3-6-2 Satellite to the Rescue

The use of maritime satellites for the handling of safety and distress communications is a matter of increasing importance. A vessel in distress installing with a satellite communication terminal would have a priority channel available for the transmission of the distress message. Such a service capacity is provided by INMARSAT system in the same way to MARISAT system.

The satellite EPIRB system which is used to transmit the distress message via maritime satellites is now under study for a powerful device in FGMDSS.
The satellite EPIRB system should provide, as a minimum, the following information.

------ distress alerting;
------ identification of the unit in distress;
------ data which enables the SAR authorities to determine the position of the unit in distress.

The IMCO operational requirements are summerized in Table 3-6-2 (1) and the possible contents of distress message is shown in Table 3-6-2 (2).

As the up-link frequency of a satellite EPIRB, the 406 MHz and 1.646 GHz bands are proposed to be used with near-polar or geostationary orbiting satellites.
The systems to be expected in operation are listed in Table 3-6-2 (3). These are planned for field trials in COSPAS/SARSAT employing 406 MHz band and the Coordinated Trial Program using INMARSAT satellites with 1.6 GHz band.

Further study might be necessary to determine the standardized system of satellite EPIRB, particularly on the transmission frequency and the modulation technique to be employed.

These will be cleared after the field trials mentioned above.

TABLE 3-6-2 (1)

Summary of the IMCO Operational Requirements

(CCIR XV The Plenary Assembly 8/1066)

IMCO operational requirements	Geostationary satellite	Low altitude polar orbiting satellite	Combined geostationary and low altitude polar orbiting satellite
Immediate alarting	Immediate alarting within coverage area	Average of 1 hour for a 4 satellite system	Immediate alerting except average of 1/2 hour in polar regions with a 4 satellite low altitude polar orbiting system [ORI, May 1979]
Identification	In message content	In message content	In message content
Positioning	Re-transmission of NAVAIDs or Ship's position	Doppler measurement and possibly re-transmission of NAVAIDs or ship's position	Doppler measurement and possibly re-transmission of NAVAIDs or ship's position
Global coverage	Limited to approximately between 70°N and 70°S	Global	Global
Nature of distress (optional)	In message content	In message content	In message content
Simultaneous transmissions (20 in 10 minutes)	Awaits evaluation	Awaits evaluation	Awaits evaluation

TABLE 3-6-2 (2)

Possible Contents of Distress Message

(CCIR XV The Plenary Assembly 8/1066)

Item	Contents	Aaproximate No. of bits
1.	Ship station identity	30
2.	Position co-ordinates:	
	latitude (minutes)	13
	hemisphere symbol	1
	longitude (minutes)	14
	hemisphere symbol	1
3.	Time of position update (minutes)	11
4.	Time of activation (minutes)	11
5.	Course (360 degree rotation)	9
6.	Speed (up to max. 63 knots)	6
7.	Nature of distress	4

Note - Position, time of position, update, time of activation, course and speed would not be necessary if position is determined by Doppler measurement techniques.

Items 3, 4, 5 and 6 may not be required if position updating is continuous, or at short intervals.

Item 4 may not be required if acquisition time is short.

TABLE 3-6-2 (3)

Summary of Expected System Parameters

SYSTEM PARAMETER	COSPAS/ SARSAT	DRCS FRG	FSK JAPAN (1)	SAMSARS USA	U.K.	PN-PSK NORWAY/E SA	USSR EPIRB	PN-PSK JAPAN (1)
Satellite orbit	Polar about 850 km	Geostationary	Geosta-tionary	Geosta-tionary	Geosta-tionary	Geosta-tionary	Geosta-tionary	Polar/ Geostationary
Minimum No. of satellites	3 NOAA and 2 COSPAS (1)	3	3	3	3	3	3	-
Type of distress equipment	121.5/243 MHz ELT/EPIRB. 406 MHz : -float free -on board ship -survival craft	-float free -on board ship -survival craft	-float free -on board ship -survival craft	-float free -on board ship -survival craft	-float free -on board ship -survival craft	-float free -on board ship -survival craft	-float free -on board ship -survival craft	-float free -on board ship -survival craft
Message type	IMCO requirements	IMCO requirements and individual telegraph message	IMCO require-ments	IMCO require-ments	IMCO require-ments	IMCO require-ments	IMCO require-ments	IMCO require-ments
Position information	Doppler measurement, ship derived position	By up-dating of ship's derived position information	By up-dating of ship's derived position information	Position information or NAVAID retrans-mission or Doppler measurement	By up-dating of ship's derived position information	By up-dating of ship's derived position information	By up-dating of ship's drived position information	Doppler measurement/ Ranging measurement
Time: for transfer (mean) (2)	Midlatitude Mean 1. 5.5 h 2. 2.5 h 3. 1.5 h 4. 1.3 h	1-8 min	2 min	2.5 - 7.0 min	10 min	5 min	5 min	see COSPAS/ SARSAT/ 5 min

TABLE 3-6-2 (3) (Continued)

SYSTEM PARAMETER	COSPAS/ SARSAT	DRCS FRG	FSK JAPAN (1)	SAMSARS USA	U.K.	PN-PSK NORWAY/E SA	USSR EPIRB	PN-PSK JAPAN (1)
Frequency Up-link, MHz	121.5, 243, 406	1645.5 - 1646.5	406/ 1645.5 - 1646.5	1645.5 - 1646.5	1645.5 - 1646.5	1645.5 - 1646.5	1645.5 - 1646.5	406/ 1645.5 - 1646.5
Transmitter power EIRP (3)	121.5, 243 MHz: 11.3 dBW 406 MHz: 7 dBW	Float free 10 dBW Keyboard 13 dBW	7 dBW	7 dBW	7 dBW	7 dBW	7 dBW	0 dBW/7 dBW
Information bit rate/ modulation	400 bits/s - PM	32 bits/s - non-coherent FSK	63 bits/s, FSK	0.2-0.7 bits/s bi-phase PSK	10 bits/s bi-phase PSK	11.61 bits/s PSK on a sub-carrier	24 bits/s FSK / 0.6 bits/s FSK	2.5 bits/s bi-phase PSK
Required bandwidth	100 kHz	100 kHz (4)	100 kHz	25 - 75 kHz (4)	200 kHz	awaits evaluation	5 kHz / 24.4 for 20 kHz	100 kHz
Theoretical simultaneous alerts, 0.95 probability	121.5/243 MHz for 10 406 MHz for 100	53 kHz for 200 (4)	136	42 with 26 dBW interference	awaits evaluation		awaits evaluation	above 200
Experiments carried out	1975 (OSCAR) land trials: 1979 ARCOS sea trials	1975/1976 (ATS-6) sea traial	1979 sea trials, but simulated satellite	1979 MARISAT land trials	None	None	None	None
Date of operational trials	1982	1982	1982-1983 (5)	1982	1982	1982	1982	1982-1983 (5)

(1) Initial system
(2) Time between initiation of transmission and read out of error free message at ground station.
(3) This value does not consider the affects of external terrestrial interference.
(4) Depends on the number of simultaneous alerts.
(5) Provisional.

3-7 General Marine Radio Facilities

As stated in Paragraph 3-1 International Trends, all countries are readjusting their domestic laws related to the SOLAS which are already in force or will come into force shortly. At the same time, all ships concerned are being obligated to have the radio facilities installed aboard.

Indonesia is no exception. The country will hasten its affilation with the pertinent international treaties including the SOLAS series and will take necessary actions from the viewpoint of the safety of life at sea. Among those actions will be to impose on all ships concerned the obligation to be furnished with radio facilities. The similar advisory action will be taken toward the small-sized ships also which are not directly bound by the obligation, so that as many of such ships as possible will be positively equipped with marine radio.

Along with the installation of the marine radio facilities, on ships, it is necessary to proceed the training of radio operators who will operate the facilities in the ship station.

The list of radio facilities required for ships of various types and provided in accordance with the trend mentioned above are given in Table 3-7 (1) and Table 3-7 (2).

Table 3-7 (1)

Marine Radio Facilities for Passenger and Cargo Ships

Type of Facilities	Ship Size				
	Up to 15GRT	Over 15GRT	Over 175GRT	Over 300GRT	Over 1600GRT
By MF (for telegraph)*				C'	C
By MF (for telephone)		V	V	C'	V
By HF (for telegraph)					V
By HF (for telephone)			V	V	V
By VHF (for telephone)	V'	V	V	V	V
Radio telegraph Installation for Fitting in Motor Life boat					C
Portable Radio Apparatus for Survival Craft				C	
EPIRB		V	V	V	V
DF (500kHz & 2182kHz)					C
RADAR				V	C
FAX				V	V
Radio telegraph (Radio telephone) Auto Alarm				C	C

Note: To be compulsorily installed on board for passenger ships irrespective of size

Symbols C : To be compulsorily installed under SOLAS
V : To be voluntarily installed
C': Either of telgraph or telephone is to be compulsorily installed under SOLAS
V': Handy transceiver of frequencies other than international VHF

Table 3-7 (2)

Marine Radio Facilities for Fishery Ships

Type of Facilities	Ship Size			
	Up to 24m in length (up to 50GRT)	24-45m in length (50-400GRT)	45-75m in length (400-1500GRT)	over 75m in length (Over 1500GRT)
By MF (for telephone)		C	C	C
By HF (for telephone & telegraph)			V	V
By VHF (for telephne)	V	V	V	V
EPIRB	V	C	C	C
Radio Telephone auto alarm		C	C	C
DF				C
FAX			V	V
RADAR		V	C	C

Note:

C: To be compulsorily installed
V: To be voluntarily installed

3-8 Domestic Telecommunications Industry

As stated in Paragraph 2-6, the telecommunications industry of Indonesia is still in its infancy. It fills only a limited part of domestic demand.

In order to improve and expand the telecommunications network in the future, it is recommendable to bring up and strengthen the domestic telecommunications industry from the following viewpoints:

(1) To increase employment

(2) To elevate the technical level by means of technological transfer;

(3) To improve maintenance service.

In the long term improvement and expansion plan for maritime radio communication facilities, the item (3) above, i.e., to improve maintenance service, assumes special importance.

In electronic equipment of today's make, semiconductors and integrated circuits are used to a great extent. Therefore, the replacement of faulty circuit components at the field is practically impossible. Hence the need to have faulty units and cards repaired at the factory.

When the telecommunications equipment manufacturing works are established in the country, the time and cost required for the repair of faulty units and cards can certainly be reduced.

Kinds of equipment for which domestic manufacturing is recommended are given below.

(1) HF Receiver
(2) SSB HF Transceiver
(3) VHF Transceiver
(4) UHF Radio equipment with multiplex carrier terminal equipment
(5) Others
Antenna Tower, Power supply equipment including engine generators and batteries

However to promote and consolidate the national telecommunication industries in Indonesia it is necessary to give a preference for local manufacturing to those equipment of greater demand.

4. DEVELOPMENT PLANS

4. DEVELOPMENT PLANS

4-1 Basic Philosophy

Indonesia is the world's largest archipelago country whose coast lines are as long as 40,000 km. Hence, for Indonesia, the strengthening of maritime transport power constitutes one of the urgent necessities. Especially for the growth of Indonesian economy, the improvement of sea transport capability is the prime requisite. It depends a great deal upon the development of port/harbor facilities, along with the operation by large-sized ships, and also upon the development of the maritime radio communication network.

As the activity of sea transport grows, the volume quantity of communication by maritime radio is bound to increase rapidly. Also, to ensure the safety of life at sea, the maritime radio communication network must be improved.

Utilization of maritime satellite systems is important matter now-a-days. Accession of Indonesia to the INMARSAT organization is recommended. And it should be studied from the technical and economical points of view to use the PALAPA system for maritime communications including SAR.

The basic philosophy in the long-term development plan for the maritime radio communication network must take all the foregoing facts into consideration and, at the same time, place emphasis on the following points.

4-1-1 Replenishment of Maritime Radio Communication System

With the SAR system improvement also envisaged, the coast station hierarchy is to comprise four classes. (Refer to Table 4-1-1 (1))

- Class A Station: The sole coast station in the region of the Sea Communications.

Functions: Operation, Control and Supervision of the intra-region communication as the operation center in the region plus the functions assigned to Class B station.

The transmitting station is located separately from the receiving station.

SAR ROS or SAR Console is established in the station of this class as shown in the Table 4-3-1 (3).

- Class B Station: The coast station to cover the communication in the nearby coast area.

Functions: Operation, Control and Supervision of the communication in the nearby coast area plus the functions assigned to Class C station.

The transmitting station is located separately from the receiving station.

SAR ROS or SAR Console is established in the station of this class as shown in the Table 4-3-1 (3).

- Class C Station: The coast station to cover the communication in its port area.

Functions: Operations Control and Supervision of the VHF communication within the port area and watch for the telephony distress signal in MF, HF and VHF.

- Class D Station: Operation of the VHF communication within the port area.

  Since most of the communication is considered to be for port operation and ship movement services, the actual operation of the coast station may be made by the Port Administrator, the Harbor Master, etc.

Table 4-1-1 (2) presents the list of newly categorized coast stations of Classes A, B, C and D, together with the present categories, i.e., Classes I, II, III and IV.

(1) Frequencies and Services (Maritime Mobile Communication)

1) MF & HF frequency assignment

Methods of the MF and HF frequency assignment for the maritime mobile service is described below.

On the basis of the frequencies being used by the existing coast stations, the frequency assignment should be made under the following conditions.

a. Frequency bands

- Class-A and Class-B coast stations are assigned the frequencies on MF, 4 MHz, 6 MHz and 8MHz bands.

- Class-A coast station at least is assigned the frequencies on 12 MHz and 16 MHz bands as well, however, further study will be necessary on the use of additional frequencies in the higher frequency band.

- Jakarta coast station is assigned the frequencies on 22 MHz band in addition to the above.

b. Distress frequencies

All of the Class-A and Class-B stations are assigned 500 KHz, 2182 KHz, ~~3023 KHz~~ and 6215.5 KHz (ch 606).

c. Number of frequencies

Most of the anticipated mobile traffic increase will be due to the increase of the public correspondence, however, it is assumed that those portion of the traffic overflowed from the MF and HF channels can be absorbed by VHF channels.

Accordingly, the number of frequencies assigned on MF and HF bands is only one for each frequency band as it is at present.

d. Frequencies for SAR

One exclusive SAR frequency which is common to all the regions is assigned in each frequency band for telegraphy and telephony.

It is recommended that in preparing the frequency assignment plan, all the frequencies allocated to Indonesia for telephony channel by APPENDIX 25 of R.R. are fully utilized, however, for the presently used frequencies on telephone channel which are not allocated to Indonesia by APPENDIX 25 of R.R. it is advisable to request to list those frequencies in the APPENDIX of R.R. in the next WARC meeting.

Tables, 4-1-1 (3)/1 & 2 for Frequency Assignment Plan are prepared basing on the above mentioned consideration under the conditions that;

i. shared use of the frequencies by radio stations of fishing industry, administration, private enterprise, etc. is considered.

ii. minimum distance between two coast stations allowing them to use the same frequency is approximately 500 km for frequencies below 6 MHz and 800 km for frequencies, 8 to 16 MHz bands.

2) VHF frequency assignment

This frequency band is used for line-of-sight links and provides very stable reception in low transmitting power.

Because of the line-of-sight link, the communication coverage is restricted to the water within 50 km or so.

Such features in VHF propagation enable the frequency assignment very easy.

3) Mobile communication services

In addition to the existing services, new services, of NBDP and DSC are provided for Class-A coast stations.

Data communication will be realized through the development of maritime satellite communication system.

As regards the NBDP service, the number of the frequencies given below is to be assigned for each Class A station.

3 frequencies on 4 MHz band
3 frequencies on 6 MHz band
3 frequencies on 8 MHz band
3 frequencies on 12 MHz band
3 frequencies on 16 MHz band
1 frequency on 22 MHz band (Only for Jakarta)

(2) Operating Hours

Class A and Class B coast stations are to operate for 24 hours/day. Class C and Class D coast stations are to operate for hours required.

(3) Watch Frequencies

- 500 kHz
- 2182 kHz
- 4125 kHz
- 6215.5 kHz
- 8364 kHz
- 156.8 MHz
- SOS buoy frequency

(4) Antenna System

a) For MF-band HF-band antenna system, the high gain antenna, broadband antenna, antenna multicoupler, etc., are to be adopted, taking into account the purpose of communication, effective use of the land space, coverage area, etc.

b) At Class A and Class B stations where the traffic in VHF mobile service is expected to increase considerably in the future, the transmitting antenna and the receiving antenna are to be separately installed. It is desirable to select the antenna whose gain is suitable for the area to be covered.

(5) Antenna Power

MF - HF : 0.5 - 5 kW

VHF : 50 W (coast station)
10 W (ship station)

(6) Personnel Training

Central and local training institutes are to be established where to administer the training of staff personnel systematically.

The system is to be established whereby to train coast station operators and technicians periodically and as occasion requires (on the occasion of their employment or transfer) and to issue the certificates of qualification to those who have successfully finished the training. This training is to be coordinated to STCW (ship crew training).

(7) Operation and Maintenance

1) Coast Station Operation

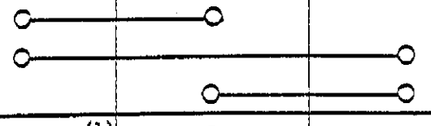
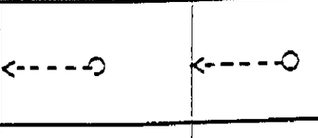
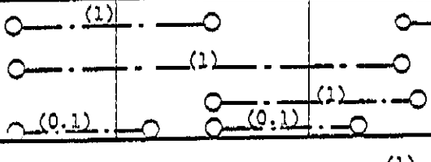
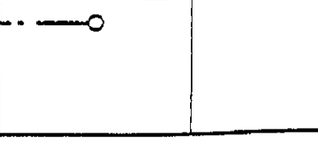
For the fulfillment of its services, each coast station is to be staffed with the required number of personnel.

2) Coast Station Maintenance

Each coast station is to make simple maintenance inspection only.

A Maintenance Center is to be established in each region and the required number of engineers and technicians are to be stationed in the Center to conduct periodical inspection, periodical test and fault correction by means of itinerary maintenance.

Table 4-1-1 (1) Classification of Coastal Radio Stations

Item \ Class	A		B	C	D
	Jakarta	Others			
Water area for which the station is in charge	whole Indonesian water and over	nearby coast area	nearby coast area	within the port area	within the port area
Service hour: Maritime communication	24	24	16 - 24	8	8
Service hour: Watch for distress signals	24	24	24	8 - 24	8
Frequency band for maritime communication	MF,HF & VHF	MF,HF & VHF	MF,HF & VHF	VHF	VHF
Distress frequencies to watch	500, 2182, 4125, 6215.5 & 8364 KHz 156.8 MHz SOS Buoy freq.			2182 & 6215.5 KHz & 156.8MHz	156.8MHz
Communication distance Type of trans-mission / Freq. band / TX output (KW) / Communication distance (KM) Note: G: Telegraph, P: Telephone, M: MF, H: HF, V: VHF	G /M /5 /1000 or over P/ M/H /5/1000 or over G/H /5/ 1500 or over P/V/0.05/50	G / M / 1 / 500 or over P / M/H / 1 / 500 or over G / H / 1 / 750 or over P / V / 0.05 / 50		P / V / 0.05 / 50	
Maritime mobile services: SAR Communication	Yes	Yes	Yes	Yes(VHF)	Yes(VHF)
Watch for distress signal	Yes	Yes	Yes	Yes	Yes
Radio navigation	Yes	Yes	Yes		
Special service	Yes				
Public correspondence	Yes	Yes	Yes	Yes	Yes
Port operation	Yes	Yes	Yes	Yes	Yes
Ship movement	Yes	Yes	Yes	Yes	Yes
NBDP & DSC	Yes	Yes			
Fixed services: P-P Communication	Yes	Yes	Yes		
Broadcast	Yes	Yes			
Station site and building: Transmitting station	Separated	Separated	Separated	At the same location	At the same location
Receiving station	Separated	Separated	Separated	At the same location	At the same location
Operation center	In the RX station	In the RX station	In the RX station		
Means of P-P communication (Note 1): Main					
Means of P-P communication (Note 1): Back-up					

Note 1: Dedicated line(PERUMTEL); Public telephone line; Back-up circuit by Sea Comm's own HF circuit; (1) Transmitting power(KW)

Table 4-1-1 (2) List of newly categorized coast stations (1/2)

KANWIL	New Class	Existing Class	Name of Coast Stations
I	A	I	Belawan
	B	II	Sabang
	B	IVa	Sibolga
II	A	I	Dumai
	B	III	Teluk Bayur
	B	IVa	Tg. Uban
	C	IVa	Tg. Pinang
	C	IVa	Tg. Balai Kariman
III	A	I	Jakarta
	B	I	Palembang
	B	III	Panjang
	B	III	Cirebon
	B	III	Pontianak
	C	IVa	Jambi
IV	A	I	Surabaya
	B	III	Semarang
	B	III	Cilacap
	B	III	Kupang
	B	IVa	Lembar (Ampenan)
	C	IVa	Benoa
	C	IVa	Panarukan
	C	IVa	Dili
V	A	III	Banjarumasin
	B	II	Balikpapan
	B	III	Tarakan
	B	IVa	Samarinda
	C	IVa	Sampit

Table 4-1-1 (2) List of newly categorized coast stations (2/2)

KANWIL	New Class	Existing Class	Name of Coast Stations
VI	A	I	Ujung Pandang
	B	IVb	Kendari
VII	A	I	Bitung
	B	III	Donggala
VIII	A	I	Ambon
	B	IVa	Ternate
	A	I	Jayapura
	B	III	Sorong
IX	B	III	Merauke
	B	IVa	Biak
	B	IVb	Fak-Fak
	C	IVa	Manokwari
I-IX	D	IVb	All Class IVb stations except Fak-Fak and Kendari

Table 4-1-1(3) Frequency Assignment Plan (MF&HF for AIA) (1/2)

K	SIN / Freq. (KHz)	430	438	448	456	458 S	465	470	474	4875	500	512	4238 S	4295	63265	6337	6355	64285S	64915	8437	8445	8457	8461	8473	8542	8686	8691	8694 S	126825	127045	129105	129705S	168617	170745S	171848	22431 (KHz)
I	Belawan					◎			○		○	◎	◎	○	◎			◎								○	◎	◎			◎	○	◎	◎	
	Sabang		○			◎					○	◎	◎			◎		◎								○	◎	◎						○	
	Sibolga					◎			○		○	◎	◎				○	◎			◎							◎								
II	Dumai			○		◎					○	◎	◎	◎		○		◎					○					◎	○			◎		◎	○	
	Teluk Bayur				◎	◎					◎	◎	◎					◎	◎		◎							◎								
	Tg.Uban		◎			◎					◎	◎	◎		◎			◎					◎					◎								
III	Palembang			○		◎					○	◎	◎	○				◎	○	○								◎								
	Jakarta					◎		○			○	◎	◎	◎		◎		◎							○			◎				◎		○	◎	
	Panjang	○				◎					○	◎	◎				○	◎									◎	◎								
	Cirebon					◎			○		○	◎	◎					◎	○			◎						◎								
	Pontianak					◎	○				○	◎	◎				○	◎						○				◎								
IV	Surabaya	○				◎					○	◎	○	◎			◎	◎					○					◎				◎		◎		
	Semarang				○	◎					○	◎	◎		○			◎					○					◎								
	Cilacap					◎			○		○	◎	◎				◎	◎				○						◎								
	Kupang	○				◎					○	◎	◎				◎	◎				○						◎								
	Lembar		○			◎					○	◎	◎		◎			◎						◎				◎								
V	Balikpapan			○		◎					○	◎	◎	◎	○			◎		○								◎								
	Banjar-masin				○	◎					○	◎	◎					◎					○					◎					◎		◎	
	Tarakan					◎				○	○	◎	◎		○			◎										◎								
	Samarinda	◎				◎					◎	◎	◎				◎	◎					○					◎								
VI	Ujung-pandang					◎	○				○	◎	◎	○			◎	◎								○		◎					◎	◎	◎	
	Kendari				◎	◎					◎	◎	◎		◎			◎						◎				◎								
VII	Bitung		○			◎					○	◎	◎	◎			◎	○									○	◎				○	◎	◎	◎	
	Donggala			○		◎					○	◎	◎					◎	◎							○		◎								
VIII	Ambon					◎	○				○	◎	◎	○				◎	◎					○				◎				◎	○	◎	○	
	Ternate					◎	○				○	◎	◎		◎			○				◎						◎								
XI	Jayapura					◎	○				○	◎	◎	◎				◎	◎									◎				◎	○	◎	○	
	Sorong					◎	◎				○	◎	◎			○		◎					○					◎								
	Merauke					○	◎				○	◎	◎		○			◎				○						◎								
	Biak						◎				◎	◎	◎		◎			◎		○								◎								
	Fak-Fak	◎									◎	◎	◎				◎	◎								◎		◎								

Legends:

◎ Frequency to be newly assigned

○ Frequency, existing

S Frequency for SAR

Ch.No \ STN	Belawan	Sabang	Sibolga	Dumai	Teluk Bayur	Tg.Uban	Palembang	Jakarta	Panjang	Cirebon	Pontianak	Surabaya	Semarang	Cilacap	Kupang	Lembar	Balikpapan	Banjar-masin	Tarakan	Samarinda	Ujung-pandang	Kendari	Bitung	Donggala	Ambon	Ternate	Jayapura	Sorong	Merauke	Biak	Fak-Fak
K	I			II			III					IV					V				VI		VII		VIII		IX				
(ch) 2234S								○																							
☆ 2221								◎																							
☆ 1621				◎								◎									◎				◎						
* 1615S	◎			◎				◎				◎						◎			◎		◎		◎		◎				
1610	◎							○										◎					◎				◎				
☆ 1221																		◎													
1212												○															○				
1210								○																	○						
1209				○																			○								
* 1203S	◎			◎				◎				◎						◎			◎		◎		◎		◎				
1201	○																				○										
830							○									◎							○								
828													○								○							○	○		
826		○			◎							○													○						
* 823																						◎					◎				
☆ 821										◎														◎							
☆ 819						◎														◎											◎
816				○				○										○												◎	
☆ 814S	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
812			◎								◎			◎	◎				◎												
810	○								◎								○									◎					
606	○	○	◎	○	◎	◎	○	○	◎	○	○	○	○	◎	◎	◎	○	○	○	◎	○	◎	○	○	○	◎	○	○	○	◎	◎
605	◎					◎		◎			○	◎					◎		○			◎	◎								◎
604			◎				◎						○		○	◎				◎	◎					◎					
☆ 603S	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
602		◎		◎					○	◎														◎	◎				○	◎	
601					◎									○				◎									◎	○			
☆ 423																															
422													○				◎		○									○			
421																							○								
418											○										○								○		
☆ 416S	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
414							○			◎																					
* 413			◎											◎										◎							
411		○			◎													○				◎									
408				◎					◎			○			◎										○					◎	
401	◎					◎		◎								◎				◎						◎	○				◎
3023(KHz)S	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
3180 "	○	○	○	○	○						○		○	○	○			○	○								○	○	○		
2690 "						◎	○	○	○	○		○				◎	○			◎	○		○	○	○	◎				◎	◎
2182 "	○	○	○	○	○	◎	○	○	○	○	○	○	○	○	○	◎	○	○	○	◎	○	◎	○	○	○	◎	○	○	○	◎	◎

Legends:

◎ Frequency to be newly assigned

○ Frequency, existing

* Frequency not allocated in Appendix 25 of R.R.

☆ Frequency available but not yet being used by Sea Comms.

(ch.No) Calling frequency S Frequency for SAR

STN Station X KANWIL

Table 4-1-1(3) Frequency Assignment Plan (MF&HF for J3E) (2/2)

4-1-2 Development Plan for SAR System

(1) Establishment of SAR Operation System

The command and control system for the maritime SAR within Sea Communications is:

Directorate General of Sea Communications

↓

District Directorate General of Sea Communications

↓

Chief of KPLP Detachment

In order to swiftly and pertinently implement the system into practice, the commanding and controlling messages should be notified without any delay and failure to the specialists for their appropriate process and action. For the effective achievement of this purpose, establishment of SAR operation system under the control of KPLP together with the necessary communications network incorporated is considered most appropriate.

(2) KPLP and SAR Radio Operating Station

The coast stations belonging to Sea Communications presently cover multi-services of despatch and receipt of public telegrams, harbor services, communications of maritime safety and SAR, and so forth.

However, maritime SAR communications are aimed at securing the safety of life and property at sea, and thus must be given the highest priority among others. An urgency of establishing a maritime radio communications system for the maritime SAR

can clearly be seen in the disaster of "TAMPOMAS II".

For this reason, it is considered most appropriate to build up a maritime SAR communications system separating the radio operationg stations for SAR from those of the SAR operating coast stations which cover the main water areas of Indonesia and establishing separate SAR Radio Operating Consoles in the other SAR operating coast stations. Figure 4-1-2(1) shows the allocation of the SAR operating coast stations.

In order to link up SAR ships with the maritime SAR communications system, the following are incorporated on-board communication stations:

Large Type SAR Ships...frequencies for its sole use in the individual bands of HF, MF and VHF

Small Type SAR Ships...frequencies for its sole use in VHF bands

It shall also be necessary for SAR ships to have radio installations to communicate with aircraft, especially helicopters which support SAR operations.

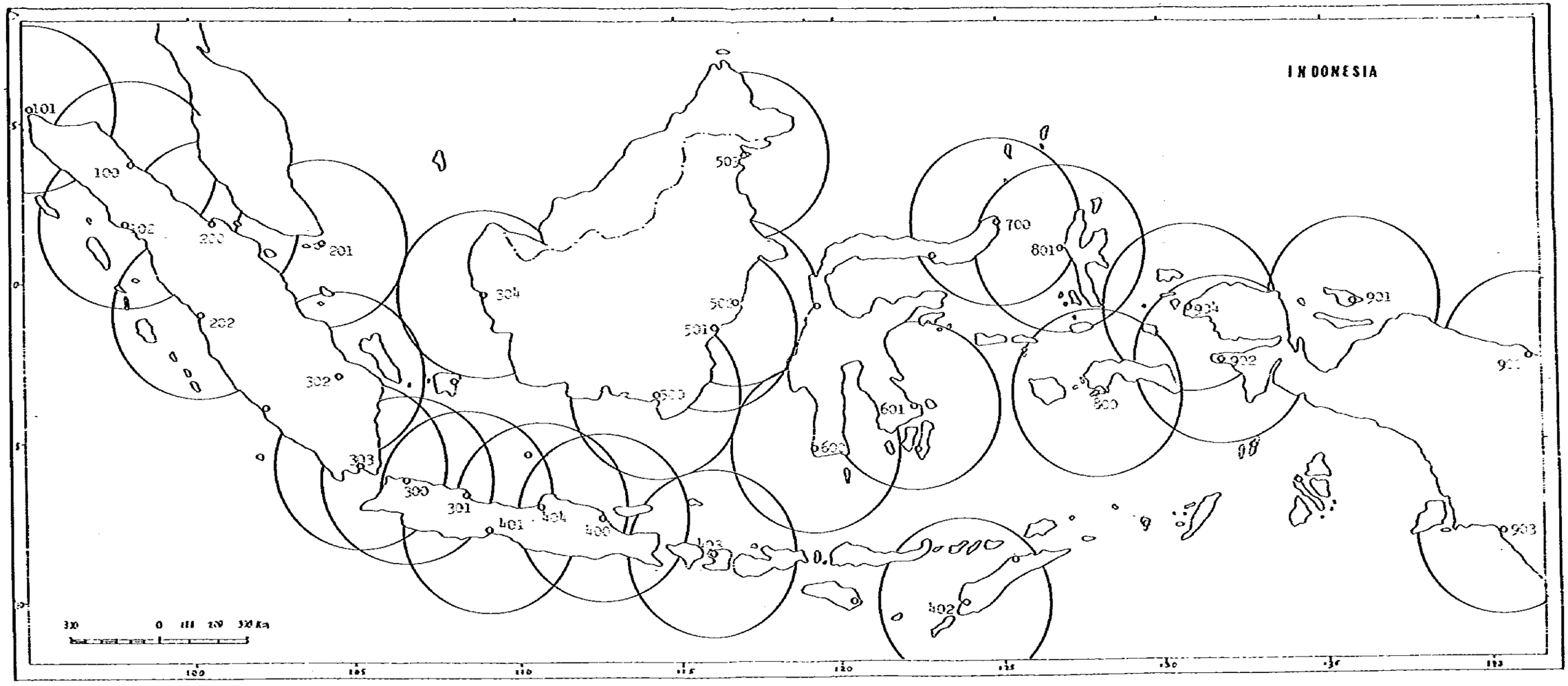
(3) Establishment of SAR Radio Direction-Finding Facility/Station

Establishment of SAR radio direction-finding facilities/ stations is an important factor for accurate positioning of a ship in distress or in a state of emergency in order to locate the ship through cross bearing between two direction-finding facilities/stations or a direction-finding facility/station and SAR ship when a ship is out of the coverage of radio direction-finding facilities/stations.

The direction-finding facilities and stations can also be used for locating ships' positions upon their request for their navigation purposes.

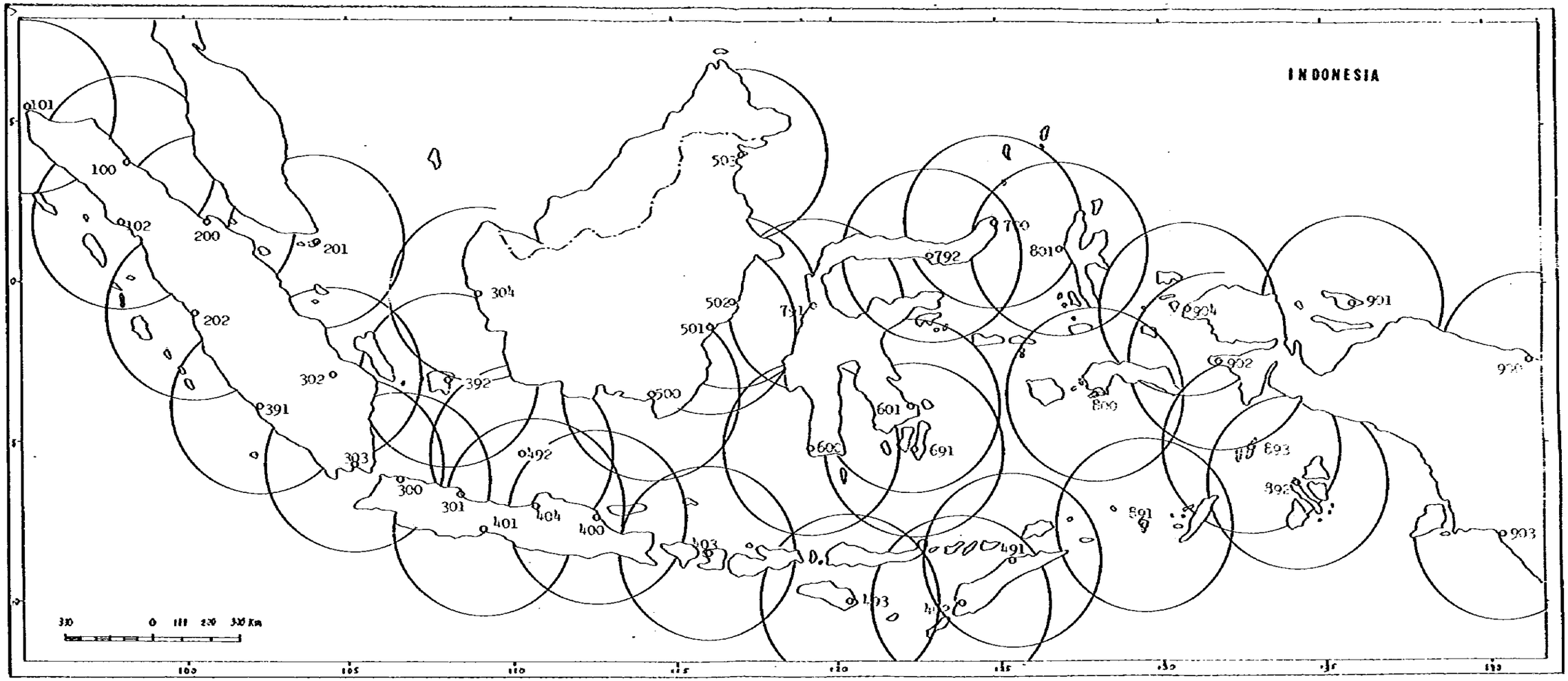
Accordingly, it is highly desirable that high accuracy radio direction-finding facilities be installed at the SAR operating coast stations and, in addition, some more radio direction-finding stations be built to fill the gap areas of the above so that the whole areas of Indonesian waters can be covered for prompt spotting of the locations where accidents occurred.

Figure 4-1-2(2) shows the allocation of radio direction-finding facilities/stations.



Note: For the station numbers, refer to Table 4-3-1(3)

Figure 4-1-2(1)
ALLOCATION OF SAR OPERATING COAST STATIONS



Note: For the station numbers, refer to Table 4-3-1(2)/2 and Table 4-3-1(3)

Figure 4-1-2(2)
ALLOCATION OF DIRECTION-FINDING FACILITIES AND STATIONS

(4) SAR Officers

The fundamental requirements for SAR officers are to be equipped with the basic knowledge on ship, aircraft, maritime law and regulations, weather, sea conditions, SAR operations and so on, and to be endowed with infallible judgement to cope with emergency situations.

It is required for SAR radio operators to have such additional requirements as obtaining radio operators licence, and expertise on radio communications equipment, and becoming familiar with the law and regulations concerned.

As for the officers for the operation centers and SAR ships, high level knowledge on operation and maintenance of ships and search and rescue as well as leadership are required in addition to the fundamental requirements.

Accordingly, establishment of training facilities is required for the above purpose.

It is also desirable that within-organization transfer of the officers be practised to raise the level of their knowledge and skill.

4-1-3 Replenishment of Point-to-Point Communication Network

(1) General Communication System

1) For liaising between Jakarta Central and Class A Station and between Class A Station and Class B Station, PERUMTEL's leased circuits are used as operational. HF circuit is to be newly established as stand-by.

2) For liaising between Class B Station and Class C Station and between Class A Station and Class C Station, PERUMTEL's public communication circuits are used as a primary means. HF circuit is to be established as stand-by.

3) For other circuits, PERUMTEL's public communication circuits are used.

Both telephone and telex terminals are installed. For routine inter-office contact, telex system is used and, for public communication, PERUMTEL's public telephone system is used.

(2) SAR Communiction System

1) For circuit between KPLP's Central Operation Center and KANWIL's Operation Centers, PERUMTEL's leased circuit is used as working channel. Both telephone and teletypewriter terminals are installed. For routine inter-office contact, teletypewriter system is used.

2) For circuit between KPLP's District Operation Center and KPLP's Detachments, PERUMTEL's leased circuit is used as a working channel.

3) For circuit between KPLP's Detachments (SAR ROS) and the relevant Class A or B Station, exclusive UHF link is established.

4) For circuit between KPLP's Detachment and the relevant Class A or B Station (SAR radio console), PERUMTEL's leased circuit or exclusive VHF is used.

5) For circuit between the Direction-Finding Station and the relevant Coast Station concerned (SAR ROS or SAR Console), HF SSB circuit is established.

(3) Adjustment of Development Plan

As regards the integration of the existing Sea Communications P - P system into PERUMTEL's network, any adjustment in the development plan may become necessary according to the progress of implementation of the PERUMTEL's long term development plan.

4-1-4 Utilization of the INMARSAT System

Communications via maritime satellites are now available with the MARISAT System which started its operations from July 1976. It is wordly recongnized the System is offering very distinctive communications at sea. The remarkable points of the merits to the System are considered to be the stability of the high qualities on communications and the short times for connection between the communicating parties.

(1) Alternatives for Utilization of INMARSAT

The INMARSAT System is scheduled to commence its services in February 1982. The services are basically going to keep continuity to the MARISAT System's, and have a wider variety in service menu and larger capacity of communication channel. The INMARSAT System is useful for not only public corresspondences but also distress communications aiming at the safety of life and property at sea. Distress calls employing the System will be powerful with the advantages of rapidity to set up links and stability on circuits which are essential for calls.

The System is composed of three segments, namely, spacesegments, coast earth stations and ship earth stations.

The spacesegments are to be leased of two MARECS Satellites, two or three INTELSAT-V Satellite MCSs and three MARISAT Satellites as described in Para 3-6 of this Report.

The coast earth stations are provided by some members of the Signatories of INMARSAT, and these technical specifications are already defined and the documents of the technical specifications are published by INMARSAT, Market Towers 1, NINE Elms Lane London SW8 5NQ England. The ship earth stations are managed by ship's owners, and these are specified technically in the technical Specifications.

There are two alternatives for utilization of the INMARSAT System in Indonesian flag's ships, described as follows.

1) Utilization as the Signatory:

   The INMARSAT Convention remains open for signature or accession to all states. The states intending for the accession to the organization are required to take procedures in accordance with the Article 32 of the Convention. Quotations from the Convention are as follows:

Article 32

Signature and Ratification

1) This Convention shall remain open for signature in London until entry into force and shall thereafter remain open for accession. All States may become parties to the Convention by:

   (a) Signature not subject to ratification, acceptance or approval, or

   (b) Signature subject to ratification, acceptance or approval, followed by ratification, acceptance or approval, or

   (c) Accession.

2) Ratification, acceptance, approval or accession shall be effected by the deposit of the appropriate instrument with the Depositary.

3) On becoming a Party to this Convention, or at any time thereafter, a State may declare, by written notification to the Depositary, to which Registers of ships operating under its authority, and to which and earth stations under its jurisdiction, the Convention shall apply.

4) No State shall become a Party to this Convention until it has signed, or the entity it has designated, has signed the Operating Agreement.

5) Reservations cannot be made to this Convention or the Operating Agreement.

The Signatory, which is a Party or an entity designated in accordance with the Article 2(3) of the Convention, shall share capital contributions to manage the Organization as procurement of space segments or others. Each Signatory shall receive capital repayment and compensation for use of capital according to the commercial principles.

By operating the INMARSAT coast earth stations, which are allowable only for the Signatories, the tariffs being generally composed of the cost for the INMARSAT System and associated international lines, may be lower because of unnecessity of additional international charges, and moreover the income by relaying the INMARSAT traffics to other countries may be expected.

2) Utilization of the System as non-Signatory:

Any ship without respect to her flag can take access to the INMARSAT satellites on the basis of the Article 7(1) of the Convention. The ship who intends to utilize the System should pass the technical verifications for her station, the type approval and the commissioning test. The former is generally accomplished by the manufacturer of the station in order to facilitate the approval procedures for the same model, therefore for the model successfully finished on type approval the test on each station is omitted. The latter is proceeded in each ship earth station. After completion of these test, the station is assigned its identification number.

The licence to the radio station shall be issued by the administration of the ship's flag separately to the INMARSAT procedures.

(2) Impact of INMARSAT on the traditional maritime communication systems

Influence of commencing INMARSAT service is not negligible on the traditional maritime communications by its superiority in quickly linking callers and highly keeping stability. Moreover the satellite communications will be able to offer new services such as facsimile, data transmission and others. However, the situation never means the decline of the traditional systems.

It is well known that the traffic of maritime communications are worldly increasing year by year with the extension of trade activity. Therefore, the satellite communications and the traditional ones will share services in different markets. The satellite systems will be useful in transmissions for long distances of international voyages or special usages such as data transmission on oildrilling rigs or especially urgent case such as rescue activity at sea.

On the other hand, the traditional systems employing MF, HF and VHF bands are useful in the communications for coastal voyaging ships, in considering its economical merits. Concerning trade activity, Indonesia has a big potentiality with its natural resources of petroleum, timber, ore or fishery.

The analysis on INMARSAT System was made by Federal Communications Commission of United States of America, where many interesting discussions were made among the government agencies concerned, communication carriers and users of USA.

As concerns the impact of satellite communications on coast stations, it is concluded that the ships that have either high message traffic needs or whose users place a high value on the quality of communications services are likely to switch to satellites. Therefore, it is said that the satellite system will be used in liquid natural gas tankers, oil tankers, container ships, cruise ships and large vessels, and that smaller ships, or ones whose operations are not improved by a high message volume, will be more likely to remain as customers of public coast stations. Finally it is stressed on the statement that for the foreseeable future there will be a continuing demand for HF high seas communications by ships that cannot or will not use satellite communications.

It is apparent that in Japan the trend of increasing maritime communications via HF band is continuing after the MARISAT Services was commenced in 1977.
Therefore, it is concluded that in Indonesia the traditional maritime communication will be used together with INMARSAT System, complementing their services to each other.

(3) Recommendation for accession to INMARSAT Organization

Considering the worldwide aspect to utilize the INMARSAT System for maritime communications, it is recommended that Indonesia, who has big possibility of trade activity's increase and located in the important area of Indian Ocean and Pacific Ocean, should enter and bear a part in INMARSAT Organization. It is also important to study to install the INMARSAT coast earth station in the country and to encourage owners of Indonesian flag's ships in usage the INMARSAT ship earth stations.

4-1-5 Suggestion on Communication Devices to be Fitted on Board the Sailing Vessels

Most of motorized vessels below 300 gross tonnage and sailing vessels have no means to report the movement of the vessel herself on a cruise and also the occurrence of a marine accident however, requesting SAR office or any other vessel cruising nearby for immediate rescue is indispensable to insure the safety of life at sea.

Therefore, it is desirous that such a vessel is provided with a handy radio equipment as suggested below, which is capable of communicating with a SAR office and with another vessel cruising nearby and also capable of emitting a frequency by which the land direction finding stations, a rescue ship, etc. are able to measure and find the direction.

(1) Vessels of 15 tons or less

Since this vessel is of very small size, it seems to be very difficult to request to install the radio equipment considering the need of the power supply.

Accordingly a set of 1 watt portable VHF transceiver with communication range of approximately 10 km is to be prepared for emergency use and also for smooth port operation.

(2) Vessels of 15 - 175 tons

This class of vessels are considered as of the average size and most of such vessels with no radio equipment fall in this category. Minimum Communication means is necessary.

It is suggested to equip an SSB radio telephone equipment in MF band.

The antenna power is 10 watts or so to cover the communication range of approximatly 200 km.

(3) Vessels of 175 tons or over

This size of vessels which exhibit a considerably good stability and have a large cargo capacity require the radio facilities which are more powerful than above.

The range of voyage is presumed to be considerably larger than the former two categories.

It is suggested to equip the SSB radio telephone equipment to covcer MF and HF bands.

The antenna power is to be 50 watts or more to cover communication range of more than approximately 300 km.

4-2 Forecast Up To 1984, 1989 and 2000

4-2-1 Sea Transportation Activities

(1) Main Traffic Routes

There are seventy-five routes for the Regular Liner Service approved presently by the Indonesian Government, and they are shown in Figure 4-2-1/1.

The actual status of sea transportation is divided into the following three categories.

1) Inter-Insular Liners

Those are for transportation between the islands or different Districts, and motorized ships of the averaged gross tonnage of about 1,200 are in service.

2) Local Liners

The local liners are for transportation between the ports located nearby or within the same Districts, and motorized sailing ships of averaged gross tonnage of about 120 are in service (Shipowner: Companies or Government).

3) Sailing Craft

They are in the same services as those of 1) and 2) above, and sailing craft of 50-100 gross tons estimated (average about 70 gross tons) are in service(Shipowner:Private).

(2) Number of Ships

The munber of cargo and passenger ships and others, motorized sailing and sailing ships and fishing vessels is as follows(the first category ship does not include the second and and the third categories ships):

Table 4-2-1/1 Number of Cargo and Passenger Ships etc., Motorized Sailing and Sailing Ships and Fishing Vessels (1978)

Ships Category	Number
(a) Cargo and Passenger Ships, etc.	3,592
(b) Motorized Sailing and Sailing Ships	4,498
(c) Fishing Vessels	369,971

Source: Statistical Yearbook of Indonesia, 1979(Pages 274 & 481)

Note: (a) does not include (b) & (c)

On the other hand, the number of motor ships and steam ships of more than 100 gross tons of Indonesian flag is shown below:

Table 4-2-1/2 Number of Motor Ship and Steam Ship

Year	1970	1971	1972	1973	1974
No. of Ships	489	501	513	573	616
Gross Tons (x 1,000)	642.5	618.8	618.6	669.0	762.3

1975	1976	1977	1978	1979	1980
724	882	1032	1093	1122	1180
859.4	1046.2	1163.2	1272.4	1309.9	1411.7

Source: Lloyd's Register of Shipping
Statistical Tables Merchant
Fleets as Recorded in Statistical
Tables 1970 - 1980

(3) Foreign and Domestic Trade Cargo

The flow of foreign and domestic trade cargo by province of Indonesia from 1970 through to 1978 is shown in Table 4-2-1/3 and is graphed in Figure 4-2-1/2. It shows that the activities of sea transportation in Sumatra province is lively occupying about 50 percent of the total tonnage.

(4) Population

According to Statistical Yearbook of Indonesia, 1979 which gives the past flow and estimate of population in Indonesia, the population of Jawa and Madura occupies about sixty-three(63) percent as the highest while that of Sumatra stands at about 18 percent for 1980.

The estimate for 1986's shows the similar trend in ratio of the composition to the population of each province in relation to the whole population in Indonesia, and accordingly it is proper to consider that the similar trend will follow up to the year 2,000.

(5) Forecast for Foreign and Domestic Trade Cargo

A method of introducing a correlation between the GDP and the cargo flows during the past ten (10) years is adopted for the forecast of foreign

and domestic trade cargo. In this case, a trend in the flow and progress of GDP should be worked out.

1) Past Flow of GDP and Its Porecast

The past flow of GDP from 1969 to 1979 is shown below:

Table 4-2-1/4 Past Flow of GDP in Indonesia

Year	1969	1970	1971	1972	1973
GDP	4,866	5,233	5,544	6,067	6,753

1974	1975	1976	1977	1978	1979
7,269	7,630	8,156	8,871	9,471	9,936

(Unit: Thousand Mil. Rp.)

Source: Statistical Yearbook for Asia and The Pacific, 1978, United Nations Statistical Yearbook of Indonesia, 1979 (Page 661)

It is appropriate in general to adopt an exponential equation for the forecast of GDP. On the basis of the data available for the last ten(10) years as well as on the assumption that a constant growth rate would be maintained, the forecast is given in the following equation:

$$G = 7,073 \times 1.07656^{t}$$

Where, G= GDP(Thousand Mil. Rp.)

t= Year; t=0,1,2,...(t=0 in 1974)

Table 4-2-1/5 shows the estimate of GDP in Indonesia.

Table 4-2-1/5 Estimate of GDP in Indonesia

REPELITA(Year)	III(1984)	IV(1989)	V(1994)	VI(1999)	(2000)
Estimated GDP	14,790	21,390	30,930	44,730	48,150

(Unit: Thousand Mil. Rp.)

2) Estimate for Foreign and Domestic Trade Cargo

A correlation between the foreign and domestic trade cargo and GDP during the period of 1970 through to 1978 is given as follows:

$$C = 1.882G - 1,847 \qquad (r=0.92)$$

Where, C = Foreign and domestic trade cargo ($\times 10^4$ tons)
G = GDP(Thousand Mil. Rp.)
r = Correlation coefficient; It is a coefficient to indicate a strengthening degree of a correlation between C & G with r=1 as the maximum

Table 4-2-1/6 shows the cargo estimate.

Table 4-2-1/6 Estimate for Foreign and Domestic Trade Cargo in Indonesia

REPELITA(Year)	III(1984)	IV(1989)	V(1994)	VI(1999)	2000
Estimated * F & D Cargo	25,938	38,409	56,363	82,334	88,771

* F & D Cargo: Estimate for Foreign and Domestic Trade Cargo ($\times 10^4$ tons)

3) Estimated Number of Ships

a) Estimate for the number of ships is made under the conditions that the number of ships and gross tonnage given in Table 4-2-1/2 are applied for the basis of the estimate.

b) Regarding the data on the number of ships, it is appropriate in general to adopt a proportional expression to work out the number of ships according to various examples practised in foreign nations.
On the basis of the data available on the number of ships during the period of 1970 through 1980, the following equation is adopted:

Number of ships;

$$N = 80.57t + 309.77 \quad (r=0.97)$$

Where, N = Number of ships
t = Year; t=1,2,3,..(t=1 in 1970)
r = Trend exponent;
It is a coefficient to indicate strength of relationship between the raw data and the trend equation, and the maximum value of 1 applies when the raw data perfectly agrees with the equation

c) The following is estimated on the basis of b) above for each REPELITA.

Table 4-2-1/7 Estimated Number of Ships and Gross Tonnage(x1,000 tons):Indonesian Flag Motor and Steam Ships of 100 GT or More

REPELITA(Year)	III(1984)	IV(1989)	V(1994)	VI(1999)	2000
Estimated Number of Ships	1,518	1,921	2,324	2,727	2,807
Estimated Gross Tonnage	1,748.5	2,196.0	2,643.4	3,090.9	3,180.3

d) For the estimate of the total number of ships including fishing vessels, the following conditions are taken into consideration:

i) The flow of increase in the number of the motor ships and steam ships are referred to in c) above, and an assumption is made that the similar trend to this would be applied to the passenger and cargo ships etc. given in Table 4-2-1/1.

ii)Assumption is also made that the number of motorized sailing and sailing ships given in Table 4-2-1/1 would follow the same increasing trend as c) above.

iii) The total number of fishing vessels is assumed not to increase although the number of inboard motor ships of more than

ten(10) gross tons is expected to increase because of future motorization and enlarging in size for the vessels. According to Fisheries Statistic of Indonesia, 1978 (see Appendix 7), the number of inboard motor ships of more than ten(10) gross tons is 3,074, and the number is assumed to increase in accordance with the trend similar to c) above.

Table 4-2-1/8 Estimate for Number of Cargo and Passenger Ships Etc., Motorized Sailing and Sailing Ships and Fishing Vessels

REPELITA	III(1984)	IV(1989)	V(1994)	VI(1999)	2000
(a)Cargo & Passenger Ships	3,994	4,397	4,800	5,203	5,283
(b)Motorized Sailing & Sailing Ships	4,900	5,303	5,706	6,109	6,189
(c)Fishing Vessels (More than 10 GT)	369,971 (3,476)	369,971 (3,879)	369,971 (4,282)	369,971 (4,685)	369,971 (4,765)
Total	378,865	379,671	380,477	381,283	381,443

Note: (a) does not include (b) & (c)

4) Estimate of the Number of Times of In-coming and Out-going Ships

Method of estimate applied;

The estimate is made on the basis of "Number of Ships" x "Operating Rate", and the operating eate is assumed as follows:

a) Ten(10) percent of the total number of cargo and passenger ships would be for ocean-going services in view of possible active expansion in the service in the future.
Assumption is made that ocean-going vessels would make the minimum of twenty (20) voyages per year while others at least thirty-five(35) voyages.

b) Motorized sailing and sailing ships would make twenty(20) voyages per year.

c) For fishing vessels, those of more than ten(10) gross tons are taken into the estimate, and they are assumed of going out for fishing at least thirty(30) times per year.

The following Table is worked out on the basis of the above assumption.

Table 4-2-1/9 Estimate for Number of Times of In-Coming and Out-Going Ships

REPELITA(Year)	III(1984)	IV(1989)	V(1994)	VI(1999)	2000
Cargo & Passenger Ships	259,610	285,805	312,000	338,195	343,395
Motorized Sailing & Sailing Ships	196,000	212,120	228,240	244,360	247,560
Fishing Vessels (More than 10 GT)	208,560	232,740	256,920	281,100	285,900
Total	664,170	730,665	797,160	863,655	876,855

Figure 4-2-1/2 shows the cargo loaded and unloaded in Indonesia.

Figure 4-2-1/3 shows the estimates for the following:

number of ships in-coming and out-going
number of ships
Lloyd's Register of gross tonnage
Lloyd's Register of number of ships
foreign and domestic trade cargo
GDP

Table 4-2-1/3

FOREIGN AND DOMESTIC TRADE CARGO FLOWS IN INDONESIA

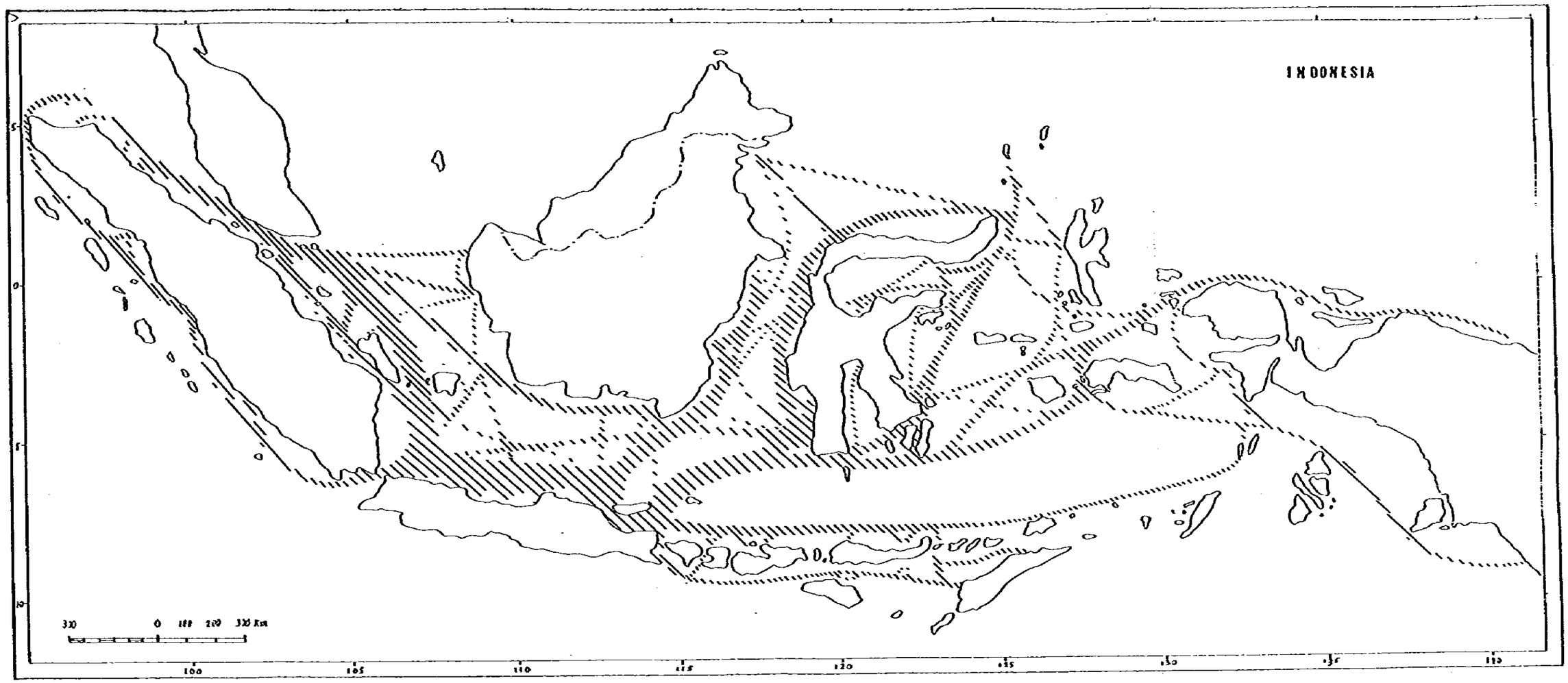
(x 10^3 ton)

	1970	1971	1972	1973	1974	1975	1976	1977	1978
Jawa & Madura	7,940	9,471	13,788	19,404	25,153	22,303	28,157	34,217	32,104
Sumatra	53,949	57,692	64,513	77,308	73,057	63,661	64,338	65,765	67,562
Kalimantan	6,760	9,895	12,400	19,384	19,815	17,715	26,263	38,013	41,034
Sulawesi	1,214	1,771	2,275	3,061	2,883	2,812	4,816	4,519	5,070
Bali & Nusa Tenggara	283	273	403	664	547	629	695	741	1,075
Muluku & Irian Jaya	565	910	1,449	1,678	2,831	3,014	4,192	5,042	8,234
Total	70,710	80,282	94,828	121,500	142,236	110,134	128,462	147,794	155,079

Source: Statistical Year Book of Indonesia 1979

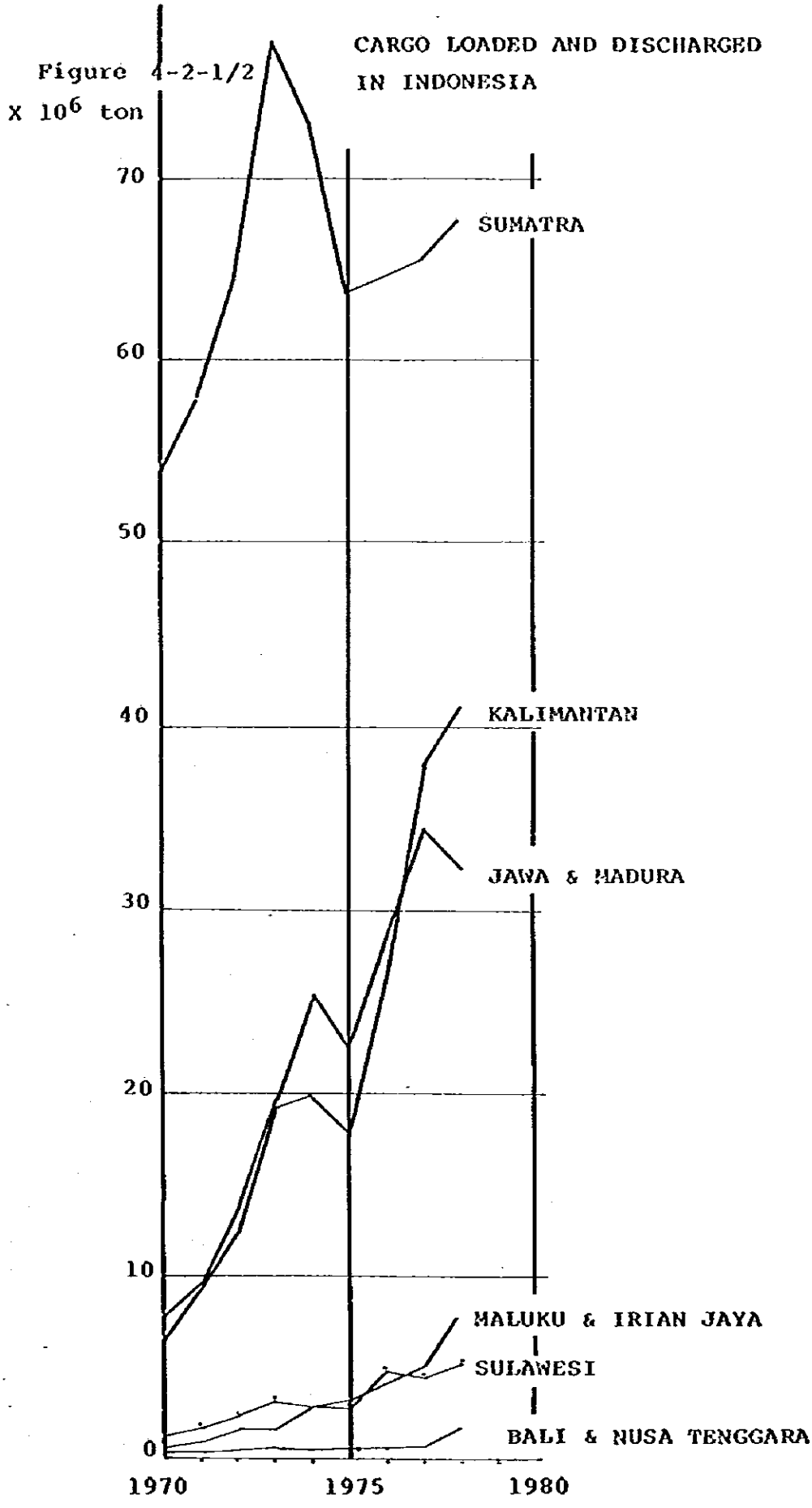
Figure 4-2-1/1

MAIN TRAFFIC ROUTES (R.L.S.)



Source:
DEPARTMEN PERHUBUNGAN
DIREKTORAT JENDERAL PERHUBUNGAN LAUT
SUSUNAN TRAYEK
PELAYARAN NUSANTARA
TETAP DAN TERATUR
(REGULAR LINER SERVICE) R.L.S.
1979/80 - 1983/84

Figure 4-2-1/2


CARGO LOADED AND DISCHARGED
IN INDONESIA
X 10^6 ton
70
60
50
40
30
20
10
0
1970
1975
1980
SUMATRA
KALIMANTAN
JAWA & MADURA
MALUKU & IRIAN JAYA
SULAWESI
BALI & NUSA TENGGARA

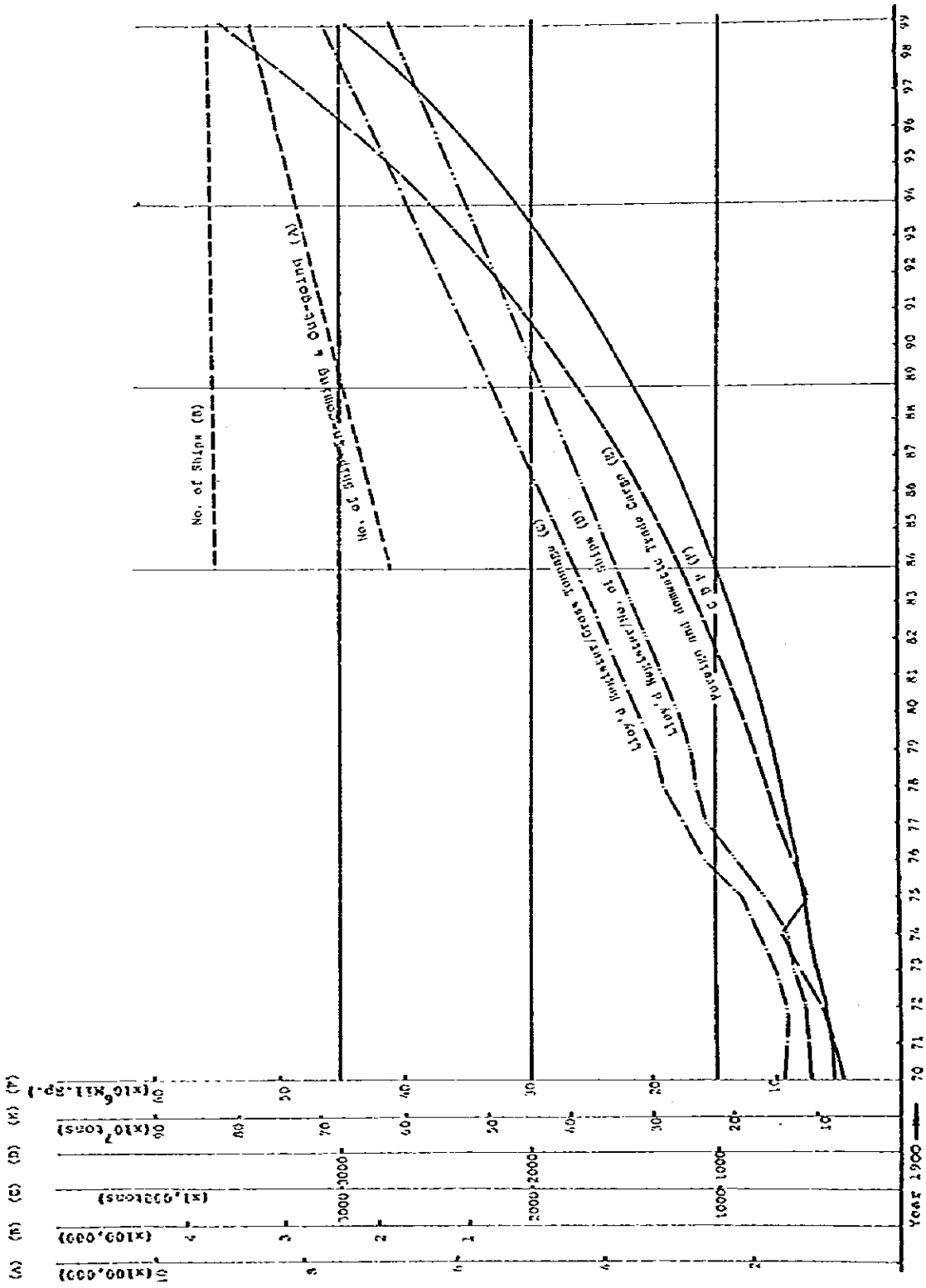


Figure4-2-1/3 Flow & Estimate for Sea Transportation Activities

4-2-2 Traffic

Traffic forecast is indispensable to establish a development plan of maritime radio communication network so that it can offer the services economically and efficiently.
Method of approach used in the forecast is outlined below.

(1) Comprehension of present status of maritime radio communications and the qualitative forecast.

The present status of the maritime radio communications and the qualitative forecast thereof are summarized as follows:

- The maritime radio communication in Indonesia is presumed to be in an early stage of development both in quality and in capacity.

- Economy and telecommunication will grow as a result of interaction between them and the telecommunications will become indispensable means to improve the sea transport efficiency, maritime safety and fishery activities. Henceforth the amount of communication where the public correspondence forms a major part is expected to expand rapidly.

- With the development of the maritime radio communication network, dependence upon telephony will tend to be accelerated owing to its easiness in use, rapidity and being able to communicate directly by voice mutually.

- Most of the distant parties of communication from/to the ship will be the land subscribers. Accordingly, the future plan of PERUMTEL operating the public communication network will affect appreciably to the quality and quantity of maritime radio communication network which uses a part of PERUMTEL telecommunication network.

(2) Quantitative forecast

As maritime radio communication in Indonesia at present is in a transient stage from which an extensive development is about to start and no sufficient data is available, the method of traffic forecast directly from the trend of the past time-series data is no more effective, then the forecast is made based on various statistical data on PERUMTEL's Longterm Plan, economy, population, etc.

The procedures adopted are to estimate first the number of ship stations and then total mobile traffic. Then the total traffic is distributed to each region taking into account the distribution of the coast stations in Indonesia.

Details of the forecast are described below.

1) Forecast of number of ship stations

Estimated number as of Year 2000, of Indonesian ships is 381,443 (see para. 4-2-1);

Among this, the number of ships which is presumed to equip the radio communication facilities by the Year 2000 is 13,761 total for cargo ships, passenger ships etc., 60% of sailing crafts and fishing boats of 10 GRT or more.

However the figure 14,000 is adopted as the target for the Year 2000 taking into account the additional number of foreign ship stations.

Trend, in the number of ship stations during period until Year 2000 is determined as the following expression according to a simulated exponential curve by initial value (881 ship stations) and target value (14,000 ship stations) taking into account the GDP and the PERUMTEL's telephone demand in Indonesia (Refer to Fig. 4-2-2 (1) for trend in GDP, PERUMTEL's telephone demand and the number of ship stations).

$$Y_{SHP} = 881 \times 1.1483^{t}$$

where,

t: Year (t = 0, 1, 2, ...)
t = 0: Year 1980

2) Forecast of mobile traffic

Total of the mobile traffic is found by the following expression knowing the number of ship stations as estimated in 1) above and the average calling rate.

$$Y_{MOB} = Y_{SHP} \times Y_{MCR}$$

where

Y_{MOB}: Mobile traffic (erl.)

Y_{SHP}: Number of ship stations

Y_{MCR}: Mobile average calling rate (erl.)

The mobile average calling rate is estimated based on the traffic conditions as given below and taking into account the existing data in Indonesia and also the data from the foreign countries.

Traffic conditions:

Average number of calls:

2/ship-day (as of Year 2000)

0.7/ship-day (data as of Year 1980)

Average holding time: 240 sec.

Busy-hour concentration rate: 10%

Mobile average calling rates at present and at Year 2000 are obtained as below under the above conditions.

Y_{MCR} (1980) 0.005 (erl.) as of Year 1980

Y_{MCR} (2000) 0.013 (erl.) as of Year 2000

Trend of mobile average calling rate till Year 2000 is given by the expression;

$$Y_{MCR} = \frac{0.02}{1 + 3e^{-0.0859t}}$$

where, t: Year (t = 0, 1, 2, ...)
t = 0: Year 1980

Number of ship stations, mobile average calling rate and mobile traffic estimated for Year 1984, 1989 and 2000 are given in the table below.

Year	Number of Ship Stations	Mobile Average Calling rate/ Ship Station (erl.)	Mobile traffic (erl.)
1984	1531	0.006	9.2
1989	3058	0.008	24.5
2000	14000	0.013	182.0

Trend in number of ship stations, Mobile average calling rate, mobile traffic during period until Year 2000 are shown in Fig. 4-2-2 (1).

(3) Traffic distribution

In the ship-shore communication, how the calls originate and are carried to the called parties involves extremely complicated considerations. Factors to be considered include the types of communication facilities installed aboard the ships, the locations of ships in the sea area, and the types of facilities and operating hours of the coast stations, and all these are different.

Therefore, the internal, as well as external, elements of those factors are to be identified and, based on the findings, the respective quantities of communication by MF, HF and VHF bands are to be estimated. And, out of such communication estimates, the traffic distribution is to be made to Jawa, Sumatra, Kalimantan, Sulawesi and Maluku areas.

1) Communication ratios by MF, HF and VHF bands

The most of ship stations as of the year 2000 are presumed to have VHF facilities installed. Out of them, 60% are assumed to be additionally equipped with MF and/or HF radio facilities. Furthermore, when the number of ships operating in the Indonesian waters is estimated from the distribution of service routes, etc., it may be presumed that the MF and HF communication assumes 50% and the VHF communication assumes the remaining 50%.

From those assumptions the exponential curves are to be drawn for the quantities of communication, classified by frequency bands, in the years 1984, 1989 and 2000; then, from those exponential curves the communication ratios by band categories for the these years are to be estimated. The results of estimation are as follows:

	MF, HF (%)	VHF (%)
1984	90.0	10.0
1989	83.0	17.0
2000	50.0	50.0

2) Regional traffic

Taking into account the regional divisions by PERUMTEL and Sea Communications, the whole Indonesia is divided into five regions, i.e., JAWA, SUMATERA, KALIMANTAN, SULAWESI and MALUKU. (Refer to Fig. 4-2-2 (2)).
Distribution of the traffic into these five regions is made in the following manner.

Three main factors to determine traffic distribution are;

- mobile traffic distribution by region at present,
- telephone demand distribution by region (it is essential because the most of the counterpart party of the ship mobile station is the PERUMTEL's subscriber), and
- population distribution to decide the local economic activities and telephone demands.

It is assumed that the sizes of population factor may increase in 15 to 20 year period, however, the regional distribution of the factor will exhibit no change in the same period.

Considering that these three factors interact each other, the evaluated distribution rate (Rev) from which the future regional traffic is estimated is obtained as in Table 4-2-2 (1) by the following expression.

$$Rev = (A \times B \times C)^{\frac{1}{3}}$$

where,

A: Mobile traffic distribution rate

B: PERUMTEL's telephone demand distribution rate

C: Population distribution rate

The result of traffic distribution among the five regions appears in Table 4-2-2 (2).

Table 4-2-2 (1)

Traffic Distribution Rate by Regional Areas

(Unit: %)

Area	Mobile Traffic	PERUMTEL's Telephone Demand			Population	Evaluated Value		
		1984	1989	2000		1984	1989	2000
JAWA	73.6	74.4	74.0	74.9	68.0	72.5	72.4	72.7
SUMATERA	12.0	16.1	16.2	15.5	18.5	15.5	15.5	15.3
KALIMANTAN	2.4	2.8	2.8	2.8	4.5	3.1	3.1	3.1
SULAWESI	6.8	4.8	4.8	4.7	7.3	6.3	6.3	6.3
MALUKU	5.2	1.9	2.2	2.1	1.7	2.6	2.7	2.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source:

Mobile Traffic: Statistics by Sea Communication

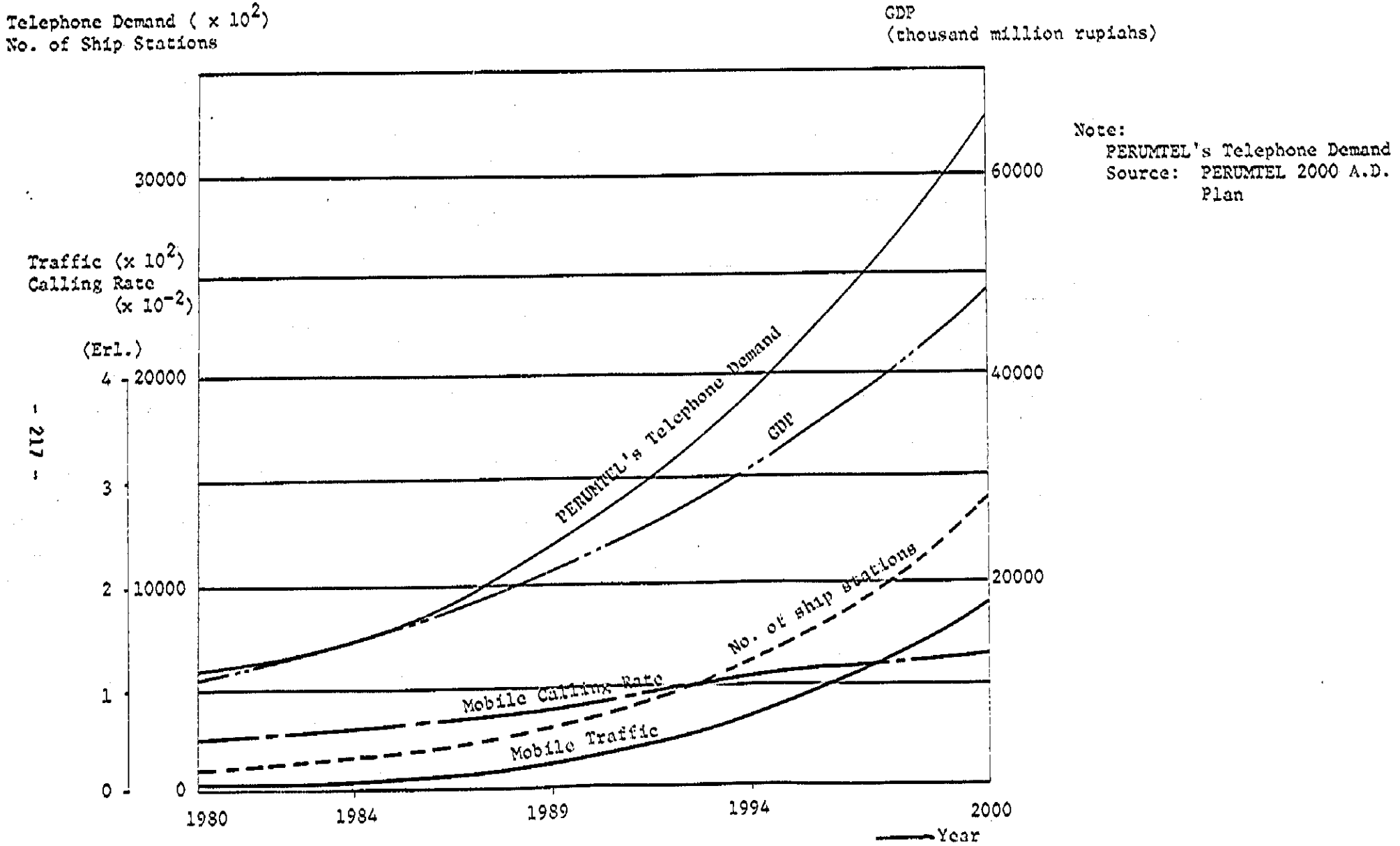
PERUMTEL's Telephone Demand: PERUMTEL's 2000 AD Plan

Population: Statistical Yearbook of INDONESIA, 1979

Table 4-2-2 (2)

Traffic Distribution by Regional Areas

Area	Frequency	Traffic (Erl.)		
		1984	1989	2000
JAWA	MF, HF	6.00	14.72	66.15
	VHF	0.67	3.02	66.15
	Sub-Total	6.67	17.74	132.30
SUMATERA	MF,HF	1.29	3.15	13.93
	VHF	0.14	0.65	13.93
	Sub-Total	1.43	3.80	27.86
KALIMANTAN	MF, HF	0.25	0.63	2.82
	VHF	0.03	0.13	2.82
	Sub-Total	0.28	0.76	5.64
SULAWESI	MF, HF	0.52	1.28	5.73
	VHF	0.06	0.26	5.73
	Sub-Total	0.58	1.54	11.46
MALUKU	MF, HF	0.22	0.55	2.37
	VHF	0.02	0.11	2.37
	Sub-Total	0.24	0.66	4.74
	TOTAL	9.20	24.50	182.00



Note:
PERUMTEL's Telephone Demand
Source: PERUMTEL 2000 A.D. Plan

Fig. 4-2-2(1) Forecast up to Year 2000

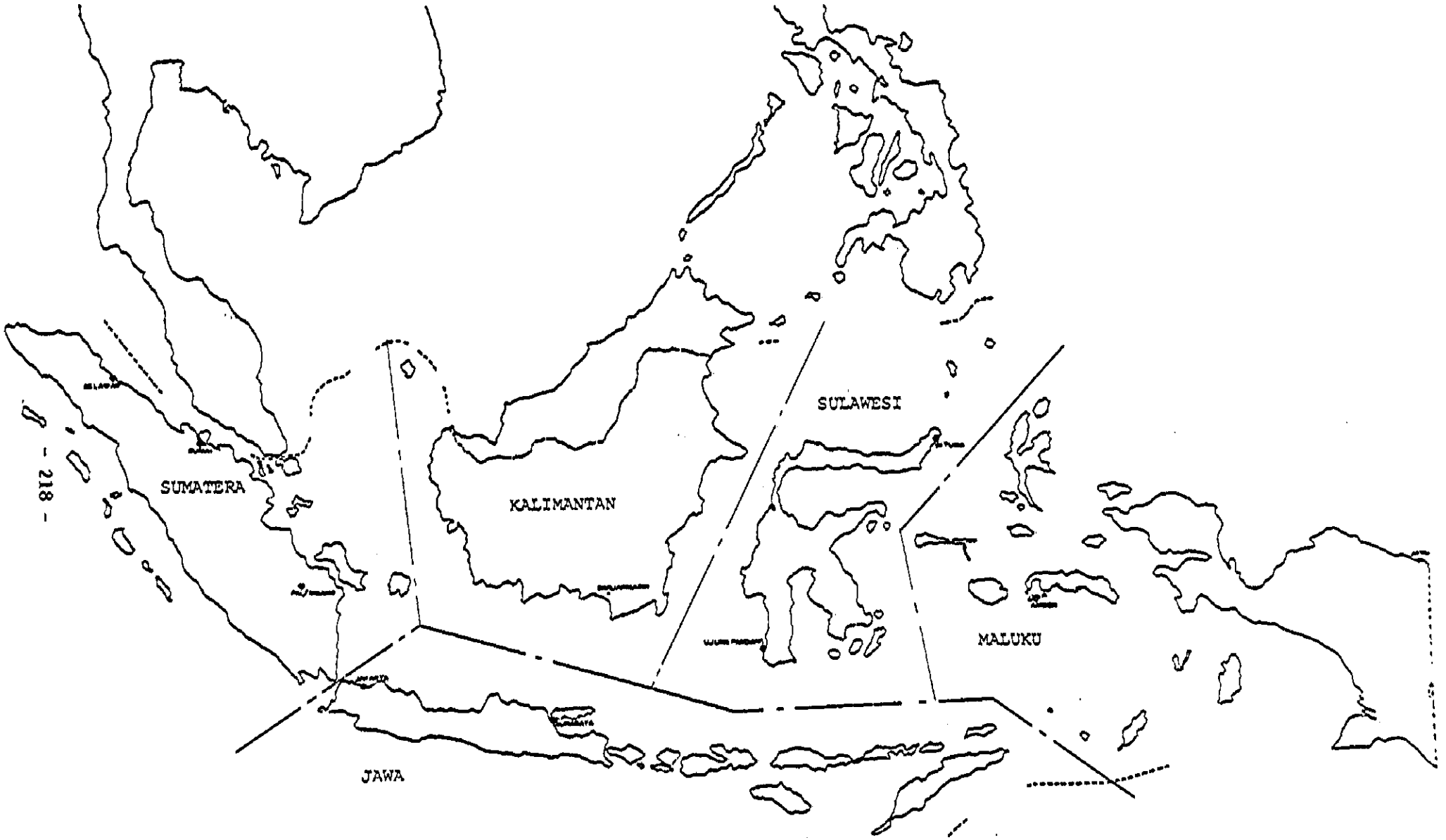


Fig.4-2-2(2) Regional Areas for Traffic Distribution

4-3 Total Plan

4-3-1 Station Site and Facilities

(1) Coast Station Site Selection and Standard Facilities

Out of the existing Class I, Class II, Class III and Class IVa and IVb coast stations, those to become Class A and Class B stations in this plan are to have the transmitting and receiving stations separated.

The existing Class I coast stations already have the separate locations of transmitting and receiving stations. However, the progress of urbanization with the resultant increase of city noise near the receiving stations is necessitating some of those coast stations to transfer their receiving stations to other places. Such transfer of receiving stations is to be carried out in this plan. The coast stations concerned are Surabaya, Ujung Pandang (Makassar) and Ambon stations.

Out of Class II coast stations, Sabang station is now operating with the receiving facilities installed in the transmitting station. This is because of frequent troubles with the control line between the transmitting and receiving stations. This control line is to be replenished in this plan and, at the same time, the transmitting and receiving stations are to be separated as before.

For the separation of transmitting and receiving stations, the following points must be duly considered:

Which, the transmitting station or the receiving station, to transfer to a new site depends upon the environmental condition of each coast station. Technical requirements for avoiding noise and radio interference and for improving service, as well as compatibility with SAR system, require careful studies. Feasibility assessment from all angles, including cost and ease of operation, is important.

New coast station sites must not be too near the harbors. Class A and Class B stations should be located at least 0.5 km inland from the harbor area. For Class A stations, the distance between transmitting and receiving stations should preferably be 2-5 km and, for Class B stations, approximately 1 km.

For Class C and Class D coast stations, if their existing sites involve no special inconvenience, they are to maintain the status quo.

The required land space for sites where the separate transmitting and receiving stations will be newly constructed appears in Table 4-3-1 (1).

Additional coast stations to be established in the harbor areas of Jawa and Sumatera will be planned in REPELITA V. The number of such additional coast stations is approximately 70. By the year 2000, about 80 more coast stations will be opened in other harbor areas.

Standard facilities required at coast stations are as follows:

The standard quantity of facilities required at coast stations of all classes is given in Table 4-3-1 (2).

As indicated in the table, the standard quantity varies station by station depending upon the local conditions such as port activity and amount of communication traffic. At the stations where the facilities presently installed exceed this quantity, the existing facilities are to be maintained. For the stations where the facilities installed fall short of the required quantity, the additiional installation is to be planned.

It is recommended to install a solid state transmitter to unnecessitate to procure the expensive HF power tube. Class-A stations are provided with the equipment of NBDP and DSC.

The antenna system is to be improved, where necessary, by the following guideline:

For MF and HF antenna systems, the high gain and/or wide band antenna is to be used or the shared use of antenna is to be considered according to the purpose and service area or for the effective utilization of site area.

One example: For the transmitting spare antenna, to use the conical monopole type, wide band antenna for the effective utilization of site area and, for the receiving antenna, to use the wide band, high gain antenna, such as log-periodic antenna and conical monopole antenna, and also to consider the user of equipment for shared use of antenna.

For VHF antenna system, the shared use of an antenna for transmission or reception of two or more frequencies is to be considered at Class A and Class B coast stations in preparation for public correspondence service expansion in the future and, at the same time, the use of corner reflector antenna is to be considered for the service area expansion.

The lists of equipment to be provided are included as APPENDIX 23 (1/8 through 8/8), however, the lists should be reexamined and may be modified before starting the implementation of the subprogram, since the technical innovation in future may call for the introduction of new equipment and/or system.

Typical site layouts for Class A through Class B coast stations in consideration of their respective service categories as per the foregoing are given in Figure 4-3-1 (1) and Figure 4-3-1 (2). Each site layout includes the antenna system layout.

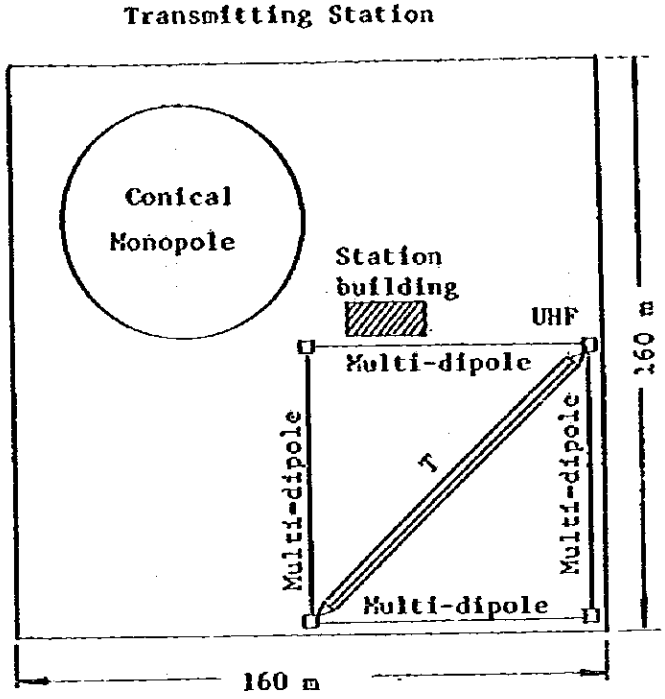
Table 4-3-1 (1)

Site Area required for Coast Stations

Item	Area
A Class Transmitting Station	160m x 160m or more
A Class Receiving Station	160m x 160m or more
B Class Transmitting Station	120m x 120m or more
B Class Receiving Station	120m x 140m or more

Table 4-3-1 (2)

Equipment	Class of Coast Stations A	B	C	D
1.0 KW MF TG Transmitter	2	2		
" MF/HF, TG, TP Transmitter	2	2		
" HF, TG Transmitter	2-4	1-2		
" HF, Tp Transmitter	2-4	1-2		
0.1 KW HF, TP Transmitter	1	1		
1.0 KW Dummy Load	1	1		
Antenna Matrix	1	1		
Supervisory Console	1	1		
UHF 12/24 Ch. T/R with Mux.	2	2		
MF Receiver	2	2		
MF/HF Receiver	2	2	3	
HF Receiver	4-8	2-4		
Antenna Multicoupler	1	1		
Antenna Exchange	8-12	6-8		
VHF Transceiver	6-16 Ch.	6-16 Ch.	3-7 Ch	3-7 Ch.
Operator's Position	7	6	1	1
VODAS	2	1		
LINCOMPEX	1			
NBDP	1			
Morse Type Transmitter	1			
DSC	1			
Teleprinter	1			
Power Plant	60 KVA	50 KVA	5 KVA	2 KVA
"	20 KVA	10 KVA		



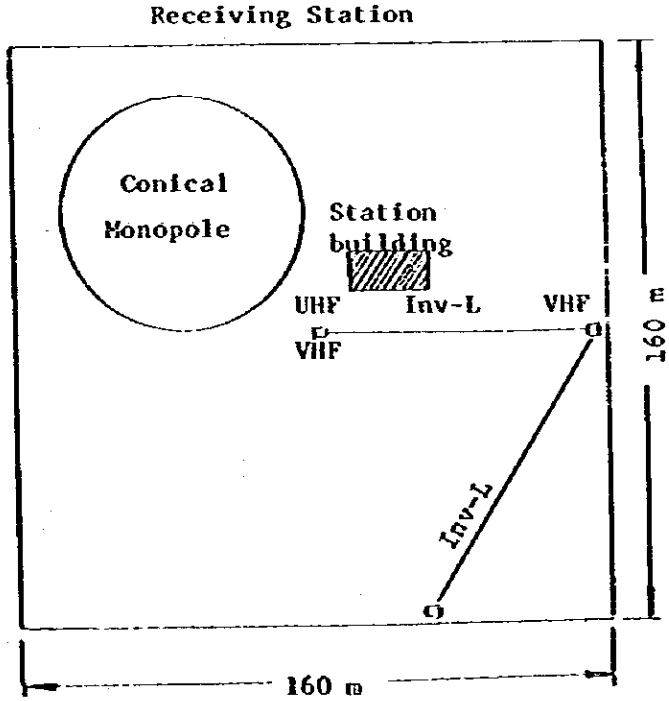
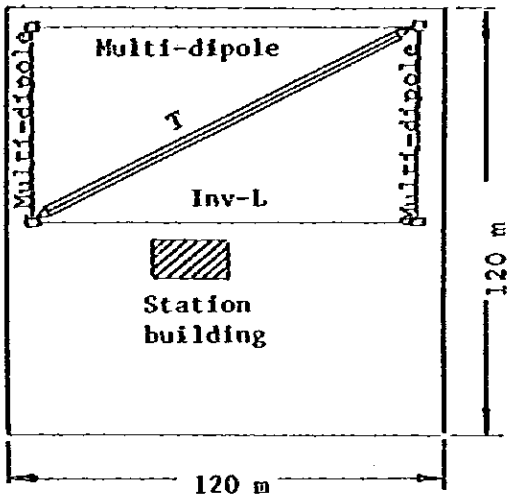


Fig. 4-3-1 (1) Typical Site Layout for Class A Station

Transmitting Station



Receiving Station

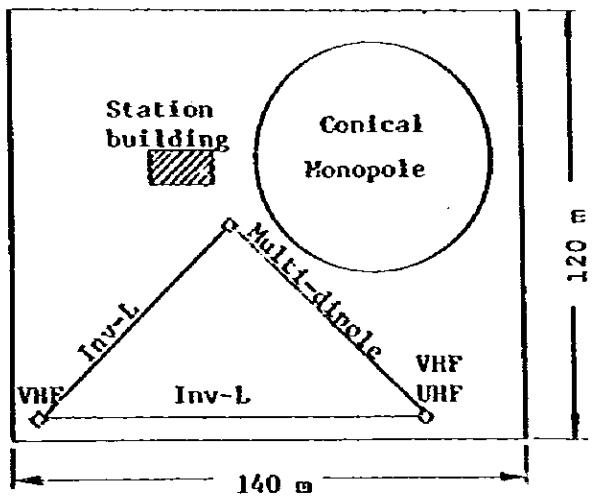


Fig. 4-3-1 (2) Typical Site Layout for Class B Station

(2) Allocation of Radio Direction-Finding Facility and Station

Radio direction-finding facilities and stations are extremely useful for accurately locating the positions of ships in distress or in a state of emergency for the prompt and effective SAR operations.

The nine direction finders have already been planned in the Development Plan, F-ST-12 to be installed at the coast stations listed in Table 4-3-1(2)/1.

Table 4-3-1(2)/1

List of Radio Direction-Finders
Planned in P-ST-12

District	Station No.	Name of Coast Station	Main Covering Waters	Covering Range
I	100	Belawan	Malaka St.	100 - 150 km
II	200	Dumai	"	"
III	300	Jakarta	Jawa Sea	"
IV	400	Surabaya	" /Bali Sea	"
	404	Semarang	"	"
VI	600	Ujung Pandang	Makassar St. Flores Sea	"
VII	700	Bitung	Maluku Sea Sulawesi Sea	"
VIII	800	Ambon	Selam Sea Banda Sea	"
IX	900	Jayapura	Pasifik	"

In addition to the above direction-finders, the direction-finding facilities and stations are established.

The radio direction-finding facilities are incorporated in all the SAR operating coast stations in which SAR communications are carried out except Cirebon station, and some more direction-finding stations are allocated independently of the coast stations to fill the area gap of the above coverage. Table 4-3-1(2)/2 gives a list of the radio direction-finding stations, while a list of the radio direction-finding facilities incorporated in the SAR operating coast stations are shown in Table 4-3-1(2)/1

The nine(9) radio direction-finders listed in Table 4-3-1(2) shall be gradually replaced by the full scale ones during the implementation stage of Long Term Development Plan for the improvement of the direction-finding performance.

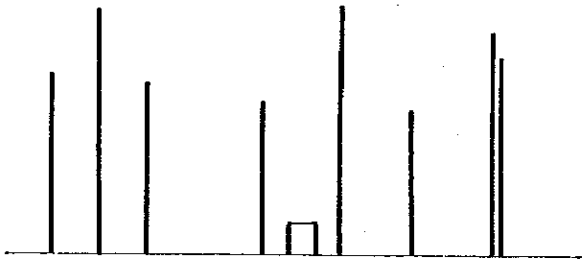
It is desired that, during the course of siting of radio direction-finding facilities and stations, due consideration be taken into account for securing enough land to be able to re-locate the existing receiving stations to the new places where radio receiving environment is improved.

Figure 4-3-1(2)/1 shows the configuration of a direction-finding station.

Table 4-3-1(2)/2

DIRECTION-FINDING STATIONS

DISTRICT	STATION NO.	NAME OF STATION	LINK TO	REMARKS
III	391	Bengkulu	302/Palembang	
	392	P. Belitung	300/Jakarta	
IV	491	Dili	402/Kupang	
	492	Karimunjawa	404/Semarang	
	493	Sumba	402/Kupang	
VI	691	Bau Bau	601/Kendari	
VII	791	Donggala	700/Bitung	
	792	Gorontalo	700/Bitung	
VIII	891	Jamdena	800/Ambon	
	892	Kep-Aru	800/Ambon	
	893	Tual	800/Ambon	
Total		11		



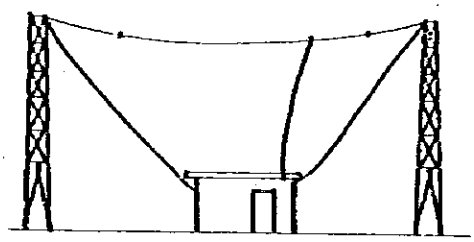


Figure 4-3-1(2) /1

CONFIGURATION OF DIRECTION-FINDING STATION

(3) Allocation of SAR Radio Operating Station

SAR Radio Operating Stations belonging to the main KPLP Detachments covering the important water areas are locationally separated from the relevant SAR operating coast stations for the effective SAR operations. In the other SAR operating coast stations, SAR Radio Operating Consoles are installed for the link with nearby KPLP Detachments. For the implementation of the above, the existing equipment are shared with the coast stations to the possible extent.

The SAR operating coast stations have their own radio direction-finding facilities except Cirebon station and are under 24-hour operation set-up.

Table 4-3-1(3) gives a list of the SAR operating coast stations with SAR ROS, SAR Console and DF facilities installed.

Figure 4-3-1(3)/1 shows the configuration of a SAR operating coast station with SAR ROS incorporated and Figure 4-3-1(3)/2 that with SAR Console installed.

Table4-3-1(3) SAR OPERATING COAST STATIONS

DISTRICT	STATION NO.	NAME OF STATION	CLASS OF STATION	SAR ROS	SAR CONSOLE	DF FACI-LITY	DF STATION LINK
I	100	Belawan	A	o	-	o	
	101	Sabang	B	-	o	o	
	102	Sibolga	B	-	o	o	
II	200	Dumai	A	o	-	o	
	201	TG Uban	B	o	-	o	
	202	Teluk Bayur	B	o	-	o	
III	300	Jakarta	A	o	-	o	392/P.Belitung
	301	Cirebon	B	-	o	-	
	302	Palembang	B	-	o	o	391/Bengkulu
	303	Panjang	B	-	o	o	
	304	Pontianak	B	o	-	o	
IV	400	Surabaya	A	o	-	o	
	401	Cilacap	B	o	-	o	
	402	Kupang	B	o	-	o	491/Dili 493/Sumba
	403	Lembar	B	o	-	o	
	404	Semarang	B	-	o	o	492/ Karimunjawa
V	500	Banjarmasin	A	-	o	o	
	501	Balikpapan	B	o	-	o	
	502	Samarinda	B	-	o	o	
	503	Tarakan	B	-	o	o	
VI	600	Ujung Pandang	A	o	-	o	
	601	Kendari	B	o	-	o	691/Bau Bau
VII	700	Bitung	A	o	-	o	791/Donggala 792/Gorontalo
VIII	800	Ambon	A	o	-	o	891/Jamdena 892/Kep-Aru 893/Tual
	801	Ternate	B	-	o	o	
IX	900	Jayapura	A	-	o	o	
	901	Biak	B	-	o	o	
	902	Fak-Fak	B	-	o	o	
	903	Merauke	B	-	o	o	
	904	Sorong	B	o	-	o	
Total				16	14	29	

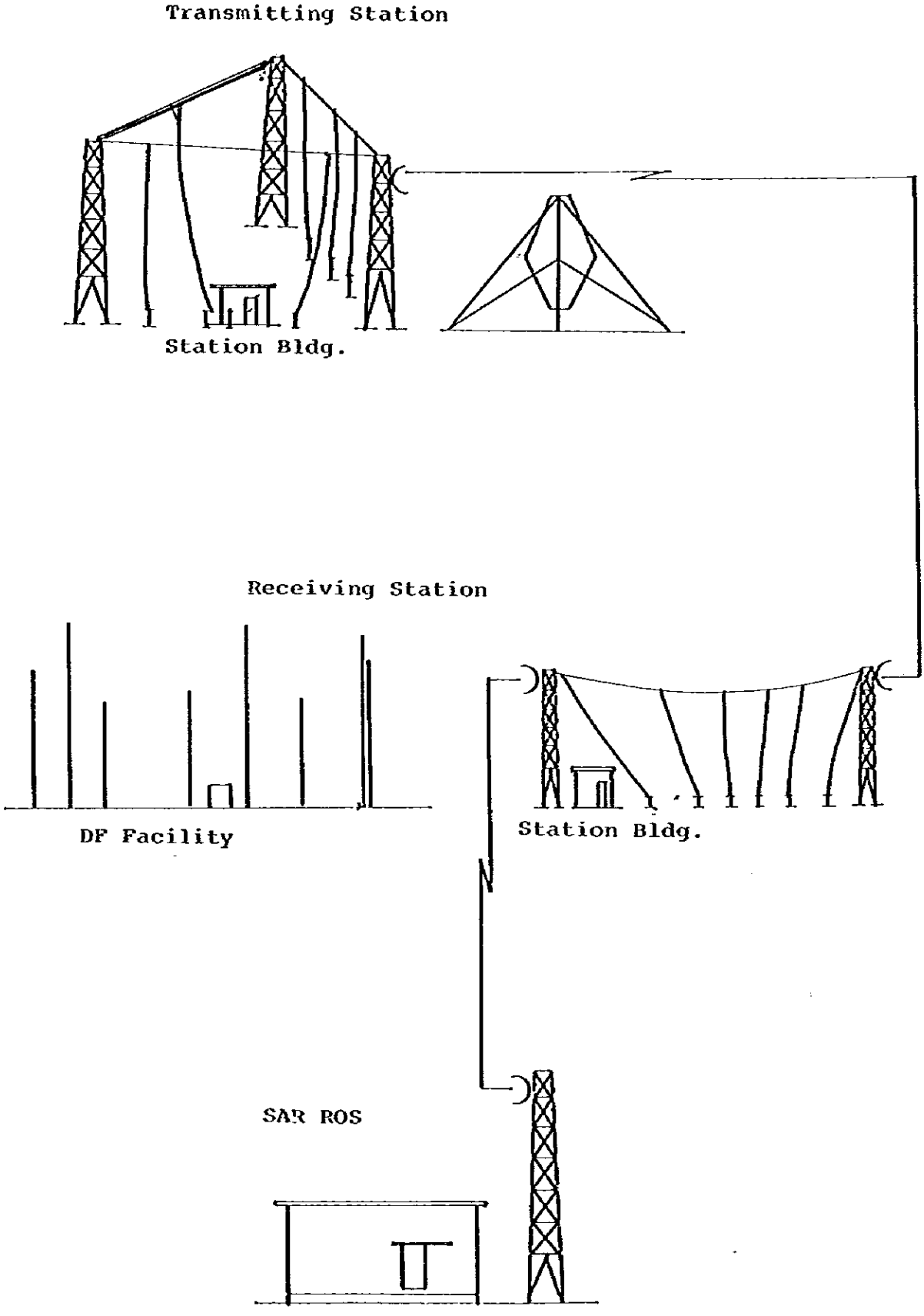


Figure 4-3-1(3)/1 CONFIGURATION OF SAR OPERATING COAST STATION WITH SAR ROS INCORPORATED

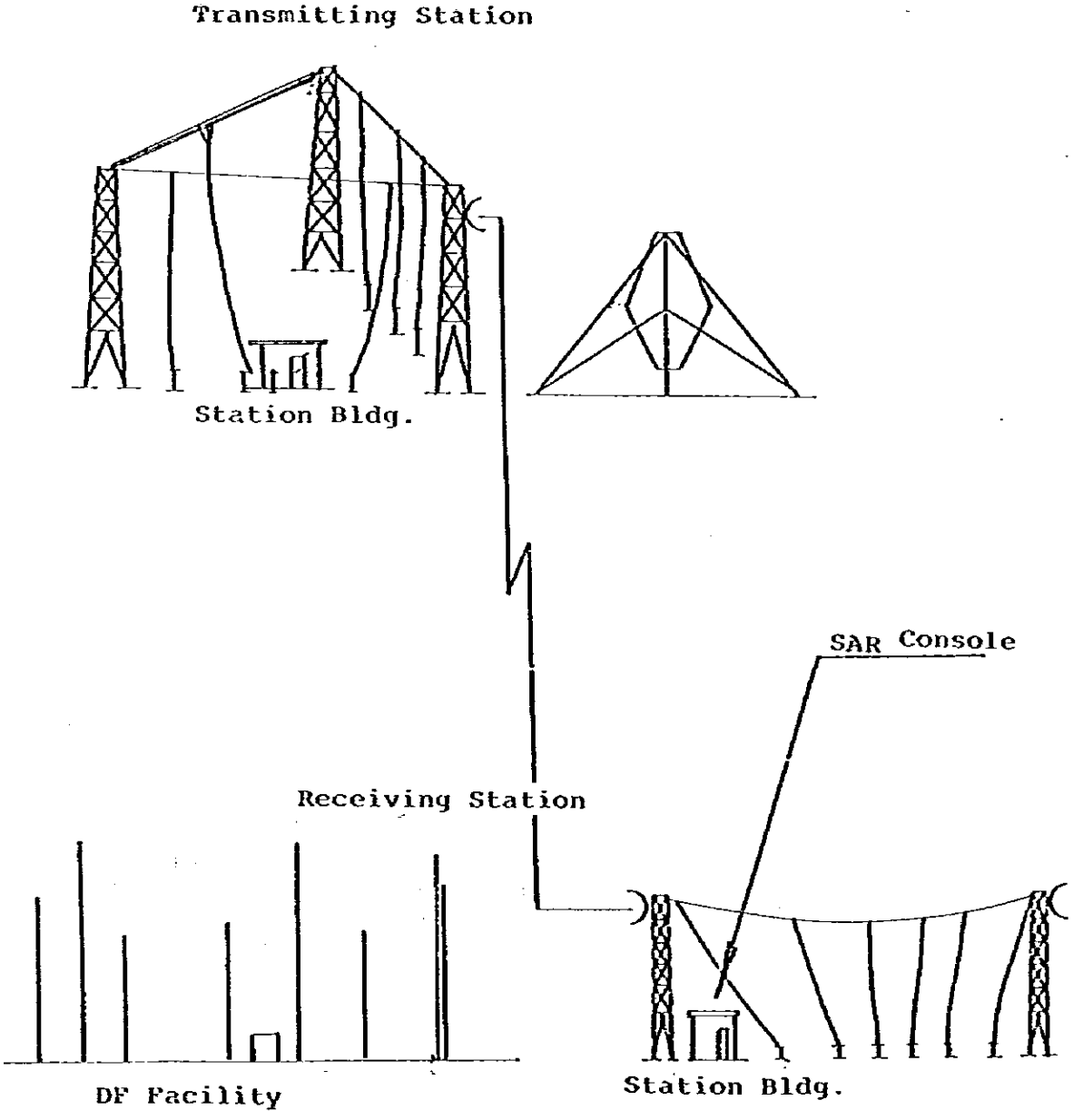


Figure 4-3-1(3)/2 CONFIGURATION OF SAR OPERATING COAST STATION WITH SAR CONSOLE INSTALLED

(4) Station Buildings

1) Required floor spaces of buildings are estimated as given below.

a. Coast Station

The space indicated includes those for equipment & traffic and station management.

Unit: m^2

Type of Section	Transmitting Station		Receiving Station		Total
	Main Bldg.	Power Plant	Main Bldg.	Power Plant	
Class A (Note 1) (Banjarmasin)	240	70	240	35	585
Class B (Note 2)	240	50	180	35	505

Type of Station	Main Bldg.	Power Plant	Total
Class C (Note 3)	100	35	135
Class D (Note 4)	50	20	70

Note 1. It is assumed that all the Class A station buildings except for Banjarmasin Station suffice to accommodate the additional equipment, however, for Surabaya, Ujung Pandang and Ambon, new receiving station buildings of 275 m^2 each are included.

2. No additional floor space is estimated for Palembang and Semarang coast stations. For the other Class B stations, the existing floor space of 100 m^2 may be utilized for equipment installation. Therefore the net required floor space is 405 m^2 (= 505 m^2 - 100 m^2).

3. Existing buildings for Class C coast stations are available for new installations.

4. All the Class D coast station buildings are newly required.

b. SAR & DF facilities & station.

Required floor spaces assumed are as follows:

i)	SAR ROS	100 m^2 for comm. equipment
		20 m^2 for power plant
ii)	SAR Console	10 m^2
iii)	DF Facilities	30 m^2
iv)	DF Station	130 m^2 for DF & Comm. equipment
		20 m^2 for power plant

2) Assumed unit price for building construction

Rp 280,800/m^2

Specifications:-

Pillars and beams	concrete
Wall	brick
Finishing	mortar & paint
Floor	terrazzo finishing
Roof	concrete slab with waterproofing

3) Air conditioning equipment

It is assumed that one unit of air conditioning equipment is necessary for 25 m^2 room and the cost of this air conditioning equipment is 1.2 million Rupiah.

Rooms requiring the air condition are assumed as follows:

Receiving equipment room

Traffic room

UHF equipment and the remote control equipment room in the transmitting station

SAR ROS room

DF facilities room

DF station

No air condition equipment is provided for transmitter room and power plant where the air ventilator is provided.

4-3-2 Point-to-Point Communication Network

(1) Point-to-Point General Communication System

1) For Jakarta Central - Class A Station and Class A Station - Class B Station Circuits, PERUMTEL's Leased circuits are used as operational. HF circuits is to be newly established as stand-by.

2) For Class B Station - Class C Station and Class A Station - Class C Station circuits, PERUMTEL's public communication circuits are used as working channels. HF circuit is to be newly established as stand-by.

3) For other circuits, PERUMTEL's public communication circuits are used.

4) At each end of the system is provided with both telephone and telex terminals, however the telex is mainly used.

5) For public communication to/from ships is connected to the nearest telephone exchange of PERUMTEL instead of using the Sea Communication's point-to-point communication network.

6) Fig. 4-3-2 (1) shows the general point-to-point communication network.

(2) SAR Communication System

1) For circuit between KPLP's Central Operation Center and Regional Operation Centers,PERUMTEL leased circuit is used as working channel. Both telephone and teletypewriter terminals are installed. For routine inter-office contact, teletypewriter system is used.

2) For ccircuit between KPLP's Regional Operation Center and Detachments, PERUMTEL leased circuit is used as working channel.

3) For circuit between KPLP's Detachments(SAR ROS) and the relevant Class A or B station, exclusive UHF link is established.

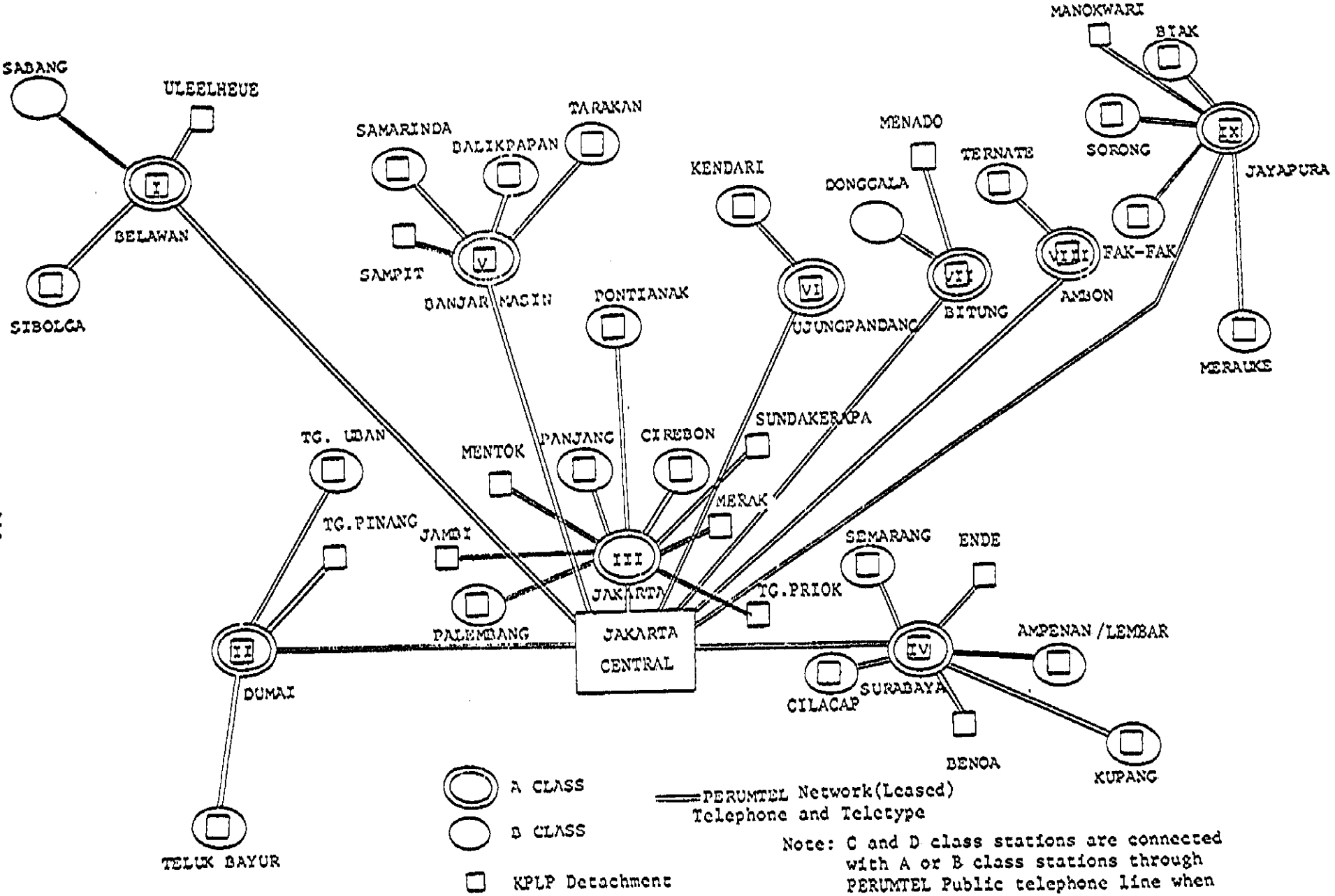
4) For circuit between KPLP's Detachments and the relevant Class A or B station(SAR Console), PERUMTEL leased circuit or exclusive VHF is used.

5) For circuit between the Direction-finding station and the relevant coast stations (SAR ROS or SAR Console), HF SSB circuit is established.

6) Coast Stations - Inherent Direction-Finding Facilities:

UHF link for the direct control and operation.

The P-P networks for 1) through to 6) above are also included in Figure 4-3-2(1) and Figure 4-4-3/2.



Note: C and D class stations are connected with A or B class stations through PERUMTEL Public telephone line when necessary.

Fig. 4-3-2(1) Point-to-point Network

4-3-3 Radio Equipment for Search and Rescue Ships

SAR ships need the following:

(1) Handling of important communications.

(2) Radio direction-finding for locating ships and other mobiles in distress or in a state of emergency.

(3) Maintenance of continuous contacts with KPLP organization.

(4) Establishment and maintenance of direct contacts with the ships and aircraft belonging to other SAR organizations than KPLP.

And, Table 4-3-3 shows the necessary radio installations to meet the above requirements.

Table 4-3-3 RADIO INSTALLATIONS FOR SAR SHIP

Class of SAR Ship	Transmitter/Receiver: Transmitter	Transmitter/Receiver: Receiver	Transmitter/Receiver: Frequency	Transmitter/Receiver: Antenna	Others	Watch Hours	Radio Operator	Remarks
I >250 DRT	MF—HF 500W x 2 sets 400W x 1 set maritime VHF 10W x 1 set aeronautical VHF 10W x 1 set	All waves x 2 sets Spot x 4 sets	MF, HF VHF aeronautical VHF Telegraph Telephone Teletypewriter	Inverted L Dipole Whip	Direction Finder x 1 set SOS Generator x 1 set Radio Buoy x 1 set Auto Alarm Receiver x 1 set	24	4	HF=4—22MHz ARQ
II 100—250 DRT	MF—HF 250W x 1 set HF 250W x 1 set maritime VHF 10W x 1 set aeronautical VHF 5W x 1 set	All waves x 1 set Spot x 4 sets	MF, HF VHF aeronautical VHF Telegraph Telephone	Ditto	Direction Finder x 1 set SOS Generator x 1 set Radio Buoy x 1 set	24	4	HF=4—22MHz
III 25—100 DRT	MF—HF 50W x 1 set	All waves x 1 set Spot x 3 sets	MF VHF Telegraph Telephone	Ditto	Direction Finger x 1 set SOS Generator x 1 set Radio Buoy x 1 set	16	2	HF=4—6MHz
IV 5—25 DRT	M(HF) 10W x 1set VHF 10W x 1 set		MF VHF Telephone	Dipole Whip	Direction Finder x 1 set SOS Generator x 1 set	while at sea	-	HF=4—6MHz MF=2—4MHz ARQ
V <5 DRT	VHF 10W x 1 set		VHF Telephone	Dipole	-	while at sea	-	ARQ

4-4 Operation Plan

The procurement of capable personnel is one of vital requirements for the promotion of the long term improvement and expansion plan for the maritime radio communication network. Those personnel must be effectively trained and efficiently assigned to duty so that they can take care of network operation by up-to-date practices. Following is the guideline for attaining the purpose.

4-4-1 General Service Coast Stations

1) As a rule, Class A and Class B coast stations operate for 24 hours/day and Class C stations for required hours. All these stations are to have necessary personnel assigned for such operations.

2) Class D stations operate for port operation and ship movement as main service. Therefore, the personnel are to be limited to the necessary minimum as at present. The Port Administrator or the Harbor Master may be entrusted in the operation of stations.

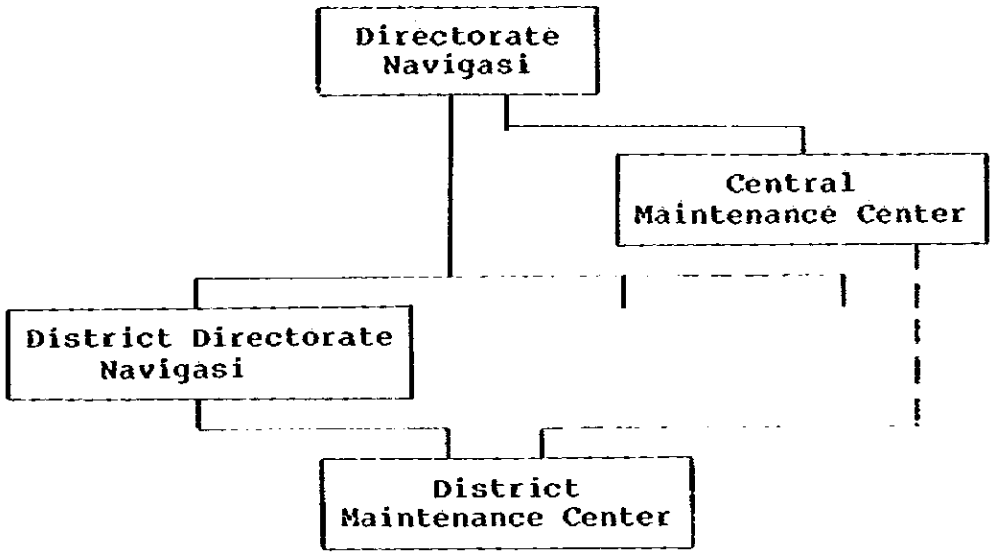
3) For station maintenance, only the simple maintenance of station facilities (such as daily inspection, faulty panel replacement and stopgap repair) is made at each station.

4) Periodical tests, fault correction, major maintenance work, etc., are carried out by itinerary maintenance personnel dispatched from the Maintenance Center of each District.

4-4-2 Maintenance Center

The Maintenance Center is to be established in NAVIGASI headquarter and each District Headquarters.

(1) Organization



(2) Facilities to be maintained

Facilities to receive maintenance are those of all radio stations (including ship stations under their control) that belong to the Directorate General of Sea Communications.

For maintenance that requires large scale work (e.g., power engine overhaul and antenna system maintenance), orders are placed with an appropriate firm on contract basis, in principle.

Faulty solid state electronic panels and units are to be repaired by a qualified firm such as the manufacturer, in principle.

(3) Functions

1) Central Maintenance Center

a) Planning, design and execution concerning the maintenance of facilities.

b) Planning of collective procurement by the Central Maintenance Center for main parts and parts whose local procurement is difficult, and distribution of such parts to each District Maintenance Center.

c) Training of engineers and technicians

i) Regular Course

For technical updating of District Maintenance Center service engineers.

ii) Special Course

To be held when necessary for familiarization with newly introduced equipment.

iii) Simple Maintenance Course

For training of radio station operators and/or technicians on ways of stopgap repair, such as replacement of equipment units.

d) Facilities to be provided

Provision of the following facilities is required for the Central Maintenance Center for reinforcing the maintenance services and training the technicians and the operators of the coast stations.

Required Facilities

(1) 1 KW MF telegraph transmitter

(2) 1 KW MF/HF telegraph & telephone transmitter

(3) 0.1 KW HF telephone transceiver

(4) 1 KW and 0.1 KW transmitter's dummy load

(5) Allwave receiver

(6) Preset Unit

(7) Scanning Unit

(8) Remote control unit

(9) UHF 12ch SS-PM Radio equipment with multiplex equipment.

(10) VHF Transceiver

(11) Power plant composed of 10 KVA Engine Generator, 2 KVA AVR, Battery and charger, control panel.

(12) Measuring equipment and tools.

These equipment is used for testing the repaired unit, panel, card, etc. and also for training the technicians and the operators.

2) District Maintenance Center

a) Maintenance of facilities and related matters.

b) Collective procurement and distribution of general parts required by radio stations under jurisdiction.

c) Maintenance practices

i) Periodical itinerary maintenance

Service engineers itinerate from one radio station to another at certain time intervals and inspect facilities of each radio station to make sure of equipment operation and stock of spares.

ii) Non-periodical itinerary maintenance

Itinerancy for emergency remedial action when trouble takes place.

4-4-3 SAR Operation System

In order to carry out useful and effective SAR operations by KPLP as maritime SAR task force, the SAR operation system is established within the organizations of Central and District Headquarters of Sea Communications having the Central Center in Jakarta and each Regional Center at the District HQ's. KPLP Detachments under the command of the respective Regional Centers are connected with the SAR operating coast stations for their necessary communications for SAR. Figure 4-4-3/1 shows the overall system, and the KPLP P-P communications network is given in Figure 4-4-3/2.
Figure 4-4-3/3 illustrates Command/Control Consoles (CC Console) to be installed in Central and Regional Operation Centers.

(1) Operation Center

1) Central Operation Center

The Central Operation Center is based in Jakarta for the centralized continuous monitoring of the movements of all KPLP-owned SAR ships for the overall command of all the Regional Operation Centers as well as of the SAR Fleet, which is under the direct control of the Central Center.

The Center also co-ordinates the Regional Centers for despatch of SAR ships from one Regional Center to the other upon necessity and carries out inter-Regional Center co-ordination required for maritime SAR operations. The Center is the main contact of the central co-ordination by SAR National including international SAR operations.

2) Regional Operation Center

The Regional Operation Centers are established in each District Headquarters of Sea Communications for the continuous monitoring of the movements of all of their respective SAR ships and for the control of the Detachments within their own Districts. A Regional Center also makes liaison with other Regional Cneters via the Central Operation Center in order to solidify the operation system. The Regional Centers are the contacts for SAR co-ordination by KKR/SKR and with other SAR organizations.

(2) SAR Radio Operating Station. (SAR ROS)

The SAR Radio Operating Stations linked with the relevant coast stations are established in the main KPLP Detachments, which cover important water areas, to carry out, under 24-hour operation, continuous watch on the important frequencies, maintain contacts with SAR ships, broadcast information on navigation safety and make communications for other SAR activities, and all the messages and information on marine accidents, direction-finding and such are fed into the Operation Centers. Figure 4-4-3/4 shows a schematic chart of SAR ROS/coast station.

(3) SAR Radio Operating Console(SAR Console)

The SAR Radio Operating Consoles are installed in the relevant coast stations, and the services to be carried out are the same as those of (2) above. All the information is sent to their counterpart KPLP Detachments.
Figure 4-4-3/5 shows a schematic chart of SAR Console/coast station.

(4) Radio Direction-Finding Facilities/Stations

24-hour set-up is implemented at the radio direction-finding stations (facilities) for the watch on the important frequencies, and the information on marine accidents and direction-findings are transmitted to the SAR radio operating stations or SAR Radio Consoles.

(5) VHF Set-up

VHF installed at all the KPLP Detachments are for the use of local communications with their ships as well as the counterpart SAR radio consoles.

The schematic charts of SAR operation center communications system are shown Figures 4-4-3/6 to 4-4-3/14 inclusive.

Figure 4-4-3/15 illustrates a functional example of SAR operations;

In case where SOS messages are received at the SAR radio operating stations in Sibolga and Teluk Bayur Detachmnets via Sibolga and Teluk Bayur coast stations -SAR operating, the both Detachments initiate immediate action of despatching their SAR ships to the scene. As the messages are transferred to each Ragional Operations Center, from which Central Operation Center is notified of the accident, SAR operation arrangements are made by 1st Regional Operation Center in this instance because of occurence of the accident within their waters having close contacts with the Central and other Regional Operation Centers as required, and then all the SAR ships regardless which Detachments they belong to and other mobiles come under the command of On-Scene-Commander appointed for intensive SAR operations. SAR Fleet may also be despatched from the Central Center upon necessity. Sibolga coast station in charge of the SAR communications carries out the distress communications with SAR ships and broadcasts the SOS and XXX messages on 2,182 and 500 kHz and Channel 16 as required. The direction-finding information is also fed into the operation system. Thus, the SAR operations are best under the control of the KPLP's centralized operation ststem.
It is obvious that necessary SAR co-ordination is carried out by SAR National for the operation.

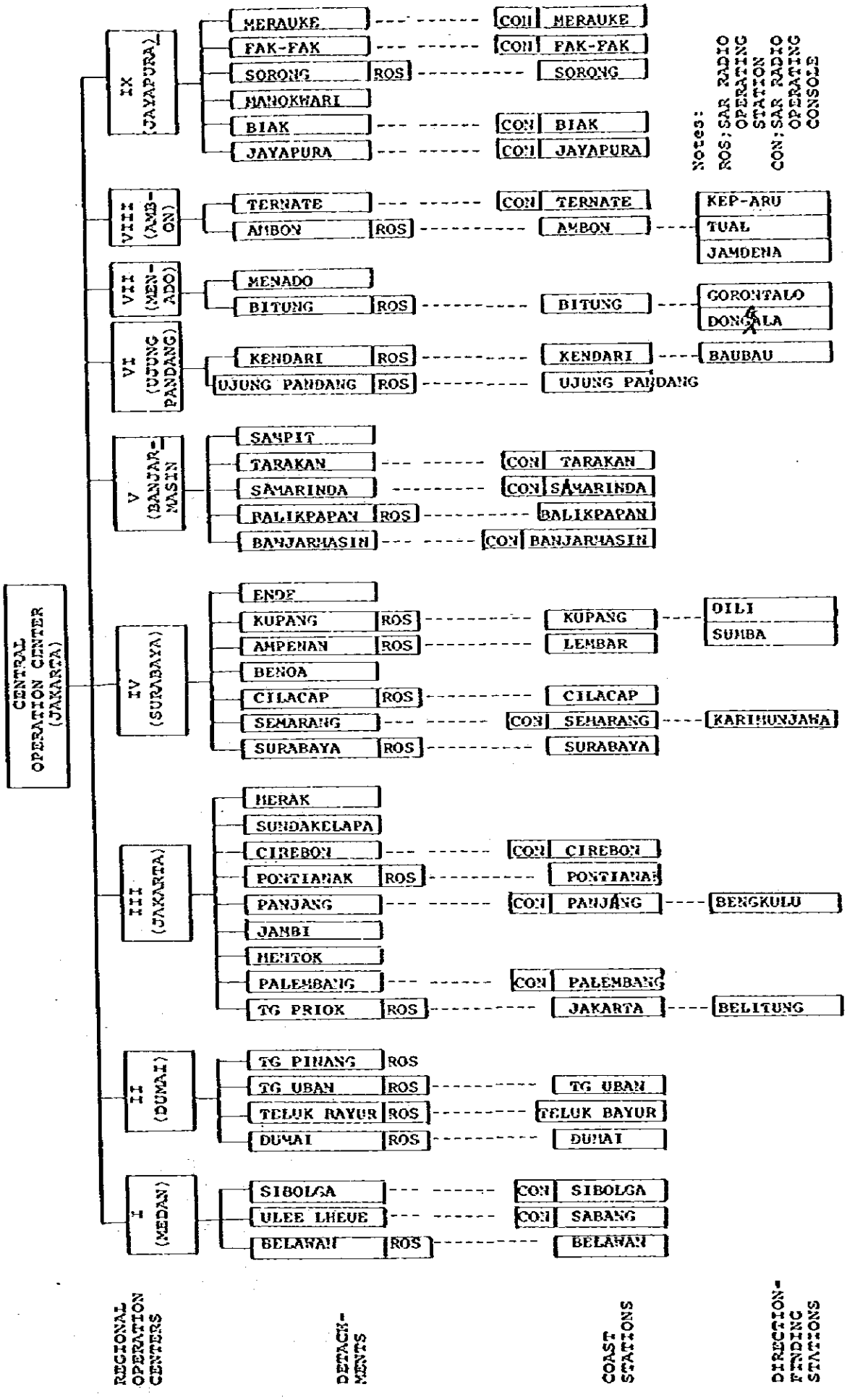
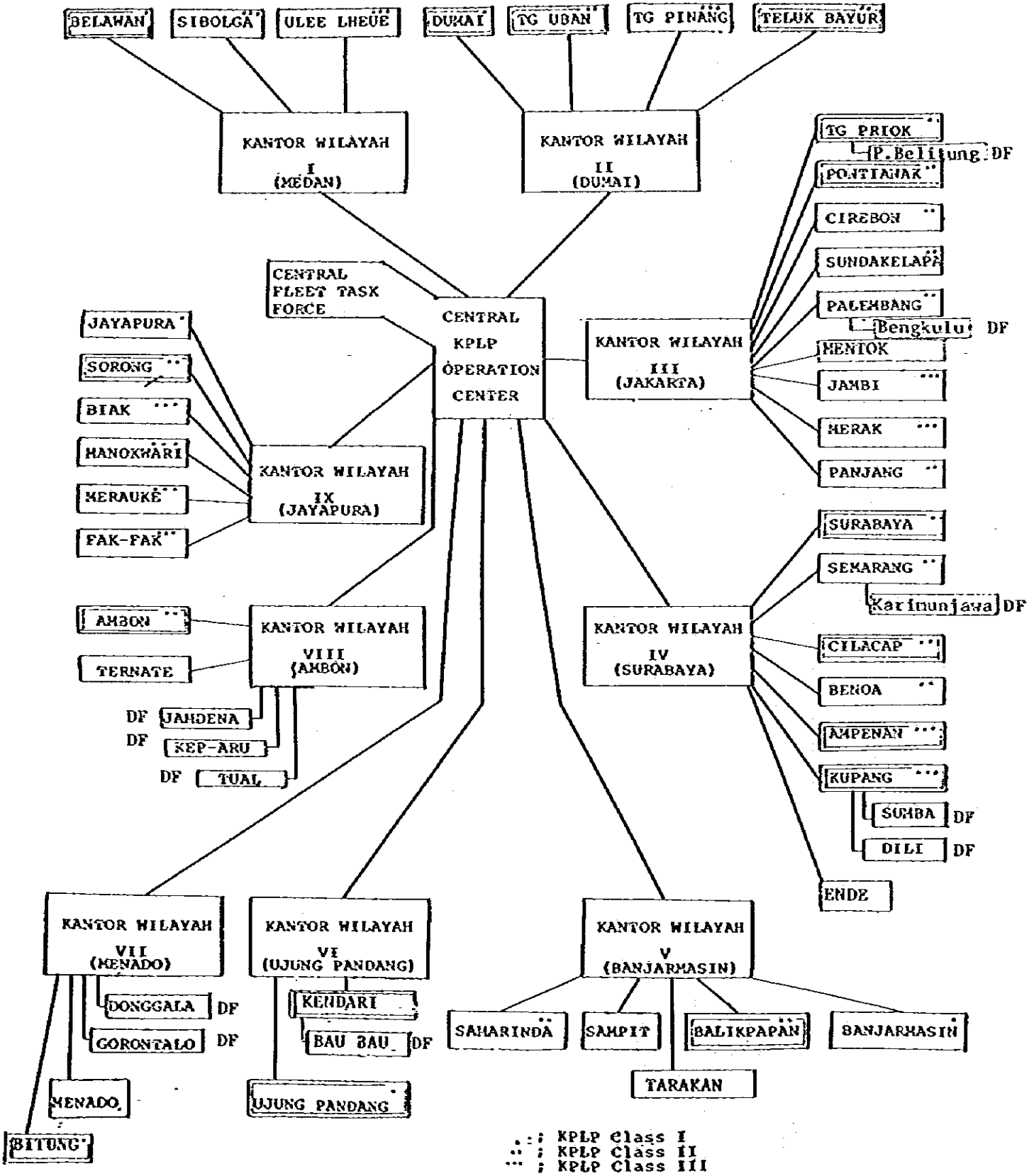


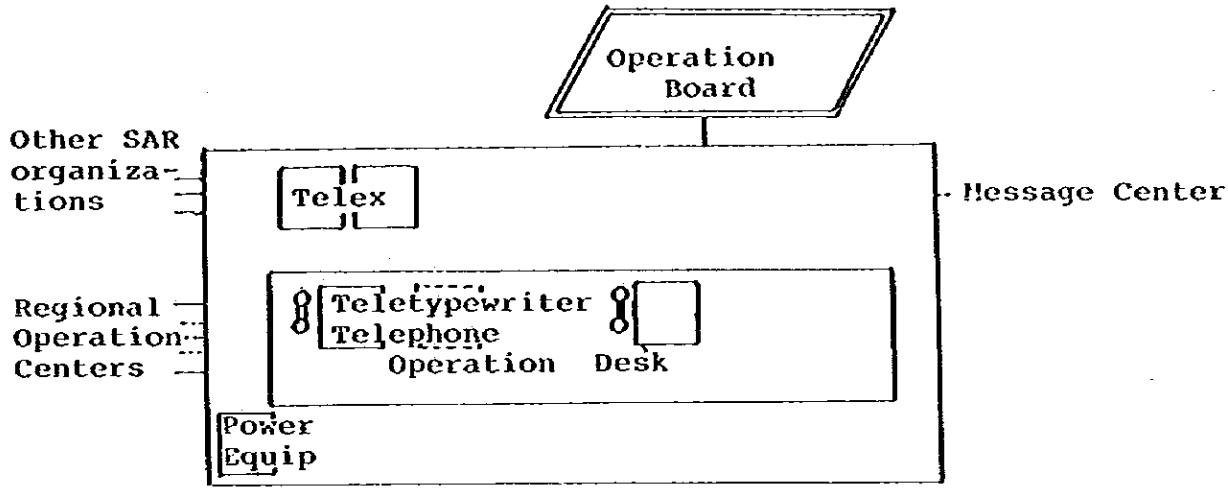
Figure 4-4-3/1 SAR OPERATION SYSTEM

Figure 4-4-3/2

KPLP P-P NETWORK



CENTRAL COMMAND/CONTROL CONSOLE (CC CONSOLE)



REGIONAL COMMAND/CONTROL CONSOLE (CC CONSOLE)

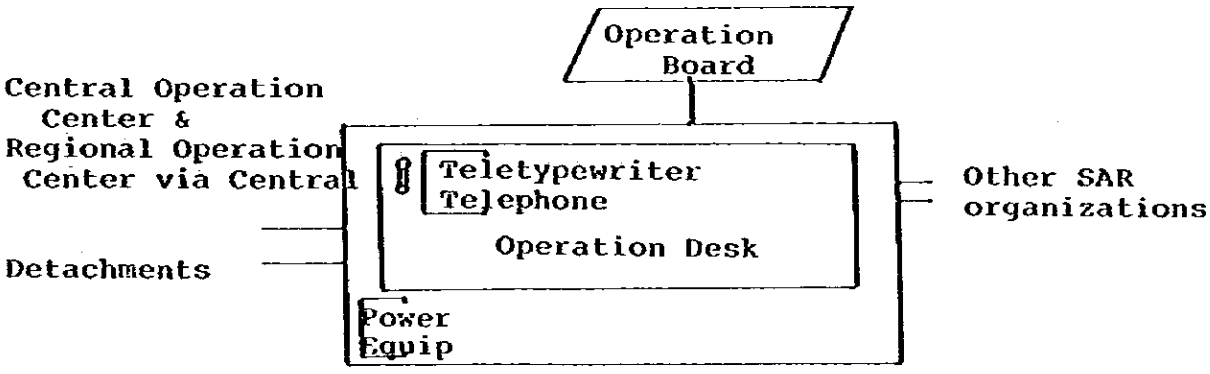


Figure 4-4-3/3 COMMAND/CONTROL CONSOLES FOR CENTRAL AND REGIONAL OPERATION CENTERS

* : The output differs
depending on the stations

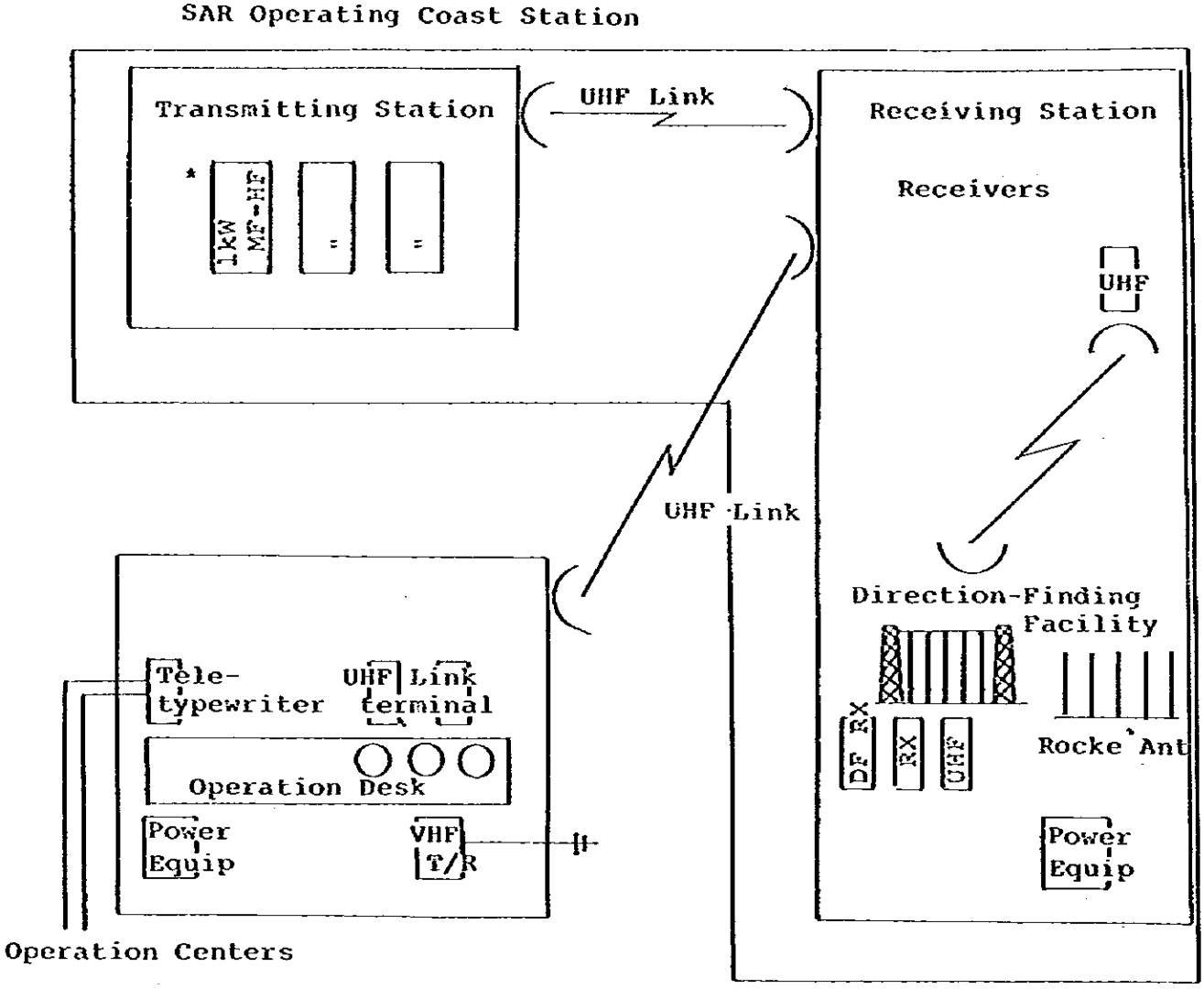


Figure 4-4-3/4
SAR OPERATING COAST STATION &
SAR RADIO OPERATING STATION(SAR ROS)

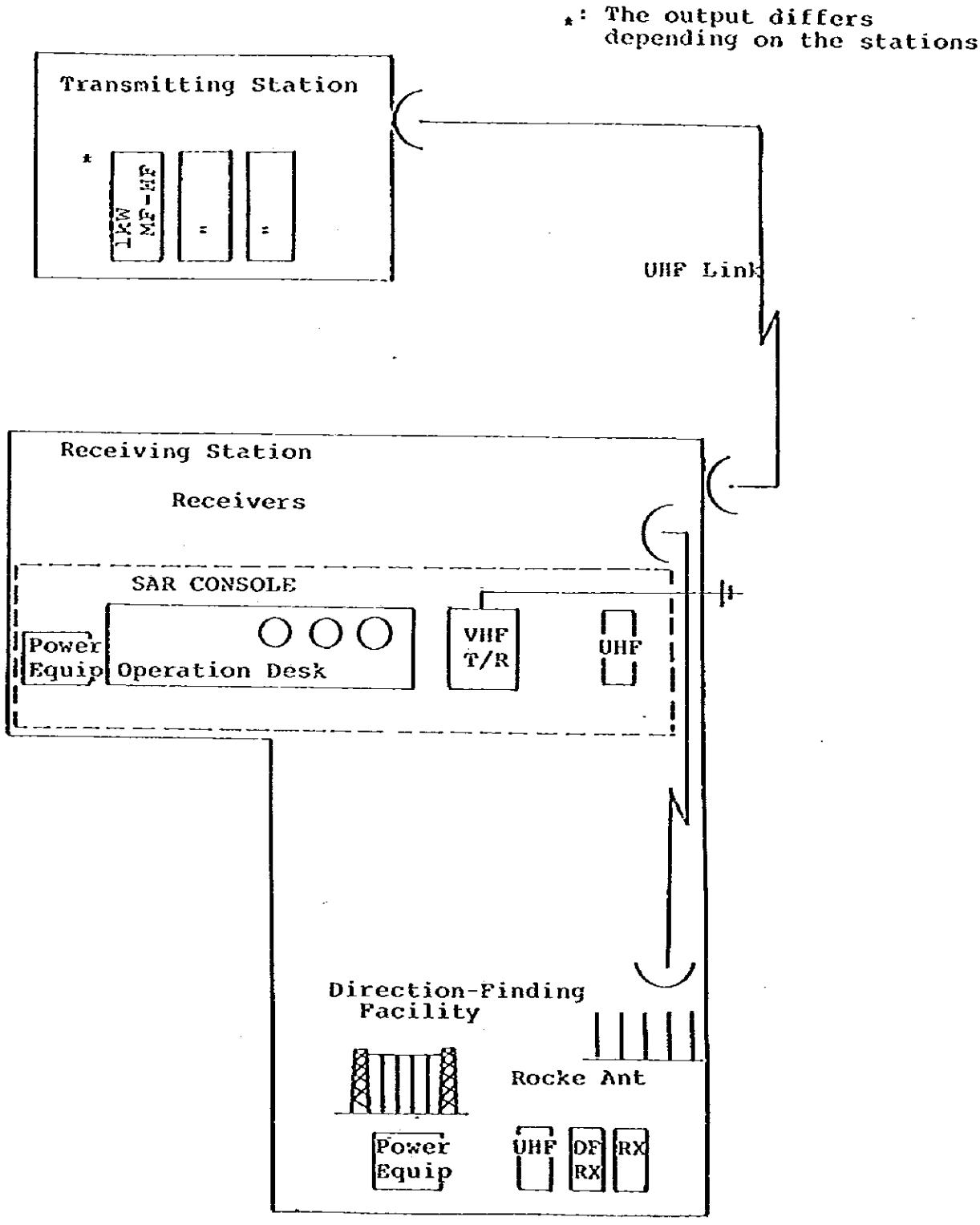


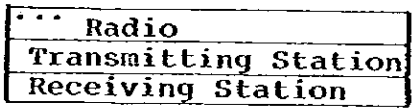
Figure 4-4-3/5

SAR OPERATING COAST STATION &
SAR RADIO OPERATING CONSOLE (SAR CONSOLE)

SAR OPERATION CENTER COMMUNICATIONS SYSTEM

- KANTOR WILAYAH I IX -

Legend:



; Transmitting and receiving stations are separately located

SAR ROS ; SAR Radio Operating Station

SAR Console ; SAR Radio Operating Console

CC Console ; Command/Control Console

DF ; Direction-Finding Facility

DF Station ; Direction-Finding Station

 ; Leased Trunk Line

 ; Leased or private line

 ; Operation/control line

 ; Mobile

Figure 4-4-3/6
SAR OPERATION CENTER COMMUNICATION SYSTEM
- KANTOR WILAYAH I -

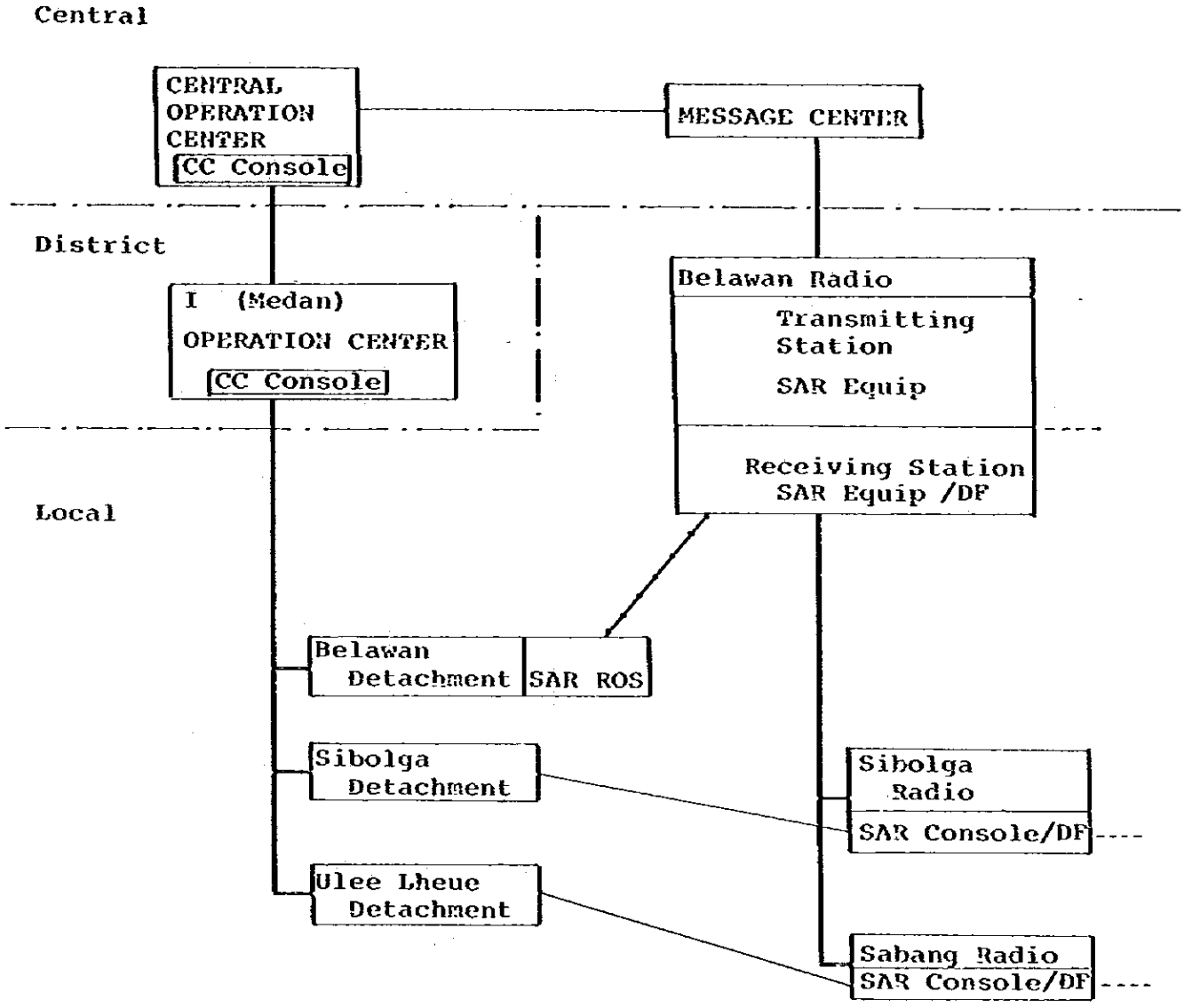


Figure 4-4-3/7

SAR OPERATION CENTER COMMUNICATION SYSTEM

- KANTOR WILAYAH II -

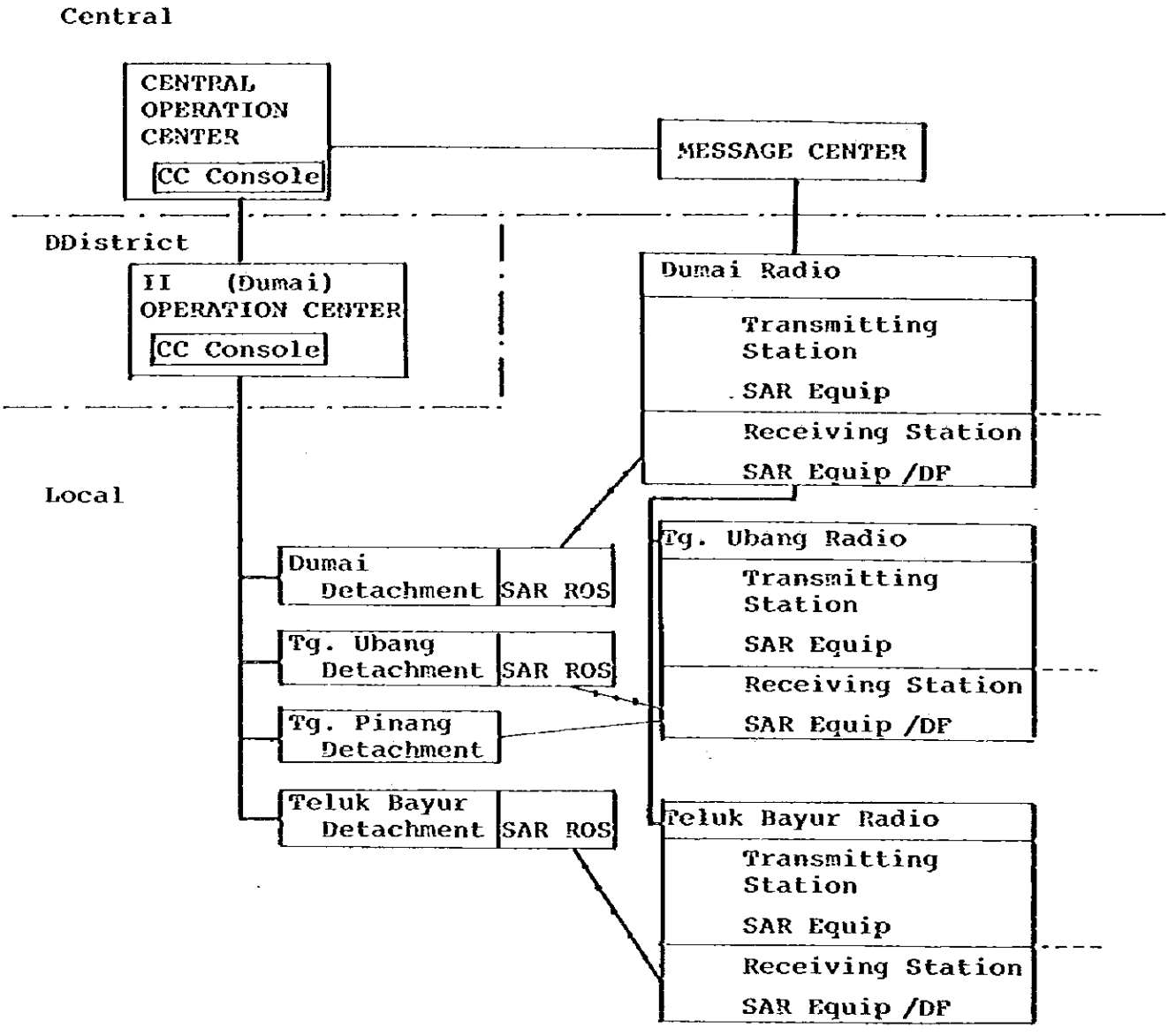


Figure 4-4-3/8
SAR OPERATION CENTER COMMUNICATIOS SYSTEM
-KANTOR WILAYAH III -

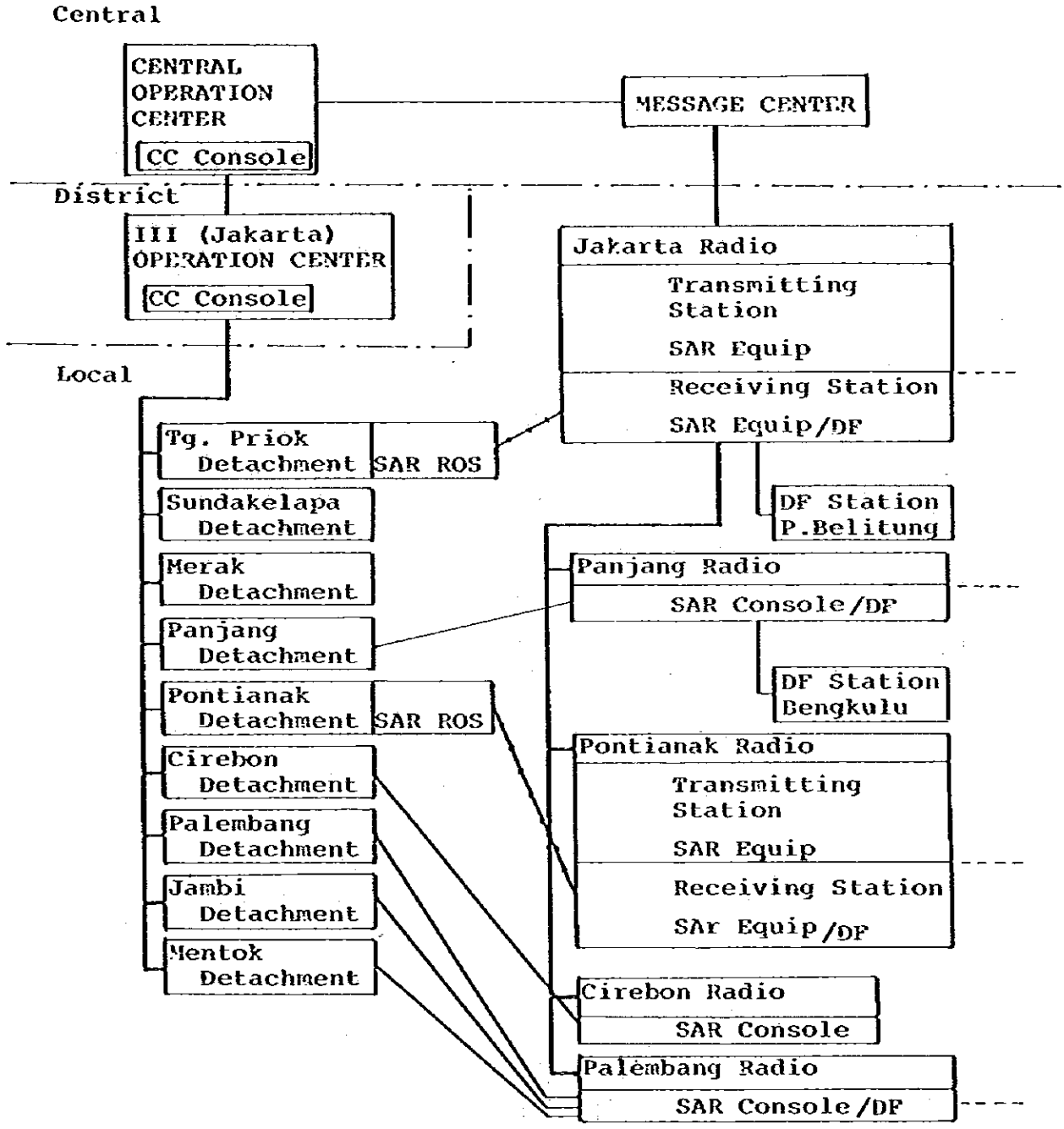


Figure 4-4-3/9
SAR OPRATION CENTER COMMUNICATIONS SYSTEM
-KANTOR WILAYAH-IV-

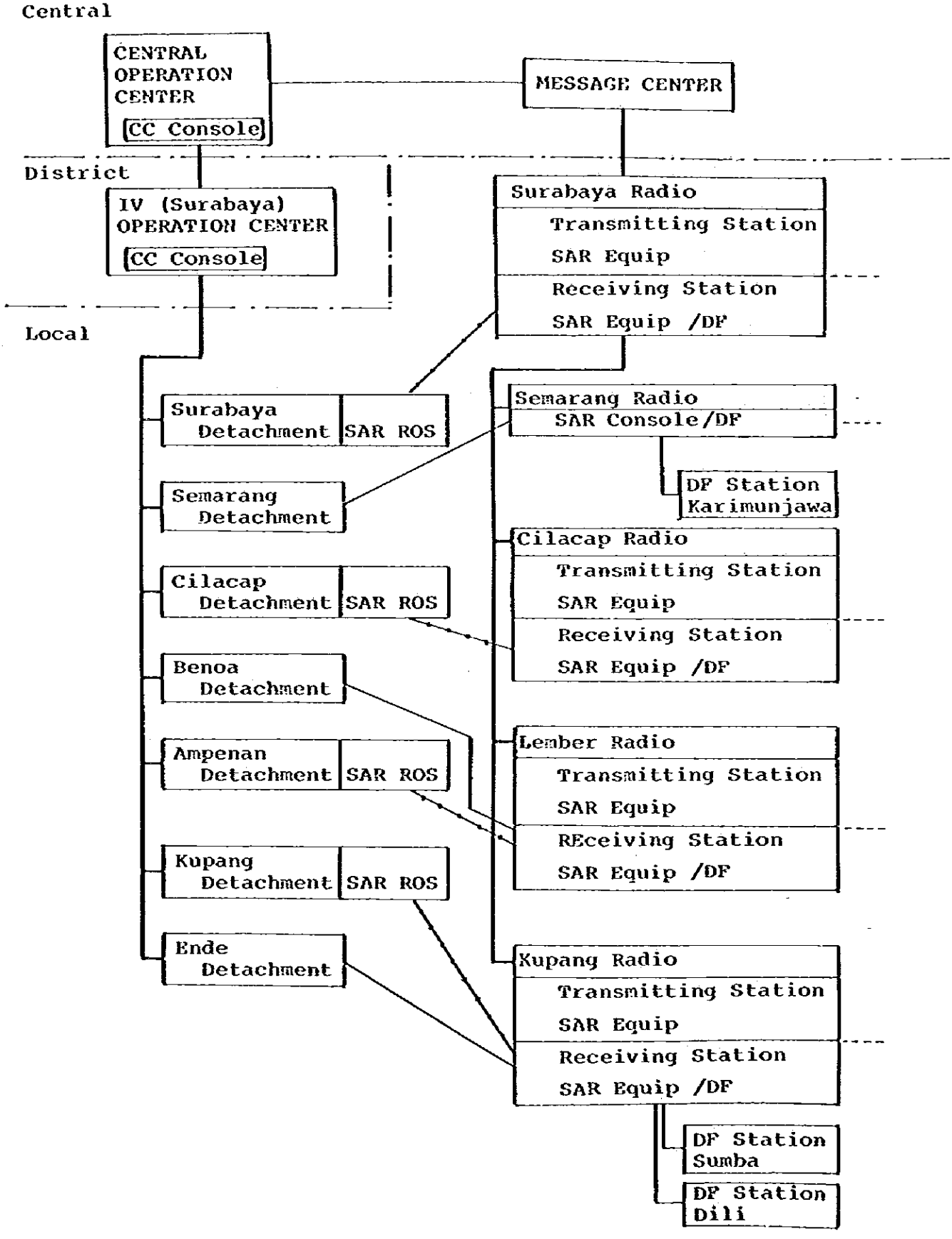


Figure 4-4-3/10

SAR OPERATION CENTER COMMUNICATIONS SYSTEM
- KANTOR WILAYAH V -

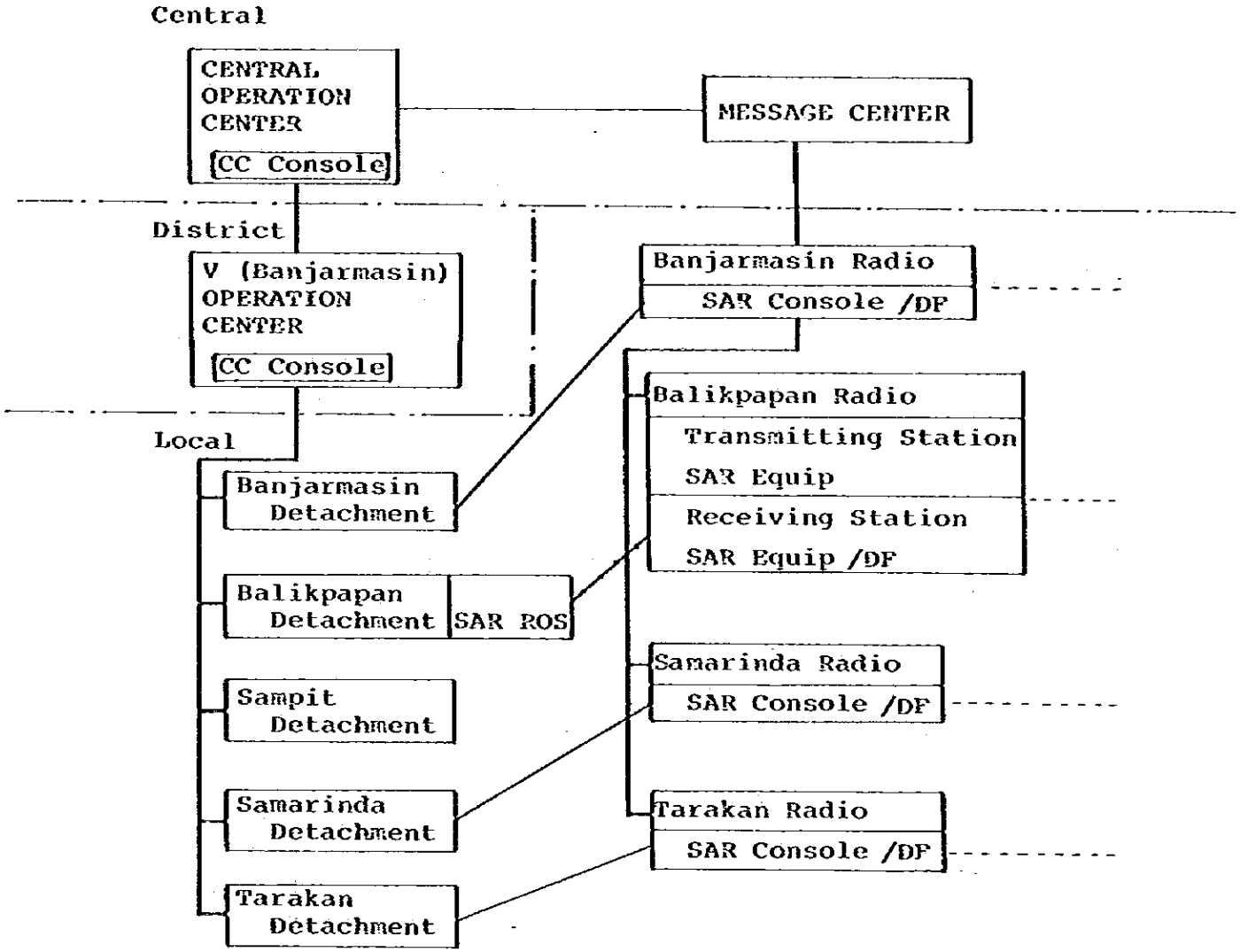


Figure 4-4-3/11

SAR OPERATION CENTER COMMUNICATIONS SYSTEM
- KANTOR WILAYAH VI -

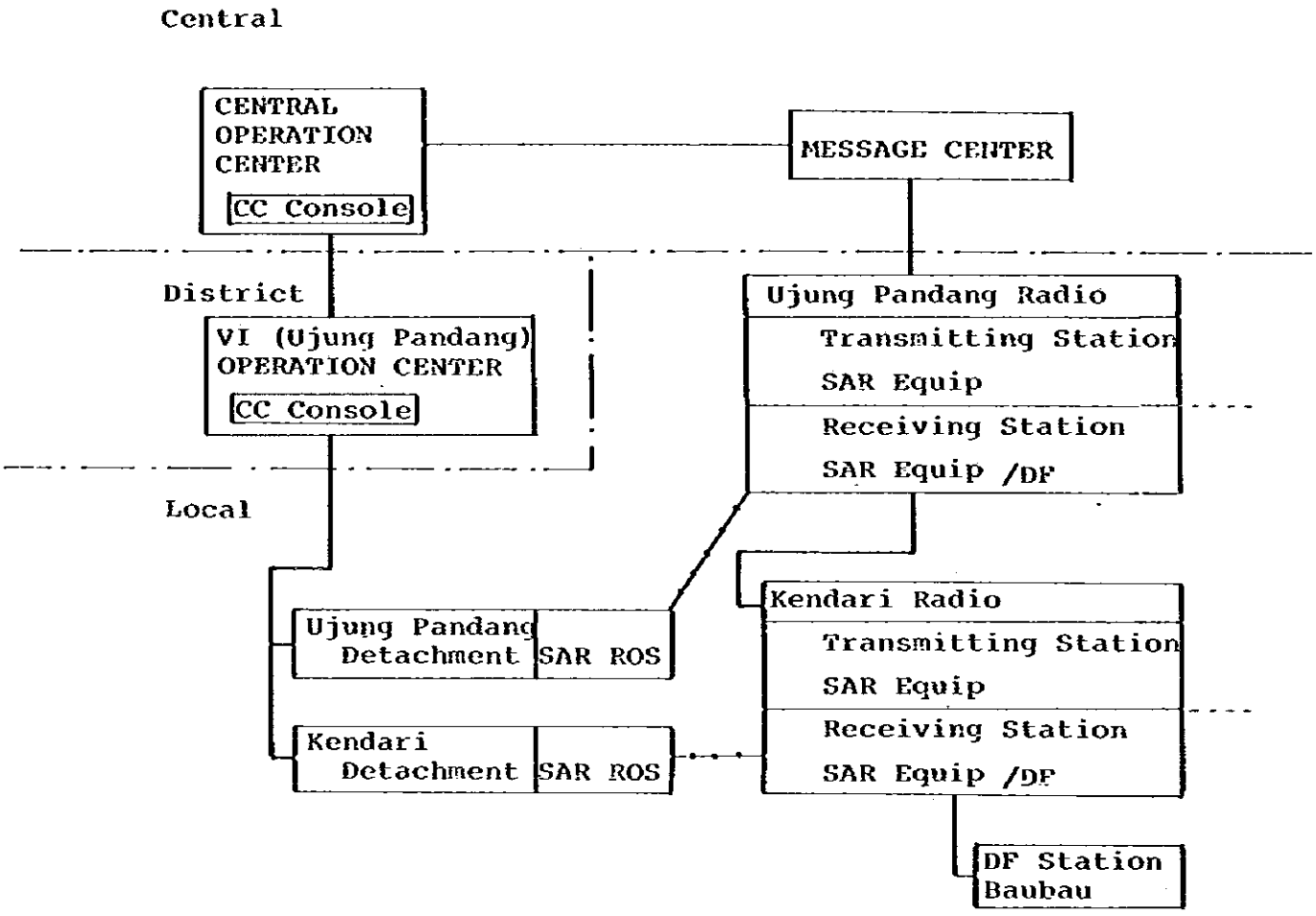


Figure 4-4-3/12

SAR OPERATION CENTER COMMUNICATIONS SYSTEM
- KANTOR WILAYAH VII -

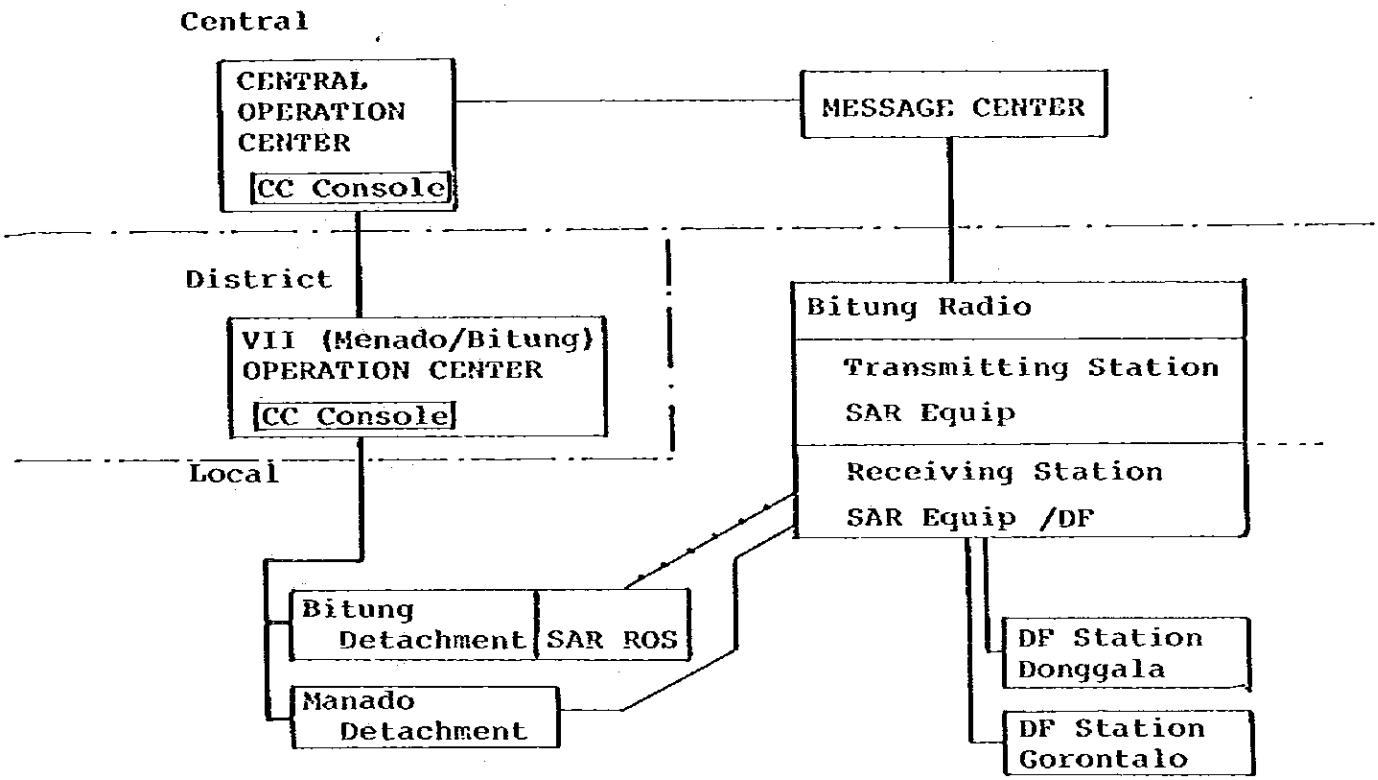


Figure 4-4-3/1 3

SAR OPERATION CENTER COMMUNICATIONS SYSTEM
- KANTOR WILAYAH VIII -

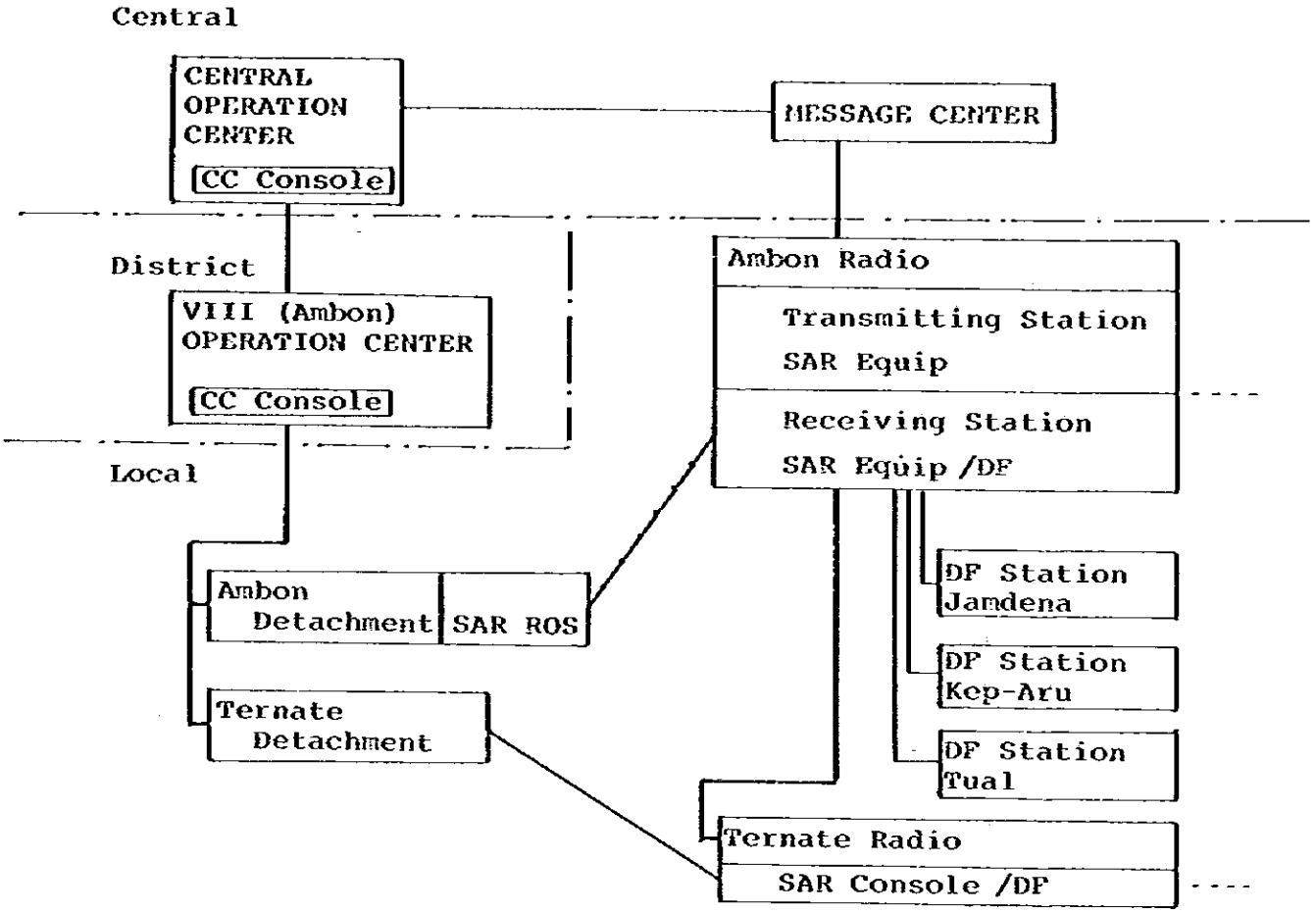
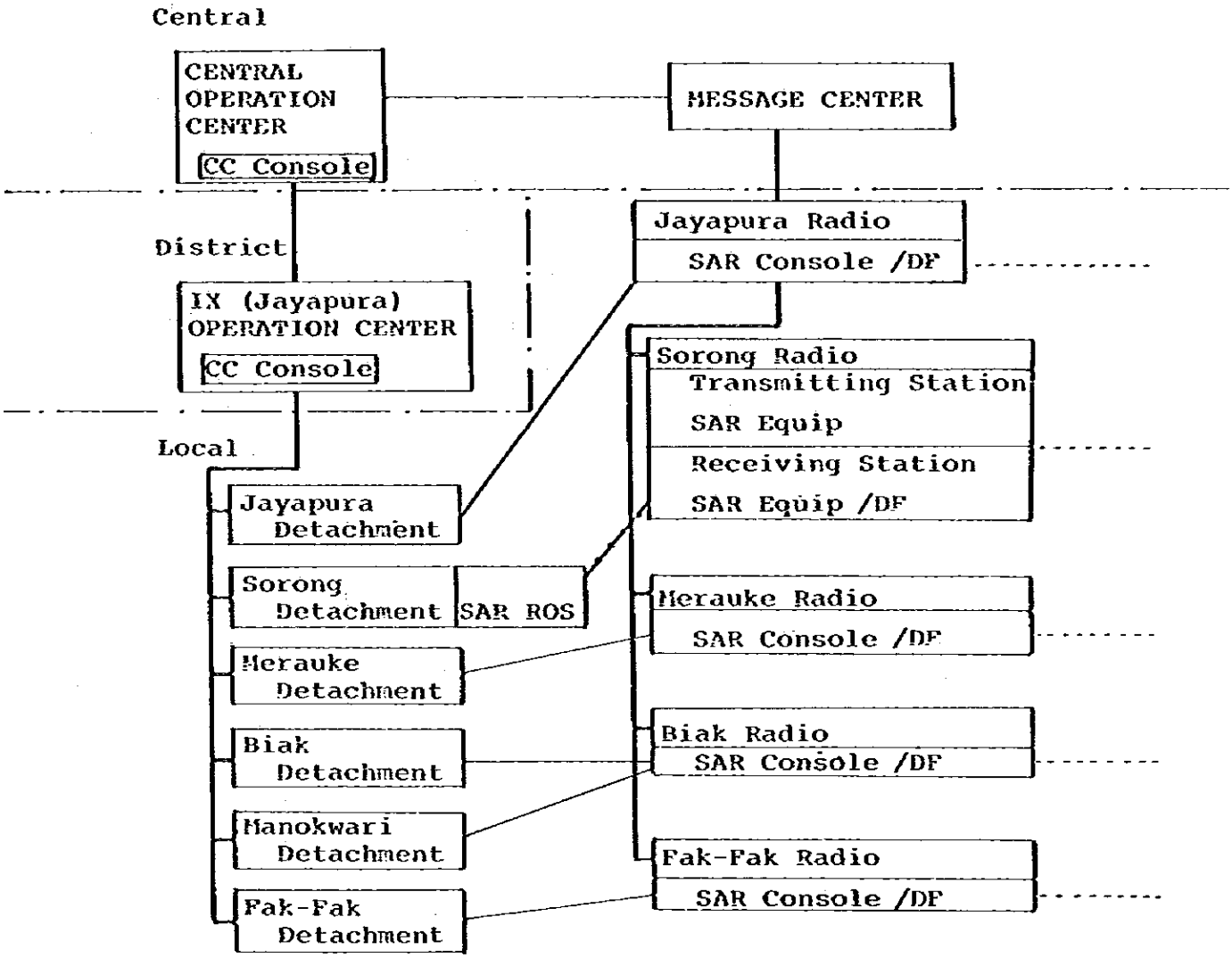


Figure 4-4-3/14

SAR OPERATION CENTER COMMUNICATIONS SYSTEM
- KANTOR WILAYAH IX -



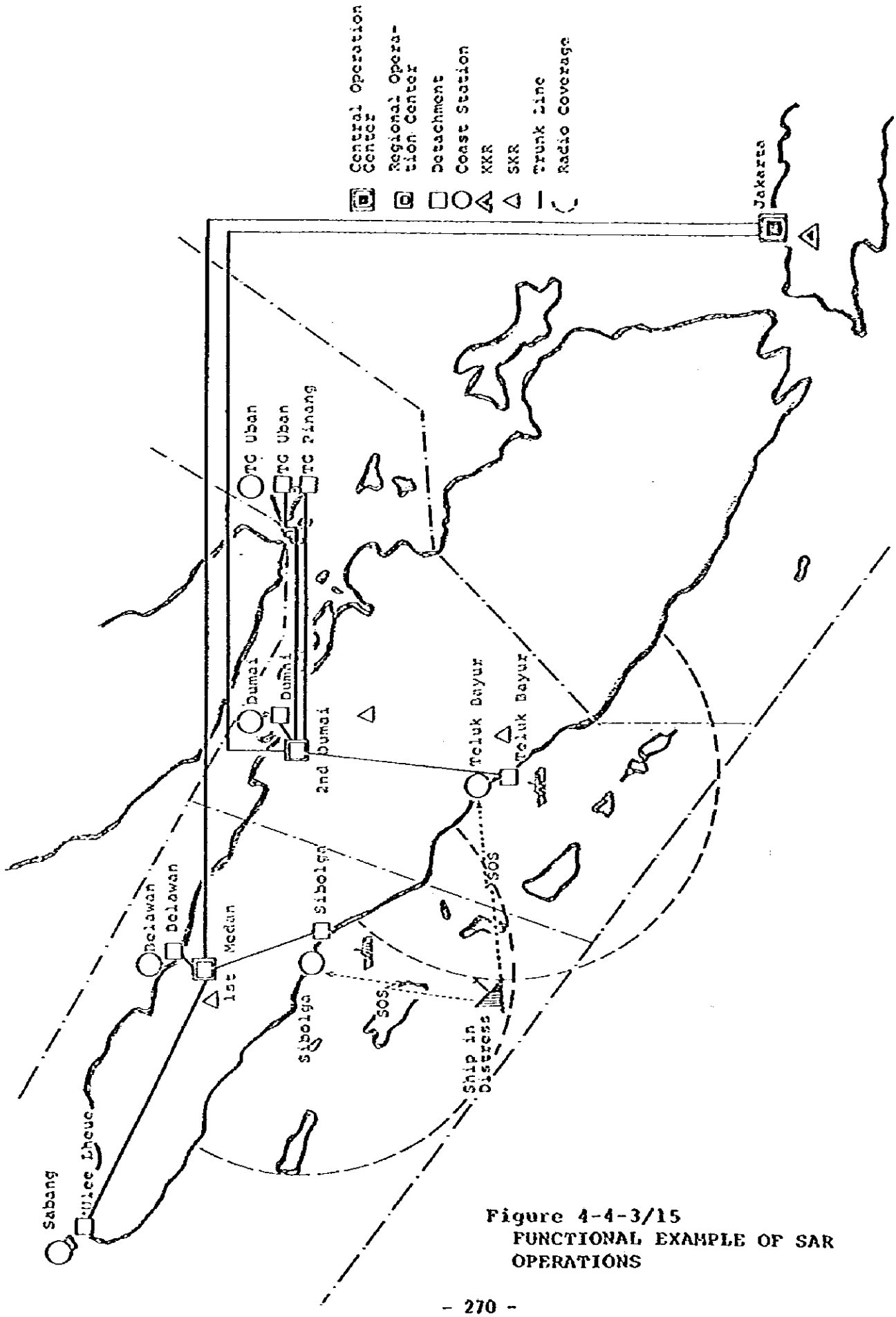


Figure 4-4-3/15
FUNCTIONAL EXAMPLE OF SAR OPERATIONS

4-4-4 Personnel Plan

(1) Required Personnel

1) General Service Coast Station

Required number of O & M (operation and maintenance) personnel, i.e., radio operators and technicians for each class of the coast station is given in Table 4-4-4 (1).

Using these figures in the table, the total number of O & M staff in the Year 2000 (or 1998 probably) reaches 1951.

2) Maintenance Center

Required personnel at Central Maintenance Center and each District Maintenance Center are given in Table 4-4-4 (2).

Total number of staff required for the Central Maintenance Center and eight(8) District Maintenance Centers at 1998 is estimated as 179 according to the table.

3) SAR Operation Center

Required personnel at SAR Operation Center are given in Table 4-4-4 (3).

Total number of staff required for SAR Operation Center at 1998 is estimated as 126 according to the table.

4) SAR Radio Operating Station and SAR Radio Console.

Required personnel at each SAR Radio Operating Station and at SAR Console are given in Table 4-4-4 (4).

Total number of staff required is 369 for 9 SAR ROS's, while it is 203 for the rest of SAR ROS's at 1998 according to Table 4-4-4 (4). For SAR Console it will be 210 at 1998

5) Radio Direction Findig Station

Required personnel at Radio Direction Finding Station are given in Table 4-4-4 (5).

Total number of staff required is 66 at 1998 according to Table 4-4-4 (5).

6) SAR Ship

Required personnel on board SAR Ship are given in Table 4-4-4 (6).

7) Total

Summarizing the above figures, the total number of O & M staff required at 1998 excluding the staff for SAR Ship is estimated as 3,104.

Total number of O & M staff for coastal radio stations at present is estimated as approx. 500 according to the information collected in Indonesia.

Consequently, training of approximately 2,600 persons is necessary at least in addition to the training being conducted at present.

In order to secure such number of staff during 15 year's period ending at 1998, 2000 or more O & M staff per year should complete one of the training courses, taking into account of training efficiency.

Such manpower demand requires establishment of a number of permanent training courses.

It is also recommended to recruit the qualified manpower from the private technical school for radio telegraph operator if any, for example.

Marine radio engineers or technicians are considered as the manpower which can be recruited easier than others from the graduates of universities, colleges or technical high school.

It is also desirous to take an appropriate measure to encourage the station's staff to obtain the necessary qualification.

(2) Personnel Training

Central Training Center (or Central School) and Regional Training Centers (or Regional Schools) under the direct control of the Directorate General of Sea Communications are to be established for the systematic training and education of personnel. Flow of training in coast station and SAR system is given in Fig. 4-4-4 (1).

(For Regional Training Centers, one Center is to be established for 2-3 Districts.) The guideline follows:

1) Central Training Center (Central School)

a) Training Courses

(Courses related to this Project only)

i) Management Course for staff administrators

ii) Training Course for Class 1 radio operators and Class 1 radio engineers

iii) Instructors Course for educating instructors to take charge of training on new service and newly introduced equipment

iv) Training Course for ship crew and SAR service leaders
An example of the curriculum is given in Table 4-4-4 (7).

v) Training Course for other staff personnel

b) Training Periods

Training of personnel is to be administered periodically as far as possible. One year course, half a year course, one month course, etc., will be provided as occasions require.

2) Regional Training Center (Regional School)

a) Training Courses

i) Training Course for Second Class and Third Class radio operators and Second Class and Third Class marine radio engineers

ii) special Refresher Course for newly employed personnel and transferes from other employments

iii) Familiarization Course for new services and newly introduced equipment

iv) Training Course for SAR personnel
An example of the curriculum is given in Table 4-4-4 (8).

b) Training Periods

Training Courses are to be divided into regular courses and temporary courses which will be held as occasion requires.

For the instructors to take care of personnel training and education, it is worth consideration to invite experts from ITU besides arranging with the locally available skilled radio operators and engineers.

Table 4-4-4 (1)

List of Operators and Technicians

Class	No. of Persons Required	Basis of Estimation	Remarks
A	65	12 x 5 Shift + 5 = 65	JAKARTA, SURABAYA
	35	6 x 5 Shift + 5 = 35	Other 7 stations
B	30	5 x 5 Shift + 5 = 30	All B-class stations
C	13	5 x 2 Shift + 3 = 13	All C-class stations with 16-hour service
D	2-5	(Present No. of Persons) + 1	All D-class sations with 8-hour service

- - - - - - - - - - - - - - - -

Table 4-4-4 (2)

List of Staff in Maintenance Center

Class	No. of Persons Required	Basis of Estimation	Remarks
Central	35	Planning = 5 Logistic = 10 Engineer = 10 Training = 10 --- Total 35	
District	18	Planning and Logistic = 5 Test and Maintenance = 8 Night Duty 1 x 5 = 5 --- Total 18	

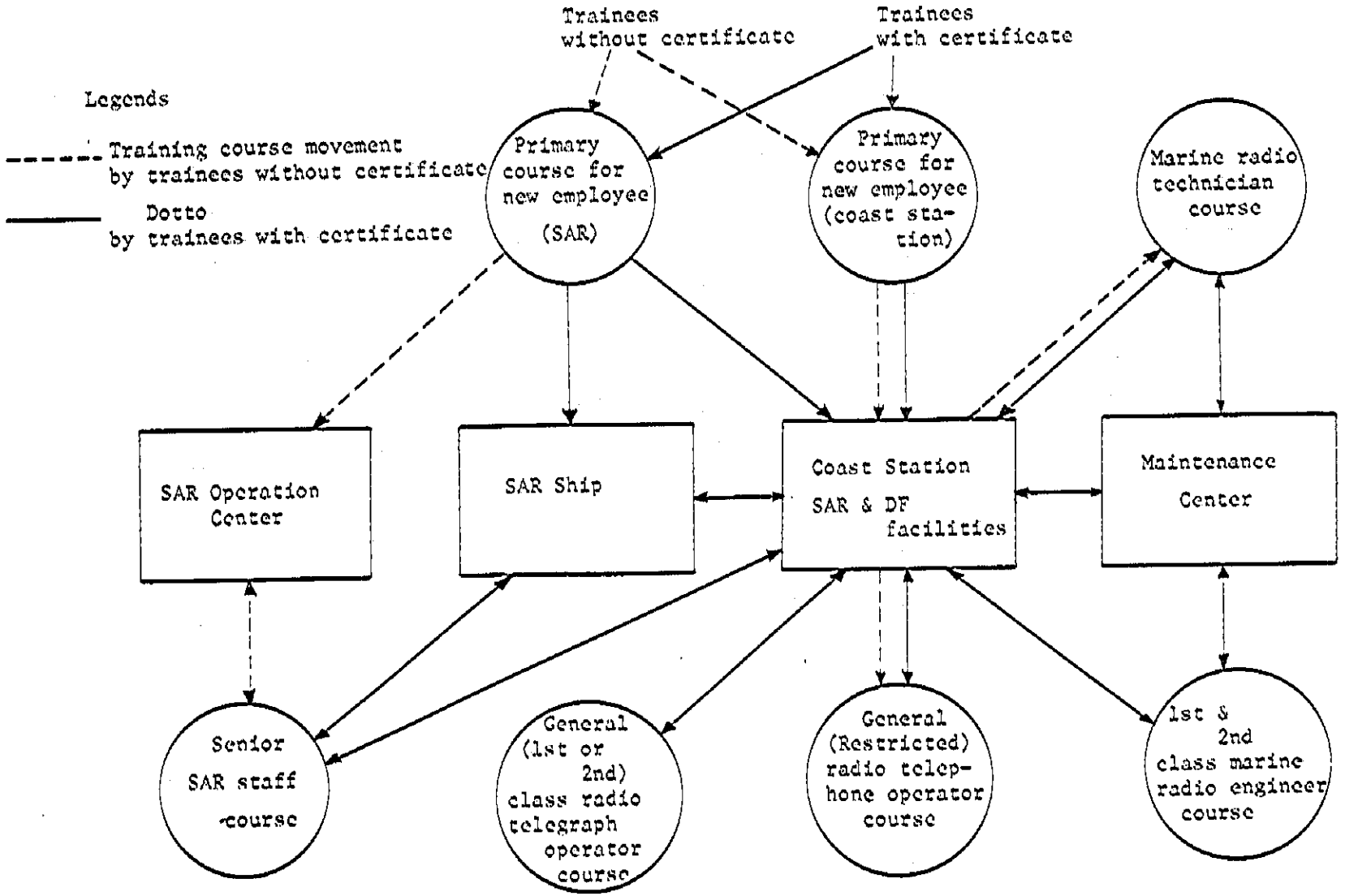


Figure 4-4-4 (1) Flow of Training in Coast Station and SAR System

Table 4-4-4(3) Number of Persons Required for Central & Regional Operation Centers

	No. of persons Required	Basis of Estimation	Remarks
Central	18	$3^{p} \times 5^{sh} + 5^{st} = 18$	
Regional	12	$2 \times 5 + 2 = 12$	9 centers

Table 4-4-4(4) Number of Persons Required for SAR ROS & SAR Console

		No. of Persons Required	Basis of Estimation	Ramarks
SAR ROS	1*	41	$7^{p} \times 5^{sh} + 6^{st} = 41$	9 stations
	2*	29	$5 \times 5 + 4 = 29$	7 "
SAR Console		12 - 18	(2 - 3) x 5 +(2 - 3) = 12 - 18	14 "

Notes:* 1;Belawan/Dumai/Jakarta/Surabaya/Balikpapan/ Ujung Pandang/Bitung/Ambon/Sorong

2;Others

Table 4-4-4(5) Number of Persons required for DF Station

	No. of Persons Required	Basis of Estimation	Remarks
Radio Direction Finding Station	6	$1^{p} \times 5^{sh} + 1^{st} = 6$	

Notes: p shows 'persons'
sh shows 'shifts'
st shows 'standby'

Table 4-4-4(6) Number of Persons required for SAR Ship

Class	No. of Radio Operator	Basis of Estimation	Remarks
I & II	4	$1^{p} \times 4^{sh} = 4$	Following are for info. only: Deck & Engine; $2^{p} \times 4^{sh} \times 2 = 16$ Captain 1 Others 2
III	2	$1^{p} \times 2^{sh} = 2$	Deck & Engine; $2^{p} \times 2^{sh} \times 2 = 8$ Captain 1 Others 1
IV & V	-		Deck & Engine $2^{p} \times 1^{sh} \times 2 = 4$ Captain 1

Notes: p shows the number of persons
sh shows 'shift'

Table 4-4-4 (7)

Curriculum for
Senior SAR Staff Course

1. Administration and management	1 Week
2. Laws and regulations	2 Weeks
3. Command and leadership	1 Week
4. Search and rescue	2 Weeks
5. Prevention of marine accidents	2 Weeks
6. Fire prevention at sea	1 Week
7. Polution at sea	1 Week
8. Oceanography	1 Week
9. Foreign language	1 Week
Total	12 Weeks

Table 4-4-4 (8)

Curriculum for

Primary Course for New Employees(SAR)

1.	Administrative organizations of Sea Communications including Ministry of Communications.	1 Week
2.	Outline of maritime affairs	4 Weeks
3.	Outline of maritime laws and regulations	1 Week
4.	SAR service	2 Weeks
5.	Meteorology including maritime climatology	1 Week
6.	Basic motions(Attention, Salute,etc.)	1 Week
7.	Exercise and drill(Fire prevention, water prevention, boat, rescue)	2 Weeks
	Total	12 Weeks

4-5 Outline of Development Plan

Since the details of the development plan is described in the Section 5, the outline of the development plan is given as follows.

It is to be noted that this long term development plan is established considering the F-ST-12 project as an its starting point.

4-5-1 Urgent Plan (REPELITA III)

The Urgent Plan includes the urgently required development of the coast station facilities to supplement F-ST-12 project, the upgrading of SAR communication system mainly of Class-A coast station and new installation of Direction-Finding station or facilities at three (3) locations, to reinforce the direction finding capability in eastern Jawa sea where the marine distress occurs very frequently.

4-5-2 Short Term Plan (REPELITA IV)

The short term plan includes the improvement of Class B coast stations in addition to the further improvement of the present First Class coast station to supplement F-ST-12 project.

In this plan eight (8) new DF facilities are provided to upgrade the direction-finding capability in the waters in and around Indonesia.

SAR facilities are newly provided to the nine (9) coast stations including Jayapura.

4-5-3 Long Term Plan (REPELITA V & VI)

This long term plan is implemented over the periods of REPELITA V and VI.

The plan includes the improvement of the Class B and C coast stations and the new provision of VHF equipment to Class D coast stations.

Improvement of SAR facilities and new provision of DF facilities is also included.

It is noted that grading up of the Direction-Finders Installed by F-ST-12 is scheduled in this period.

4-6 Required Expenses

Cost estimation for this long-term development project is summarized in Table 4-6(1).

The cost estimation for the long Term Development plan is based only on the current price quotation, and reference to future cost escalation has not been made.

With respect to the domestic manufacturing of telecommunication equipment, it should be noted that some equipment items to be estimated in foreign currency will be transferred to those to be estimated in local currency according to the future development of the domestic telecommunication industry.

4-6-1 Scope of Estimation in Foreign Currency

(1) Equipment and installation

a. Costs (C.I.F. Jakarta) of equipment including spares, measuring instruments & tools and installation materials and cost of installation (refer to APPENDIX 23 for the list of equipment).

b. Approximately 20% of spares is provided for the existing equipment.

c. Costs for domestic transportation of the equipment and materials are not included as in F-ST-12 Project.

d. Hiring charges of any special test equipment and tools required for project implementation.

e. Costs for factory test (cost for witness to Factory Test is included in Consultancy fee)

f. Any kind of tests required for completion of the project including the test to evaluate the DP performances, however, the cost for chartering an appropriate vessel necessary for the DP test is not included.

(2) Maintenance Center

The Central Maintenance Center at Jakarta is provided with a number of typical main equipment with a power plant and a complete set of measuring instruments and tools, while each of eight Regional Maintenance Centers is provided with a set of measuring instruments and tools as well as a voltage adjusting device (refer to APPENDIX 23 (1/8) and APPENDIX 24 for details).

(3) Training

Cost for training includes;

a. return air flight fare (Jakarta and Tokyo)

b. personnel expenses for manufacturer's instructors

c. living cost for trainees in Japan for two(2) months.

d. cost for text books and training materials

e. travelling cost in Japan

(4) Consultancy services

Cost for consultant includes;

a. payroll

b. overhead charges

c. engineering fee

d. direct expenses such as flight fare, printing fee, local employee's salary, etc.

4-6-2 Scope of estimation in local currency

(1) Equipment and installation

a. cost for locally procured installation materials

b. local staff and laborer's salary

c. domestic flight fare

d. office expenses

e. living allowances

f. communication fee

g. vehicle maintenance fee and fuel

(2) Maintenance Center

same as (1) above.

(3) Station buildings

a. new receiving or transmitting station buildings required for separating the transmitting station from the receiving station.

b. new Class-D coast station buildings.
(It is assumed that existing buildings for Class-C coast stations are available for accommodation of the proposed equipment)

c. new buildings for SAR ROS, DF facilities and DF stations.

d. expansion of the existing building to accommodate SAR console.

e. provision of air conditioning equipment

For details of the above, refer to para. 4-3-1 (4) and APPENDIX 25.

(4) Consultancy fee

a. living allowance

b. domestic flight fare

c. local transportation

d. office rent share

e. communication fee

f. office supply and printing fee

g. electricity and city water charges

h. bilingual secretary

i. laborer fee

j. sales tax 2.5%

NOTE: Human factor

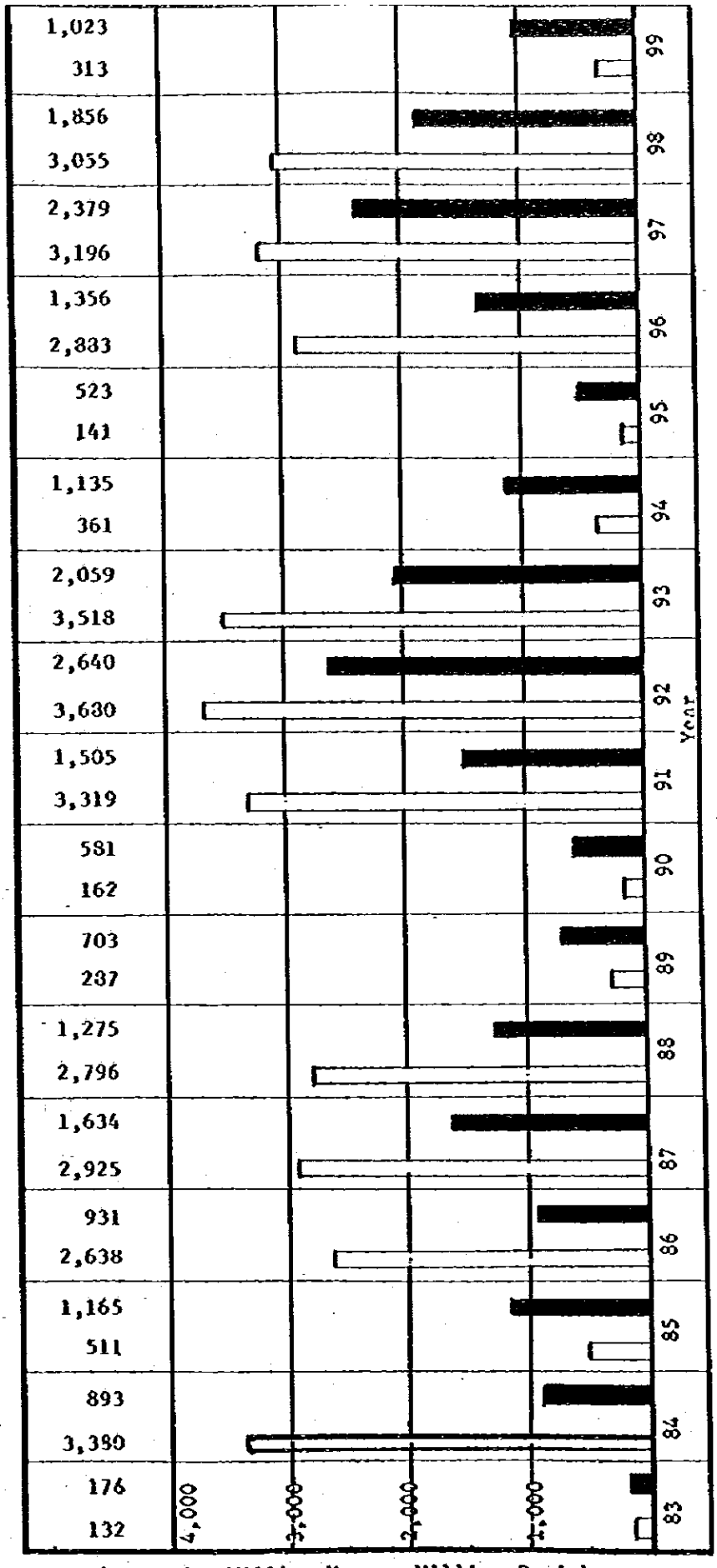
Human factor should be taken into consideration with respect to the station personnel. The living quarters for the personnel shall be sited within the commuting distance from the stations, and the transportation for the personnel should also be considered so that they may not be dependant on public transportation, though the costs for the living quarters and the transportation means are not included in this estimation.

TABLE 4-6 (1)

Summary of Cost Estimation

REPELITA	Item	Foreign Currency			Local Currency	
		in million Yen	in thousand US Dollar	in million Rupiah	in million Yen	in million Rupiah
III	1. Coast station equipment & installation	957.2	4,558.5	2,826.0	106.6	314.4
	2. SAR & DF " "	1,965.0	9,357.2	5,801.4	177.1	523.2
	3. Maintenance center	368.8	1,756.2	1,088.8	13.0	38.4
	4. Training	49.4	235.2	145.9		
	5. Station building				213.9	631.6
	6. Consultancy fee	200.4	954.4	591.7	66.8	197.2
	7. Contingency	354.1	1,686.2	1,045.4	57.8	170.5
	8. Total	3,894.9	18,547.7	11,499.2	635.2	1,875.3
IV	1. Coast station equipment & installation	5,386.2	25,648.1	15,902.1	600.0	1,770.2
	2. SAR & DF " "	2,037.7	9,703.6	6,016.1	219.2	647.4
	3. Training	98.9	471.0	292.0		
	4. Station building				535.4	1,580.8
	5. Consultancy fee	451.4	2,149.4	1,332.6	150.6	444.6
	6. Contingency	797.4	3,797.2	2,354.3	150.5	444.3
	7. Total	8,771.6	41,769.3	25,897.1	1,655.7	4,887.3
V	1. Coast station equipment & installation	6,550.2	31,191.5	19,338.7	730.8	2,157.6
	2. SAR & DF " "	2,820.0	13,429.1	8,325.7	362.6	1,070.4
	3. Training	98.9	471.0	292.0		
	4. Station building				1,140.6	3,367.4
	5. Consultancy fee	568.2	2,705.5	1,677.5	189.4	559.2
	6. Contingency	1,003.7	4,779.1	2,963.3	242.3	715.5
	7. Total	11,041.0	52,576.2	32,597.2	2,665.7	7,870.1
VI	1. Coast station equipment & installation	5,713.7	27,208.1	16,869.0	637.7	1,882.9
	2. SAR & DF " "	2,410.1	11,477.7	7,115.5	353.9	1,044.8
	3. Training	98.9	471.0	292.0		
	4. Station building				1,041.3	3,074.2
	5. Consultancy fee	493.4	2,349.5	1,456.7	164.5	485.7
	6. Contingency	871.6	4,150.5	2,573.3	219.7	648.8
	7. Total	9,587.7	45,655.8	28,306.5	2,417.1	7,136.4
	Grand Total	33,295.2	158,549.0	98,300.0	7,373.7	21,769.1

Note: Assured conversion rate: US$1.0 = Rp620.0 = ¥210.0
¥1.0 = Rp2.95238 = US$0.0047619



Note 1. The unit is million yen or million rupiah.

2. The white bar and black bar show the amounts of foreign currency and local currency, respectively.

Year by Year Payment during Long Term Development Plan

5. IMPLEMENTATION SCHEDULE

5. IMPLEMENTATION SCHEDULE

The implementation schedule up to Year 2000 are shown in Table 5 (1).

As shown in the table the whole programs are broadly divided into three programs; i.e.,

urgent development program,

Short term development program and

Long term development program.

Considering the size of each program, the short term and the long term development programs are further divided into three (3) sub-programs, S-1, S-2 and S-3, and six (6) sub-programs, L-1, L-2, ..., L-6, respectively.

During the course of implementation in each stage of the development program, reviewing for the plan, and if necessary, any modification therefrom should duly be made in order to cope with the implementation of port construction plans.

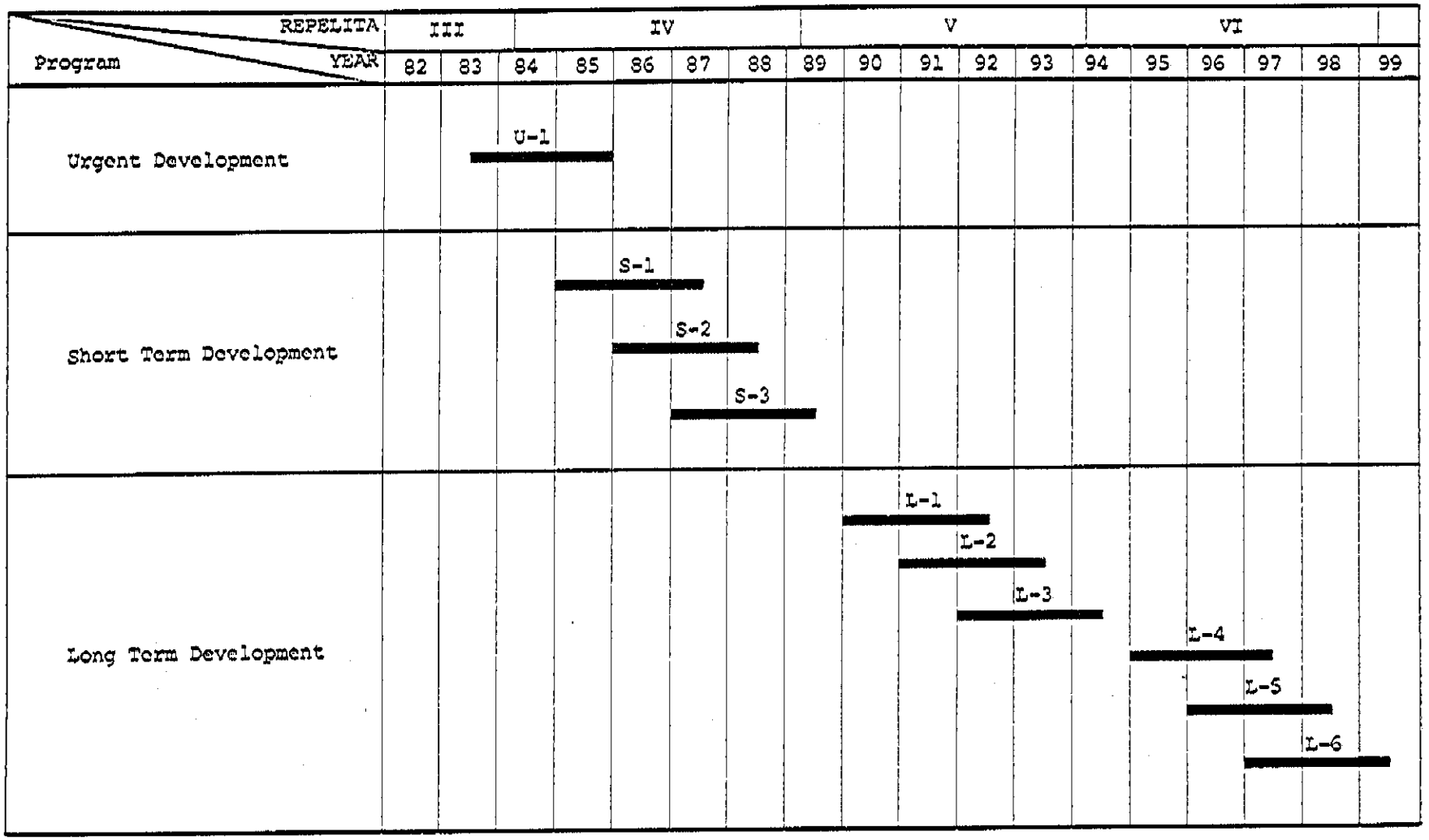
The sub-program is indicated by a thick bar in the table.

Detailed schedule of the sub-program is given in the Table 5 (2).

The sub-program covers the consultancy services and the Contractor's works up to the handover of the installed facilities.

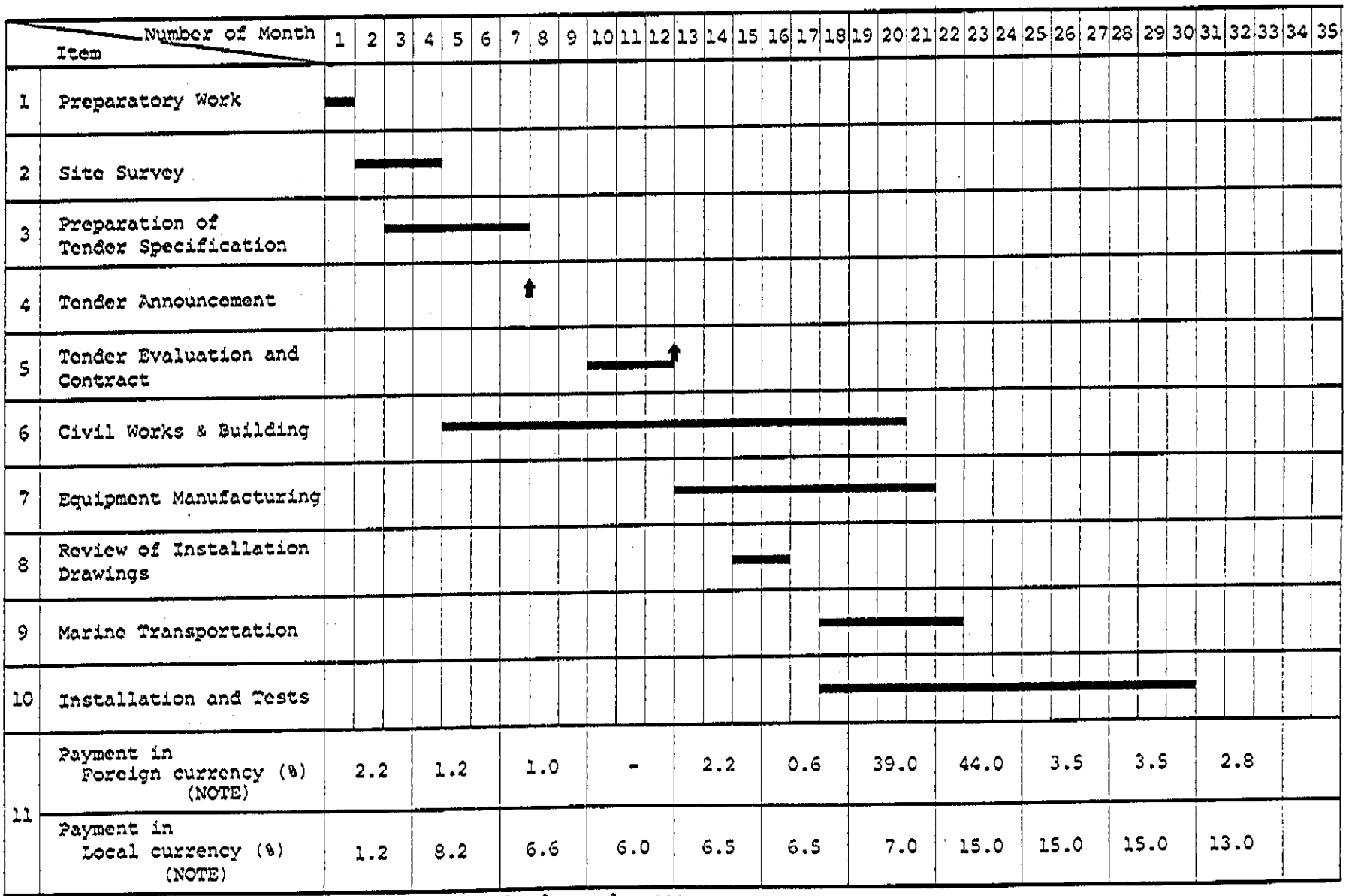
Details of the programs are described in the following paragraphs.

TABLE 5 (1) IMPLEMENTATION SCHEDULE UP TO YEAR 2000



Note: For details of the subprogram indicated by a sigle bar, refer to TABLE 5 (2).

TABLE 5 (2) IMPLEMENTATION TIME SCHEDULE OF SUBPROGRAM



Note: Indicated payment schedule is only for reference.

5-1 Urgent Development Program

5-1-1 Development Plan

The urgent development should include the provision of the facilities urgently required for improvement of the maritime communication and SAR systems.

The program includes;

for general maritime communication,

- improvement of Balikpapan and Sorong coast stations
- replacement of UHF link in Ambon coast station

(List of equipment to be provided is given in Appendix 23 (1/8).

- improvement of SAR system with provision of exclusive MF & HF transmitters and of ROS as given in Appendix 4 and the associated facilities.

- establishment of nine (9) ROS, one each in every District

- establishment of DF station at Belitung.

- provision of DF facilities at Balikpapan and Sorong.

establishment of Central Maintenance Center at Jakarta and eight (8) District Maintenance Centers.

The district maintenance center is located each at Medan, Dumai, Surabaya, Banjarmasin, Ujung Pandang, Menado, Ambon and Jayapura.

5-1-2 Cost Estimation

The cost break down of the Table 4-6 (1), is shown below.

(1) Coast station equipment & installation

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Ambon	51.4	245.2	16.8
Balikpapan	427.0	2,033.3	140.2
Sorong	478.8	2,280.0	157.4
Total	957.2	4,558.5	314.4

(2) SAR & DF equipment & installation

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Belawan	196.5	935.7	52.3
Dumai	198.8	946.7	52.3
TG. Priok & Jakarta Central	271.1	1,291.0	58.2
Surabaya	205.3	977.6	52.3
Ujung Pandang	194.3	925.2	52.3
Bitung	194.3	925.2	52.3
Ambon	194.3	925.2	52.3
Balikpapan	180.8	861.0	45.5
Sorong	180.8	861.0	45.5
Belitung	148.8	708.6	60.2
Total	1,965.0	9,357.2	523.2

(3) Maintenance Center (M/C)

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Central M/C	116.8	556.2	38.4
District M/C	252.0	1,200.0	-
Total	368.8	1,756.2	38.4

(4) Station building (Local currency only)

	Total floor space, m2	Amount Million Rp
TX and RX stations for Balikpapan & Sorong	810	227.4
Aircondition eqpt. for the above		7.2
Buildings for SAR & DF facilities	1,290	362.2
Aircondition eqpt. for the above		34.8
Total	2,100	631.6

5-2 Short Term Development Program

5-2-1 Development Plan

(1) Coast station facilities

In this plan the grade-up of Banjarmasin coast station and the further improvement of the other Class-A coast stations to supplement the F-ST-12 project are intended.

The plan also includes the provision of the NBDP equipment and the DSC equipment to all the Class-A coast stations.

Eight (8) Class-B coast stations including Palembang coast station are improved in this short term development program. The quantities and types of the equipment to be provided are determined considering the status of the existing equipment and the expected growth of the traffic. Antenna system should also be improved through the use of 6-frequency dipole, conical monopole. inverted L antenna, etc.

(2) SAR and DF facilities

Two (2) Class-A stations, i.e., Banjarmasin and Jayapura and seven (7) Class-B coast stations are to improve their SAR facilities and all the stations except for Jayapura are furnished with the DF facilities (for Jayapura the Direction-Finder is installed by F-ST-12 project).

SAR ROS is provided for Tg. Uban, Teluk Bayur, Pontianak, Cilacap, Lembar, Kupang and Kendari, while the SAR console is provided for Banjarmasin and Jayapura.

5-2-2 Cost Estimation

The cost break down is given as follows:

(1) Coast station equipment and installation

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Belawan	218.3	1,039.5	71.7
Dumai	218.3	1,039.5	71.7
Jakarta	62.7	298.6	29.7
Surabaya	218.3	1,039.5	71.7
Banjarmasin	517.1	2,462.4	170.1
Ujung Pandang	177.1	843.3	58.2
Bitung	187.9	894.8	61.7
Ambon	221.2	1,053.3	71.7
Jayapura	184.1	876.7	60.5
Palembang	352.4	1,678.1	116.0
Tg. Uban	408.0	1,942.9	134.3
Teluk Bayur	474.0	2,257.1	155.9
Pontianak	469.6	2,236.2	154.4
Cilacap	402.0	1,914.3	132.3
Lembar	420.1	2,000.0	138.2
Kupang	437.5	2,083.3	143.8
Kendari	417.6	1,988.6	137.3
Total	5,386.7	25,648.1	1,770.2

(2) SAR and DF equipment and installation

Station	Foreign Curr. Million ¥	Foreign Curr. 1000 US$	Local Curr. Million Rp
Tg. Uban	330.3	1,572.9	161.5
Teluk Bayur	180.8	861.0	45.5
Pontianak	180.8	861.0	45.5
Cilacap	180.8	861.0	45.5
Lembar	313.8	1,494.3	89.8
Kupang	180.8	861.0	45.5
Banjarmasin	318.5	1,516.7	101.6
Kendari	148.8	708.6	60.2
Jayapura	203.1	967.1	52.3
Total	2,037.7	9,703.6	647.4

(3) Station building

	Total floor space, m2	Amount Million Rp
Coast station	4,145	1,163.9
Aircondition eqpt. for the above		36.0
Buildings for SAR & DF facilities	1,130	317.3
Aircondition eqpt. for the above		63.6
Total	5,275	1,580.8

5-3 Long Term Development Program

5-3-1 Development Plan

The long term development program covers the development of the maritime communication and SAR & DF systems to be implemented in REPELITA V and REPELITA VI periods.

Stations to be improved or newly established are as follows:

(1) General coast station facilities

1) REPELITA V

a. Class B stations at:

Sabang, Panjang, Cirebon, Semarang, Samarinda, Tarakan, Donggala and Biak

Improvement of Semarang coast station is considered to supplement the F-ST-12 project.

b. Class-C stations at:

Tg. Balai Kariman, Tg. Pinang, Jambi and Dili

Provision of MF/HF receivers and VHF equipment is included as well as the power plant.

c. Class-D stations

95 stations including 25 existing Class IVb stations. Provision of VHF equipment as well as power supply is included.

2) REPELITA VI

a. Class-B stations at;

Sibolga, Ternate, Merauke and Fak-Fak

b. Class-C stations at;

Panarukan, Benoa, Sampit and Manokwari

Provision of MF/HF receivers and VHF equipment as well as the power plant is included.

c. Class-D stations

108 stations including 28 existing Class-IVb stations are provided with VHF equipment as well as the power supply.

(2) SAR and DF Facilities/Staations

1) REPELITA V

Eight (8) new DF stations are established and the other seven (7) stations are provided with the DF facilities as well as SAR ROS or SAR Console.

The DF stations are at;

Sumba, Dili, Baubau, Donggala, Gorontalo, Jamdena, Tual and Kep-Aru.

The stations with DF facilities are at;

Sabang, Palembang, Panjang, Semarang, Samarinda, Tarakan and Biak.

Cirebon station is provided with only SAR facilities.

The Direction-Finder to be provided in F-ST-12 for Semarang is replaced with the higher grade DF facilities and the removed Direction-Finder may be fitted on board KPLP ship.

2) REPELITA VI

Two (2) DF stations, i.e., Bengkulu and Karimunjawa are established and four (4) stations, i.e., Sibolga, Ternate, Fak-Fak and Merauke are provided with the DF facilities.

And the Direction-Finders provided for the following stations in F-ST-12 project are to be replaced by the higher grade DF facilities.

Belawan, Dumai, Jakarta, Surabaya, Ujung Pandang, Bitung, Ambon and Jayapura.

5-3-2 Cost Estimation

(1) Coast station equipment and installation

1) REPELITA V

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Sabang	417.6	1,988.6	137.3
Panjang	410.4	1,954.3	134.9
Cirebon	410.4	1,954.3	134.9
Semarang	73.7	351.0	24.2
Samarinda	473.5	2,254.7	155.6
Tarakan	485.1	2,310.0	159.7
Donggala	365.8	1,741.9	120.2
Biak	417.6	1,988.6	137.3
Tg. Balai Kariman	72.4	344.8	23.9
Tg. Pinang	71.8	341.9	8.0
Jambi	59.3	282.4	19.5
Dili	62.6	298.1	20.7
(single Class-D st.)	(34.0)	(161.9)	(3.8)
95 Class-D stations	3,230.0	15,380.9	1,065.8
Total	6,550.2	31,191.5	2,157.6

2) REPELITA VI

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Sibolga	486.5	2,316.7	160.0
Ternate	381.6	1,817.1	125.5
Merauke	398.1	1,895.7	130.8
Pak-Pak	486.5	2,316.7	160.0
Panarukan	73.1	348.1	23.9
Benoa	69.7	331.9	23.2
Sampit	73.1	348.1	23.9
Manokwari	73.1	348.1	23.9
108 Class-D stations	3,672.0	17,485.7	1,211.7
Total	5,713.7	27,208.1	1,882.9

(2) SAR & DF equipment and installation

1) REPELITA V

	Foreign Curr.		Local Curr.
Station	Million ¥	1000 US$	Million Rp
Sabang	180.8	861.0	45.5
Palembang	180.8	861.0	45.5
Panjang	180.3	861.0	45.5
Cirebon	64.2	305.7	23.6
Semarang	180.8	861.0	45.5
Samarinda	346.7	1,651.0	161.5
Tarakan	148.8	708.6	60.2
Biak	346.7	1,651.0	161.5
Sumba	148.8	708.6	60.2
Dili	148.8	708.6	60.2
Baubau	148.8	708.6	60.2
Donggala	148.8	708.6	60.2
Gorontalo	148.8	708.6	60.2
Jamdena	148.8	708.6	60.2
Tual	148.8	708.6	60.2
Kep-Aru	148.8	708.6	60.2
Total	2,820.0	13,429.1	1,070.4

2) REPELITA VI

Station	Foreign Curr.		Local Curr.
	Million ¥	1000 US$	Million Rp
Sibolga	330.3	1,572.9	161.5
Ternate	330.3	1,572.9	161.5
Pak-Pak	330.3	1,572.9	161.5
Merauke	180.8	861.0	45.5
Bengkulu	148.8	709.0	60.2
Karimunjawa	148.8	709.0	60.2
Belawan	117.6	560.0	49.3
Dumai	117.6	560.0	49.3
Jakarta	117.6	560.0	49.3
Surabaya	117.6	560.0	49.3
Ujung Pandang	117.6	560.0	49.3
Bitung	117.6	560.0	49.3
Ambon	117.6	560.0	49.3
Jayapura	117.6	560.0	49.3
Total	2,420.1	11,477.7	1,044.8

(3) Station building

	Total floor space, m2	Amount Million Rp
REPELITA V		
Coast station	9,485	2,663.4
Aircondition eqpt. for the above		139.2
Buildings for SAR & DF facilities	1,490	418.4
Aircondition eqpt. for the above		146.4
Total	10,975	3,367.4
REPELITA VI		
Coast station	9,180	2,577.7
Aircondition eqpt. for the above		144.0
Buildings for SAR & DF facilities	670	188.1
Aircondition eqpt. for the above		164.4
Total	9,850	3,074.2

6. EFFECT OF INVESTMENT IN ECONOMIC AND FINANCIAL ASPECTS

6. EFFECT OF INVESTMENT IN ECONOMIC AND FINANCIAL ASPECTS

6-1 Impact on Protection of Life and Property

To promote the protection of life and property at Sea under the mutual co-ordination between neighboring nations, SAR 1979 was adopted and its entry-into-force is expected shortly.

While Indonesia being one of the major maritime states in the world, the activities in maritime and fishery sectors are expected to lead to the furtherance in the future, and it is accordingly necessary to develop and expand the maritime communication networks throughout the country for the safety of life and navigation.

However, this necessity should be realized implementing as a national policy from its own viewpoint independently of its economical investment and outcome.

By securing radio communication contracts for SAR between coast and ship stations, occurence of marine accidents could possibly be avoided and prevented, and even in case of the occurrence, the immediate and prompt report to the authorities via the telecommunication networks will serve the rescue of the human life of immense value and the protection of enormous amount of property at sea.

6-2 Impact on Operating Entity, Users and Others

Benefits to be gained by completion of this long term development plan for Sea Communications, users and others are as follows:

(1) Outstanding increase of the revenue of the Sea Communications from the maritime public correspondence service will be expected as shown in Paragraph 6-3-1.

(2) As regards the public correspondence as mentioned above, the revenue of PERUMTEL will also be increased as an income by the line charges.

(3) Use of the leased lines of PERUMTEL for the point-to-point communication nerwork for Sea Communications will lead to the effective utilization of PERUMTEL's network.

(4) Communication between the ships in and around the port and the coast station become easy and the orderly ship movement will be maintained. As a result the efficiency of utilization of the port will be raised and the water polution in the port will be effectively prevented.

(5) Port operation service will be furnished efficiently and the activities of sea transportation will be effectively promoted. This will contribute greatly to the enhancement of social welfare and to the growth of economy in the region and the whole country.

6-3 Estimation of Revenue and Running Cost

The public correspondence service will produce a revenue of the coast station in proportion to the amount of communication traffic handled.

The revenue and the running costs for the facilities to be provided by this long term plan are estimated as given in the following paragraphs, 6-3-1 and 6-3-2.

6-3-1 Expected Revenue

The revenue by the maritime mobile service at the Year 1984, 1989 and 2000 is estimated as below.
Maritime mobile service consists of telegram service and telephone service, and various conditions for the calculation are assumed as follows;

(1) Coast charge for telegram service

Gf. 4.40 = Rp. 1086.80 (for minimum 22 words)
Gf. 0.20 = Rp. 49.40 (for an additional word)

(2) Coast charge for telephone service

Gf. 7.20 = Rp. 1778.40 (for initial three minutes by HF)
Gf. 5.40 = Rp. 1333.80 (" by MF)
Gf. 4.80 = Rp. 1185.60 (" by VHF)
Coast charge for each additional minutes is 1/3 of initial charge (3 min.).

(3) Communication ratios by MF & HF and VHF band (number of calls)

Year	MF & HF (%)	VHF (%)
1984	90.0	10.0
1989	83.0	17.0
2000	50.0	50.0

(4) Communication ratios by telegram service and telephone service (number of calls)

Year	Telegram (%)	Telephone (%)
1984	80.0	20.0
1989	60.0	40.0
2000	25.0	75.0

(5) Average number of calls per ship station, number of ship stations and total calls

Year	Average number of calls/ship station	Number of ship stations	Total calls
1984	0.9	1,531	248,022
1989	1.2	3,058	660,528
2000	2	14,000	5,040,000

Note: Total calls are calculated as 180 working days per year.

(6) Coast charge per call by service categories

Rp. 1136.2 for telegram service (23 words)
Rp. 2074.8 for telephone service by MF and HF bands (4 minutes)
Rp. 1580.8 for telephone service by VHF bands (4 minutes)

In case of telephone service by MF and HF bands, the mean value of those for MF and HF bands is used as its coast charge.

Based on the above mentioned conditions, number of calls and expected revenue at the Year 1984, 1989 and 2000 are obtained as shown in the following table.

Year	Telegram service	Telephone service MF& HF	Telephone service VHF	Total
1984	198,418	24,802	24,802	248,022
	225,442	51,459	3,921	280,822
1989	396,317	151,921	112,290	660,528
	450,295	315,206	177,508	943,009
2000	1,260,000	1,260,000	2,520,000	5,040,000
	1,431,610	2,614,248	3,938,616	8,029,474

Note: Upper row - number of calls
Lower row - expected revenue (x thousand Rupiah)

6-3-2 Estimated Running Cost

The running cost is assumed to consist of the operation cost and the maintenance cost as follows:

(1) Operation cost

The operation cost consists of the operating personnel expenses including the overhead, the electricity charges and the lease charge of the PERUMTEL lines.
The average annual salary assumed for the operating personnel is Rp 2,000,000.
The total number of the operating personnel at year 2000 is assumed to be 2,705.
The overhead charge corresponding to 20% of the personnel expenses is to be added to the personnel expenses.
The amount of the electricity consumption at year 2000 is assumed to be 61,322 KWH per day.
Assumed unit electricity charge is Rp 76.5 KWH.

Lease charges of PERUMTEL lines are estimated by the tariff book issued by PERUMTEL.
Number of channels to be leased is one telephony and one teleprinter channel for each section.
The monthly charge for one telephone channel is estimated depending on the distance between both ends of the circuit, i.e.,

Rp	600,000	up to 100Km
Rp	720,000	100Km to 200Km
Rp	900,000	200Km to 300Km
Rp	1,200,000	300Km to 1,000Km
Rp	1,800,000	longer than 1,000Km

To add one teletypewriter circuit the above cost is increased to 115%.

(2) Maintenance Cost

The mintenance cost consists of the maintenance personnel cost including the overhead, the electricity charges and the cost for the spare parts.

Total number of the maintenance personnel is assumed to be 399 at year 2000 and the average annual salary of the personnel is Rp 2,000,000.

Assumed amount of the electricity consumption for maintenance at year 2000 is 272 KWH per day.

Cost for the spare parts is estimated for years after 5 years from the end of each subprogram. It is assumed that for the initial five years after the end of each program the spare parts to be provided by the sub-program will be available for the maintenance.

(3) Etimated running cost

Estimated running costs for the year 1989 and 2000 are given below.

(Unit: million Rupiah)

Item	1989	2000
Operation Cost		
Personnel expenses including overhead	3,084	6,492
Electricity charge	636	1,711
Lease charge of PERUMTEL lines	2,607	3,590
Subtotal	6,327	11,793
Maintenance Cost		
Personnel expenses including overhead	727	985
Electricity charges	8	8
Spare parts	283	711
Subtotal	1,018	1,677
Total Running Cost	7,345	13,470

APPENDICES

APPENDICES

APPENDIX-1

List of Coast Stations

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
I	I	Belawan	PKB		474, 500	A_1 A_2	1	0000 - 1700	98°40'08"E	3°43'17"N	Mobile
					4295	A_1	1				
					8686	A_1	1				
					12910.5	A_1	1				
					16861.7	A_1	1				
					2182	A_3A A_3J	0.8				
					3180	"	0.8				
					6215.5	"	0.8				
					8746.8	"	0.8				
					13100.8	"	0.8				
			Belawan Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	0000 - 1700			Mobile
				SAI	13661, 11060	A_3B	1	0100 - 1000			Fixed
					17615, 5316	A_3J	0.125				
					6926, 5165		0.250				
					5295.5						
I	II	Sabang	PKA		438, 500	A_1 A_2	1	0100 - 1100	95°21'00"E	5°54'00"N	Mobile
					8686	A_1	1	0200 - 0230 1000 - 1030			
					17184.8	A_1	1	0230 - 0300			
					2182	A_3A A_3J	0.5	0130 - 0230 0500 - 0530			
					3180	"	0.5	0930 - 1030			
					4388.4	"	0.5	0230 - 0300			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
I	II	Sabang	PKA		6215.5	A_3A A_3J	0.5	0300 - 0330	95°21'00"E	5°54'00"N	Mobile
					8796	"	0.5	0400 - 0430			
			Sabang Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	0100 - 0700 0900 - 1100			
				$8AI_2$	5165	A_3J	0.25/0.125	0100 - 1000			Fixed
					5295.5	"					
					5316	"	0.25/0.125				
					11060	A_1	0.25				
					171623	A_1					
I	IV/A	Sibolga	PKB_3		474, 500	A_1 A_2	0.08	0000 - 1000	98°46'15"E	1°44'25"N	Mobile
					6355 2182	A_1	0.08	0100 - 0930			
					3180	A_3A A_3J	0.1	0030 - 1000			
			Sibolga Radio		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	Hx	98°46'15"E	1°44'25"N	Mobile
				$8AI_4$	5165	A_3J	0.1	0130 - 1000			Fixed
					5295.5	"	0.1	0130 - 1000			
					6926	"	0.1	0130 - 1000			
					5316	"	0.1	0130 - 1000			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
I	IV/B	Ulee-Lheue	PKA$_5$		VHF Ch12 Ch13 Ch14 Ch16	F$_3$	0.03	Hx	95°16'55"E	5°33'50"N	Mobile
				8AI$_3$	5316 6926 5165 5265	A$_3$J	0.100	0100 - 0930	95°16'55"E	5°33'50"N	Fixed
I	IV/B	Gunung Sitoli		8AI$_5$	5316 5165 5295.5	A$_3$J	0.100	0130 - 1000			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
II	I	Dumai	PKP		448. 500	A_1 A_2	1	0100 - 1300	101°27'20"E	1°41'10"N	Mobile
					6337	A_1	1	1200 - 1300			
					8457	A_1	1	0100 - 0200 1300 - 1400			
					12682.5	A_1	1	0230 - 0330 0630 - 0730			
					17184.8	A_1	1	0500 - 0600			
					2182 3180	A_3A A_3J	0.8	0130 - 0230 0700 - 0800 1100 - 1200			
					4357.4	"	0.8	Nx			
					6215.5	"	0.8	0230 - 0330			
					8765.4	"	0.8	0000 - 0100 0800 - 0900			
					13125.6	"	0.8	Nx			
			Dumai Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	0000 - 0600 0700 - 0900 1100 - 1400			
				8A0	8110 9110 10300	A_3B A_1	0.800	0100 - 0900			Fixed
					5316 4055	A_3J	0.300	0000 - 0600			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
II	III	Teluk Bayur	PKP_2		430, 500	A_1 A_2	0.250	0000 - 0100 0400 - 0500 0800 - 0900	100°21'22"E	1°00'02.3"S	Mobile
					6355	A_1	0.250	0130 - 0200 0530 - 0600 0930 - 1000			
					2182 3180	A_3A A_3H A_3J	0.250	0200 - 0230 0900 - 0930			
					6215.5 6218.6	"	0.250	0030 - 0100			
					6518.8	"		0100 - 0130			
			Teluk Bayur Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	0000 - 0600 0700 - 1000			
				$8AO_2$	5316	A_3J	0100	0330 - 0800			Fixed
II	IV/A	Tg. Pinang	PKJ_2		4295	A_1	0.025	0130 - 0845	104°26'26"E	0°55'50"N	Mobile
					2182 3180	A_3A A_3J A_3H	0.100	0100 - 0430			
			Tanjung Pinang Radio		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	Hx			
				$8AJ$	4055	A_3J	0.10	0000 - 0830			Fixed
					5316	"	0.10				
II	IV/A	Tg. Balai Kariman	PKJ_4		4295	A_1	0.025	0100 - 0330	103°26'14"E	0°59'17"N	Mobile
				$8AK$	5316 4055	A_3J	0.10	0000 - 0600			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
II	IV/A	Tg. Uban	PKJ		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	Hx	104°13'27"E	1°03'57"N	Mobile
				8AH	5316 4055	A_3J	0.100	0130 - 0500			Fixed
II	IV/B	Dabo P. Singkep		$8AJ_2$	5316 4055	A_3J	0.100	0000 - 0830			Fixed
II	IV/B	Pulau Sambu	PKJ_3		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	Hx	103°53'58.2"E	1°09'08"N	Mobile
				8AL	5316 4055	A_3J	0.100	0000 - 0600			Fixed
II	IV/B	Tarempa		$8AM_4$	5316	A_3J	0.10	0000 - 0530			Fixed
II	IV/B	Tembilahan		$8AO_3$	4055 5316	A_3J	0.10	0000 - 0600			Fixed
II	IV/B	Pekan Baru		$8AO_4$	4055 5316	A_3J	0.10	0000 - 0600			Fixed
II	IV/B	Bagan Siapi Api		$8AO_5$	4055 5316	A_3J	0.10	0000 - 0600			Fixed
II	IV/B	Selat Panjang	PKP_3		VHF Ch12 Ch13 Ch14 CH16	F_3	0.03	Hx	102°43'10"E	1°01'15"N	Mobile
				$8AO_6$	5316 4055	A_3J	0.10	0000 - 0600			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
II	IV/B	Rengat		$8A0_{23}$	5316	A_3J	0.10	0100 - 0530			Fixed
II	IV/B	Bengkalis		$8A0_{24}$	4055 5310	A_3J	0.10	0000 - 0600			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
III	I	Palembang	PKC		448, 500	A_1 A_2	1	0000 - 1600	104°46'44"E	2°50'00"S	Mobile
					4295	A_1	1	Hx			
					6491.5	A_1	1	0000 - 1300			
					8437	A_1	1	0000 - 1300			
					2182	A_3^ A_3J	0.7	0230 - 1230			
					2690	"	0.7	0100 - 1400			
					4397	"	0.7	0100 - 1400			
					6215.5	"	0.7	0100 - 1400			
					8808.8	"	0.7	0100 - 1400			
			Palembang Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	0000 - 1600			
				8AB	8110	A_1	0.7	0100 - 0700			Fixed
					9925	A_3J	0.7	0130 - 0630			
					4446.5	A_3J	0.7/0.10	0130 - 0630			
					5381.5	A_3J	0.10	0130 - 0630			
III	I	Jakarta (Tg. Priok)	PKI		470, 500	A_1 A_2	1 - 5	H_{24}	106°54'28"E	6°05'56"S	Mobile
					8542	A_1	1 - 3	0000 - 0700			
					12970.5	A_1	1	1130 - 2400			
					16861.7	A_1	1 - 3				
					22431	A_1	1	Hx			
					2182 2690	A_3^ A_3J A_3H	1	H_{24}			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
III	I	Jakarta (Tg. Priok)	PKI		62155	A_3J A_3A	1	Hx	106°54'28"E	6°05'56"S	Mobile
					8753	"	1	Hx			
					13128.7	"	1	Hx			
					17260.8	"	1	Hx			
					22698.3	"	1	Hx			
			Jakarta Radio/PKI		VHF Ch16 Ch20 Ch22 Ch25 Ch26 Ch27 Ch28	F_3	0.05	H_{24}	106°52'00"E	6°06'00"S	
				8AA	11060 13661(R)	A_3B A_1	1	0100 - 0900	106°54'28"E	6°05'56"S	Fixed
					8110 10300(R)	A_3B	1	0100 - 0900			
					11060	A_1	0.1	0100 - 0900			
					9110 9060 (R) 10226(R)	A_3B	1	0100 - 0900			
					14639 17623(R)	A_1	1	0100 - 0900			
					17615 13661(R)	A_1	1	0100 - 0900			
					9950	A_1	1	0210 - 0230			
					5381.5	A_3J	0.3	0100 - 0600			
III	III	Panjang	PKC_4		430. 500	A_1 A_2	0.05	0100 - 0530	105°19'03"E	5°28'23"S	Mobile
					6355	A_1	0.05				
					2182 2690	A_3A A_3H A_3J	0.1	Hx			
					6509.5	A_3A A_3J	0.1	Hx			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
III	III	Panjang	Panjang Radio		VHF Ch10 Ch15 Ch16 Ch20 Ch22	F_3	0.05	Hx	105°19'03"E	5°28'23"S	Mobile
				8AB$_2$	5381.5	A_3J	0.1	0030 - 0700			Fixed
					8110	A_1	0.1				
					4446.5	A_3J	0.1				
					5381	A_3J	0.1				
					9950	A_1	0.1				
III	III	Cirebon	PKZ$_2$		474. 500	A_1 A_2	0.085	0030 - 1230	108°33'20"E	6°45'50"S	Mobile
					6491.5	A_1	0.085				
					2182	A_3J A_3A A_3H	0.085				
					2690	"	0.085				
					6215	"	0.085				
			Cirebon Radio		VHF Ch10 Ch15 Ch16 Ch20 Ch22	F_3	0.05	0030 - 0830			
				8AA$_2$	5381.5	A_3J	0.125	0100 - 0730			Fixed
					8110	A_1					
III	III	Pontianak	PKS		465. 500	A_1 A_2	0.25	0000 - 1130	109°22'24"E	0°06'34"S	Mobile
					6355	A_1	0.25	0230 - 1230			
					8473	A_1	0.25	0530 - 1300			
					2182	A_3A A_3J A_3H	0.25	0130 - 1200			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
III	III	Pontianak	PKS		3180	A_3J A_3A	0.25	0130 - 1200	109°22'24"E	0°06'34"S	Mobile
					4410.1	A_3A A_3J	0.25	0330 - 0400			
					6215	A_3A A_3J A_3H	0.25	0030 - 0900			
					6218.6	A_3A A_3J	0.25	0030 - 0900			
					6518.8	"	0.25	0030 - 0900			
			Pontianak Radio		VHF Ch10 Ch16 Ch20 Ch22 Ch26	F_3	0.05	0000 - 0930			
				8AF	9950	A_1	0.1	0200 - 0430			Fixed
					11060	A_1	0.1				
					5381.5	A_3J	0.1	0100 - 0800			
III	IV/A	Jambi	PKC_3		448, 500	A_1 A_2	0.125	0030 - 0830	104°06'51"E	1°01'59"S	Mobile
					6491.5	A_1	0.025	0230 - 0600			
					2182	A_3A A_3J	0.1	0000 - 0900			
					3180	A_3A A_3J	0.1	0000 - 0900			
					6215.5	A_3A A_3J	0.1	0130 - 0630			
			Jambi Radio		VHF Ch10 Ch15 Ch16 Ch20 Ch22	F_3	0.05	Hx			
				8AM	8110	A_1	0.1	0200 - 0700			Fixed
					4446.5	A_3J	0.1	0200 - 0700			
III	IV/B	Muara Sabak		$8AM_5$	5381.5	A_3J	0.025	0200 - 0900			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
III	IV/B	Bengkulu		$8AB_3$	5381.5	A_3J	0.1	0210 - 0430			Fixed
					9950	A_2	0.1	0130 - 0630			
					4446.5	A_3J	0.1	0130 - 0600			
III	IV/B	Pangkalan Balan	PKC_5		2182	A_3A A_3J A_3H	0.1	0030 - 0400	106°07'54"E	2°10'58"S	Mobile
					2690						
			Pangkalan Balan Radio		VHF Ch10 Ch15 Ch16 Ch20 Ch22	F_3	0.05	0100 - 0700			
				$8AB_4$	5381.5	A_3J	0.1	0100 - 0630			Fixed
					6926	A_3J	0.1	0100 - 0630			
					4446.5	A_3J	0.1	0100 - 0630			
III	IV/B	Muntok		$8AB_5$	4446.5	A_3J	0.1	0100 - 0630			Fixed
					5381.5	A_3J	0.1	0100 - 0630			
III	IV/B	Tg. Pandan		$8AB_9$	4446.5	A_3J	0.1	0130 - 0630			Fixed
					5381.5	A_3J	0.1	0130 - 0630			
					6926	A_3J	0.1	0130 - 0630			
					9950	A_3J	0.1	0130 - 0630			
III	IV/B	Sinteta		$8AF_5$	5381.5	A_3J	0.1	0100 - 0130 0330 - 0400 0730 - 0800			Fixed
III	IV/B	Teluk Air		$8AF_2$	5381.5	A_3J	0.1	0100 - 0130 0330 - 0400 0730 - 0800			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	I	Surabaya	PKD		430, 500	A_1 A_2	1	H_{24}	112°44'10"E	7°12'59"S	Mobile
					4238	A_1	1	0230 - 0330			
					8461	A_1	1	0200 - 0900			
					12704.5	A_1	1	0000 - 1200			
					16861.7	A_1	1	0500 - 1400			
					2182	A_3A A_3H A_3J	0.8	0000 - 1400			
					2690	"	0.8	0000 - 1400			
					4379.1	A_3A A_3J	0.8	0330 - 0430			
					6215.5	A_3A A_3H A_3J	0.8	0100 - 1000			
					8796.4	A_3A A_3J	0.8	0100 - 1100			
					13134.9	A_3A A_3J	0.8	0100 - 1100			
			Surabaya Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	H_{24}			
				8AD	8110	A_1	0.25	0000 - 0600			Fixed
					10226	A_3B	1	0000 - 0600			
					5316	A_3J	0.25/0.3	0000 - 0600 0730 - 0745			
					9950	A_1	0.25/0.3	0000 - 0830			
					5165	A_3J	0.25/0.3	0000 - 0600			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	III	Semarang	PKR		456. 500	A_1 A_2	0.25	0000 - 1300	110°22'00"E	6°59'00"S	Mobile
					4238	A_1	0.25	Hx			
					63265	A_1	0.25	Hx			
					8461	A_1	0.25	0100 - 0930			
					2182 3180	A_3A A_3H A_3J	0.25	0100 - 0200 0500 - 0600			
					4422.5	A_3A A_3J	0.25	Hx			
					6215.5	A_3A A_3H A_3J	0.25	0000 - 0100 0800 - 0900			
					6515.7	A_3A A_3J	0.25	0230 - 0300 0930 - 1000			
					8802.6	"		0200 - 0230 0730 - 0800			
			Semarang Radio		VHF Ch16 Ch20 Ch26	F_3	0.05	0000 - 0600 0730 - 0800			
				8AC	5165	A_3J	0.1	0100 - 0930			Fixed
					8110	A_1	0.1	0100 - 0930			
					4055	A_3J	0.1	0100 - 0115			
IV	III	Cilacap	PKR_3		474. 500	A_1 A_2	1	0000 - 1500	109°02'23"E	7°45'17"S	Mobile
					8445	A_1	1	0200 - 0300 0700 - 0800			
					2182 3180	A_3A A_3H A_3J	0.3	0000 - 0100 0400 - 0500 1100 - 1200			
					6218.6	A_3A A_3J	0.3	0100 - 0130			
					6506.4	"	0.3	0500 - 0530			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	III	Cilacap	Cilacap Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	0000 - 0600 0800 - 1200	109°02'23"E	7°45'17"S	Mobile
				$8AC_3$	5165	A_3J	0.1	0100 - 0600			Fixed
IV	III	Kupang	PKK		430, 500	A_1 A_2	0.25	0000 - 0030 0400 - 0430	123°34'00"E	10°09'50"S	Mobile
					8445	A_1		0030 - 0100 0430 - 0900			
					2182 3180	A_3A A_3H A_3J	0.25	0000 - 0200			
					6221.6	A_3A A_3J	0.3	0230 - 0300			
					6515.7	"		0400 - 0430			
			Kupang Radio		VHF Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.05	Hx			
				$8AD_2$	9950	A_1	0.7	0100 - 0900			Fixed
					5316	A_3J	0.1	2330 - 0500			
IV	IV/A	Benoa	RKD_5		487.5, 500	A_1 A_2	0.1	0100 - 0200 0400 - 0500 0800 - 0900	115°12'29"E	8°44'43"S	Mobile
					6491.5	A_1	0.1	0100 - 0130 0500 - 0530 0900 - 0930			
					2182 2690	A_3A A_3J A_3H	0.1	0200 - 0230 0930 - 1000			
					8796.4	A_3A A_3J	0.1	0030 - 0100 1000 - 1030			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	IV/A	Benoa	Benoa Radio		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	0030 - 0200 0400 - 0700	115°12'29"E	8°44'43"S	Mobile
				$8AD_8$	9950	A_1	0.1	0000 - 0600			Fixed
					5316	A_3J	0.1	0030 - 0700			
					4055	A_3J	0.1	0030 - 0700			
					6926	A_3J	0.1	0030 - 0700			
IV	IV/A	Ampenan	PKD_3		438. 500	A_1 A_2	0.085	0000 - 0100 0500 - 0600	116°04'20"E	8°34'13"S	Mobile
			Ampenan Radio		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	0000 - 0100 0500 - 0600			
				$8AD_9$	5316	A_3J	0.1	0100 - 0200 0330 - 0400			Fixed
					6926	A_3J	0.1	0330 - 0500			
					9950	A_1		0700 - 0930			
					10226	A_1		0700 - 0930			
IV	IV/A	Panarukan	PKD_2		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	0000 - 0600	113°56'02"E	7°14'04"S	Mobile
				$8AD_3$	5316	A_3J	0.1	0000 - 0600			Fixed
					6926	A_3J	0.1	0800 - 0830			
					9950	A_1	0.1				

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	IV/A	Dili	PKT		8445	A_1	1	Hx	125°34'00"E	8°33'15"S	Mobile
					2182 2690	A_3A A_3J A_3H	0.15	Hx			
					4394.6	A_3A A_3J	0.15	Hx			
					6215.5	A_3A A_3H A_3J	0.15	Hx			
					6221.6	A_3A A_3J	0.15	Hx			
					8787.1	"	0.15	Hx			
					13107	"	0.15	Hx			
					17276.3	"	0.15	Hx			
			Dili Radio		VHF Ch12 Ch14 Ch16 Ch20 Ch22 Ch26 Ch28	F_3	0.025	0000 - 0500			
				$8AD_{23}$	9950	A_1	0.1	0000 - 0500			Fixed
					5165	A_3J	0.1	0000 - 0500			
					14410	A_3B	-	0100 - 0930			
IV	IV/B	Tegal	PKD_{21}		2182 3160	A_3A A_3J	0.1	0030 - 0100 0400 - 0430	109°08'05"E	6°51'02"S	Mobile
					VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	0100 - 0500			
				$8AC_2$	5165	A_3J	0.1	0100 - 0130 0230 - 0300			Fixed
					9950	A_1	0.1	0430 - 0500			

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	IV/B	Bawean		8AC$_4$	5316	A$_3$J	0.1	0245 - 0300 0600 - 0615			Fixed
IV	IV/B	Kalianget		8AC$_5$	5316	A$_3$J	0.02	0030 - 0100 0200 - 0500			Fixed
IV	IV/B	Buleleng		8AC$_6$	5316	A$_3$J	0.02	0030 - 0700			Fixed
					4055	"	0.02	0030 - 0700			
					5165	"	0.02	0030 - 0700			
IV	IV/B	Colukan Bawang		8AC$_{22}$	5316	A$_3$J	0.1	0000 - 0700			Fixed
					6926	A$_3$J	0.1	0000 - 0700			
					9950	A$_1$	0.1	0000 - 0700			
					4055	A$_3$J	0.1	0000 - 0700			
IV	IV/B	Padang Bai		8AC$_7$	4055	A$_3$J	0.1	0030 - 0700			Fixed
					5316			0030 - 0700			
					6926			0030 - 0700			
IV	IV/B	Lombar		8AC$_8$	5316	A3J	0.02	0100 - 0130 0230 - 0300 0400 - 0500			Fixed
					6926						
IV	IV/B	Badas		8AC$_9$	5316	A$_3$J	0.1	0100 - 0130 0230 - 0300 0400 - 0500			Fixed
					6926						
IV	IV/B	Waingapu		8AC$_{20}$	5165	A$_3$J	0.1	2300 - 2400 0100 - 0230 0400 - 0500			Fixed
IV	IV/B	Kalabahi		8AC$_{21}$	5165	A$_3$J	0.02	2300 - 0500			Fixed
					5316	A$_3$J	0.02				
IV	IV/B	Bima		8AD$_4$	5316 4055 5165 6926	A$_3$J	0.1	0100 - 0700			Fixed

Area	Class	Station Name	Call Sign		Emission			Service Hours of Service (GMT)	Longitude	Latitude	Remarks
			Mobile	Fixed	Frequency KHz or MHz	Class	Power KW				
IV	IV/B	Probolinggo	PKD_{23}		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.03	0030 - 0600	113°13'00"E	7°23'00"S	Mobile
				$8AD_6$	5316	A_3J	0.1	0030 - 0600			Fixed
					6926	A_3J		0030 - 0400			
					9950	A_1					
IV	IV/B	Ende	PKD_{20}		VHF Ch12 Ch13 Ch14 Ch16	F_3	0.05	Hx	121°38'38"E	8°50'20"S	Mobile
				$8AD_{20}$	5316	A_3J	0.1	0000 - 0600			Fixed
					5165	A_3J	0.1	2330 - 2400 0100 - 0130			
					9950	A_1	0.1	0400 - 0500 0700 - 0730			
IV	IV/B	Maumere		$8AD_{21}$	5316	A_3J	0.1	2300 - 2400 0100 - 0300 0400 - 0500			Fixed
IV	IV/B	Meneng	PKD_{22}		2182 2690	A_3J A_3A	0.1	0100 - 0200	114°23'50"E	8°07'30"S	Mobile
					8796	A_3A A_3J	0.1	0000 - 0030			
			Meneng Radio		VHF Ch12 Ch13 Ch14 Ch16			0000 - 0500			
				$8AD_{22}$	5316	A_3J	0.1	0030 - 0700			Fixed
					9950	A_1	0.2	0030 - 0700			