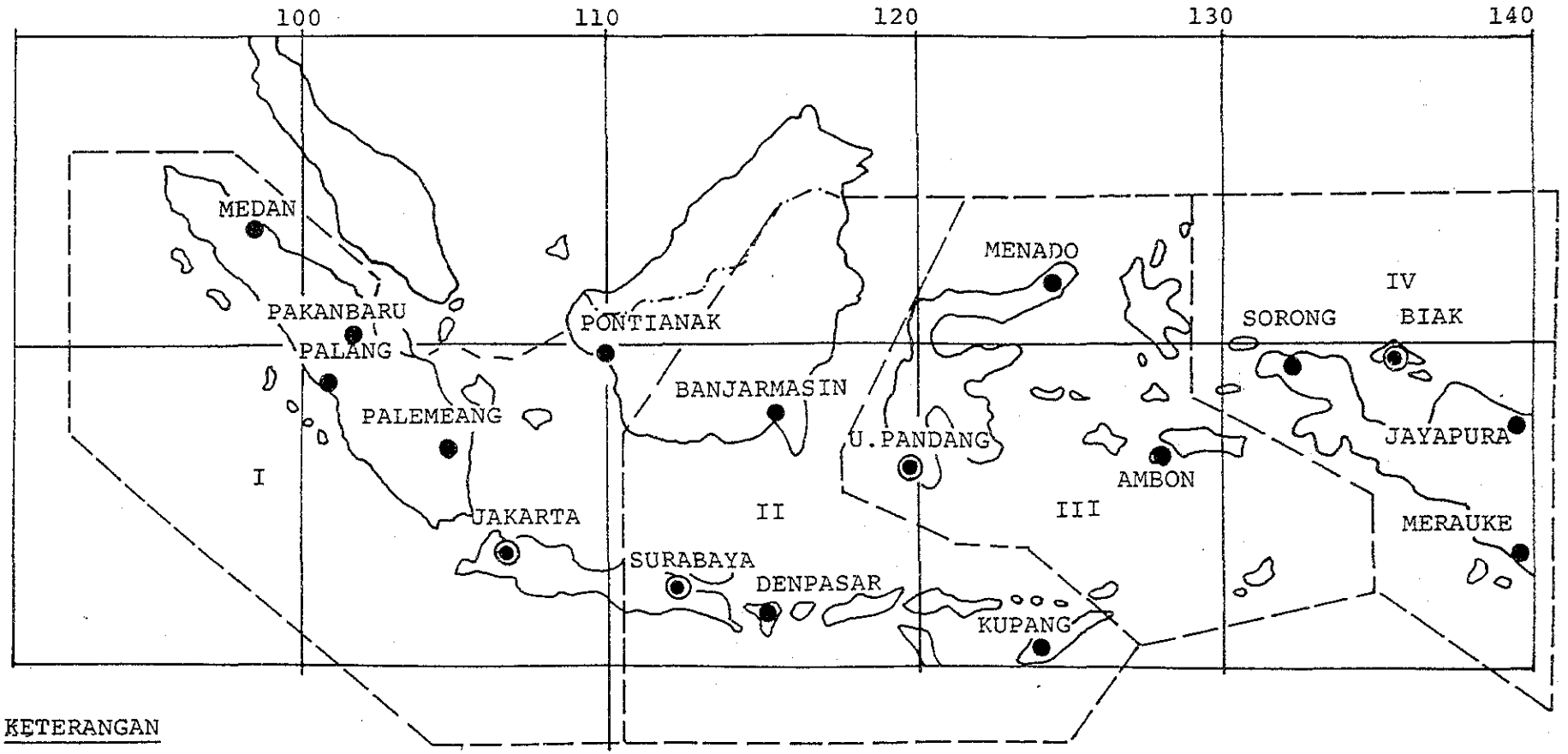


Fig. 2-1-2/4 PEMBAGIAN WILAYAH SEARCH AND RESCUE

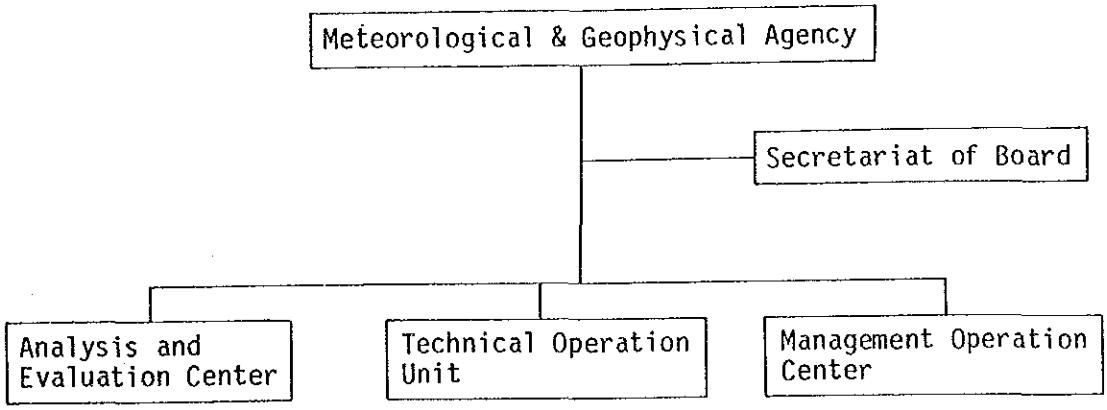


(3) Meteorological and Geophysical Agency

The Meteorological and Geographical Center, belonging to the Department of Communication is in charge of conducting climatic observations, analysis, etc. of the meteorological and geophysical data collected from the climatological stations network scattered around all over the country. The processed data is circulated to various social sectors and to the authorities concerned with the safety of vessels and aircraft.

Fig. 2-1-2-(3)/1 and **Fig. 2-1-2-(3)/2** show the organization and climatological observation station network.

Fig. 2-1-2-(3)/1 Organization Chart, Meteorological & Geophysical Agency



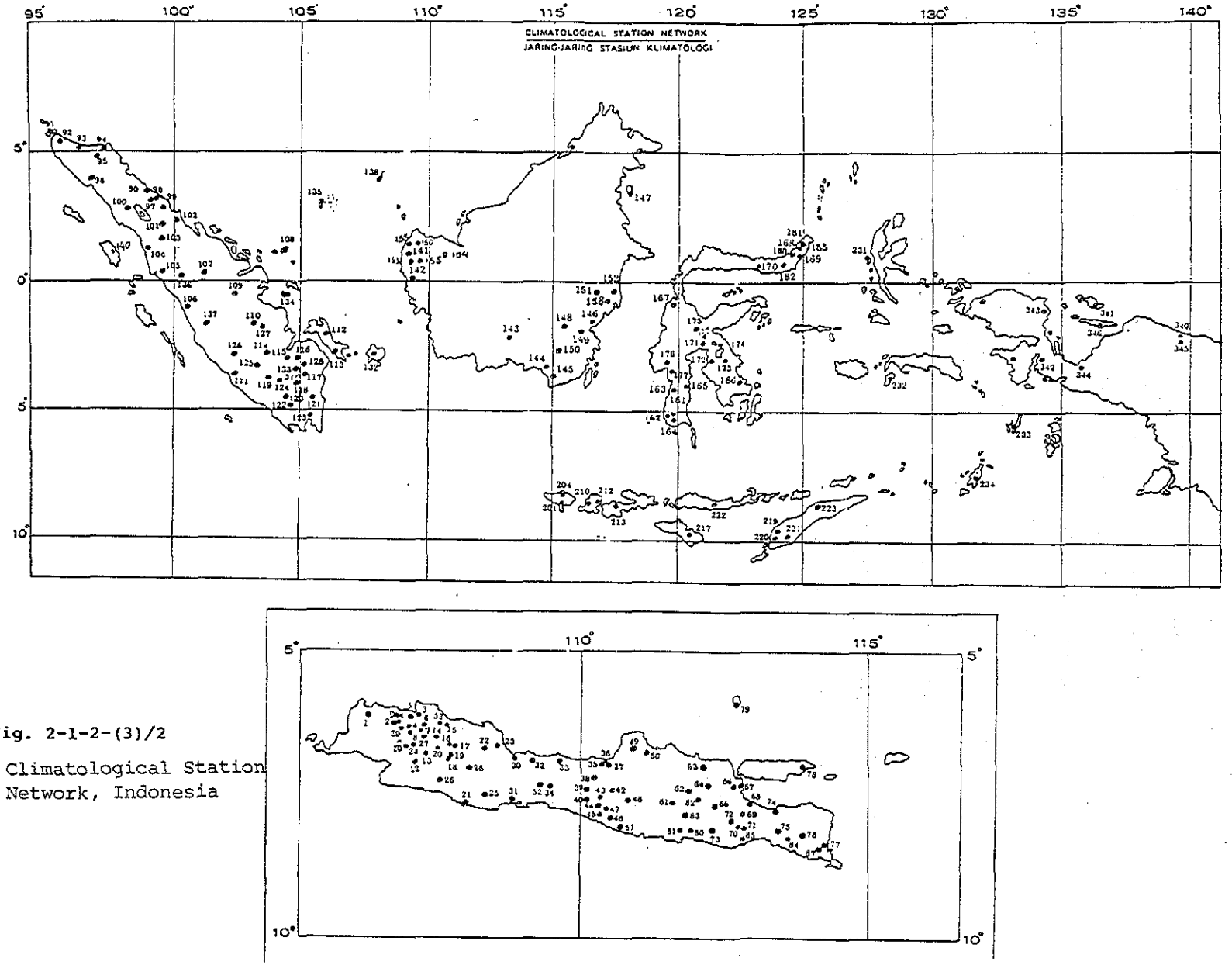


Fig. 2-1-2-(3)/2

Climatological Station Network, Indonesia

(4) PERTAMINA

PERTAMINA owns number of aids to navigation installed for the purpose of carrying out their operations for oil development and supply. The Shipping·Communication Department is in charge of the navaids and their own coast stations.

Fig. 2-1-2-(4) shows the organization chart of PERTAMINA.

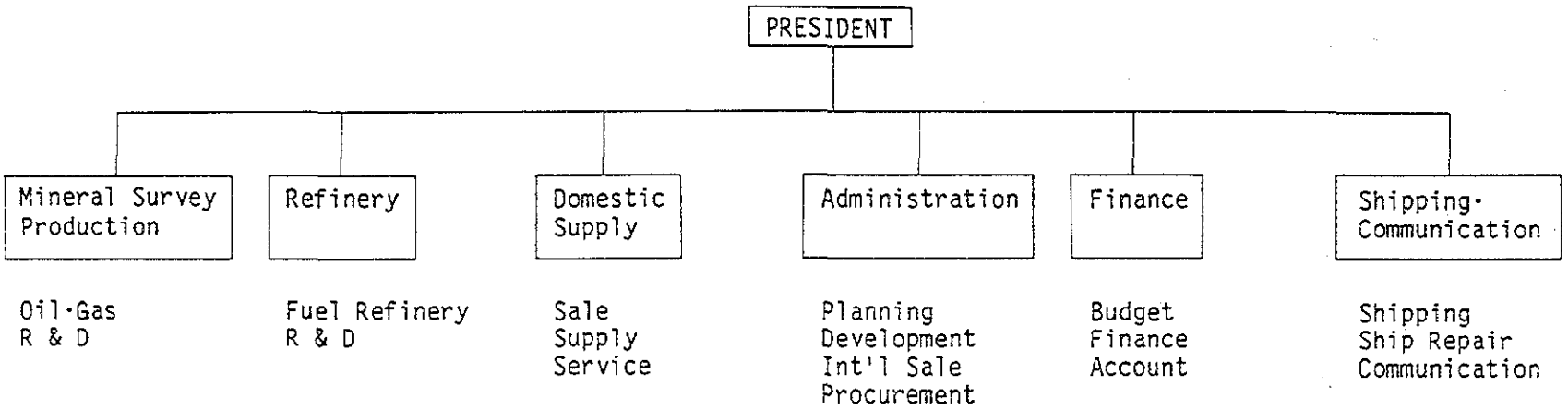


Fig. 2-1-2-(4) Organization Chart, PERTAMINA

2-2 Information Flow System for Navigation Safety

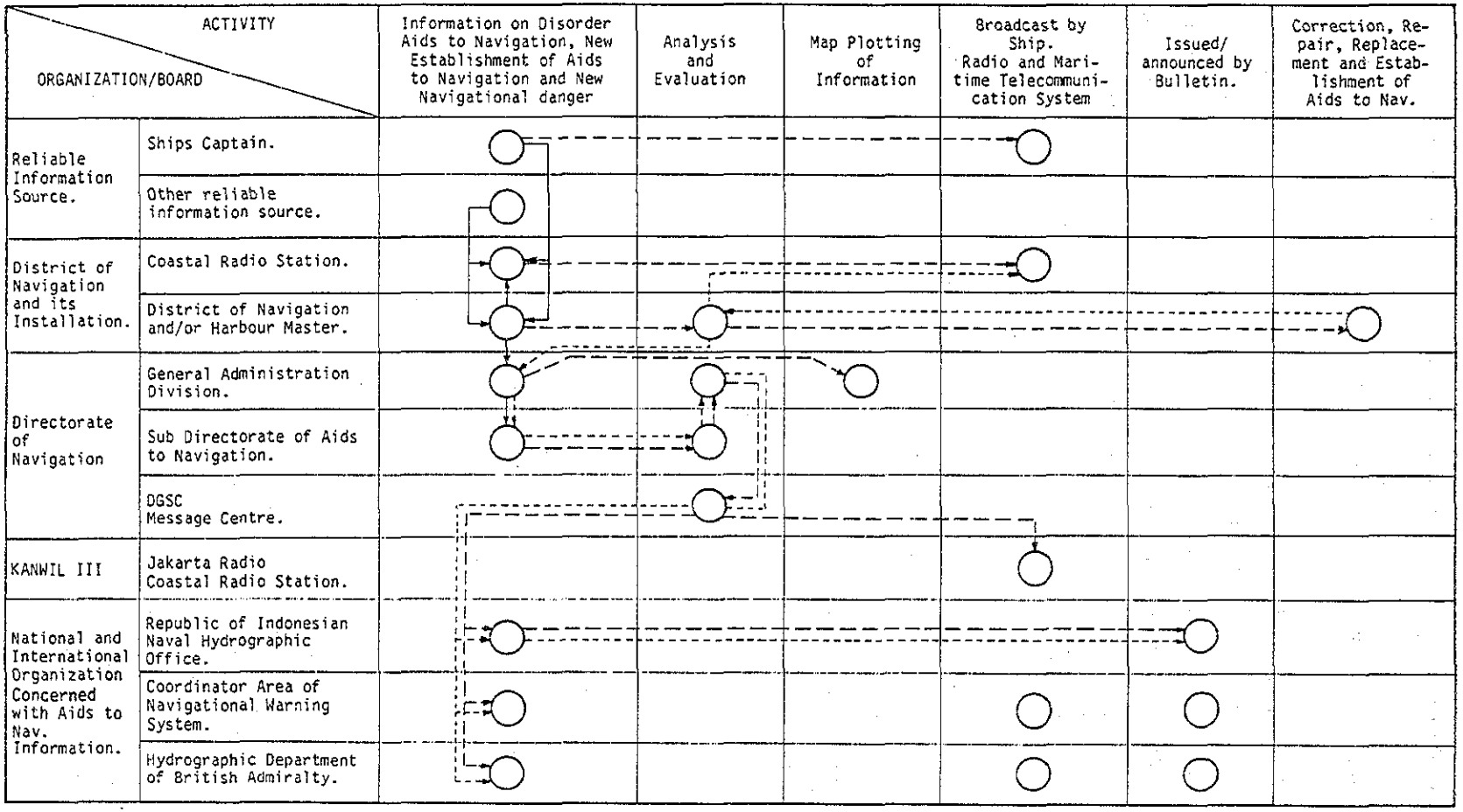
2-2-1 Notices and Procedures

Failure and delay in notifying mariners of any disorder of aids to navigation may possibly lead to an inevitably great disaster of losing invaluable human life and property at sea. The information on disorder or failure of aids to navigation currently flows as shown in **Fig. 2-2.**

Due to non-establishment of remote monitoring system for the currently-available aids to navigation, ships captains and such, witnessing the failures, constitute the reliable source of information. Any disorder found by them will be forecast by their radio while notifying to District of Navigation through coastal radio stations, which immediately broadcast, upon authorization by District of Navigation, the information on the safety frequencies allocated. Simultaneously, District of Navigation endeavours to restore the functions of disordered navaids. The information will be reported to Directorate of Navigation of the Headquarters for their efficient actions of analysis and evaluation so that all mariners may be notified of the information via the DGSC Message Center and then the Central Radio Station at Jakarta.

The information on obstacles to safety navigation follows the same procedures as above flowing the identical routes to that stated above. The notice to mariner on new establishment of navaids will initially originate from District of Navigation and then follow the procedures. All the above information will also be sent by Directorate of Navigation to the national and

Fig. 2-2 Flow of Information on Disorder of Aids to Navigation



Aids to Navigation disorder means:

1. Lost/sunk
2. Drifting
3. Deviation and irregulation of characteristic
4. Extinguished.

——— Information on Aids to Navigation disorder

– – – – Action after Aids to Navigation disorder Information

------- Action after Aids to Navigation disorder repaired, adjusted, corrected, replaced or new

international organizations concerned with aids to navigation such as Indonesian Naval Hydrographic Office, NAVAREA and so forth for their broadcast and circulation.

Fig. 2-2 describes the flow of information on disorder and failure of aids to navigation.

The following gives an example of Indonesian notice to mariner:

"591/84 Sumatera East Coast Selat Gelasa - Selat Baur Kasenga Light (Fl 5 sec 10 M) (3-02.35, 107-20.7 E) extinguished"

2-2-2 World-Wide Navigational Warning Service (NAVAREA)

The NAVAREA system, established by IHO and IMO, comprises the sixteen areas covering the entire world except north and south poles. The area coordinators are designated for the individual areas for their timely transmission of navigational warnings over long range. The messages consist of disorder of aids to navigation, new dangers like wreck and obstacles to navigation as well as search and rescue, anti-pollution action, cabling, under-water works, and so forth.

Indonesia belongs to NAVAREA XI, and the Coordinator is the relevant authority in Japan. The coast radio stations in Indonesia under NAVAREA XI are Belawan, Bitung, Dumai, Jakarta, Jayapura, Makassar and Surabaya. **Fig. 2-2-2** shows the geographical divisions of NAVAREA.

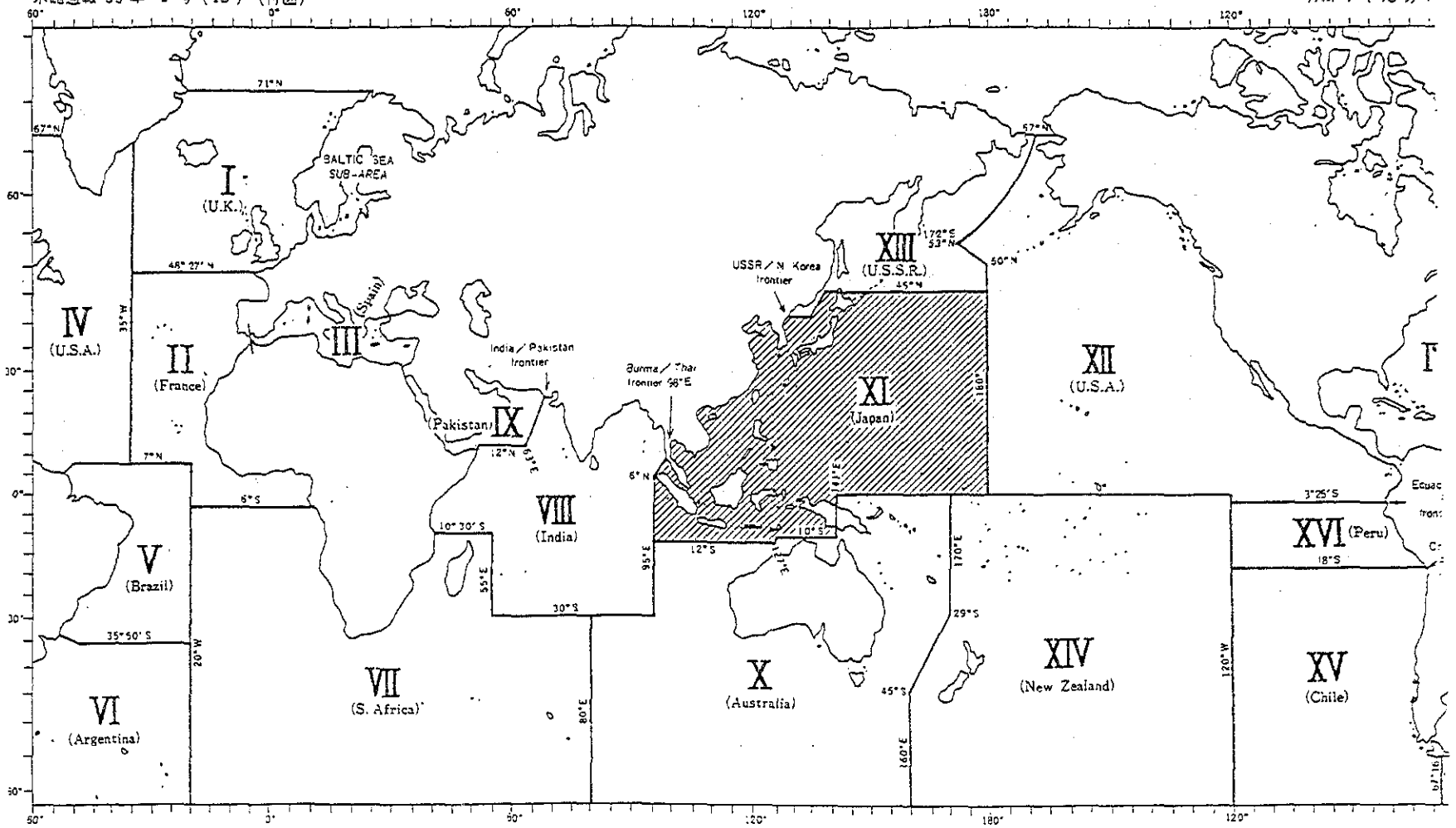
Following are examples of the information recently disseminated through NAVAREA XI: -

174/84 Bali Sea Selat Lombok - Teluk Sedihing
New Light established (Gp Fl (3) 10 sec 208 m 25 M) (8-49.1 S, 115-35.6 E)

366/84 Jawa Sea
Kasenga Light 03-02.3S 107-20.7E extinguished.
Cancel 531/80

Fig. 2-2-2 N A V A R E A

GEOGRAPHICAL AREAS FOR COORDINATING AND PROMULGATING NAVAREA WARNINGS



2-2-3 Distress Message

Some of the lighthouses located along the major traffic routes and near the main ports carry out watch-keeping for ships. If and when a vessel in distress or in a state of emergency would be sighted, the watch-keepers report the fact to a nearby coast station. General flow of distress message is shown in **Fig. 2-2-3/1.**

SOS message received at a coast station is transferred to the nearby KPLP Detachment for their immediate SAR action as well as to the District Directorate General of Sea Communication, from which the organizations of SAR National are notified of the information for their co-ordination. At the same time, the local Harbor Master, and local Port Administrator receive the information for their necessary SAR assistance.

The handling process of important messages and information at a coast station is given in **Fig. 2-2-3/2** giving an example at Jakarta Radio.

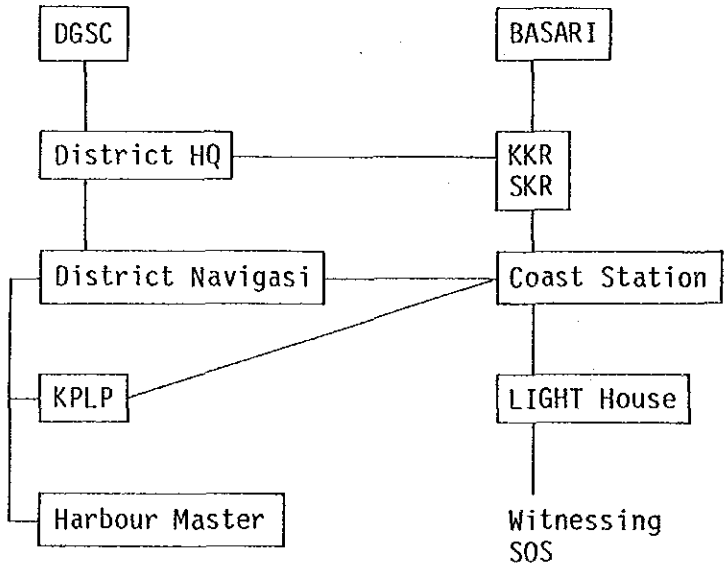
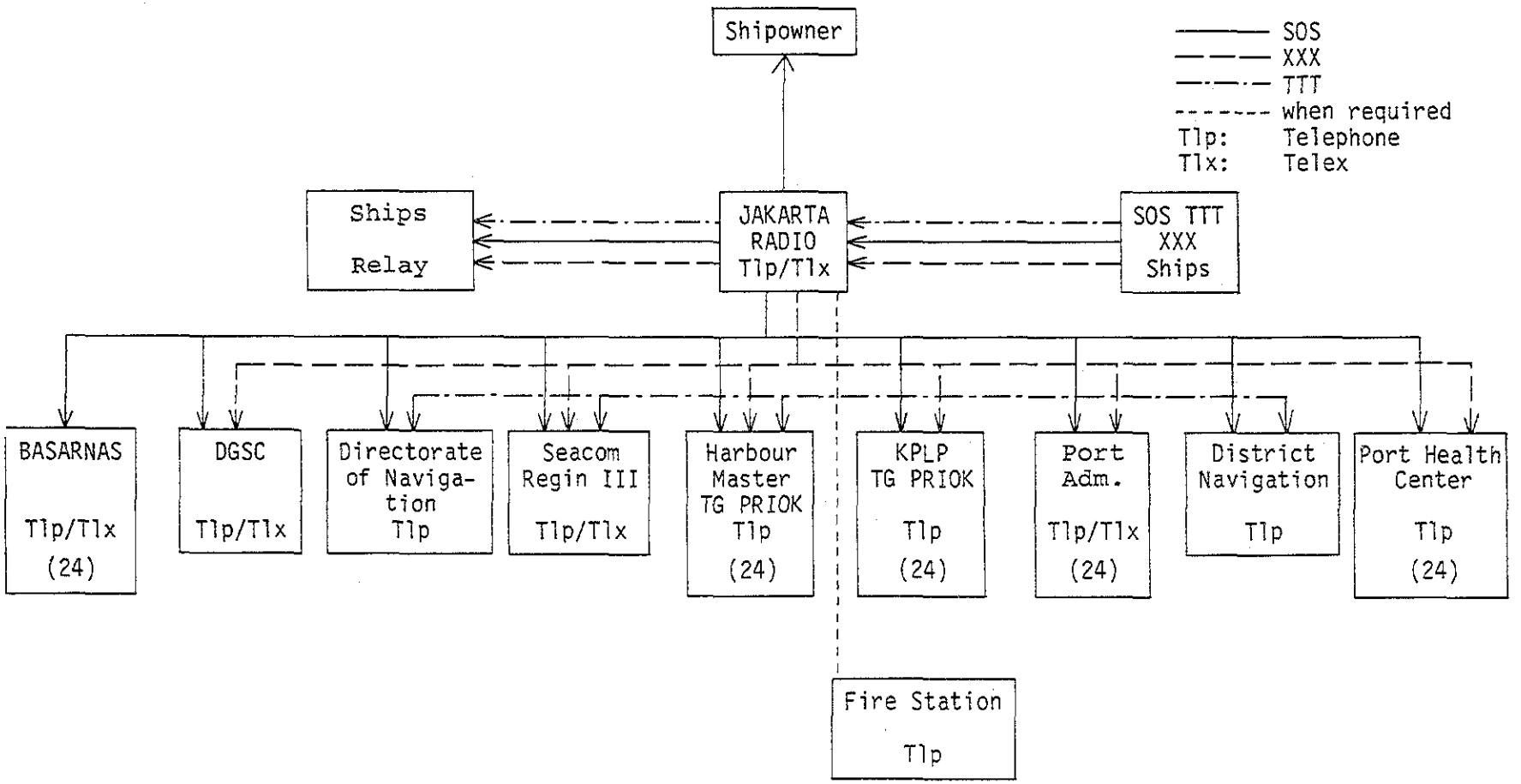


Fig. 2-2-3/1 General Flow of Distress Message

Fig. 2-2-3/2 FLOW OF INFORMATION (IMPORTANT MESSAGES) AT JAKARTA RADIO



2-3 Aids to Navigation

2-3-1 Visual Aids to Navigation

(1) Management

As described in Section 2-1-1, the aids to navigation are under the managerial responsibility of Directorate of Navigation, and the 1st and 2nd Districts of Navigation are the local organizations in charge of their maintenance and operation.

There are five (5) 1st Class and nineteen (19) 2nd Class Districts of Navigation: the details of manpower, navaids and vessels per each District of Navigation are shown in **Table 2-3-1/1** together with the ships belonging to them.

Table 2-3-1/1 DISTRICTS OF NAVIGATION

- Manpower, Navaids, Vessels -

As of Feb. 1984

KANVIL	PLACE	CLASS	PERSONAL					TYPE OF NAVAIDS						TYPE OF VESSEL						
			STAF T.U.	M.S (P3)	SROP	K.N	BENG-KEL	LIGHT HOUSE	LIGHT BEACON	LIGHT BODY	MARBOR LIGHT	SMALL BUOY	DAY MARK	BUOY TENDER	SUPPLY VESSEL	WATCH BOAT	INSPEC-TION BOAT	SURVEY VESSEL	SURVEY CRAFT	OTHERS
I	BELAWAN	(II)	18	35	30	40		3	17	24	6	34				3				
	SABANG	(II)	11	18	13	16		4	19	13	2	28	9			2				
	SIBOLGA	(II)	6	5	5	12	5	1	7		1		3			1				
II	DUMAI	(I)	26	43	28	110		2	19	29	7	7		1	1	3	2			
	TG. PINANG	(II)	25	86	2	57		19	25	15	13	63	113			4	2			
	TLK BAYLUR	(II)	14	62	10	24		9	18		6	26	16			1				
III	TG. PRIOK	(I)	109	107	83	266	186	26	48	34	4	44	12	2	2	4		1	4	1
	PALEMBANG	(II)	20	27	14	66	10		39	22	2	3	6			6	1			
	PONTIANAK	(II)	18	13	6	16	3		12	10	1	19	6			2				
IV	SURABAYA	(I)	67	36	64	198	41	10	22	19	7	20	25	2	2	4	1			
	SEMARANG	(II)	15	18	12	32	15	7	11	6	2	2	18			3				
	CILACAP	(II)	12	9	3	8		2	13	20		23	2			1				
	BENOA	(II)	21	23	4	12	8	9	18	5	2	15	24			1				
	KAPANG	(II)	19	49	25	32	7	10		3	15		10			2				
V	SMARINDA	(I)	20	8	7	98	19	2	51	68	2	35	115	1	1	2	1			
	BANJARMASIN	(II)	12	31	13	40	17	6	14	20	2	8	2			2	1			
	BALIKPAPANN	(II)	10		10	12		1	8	11		6				1				
VI	UJUNG PANDANG	(II)	23	84	44	24		11	7	4	10	5	54			1				
	KENDARI	(II)	19	9		12		1	17		5		11			1				
VII	BITUNG	(II)	25	60	32	40		12	4	1	34	15	60			3				
VIII	AMBON	(II)	14	32	33	32	13	4	11		29	19	61			1	1			
IX	SORONG	(I)	18	10	5	89	9	4	29	19	3	28	24	1		2	3			
	JAYAPURA	(II)	18	10	18	76	15	2	18	3	4	14					8			
	MERAUKE	(II)	5	5	6	15	31	1	4	3	1	1	1				2			
TOTAL			545	780	467	1,327	379	146*	431*	329*	158*	415	572	7	6	50	22	1	4	1

Notes: 1) Non-property navaids are included in the number given above.
2) * ..... total number of the lights with * gives 1,064, and the data as of March 1984 gives additional 28, resulting in the total number of 1,092.
3) STAF T.U : Administration
M.S. (P3): Light house
SROP : Coast Station
K.N. : Ship
BENKEL : Workshop

Source: DGSC Data on organization, personnel, navaids, vessels provided in a form of list and chart for 1st and 2nd classes of District of Navigation.

(2) Visual Aids to Navigation

The visual aids to navigation have been playing an important role as one of the main pillars for the safety of navigation in the development of shipping and fishery industries and other relevant maritime sectors in Indonesia.

The present installations, however, do not sufficiently meet the recent maritime requirements brought about due to increasing sea transportation and fishery activities in the country.

There are currently 1,092 lighted aids to navigation established in Indonesia, comprising: -

	(As of March 1984)
Lighthouse	149 units
Light beacon	436 units
R. L. B.	2 units
Harbour light (Oil rigs, maritime structures)	163 units
Light buoy	342 units
Total	1,092*units

(*: see Notes 2) of **Table 2-3-1/1**)

This gives the per-100 miles-unit of 3.3 for coast line, i.e., the number of 3.3 lighted aids are presently installed per 100 miles along the coast lines in Indonesia.

In addition to the above aids to navigation, there are in Indonesia 987 other navaids comprising 415 unlighted (small) buoys and 572 day marks.

There are also 217 radar reflectors, 76% of which are fitted on light buoys.

1) Distribution and Coverage

The visual aids to navigation are scattered around the coasts; 348 units are along Sumatera, 210 units along Jawa, 62 units in Flores Sea areas, 213 units along Kalimantan, 106 units along Sulawesi and 125 units around West Irian areas. Out of the 146 lighthouses, 139 units are manned. There are the 272 coastal lighthouses, coverage of which is ten miles or over, and distribution of their locations is shown in **Fig. 4-3-1-(1)/1.**

According to the Annual Report of Directorate of Navigation, 1982/83, the reliability of the aids to navigation in Indonesia gives 84.95% and the availability 90.5%.

2) Power Sources for Lights

The power sources for lighted aids to navigation comprise the various sources of electricity (diesel generator, commercial power and battery), acetylene gas, propane gas and petroleum, and the maximum use is electricity accounting for 53.9% followed by acetylene gas, 28.8% and then by propane gas, 8.9% and petroleum, 8.4%.

As regards the power sources by type of navigation aids, most of lighthouses (76%) are powered by diesel generators and only about ten percent of those use commercial power source, while light-beacons are by either battery or acetylene gas (both constitutes 82%). The power sources for harbour lights are commercial power and petroleum on nearly 50-50 basis. About 34% of the lighted buoys including non-property ones use batteries, followed by about 29% by acetylene, occupying the majority as given in **Table 2-3-1/2**, which shows the details of power sources in use.

In their comparison with the power sources used in 1970, use of petroleum those for both lighthouses and buoys faded out and switch-over has been made from acetylene gas and carbide to diesel generators for lighthouses, and from acetylene and propane gas to solar cells and secondary batteries including wave-activated generators for lightbeacons and buoys.

Fig. 2-3-1/1 shows the change-over status of power sources.

Table 2-3-1/2 POWER SOURCE OF NAVAIDS

As of Feb. 1984

NAME OF NAVAIDS	DIESEL GENERATOR	COMMERCIAL ELECTRICITY	ELECTRIC BATTERY	ACETYLENE	PROPANE	PETROLEUM	TOTAL
LIGHTHOUSE	111	16	1	15	3	0	146
LIGHT BEACON	0	25	174	178	54	0	431
HARBOUR LIGHT	0	59	7	3	0	89	158
LIGHT BUOY	0	0	181	110	38	0	329
TOTAL	111	100	363	306	95	89	1064
RATIO	10.4%	9.4%	34.1%	28.8%	8.9%	8.4%	100%

Source: Same as for **Table 2-3-1/1**

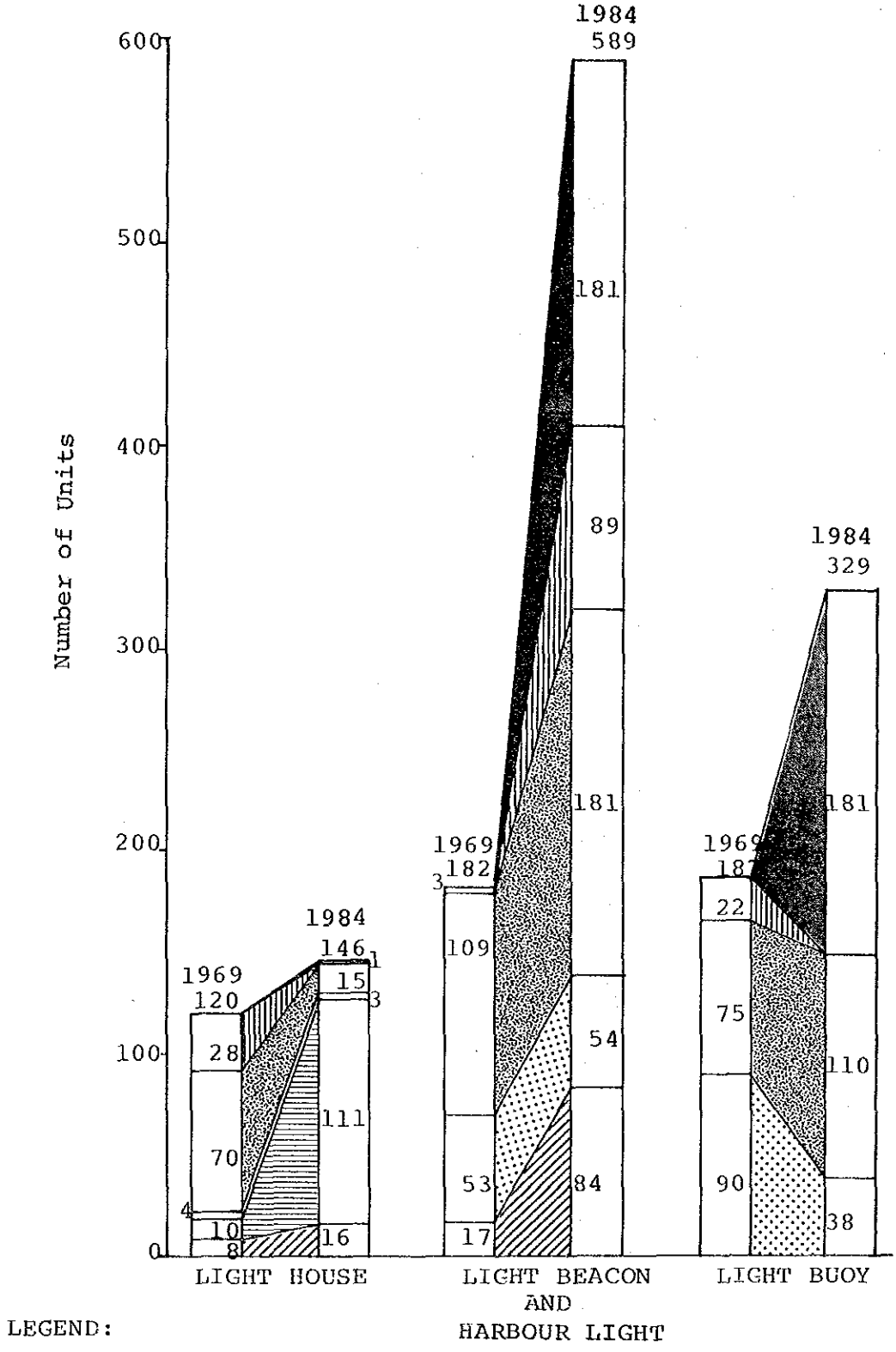


Fig. 2-3-1/1 Change-Over Status of Power Sources for Navaids

Source: 1) Same as Table 2-3-1/1 for 1984
2) Survey Report for Indonesian Projects, March 1970, OECF for 1969

3) Construction Materials of Lighted Aids

The construction materials of tower structures for on-shore navaids facilities may be divided mainly into the three categories of iron, stone and wood. Most of the structures are iron-make framed towers, and rest of them are wooden or stone-make. Apart from the insufficient visual effect of the framed towers, iron structures self-contain the inherent serious problems of rust and corrosion. The stone-make towers or reinforced concrete towers are best suited for coastal installations from the operational point of view as well.

Table 2-3-1/3 gives the details of construction materials for the existing on-shore lighted aids in Indonesia.

Table 2-3-1/3 CONSTRUCTION MATERIALS OF NAVAIDS

Material / Lights	Iron (Metal)	Stone	Wooden	Not-described	Total	Remarks
Lighthouse	90	5	3	42	140	
Light Beacon	186	0	7	165	358	
Harbor Light	63	6	22	69	160	
Others	4	0	0	25	29	Note
Total	343 (49.7%)	11 (1.6%)	32 (4.7%)	301 (43.8%)	687	

Note: Radio mast, oil platform, lamp post, oil barge, mooring, etc.

Source: List of Lights, Indonesia, 1982

4) Non-Property Lights

The establishment, operation and maintenance of aids to navigation should be the primary national responsibility, and more specifically that of Directorate General of Sea Communication. It should, however, be impractical to cover those required for special use or exclusive private use due to the limited number of beneficiaries, not for unlimited use by any mariners. They are referenced as non-property aids to navigation.

There are the total of 227 lights owned and being maintained mainly by PERTAMINA for their operations. Details are given in **Table 2-3-1/4.**

Table 2-3-1/4 AIDS TO NAVIGATION/NON-PROPERTY

Owner	Light Beacon	Light Buoy	Harbour Light	Total
- PN PERTAMINA	56	118	-	174
- Otorita Batam	11	3	2	16
- PT Inalum	1	1	1	3
- PN Aneka Tambang	2	-	-	2
- P L N	-	4	1	5
- DITJENDAT	6	1	-	7
- PT Free Port/ Tembaga Pura	10	10	-	20
Total	86	137	4	227

Source: DGSC data, December 1983

5) Present Status of Equipment and Facilities of Light Aids

Present status of the light aids surveyed during the first site survey is given in **Table 2-3-1/5.**

Table 2-3-1/5 Present Status of Navaids Facilities surveyed by JICA Study Team

March, 1984

Name of Lighthouse	Description of Tower Structure (Elevation: m)	Lighting Equipment	Power Source	No. of Personnel	Remarks
Tg. Suaja (NE of Jayapura Jaya)	Iron Framed (10)	BBT, 375 mm	Engine Generator x 3	5	2 persons during daytime. 3 persons off duty work at District Navigasi. Every 3 months shift.
Pu. Buaya (NE of Seram Sea)	Iron Framed (20)	BBT, Rotary	Engine Generator 8 ps 4 KVA x 3, 125 V Made in England	5	Built in 1981. Every 6 months shift. Overhaul for EG is carried out by technicians despatched from Sorong.
Tg. Nusanive (South of Ambon)	Iron Framed (30)	375 mm, 500 W	Engine Generator 2.7 KVA x 3, 110 V Made in England	5	Every 3 months shift. Engines are switched over every 6 hours.
Teluk Palu (E coast of Makassar Strait)	Iron Framed (21)	BBT, 500 W	Engine Generator 8 ps 3.4 kW made in England	4	
Sorido Laguno (South of Biak Is.)	Iron Framed (5.5)		Engine Generator x 3		The power source is being converted into commerical power from engine generator. Facility already completed, and waiting for supply of lighting equipment.
Jayapura (NE of Irian Jaya)	Iron Framed (6) Wooden Pote (10) With Triangular Top Mark			4	

Name of Lighthouse	Description of Tower Structure (Elevation: m)	Lighting Equipment	Power Source	No. of Personnel	Remarks
Talisei (NE point of Sulawesi)	Iron Framed (20)	BBT	Engine Generator 5 ps 2.7 KVA x 3 Made in England 1 set under repair	3	Built in 1910. Every 3 months shift is planned, but seemingly longer. Engines are switched over every 6 hours.
Parigi (Parigi Port)	Iron Framed (31)	BBT	Engine Generator 7.5 KVA x 3	3	Built in 1982. The personnel are with Harbour Master Office. Maintenance is carried out by technicians from Manado.
Jamuang (Off Surabaya Port)	Iron Framed (40)	4th Class, Fl. 4 faces, 1,000 W	Engine Generator 8 ps 4 KVA x 3, 110 V, Made in England	4	Every 4 months shift from Surabaya. 4-hour shift during night time. Light is watched every hour.
Masalembo (Jawa Sea)	Iron Framed (40) Cage: FRP	Sealed-beam lamp, 8 lamps, 3 faces	Engine Generator 22.6 ps, 125 KVA x 3, 110 V, Made in England	-	Built in 1984, but not in operation yet. 5 living quarters for the personnel.
SAHARU (Makassar Strait)	Iron Framed (41)	300 mm 1000 W	Engine Generator 11 ps 7.5 KVA x 3, 110 V, Made in Japan	4	Every 6 months shift. Fuel is supplied every 3-4 months from Ujung Pandang. Average age of the personnel: 30
Wangi Wangi (SE of Sulawesi)	Iron Framed (21)	4th Class, Fl, 4 faces, 1000 W, Mercury bath	Engine Generator 8 ps 3.5 KVA x 3, 110 V, Made in England	5	Fuel is supplied from Kendari. SSB communication with Kendari. Average age of the personnel: 23

Name of Lighthouse	Description of Tower Structure (Elevation: m)	Lighting Equipment	Power Source	No. of Personnel	Remarks
Dewakang Besar (S. coast of Sulawesi)	Iron Framed (32)	500 mm, 1,000 W	Engine Generator 11 ps, 7.5 kVA x 3, 100 V, Made in Japan	4	Fuel and spares are supplied every 3 months from Ujung Pandang. 1 person sick off.
Mandalika (Central Jawa)	Iron Framed (16)	4th Class, 4 faces, 1,000 W,	Engine Generator 8 ps, 4.25 KVA x 3, 110 V, Made in England	4	Built in 1886. Fuel is supplied from Semarang. Overhaul of engines is carried out by the technicians every 3 months.
Cimiring (Central Jawa)	Stone reinforced by concrete (10)	4th Class, Fl, 4 faces, 1,000 W, Mercury bath	Engine Generator 8 ps, 4.25 KVA x 3, 110V Made in England	4	Built in 1855. Supply of spares is seemingly insufficient. Engines are switched over every 6 hours. Lamps are changed every 2 months.
Ambo (N. of Makassar Strait)	Iron Framed (43)		Acetylene Gas	-	Unattended. Non-lighted for about 8 months due to gas shortage. Tower foundation is partly damaged.
Tg. Selatan (S. of Banjarmasin)	Iron Framed (30)	375 mm x 2 (Duplex) 250 W lamp x 2	Engine Generator, 4.25 kVA x 3 Made in France	5	Built in 1913. Every 3 months shift and supply.
Giliselang (E. point of Bali)	(20)		Engine Generator 22 ps 7.5 kW, 110 V 7 ps 5 kW, 115 V, Made in Japan	5	Built in 1983.

Name of Lighthouse	Description of Tower Structure (Elevation: m)	Lighting Equipment	Power Source	No. of Personnel	Remarks
Celukan Bawang (N. coast of Bali)	Leading Lights (13, 17)		Engine Generator 22 ps 7.5 kW 5 ps 3 kW 5 ps 2 kW 220/110 V	5	
Benoa (S. coast of Bali)	Harbour Light (25)	Shield-beam lamp, 1,200 W, 4 faces, 32 lamps	220-230 V (110 V), 68 AH		
Tg. Pengambengan (E. coast of Bali)	Iron Framed (40.5)	500 mm, 1,000 W	Engine Generator 8 ps 4.5 KVA, 110 V, Made in England	5	
Lembongan (SE coast of Bali)	Iron Framed (25)	500 mm, 500 W	Engine Generator 5 ps 4,25 KVA, Made in England	5	
Kelapa (W. of Sape Strait)	Leading Lights Iron Framed (4, 15)	BBT (R) 500 mm, 500 W (F) 375 mm, 100 W	Engine Generator 22 ps, 4.25 kVA x 3 Made in France	5	3 persons shift every year, 2 persons shift every 6 months.
Ampenan (E. of Lombok Strait)	Iron Framed (30)	Gakuyo Toki	Engine Generator, Made in Japan	5	
Sedihing (SW of Lombok Strait)	(20)		Engine Generator 7 ps 5 kW, 115 V Made in Japan	5	Built in 1983. Every 3 months shift and supply.
BULELENG (N. coast of Bali)	Iron Framed (20)		Engine Generator 5 ps, 2.7 kW	5	

(3) Maintenance and Operation

1) Attended Lighthouses

There are presently 139 lighthouses attended respectively by four to five lighthouse keepers and technicians with their families. Although a plan is to implement the minimum shift period of every three months for lighthouse keepers and technicians from one lighthouse to other lighthouse, workshop or base, or vice versa, the reality is that in some cases, four to six months shift period has been applied with some exceptional cases of over one year period on isolated areas.

Consideration is now being given to substantial improvement of their living and duty conditions from the view points of both personnel recruitment and efficiency of maintenance and operation of navaids.

The main duties which they carry out at the field are checking and maintenance of the equipment, night watch for lights, overhaul of engines, painting of tower mast and so forth.

Government pays food allowance for wife and 2 children only. The allowance for extra number of children is nil. However, transportation charges for all the family are free in case of their transfer (i.e. government payment).

There are allowances in terms of geographical locations:

	Isolated L/H	Non-Isolated L/H
Salary:	same	same
Family Allowance: (1 x wife, 2 x children)	same	same
Premier:		
LH Technician	Rp. 2,980/day	Rp. 2,280/day
LH Keeper	Rp. 2,680/day	Rp. 1,790/day

2) Unattended Lights

The other lights such as light beacons, light buoys, etc. located in remote areas and high seas are serviced generally twice a year mobilizing buoy tenders and supply vessels for supply of fuel and other necessaries, checking of equipment and their maintenance. The navaids located nearby coasts and in ports are locally serviced using watch boats and so on.

With regard to buoys, they are serviced by buoy tenders at sea generally twice a year lifting them onboard deck for clearing-up, checking, parts replacement, and placing them back to the original locations. A serious problem involved here is the at-sea maintenance of checking and painting, which adversely affect anti-corrosion of painting buoys, and even shorten the life time. It is, therefore, extremely difficult to implement the sufficient maintenance for buoys unless on-shore maintenance is carried out at bases.

The maintenance works for buoys by buoy tenders are under the responsibility of 1st District of Navigation. There are five 1st Class Districts of Navigation throughout the country as shown in **Fig. 2-1-1/14.**

In other words, the whole area is divided into the five divisions with some parts overlapping the administratively divided areas of Regional Headquarters of Sea Communication (KANWIL) in order to carry out the most effective operation of buoy maintenance service.

As shown in **Fig. 2-1-1/14**, there are also 2nd Class Districts of Navigation, the areas of which are overlapped with those of the 1st Class. However, their prime responsibility as far as the buoy maintenance is concerned is to conduct regular checking and minor repair works using their watch boats.

The arrangements and coordination for the works carried out by buoy tenders are shown in **Fig. 2-3-1/2** in a flow form:

- Request of service by 2nd Class District of Navigation for the buoys within their maintenance regions will be made to the 1st Class District of Navigation (see (1)), with information to be sent to the KANWIL (see (1B)) and the central Headquarters (see (1A)).

- The 1st Class District of Navigation received the request of service will instruct their buoy tender to carry out necessary works (see (2)).

- The ship carries out the works instructed (see (3)).

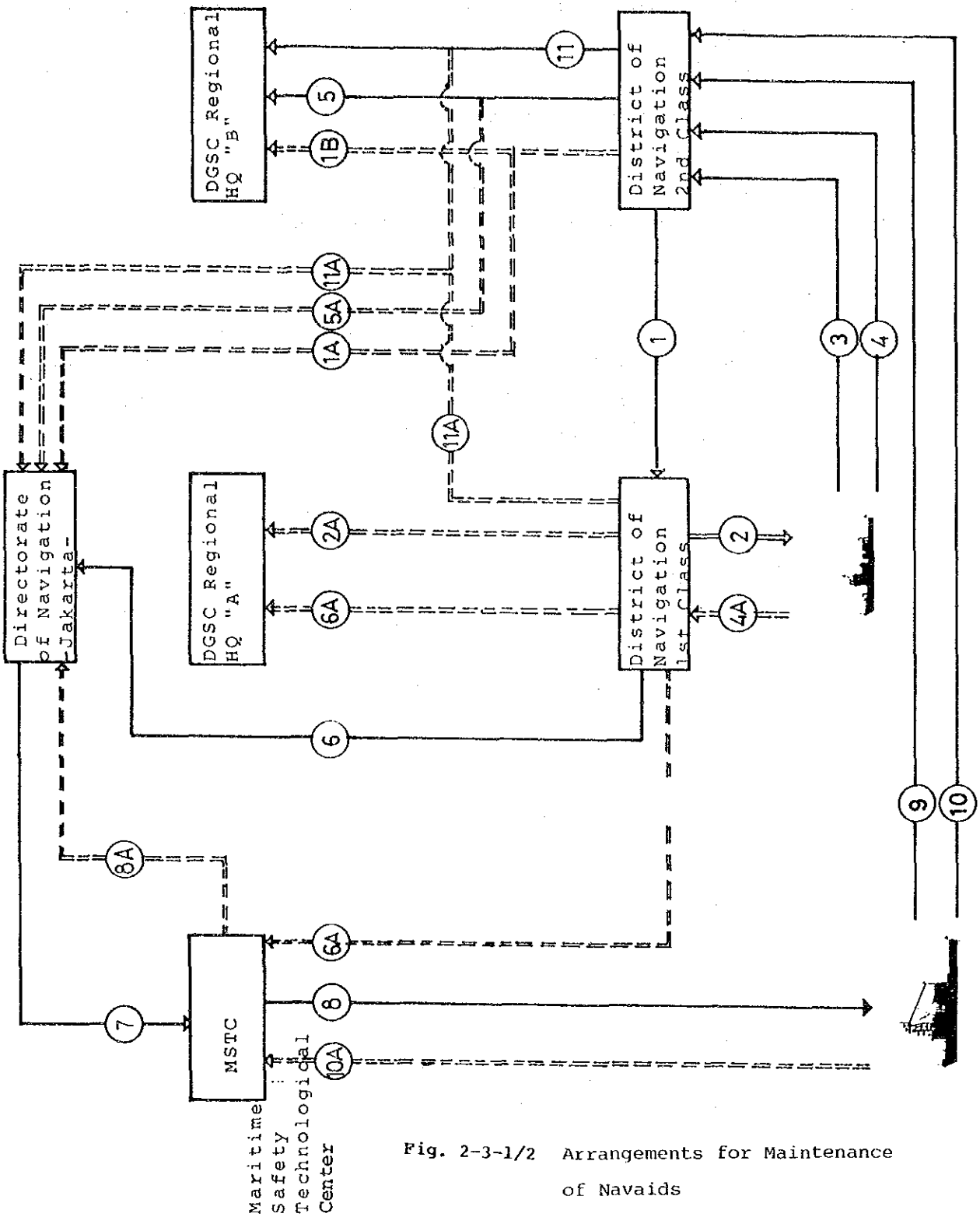
- After completion of the works, the ship reports to the 2nd Class District of Navigation on the completion (see (4)) with the information to be sent to the 1st Class District of Navigation (see (4A)).

  The 2nd Class District of Navigation reports to their KANWIL about the completion of works (see (5)) with the information to be sent to the central Headquarters (see (5A)).

  If the 1st Class District of Navigation could be unable to meet the request for service to be made by 2nd Class District of Navigation, then the request is sent to the Maritime Safety Technological Center (see (7)) via the central Headquarters (see (6)) with the information sent to the Maritime Safety Technological Center (see (6A)).

  The Maritime Safety Technology Center provides their ship with the instruction to carry out the works (see (8)).

  The ship instructed carries out the works (see (9)), and reports the completion to the 2nd Class District of Navigation (see (10)) with the information sent to the Maritime Safety Technology Center (see (10A)).



MSTC: Maritime Safety Technological Center

Fig. 2-3-1/2 Arrangements for Maintenance of Navaids

The 2nd Class District of Navigation reports to their KANWIL regarding the completion of works with the information sent to the 1st Class District of Navigation.

3) Actual Status of Maintenance and Operation

The maintenance and operation status for the attended lighthouses are in good order both for the facilities and for the equipment, especially engine generators are well maintained through regular overhaul carried out by competent technicians. There have, however, been seen, through the surveys, in some cases necessities of improvement in replacement of lamps and in maintaining the performances of light devices and also of providing the lighthouse personnel with the training on maintenance of other associated devices. It was also found that failure of lights was due to shortage of gas supply and the corrosion of gas pipe causing gas leakage.

The records of failure data collected at a Districts of Navigation show:

Period	Failure of Lights
April, 1981 - March, 1982	6,701 days for 227 units
April, 1982 - March, 1983	7,331 days for 259 units
April, 1983 - Dec., 1983	5,486 days for 39 units

(4) Supporting Facilities/Logistic System

In order to provide the support for maintenance and operation of aids to navigation, various types of vessels as well as buoy bases, dockyards, and workshops are available to meet the operational requirements.

The present status of establishments of those facilities is given in **APPENDIX-24.**

Only a few of 1st Class Districts of Navigation have all installations of such facilities, and the development and rehabilitation need to be implemented for the full and reliable support to aids to navigation.

1) Aids to Navigation Service Vessels

The types of vessels and their functions are given hereunder:

a. Buoy Tender

The principal functions are for:

- installation of light buoys and unlighted buoys
- maintenance and treatment of light buoys and unlighted buoys.
- maintenance and treatment of lighthouses on high sea
- maintenance and treatment of light beacons
- maintenance of shallow water beacons and beacons on land
- Transportation of gas cylinders.

b. Supply Vessel

The principal functions are for:

- shift of lighthouse keepers
- transportation of installation materials for lighthouses
- transportation of supply, spare parts, and other necessities for the lighthouse installation

- transportation of gas cylinders, batteries, etc.

c. Aids Tender

The function of this vessel is to support the buoy tender and supply vessel for maintenance of aids to navigation which are situated close to the base, i.e.:

- maintenance and treatment of buoys
- treatment of light beacons and beacons
- changing gas cylinders, batteries, etc.
- transportation of necessary supplies and personnel for shift duty at attended light-houses

d. Inspection and Service Boat

The function of this type of ship is to:

- inspect and control the functions of aids to navigation on sea lanes with heavy traffic, such as TSS at Malacca Strait and Strait of Singapore, etc., and
- repair minor damages of power sources and light/lamps equipment

e. Survey Vessel

The major functions of this type of ship are to perform navigational survey works, i.e.:

- study, control and calibration periodically for the visual as well as electronical aids to navigation in order to secure their operation.

- engineering survey for the construction/ installation of aids to navigation
- survey of sea banks, sea lanes where the depth is still in doubt, in connection with the planning of installing aids to navigation
- survey of isolated dangerous waters, positioning of ship wreckage which is still in doubt, to install signs and send notice as a "Navigational Warning"

f. Survey Craft

The functions of this type of ship are primarily engaged in the navigational survey of limited coastal areas and assisting survey vessel.

g. Pile Ponton

The functions are as follows:

- an aid or platform to execute large scale maintenance work at offshore lighthouses and resilient light beacon, etc.
- an aid to install piles for building temporary beacon structure at sea

The total number of vessels are as given below:

Buoy Tender	7
Supply Vessel	6
Aids Tender	50
Inspection Boat	22
Survey Vessel	1
Survey Craft	4
Pile Pontoon	1
Total	91

However, majority of the vessels are overaged with many of them to be scrapped, and those included in the scrapping plan by 1988/89 are:

Supply Vessel	1
Aids Tender	27
Inspection & Service Boat	22
Total	50

Table 2-3-1/6 shows the data of buoy tenders and supply vessels, and the details are given in **APPENDIX-12.**

Table 2-3-1/6 DATA ON BUOY TENDER-SUPPLY VESSEL

No.	Name of Ship	Port of Registration	Year Built	BRT	Class
	BUOY TENDER				
1.	KARAKATA	DUMAI	1972	569.1	I
2.	KUMBA	SURABAYA	1972	568.23	I
3.	MESA	TANJUNG PRIOK	1975	644.46	I
4.	MITHUNA	SAMARINDA	1975	644.23	I
5.	PARI	TANJUNG PRIOK	1978	644.46	I
6.	PRAJAPATI	SURABAYA	1978	684.68	I
7	PRADAWANA	SORONG	1979	762.78	I
	SUPPLY VESSEL				
8.	MUCI	DUMAI	1975	608.83	I
9.	MANDALIKA	SURABAYA	1975	767.82	I
10.	PAMANCASA	TANJUNG PRIOK	1978	904.52	I
11.	INTAN	SURABAYA	1952	668.50	II
12.	PUSPARAGAM	SORONG	1953	668.50	II
13.	PERMATA	TANJUNG PRIOK	1953	664.89	II

Source: DGSC Aids to Navigation Service Vessel's Data, March 1984. (Ref. APPENDIX-12)

2) Buoy Bases

There are five buoy bases to cover the whole area of Indonesia; 1st Class Districts of Navigation have the basis, i.e. Dumai, Tg. Priok, Surabaya, Samarinda and Sorong. Buoy tenders and supply vessels operate from those bases.

The outline of Surabaya buoy base is as follows:

Facilities: -

Area	Approx. 6,000	m^2
Jetty	105	m
Office, Storage (2nd stored)	Total 880	m^2
Machine room, Workshop	420	m^2
Storage for gas cylinder etc.	120	m^2
Guard house	15	m^2

Equipment: -

Truck crane, 10 t	1
Lathe	2
Drilling machine	1
Milling machine	1
Work deck	8
Engine generator, 70 ps 50 kVA (1974)	2

Vessels: -

Prajapati (1978)	Buoy Tender
Kumba (1972)	Buoy Tender
Mandalika (1975)	Supply Vessel
Intan (1952)	Supply Vessel
Boga (1953)	Aids Tender
Sura-002 (1951)	Aids Tender
B-068 (1945)	Inspection Boat

3) Workshop

Workshop installation is a supporting means on land which is used for:

- Repair and maintenance of aids to navigation
- Repair and maintenance of radio equipment and navigational telecommunication
- Emergency maintenance and planned maintenance for vessels, especially in isolated areas.

All Districts of Navigation have the workshops installed for relevant work to be done, but further installations of necessary gears are required.

Following gives the outline of workshop at Ujung Pandang District of Navigation:

Facilities

Office	Approx. 57 m^2
Workshop	Approx. 183 m^2
Storage	Approx. 40 m^2
Total	Approx. 280 m^2

Equipment: -

Lathe	3
Milling machine	1
Shaping machine	1
Electric welding machine	1
Air compressor	1
Work deck	4

4) Gas Plant

Gas plant is an aid to fulfil the need of acetylene gas for the light aids to navigation using gas for the energy source. There is a gas plant in Cilincing. However, due to the limited supply capacity of gas at the plant, needs are not being sufficiently met even when the vessels are in port waiting for loading. Accordingly, added facilities of gas generator are presently required.

5) Jetty

The supporting facility of jetty for aids to navigation service vessels currently available is insufficient, and further development is required for a number of Districts of Navigation.

6) Procurement of Spares

The procurement system has been established for spares: the main items are procured collectively by central Headquarters in Jakarta with other items by Districts of Navigation through the allocation of budget by Directorate of Navigation, via KANWIL.

Some problems having encountered are difficulties in purchasing these spare items off shelf: because of rather specialized items, they should be placed under special orders to sales agents of foreign manufacturers since many of navaids equipment are from overseas. The fact leads to high pricing as well and the reality is that spares are generally in shortage because of the limited budget available.