Meanwhile, the productive effects of the Project may be identified in agricultural production in the future; when a long-term weather forecast becomes reliable through the Project, either cropping pattern or variety can be identified to obtain the best harvest under the forecasted weather conditions.

9.1.2 Expected Typhoon Damage Mitigation Surveyed through "Delfi Method"

Although the preventive and productive effects of the Project can be identified as mentioned above, it is difficult to quantify these effects; the method to assess these effects is not established yet and the data to estimate these effects is not available too. As the economic benefit of the Project, the mitigation of typhoon damage to be brought by the Project only was adopted in this Study. It is noted that this adopted benefit represents only a portion of the whole benefit of the Project; other effects than the above are hard to be assessed accurately enough to be used in this Study.

The future mitigation of typhoon damage was estimated in this Study through the principle of "Delfi Method". The questionnaire distributed to the estimaters and its result of three times of filling are compiled in Appendix C. The seven well-experienced personnels in each field related to typhoon damage such as MPWH, OCD, PAGASA, WMO, TCS, NIA, PNRC and PCIC were selected.

Three assumptions for future situations were made as shown below.

(1) The Meteorological Telecommunication System now under study is assumed to have been completed and operated with its full effects.

(2) Consequently, the weather forecast is much improved in terms of its accuracy and the typhoon track forecast can be disseminated to the general public quickly enough to take all the possible protective actions for the coming typhoon.

(3) Mitigation of typhoon damage can be fully realized by the aggregated effects of flood control structure such as dams and levees, and non structural measures such as Flood Forecasting and Warning System (FFWS) and Meteorological Telecommunication System (MTS). In this questionnaire the typhoon damage mitigation is estimated assuming the conditions in which structural measures such as dams and levees are constructed and non structural measures such as FFWS and MTS are installed.

The above third assumption is essential under such situations that a part of the main trunk line is planned to be used commonly by FFWS and MTS, and that the meteorological data obtained through MTS will be required for the effective dam operations.

Based on the above assumptions, the estimaters were requested to assess the extent of mitigation effect of typhoon damage for each damage item by valuing the future damage comparing with the present damage indexed by 100.

The identical questionnaire was distributed three times; after the first filling, the compiled result was distributed and the second filling was requested to be made by taking into consideration the other peoples' estimation. The same procedure were taken for the third fillings. The resulted estimations were expected to be, and really were, convergent to smaller ranges and finally, the values of the seven estimaters for each damage item were averaged to obtain the aggregated value.

The result of survey on estimated mitigation of typhoon damage is summarized hereunder. The figures show the estimated ratio of typhoon damage mitigation to be realized under the above-mentioned assumptions.

		Damage Mitigation Ratio	
(i)	Casualties (in Number)		
A	Death or Mission	30%	
B	Injured	25%	
(ii)	Houses Destroyed (in Number)		
A	Totally destroyed	20%	
B	Partially destroyed	15%	
(iii)	Damage to Properties (in Monetary Value)		
A	Agricultural Crops	20%	25% (A–C)
B	Livestocks	50%	
C	Fishponds	40%	
D	Government Properties		
	a Public Works	10%	10% (D–E)
	b Road & Bridge	10%	
	c Others	10%	
E	Private Houses	15%	

The composition of typhoon damage was available for the biggest typhoon in these six years (without breakdown for 1980) and is presented in Table 2.17. Due to the limitation of the available breakdown of each damage item, the above historical typhoon damages were classified into only two categories: one is the damage to primary products such as agricultural crops, livestock and fishponds and another is the damage to properties such as government properties including public works and roads and bridges and private houses. Based on the average damage of five typhoons in the past six years, the percentage share of primary products to the total typhoon damage was estimated at 49.5% and that of properties was estimated at 50.5% (Table 2.17).

Consequently, the future typhoon damage mitigation was estimated at 17.4% of the whole typhoon damage as presented hereunder.

Damage mitigation in primary products	:	49.5% x 25%
Damage mitigation in properties	:	50.5% x 10%
Total Damage mitigation		17.4%

9.2 Economic Evaluation of the Project

9.2.1 General

The primary objective of economic evaluation is to confirm if the Project is justified or not; if, after discounted by the opportunity cost of capital, the benefit of the Project is bigger than the cost of the Project, then, the Project can be justified from the point of view of whole economy. In this Study, as mentioned already in sub-section 9.1.2, the reduction of direct typhoon damage is adopted as the economic benefit of the Project. Since this reduction of direct typhoon damage can be realized as the aggregated effects of dam construction, FFWS and MTS, the cost of the Project cannot be simply compared with the said aggregated benefit.

Therefore, in this Study, the benefit that will suffice the benefit cost ratio (B/C) of more than unity will be examined in stead of computing the B/C.

9.2.2 Projection of Future Typhoon Damage in the Philippines

Based on the historical typhoon damage for the period of 1970 - 1983, shown in Table 9.1, the future typhoon damage was projected by applying a multiple regression method as shown below.

$$T = -1,491.45082 + 11.51213M + 0.14717I + 2,208.72076D$$

Where; T: Future typhoon damage
M: Projected population density
I: Projected per capital GDP
D: Dummy variable

The historical data of both the typhoon damage and GDP were evaluated by the constant price in June 1984 (Table

9.1). The population projection based on medium assumption made by Census Statistics Office was adopted up to 2000 and thereafter an annual growth rate of 1.5% was assumed. The future GDP was projected based on historical GDP by applying a simple linear regression method. The projections of both the population and GDP are shown in Table 9.2. Dummy variable was used in the above multiple regression to take into consideration the irregular extremity of typhoon damage that was experienced in the historical data from 1970 to 1983. The projected typhoon damage is presented in Table 9.2.

This is the projected future typhoon damage under the "without Project" conditions.

The mitigatable typhoon damage in this table was computed by assuming that the aggregated effect will be fully realized in year 2000.

9.2.3 Examination of Benefit of the Project

The mitigation ratio of 17.4% obtained through the Delfi Method is that to be realized by the aggregated effects of dam, FFWS and MTS. Therefore, the contribution of MTS toward damage mitigation is estimated to be less than this 17.4%.

Since the proportion of the MTS's contribution toward the typhoon damage mitigation is not distinguished, a mitigation ratio by which the estimated benefit becomes equal to the cost of the Project was sought based on the Table 9.3 and the mitigation ratio of 1.7% was derived.

In deriving 1.7%, the operation and maintenance costs were assumed at 3% of the capital cost (cf. 9.3). The replacement was assumed for 90% of equipment value with an interval of 10 years. The evaluation period was set at 33 years including 3 years of construction period.

Meanwhile, economic evaluation of a project for the improvement in weather information does not have any so long history that any methodology how to justify such kind of project is not established yet. In this context, a dissertation prepared by Mr. J.C. Thompson presented in Planning Report of WMO is valuable*. After analyzing economic gains in weather forecasting in four areas in the USA, it is concluded that scientific advances and operational improvements in weather information could alleviate 5% of the total current losses due to adverse weather.

Although nothing can be stated on the proportion of individual contribution of dam, FFWS and MTS toward mitigation of typhoon damage, the contribution of the Project toward mitigation of typhoon damage could be estimated to be more than 1.7% when the mitigation ratio of 5% which is indicated in the above Thompson's study is referred to. When the fact that the above benefit was estimated based on a portion of the whole conceivable benefit of the Project (cf. 9.1.2) is considered, the real contribution of the Project toward the mitigation of typhoon damage may be estimated to be more than 1.7%. From these

*: "Potential Economic Benefits from Improvements in Weather Information" by J.C. Thompson, World Weather Watch Planning Report No. 27, WMO, 1968.

contexts, it may be moderate to state that the B/C ratio of the Project is estimated to be more than unity.

If the Thompson's study is directly adopted neglecting the differences in climatological conditions between the USA and the Philippines, the benefit of the Project can be computed by 5% of the projected typhoon damage and an economic internal rate of return (EIRR) of 52% can be derived as shown in Table 9.4.

10. Conclusion

The Project has been investigated with respect to both the technical and economic aspects in the present study.

The conceived meteorological telecommunication system comprising the OH main trunk, VHF and HF branch networks connected to each of 64 weather stations has been found technically sound.

The economic feasibility was examined through reviewing the estimated benefit of the Project and it was inferred that the benefit of the Project would exceed the cost of the Project.

As mentioned in sub-section 2.4.3, the improvement of meteorological telecommunication system will bring significant effects, though their quantification is hard, in many fields of economic activities such as agriculture, fishery, railway, road transport, aviation, navigation and power industry. Mitigation of typhoon damage to housings and buildings can also be expected. Among others, the expected decrease in number of casualties is of a great significance from the point of view of basic human need.

Actually, more than 1,000 human lives has been lost due to a destructive typhoon (Typhoon Nitang : September 1984). Besides the domestic contribution, the Project is expected to promote the development of meteorological services in the neighboring countries of the Philippines. Judging from its extensive and significant effects, though they are not fully quantified, to the socio-economic situation of the whole Philippines, the improvement of meteorological telecommunication system is urgently recommended to be implemented.

Figure

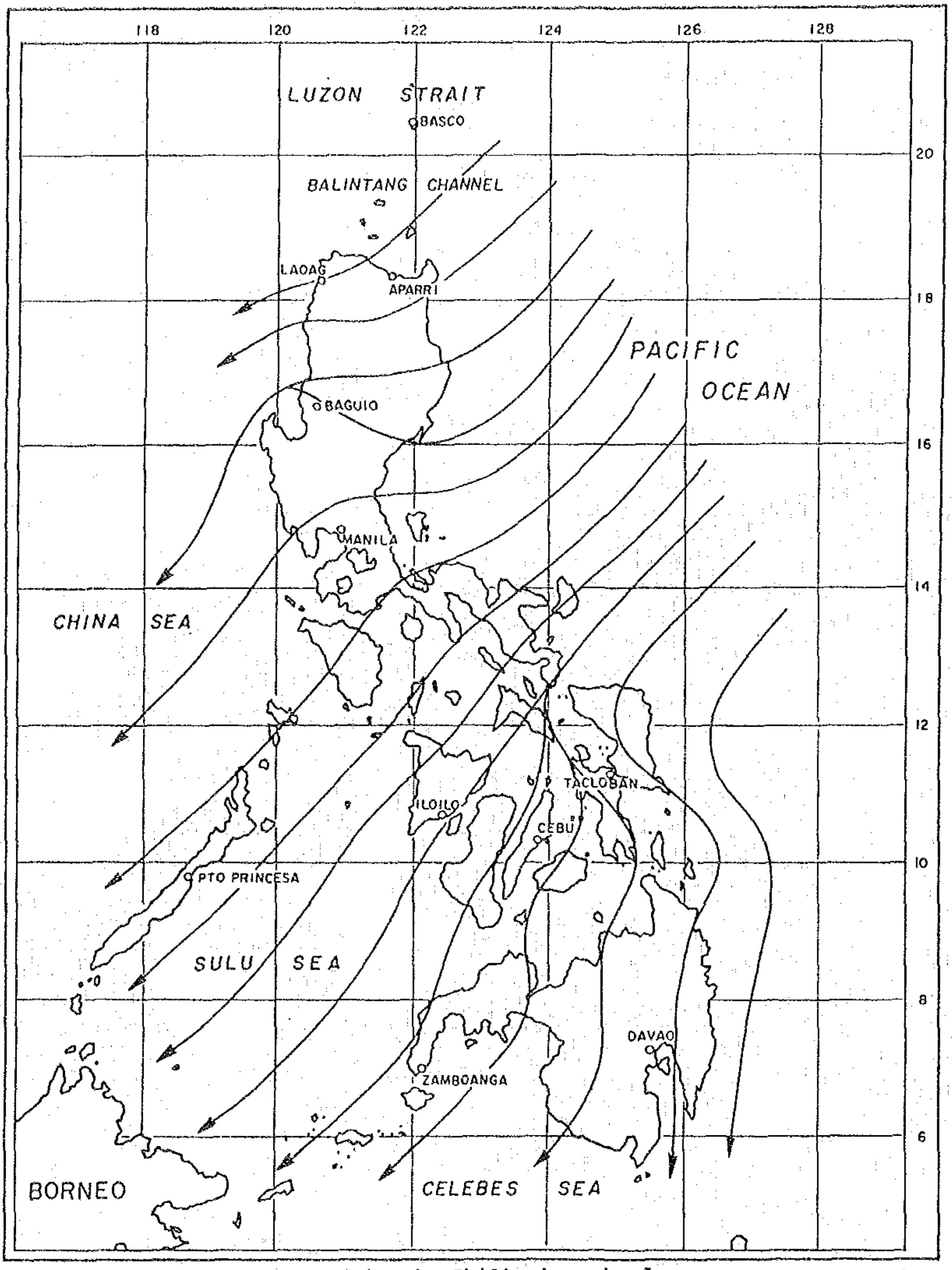


Fig.2.2 Surface Air Flow in the Philippines in January

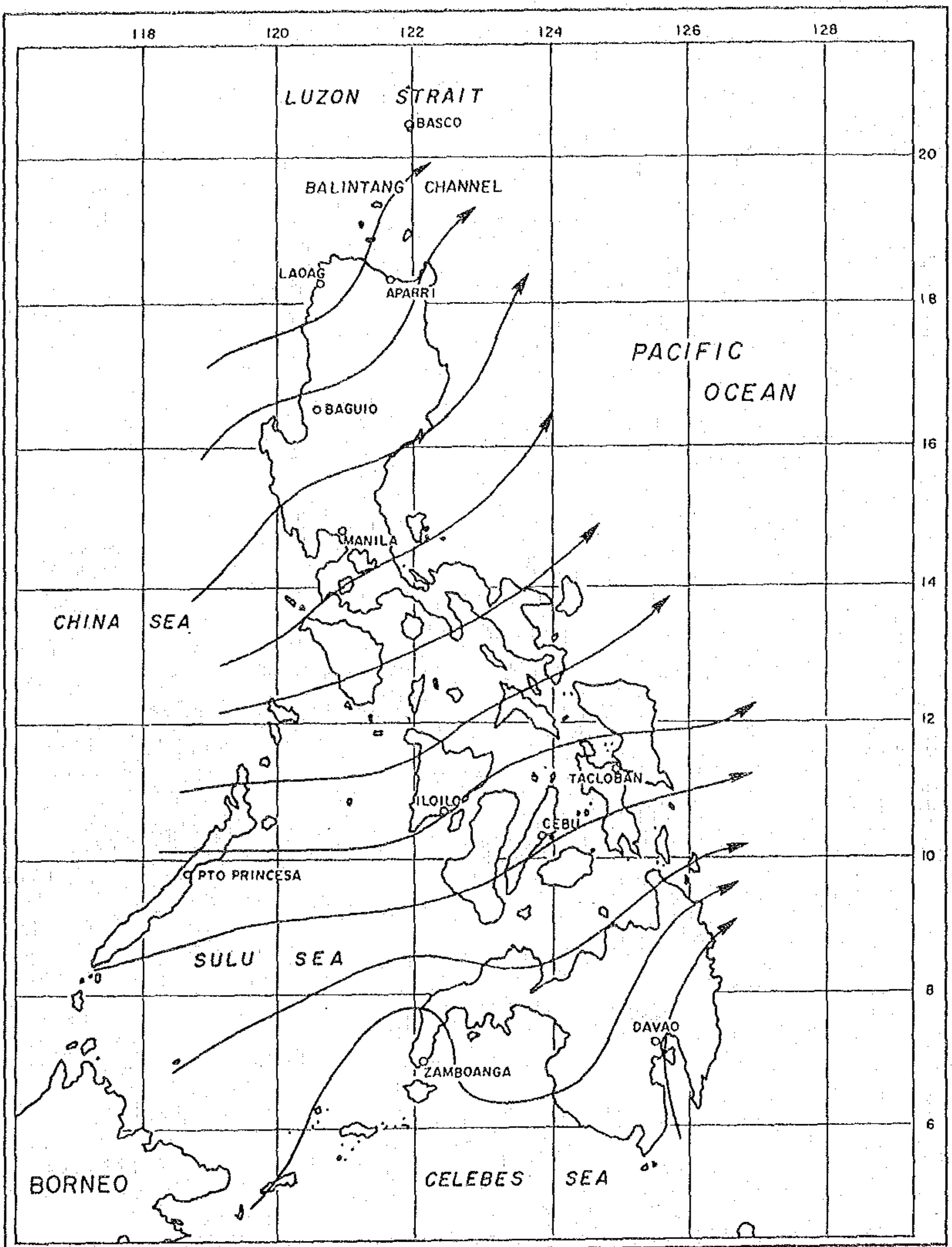


Fig.2.3 Surface Air Flow in the Philippines in July

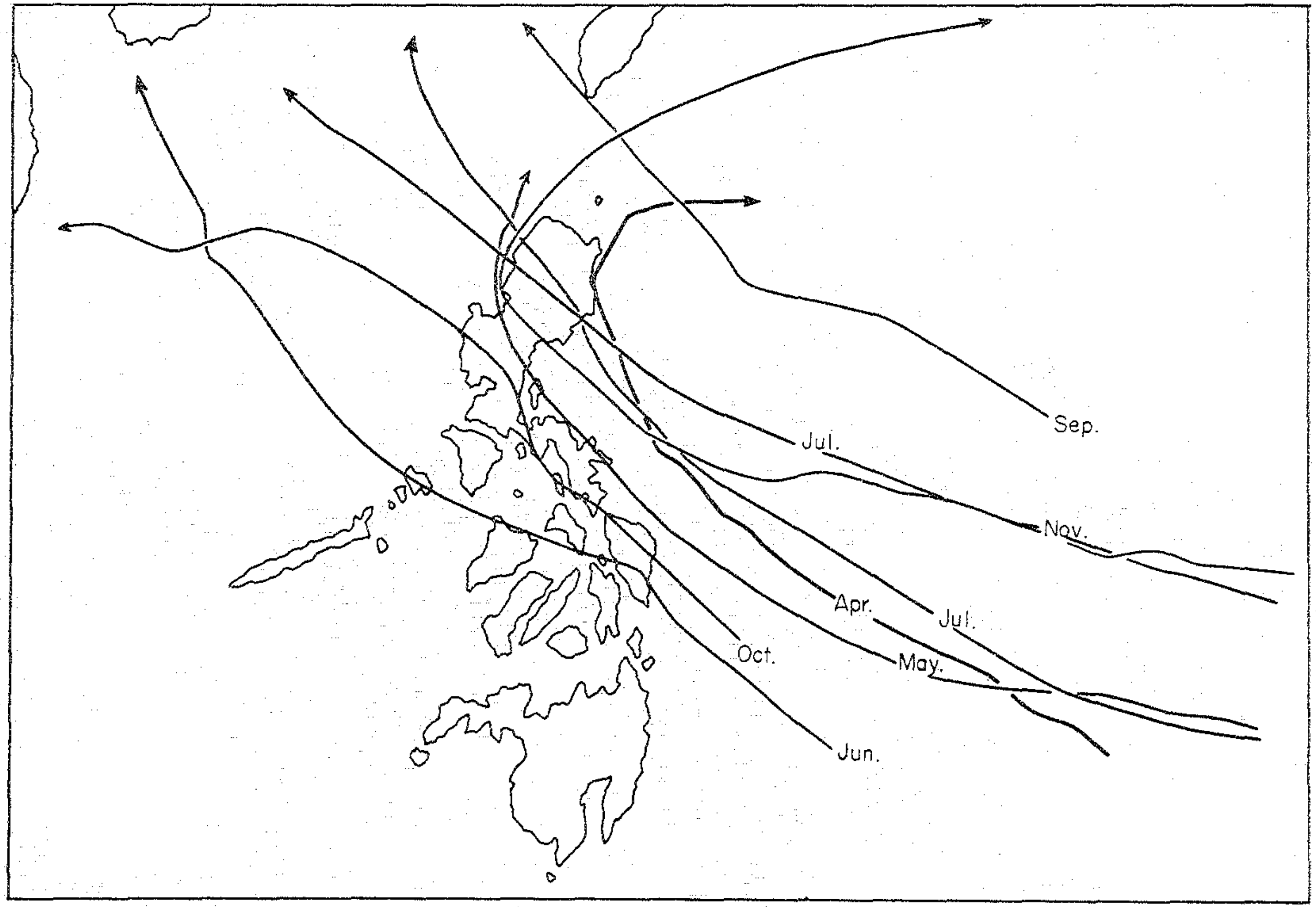


Fig.2.4 Typhoon Tracks in the Philippine Area of Responsibility in 1981

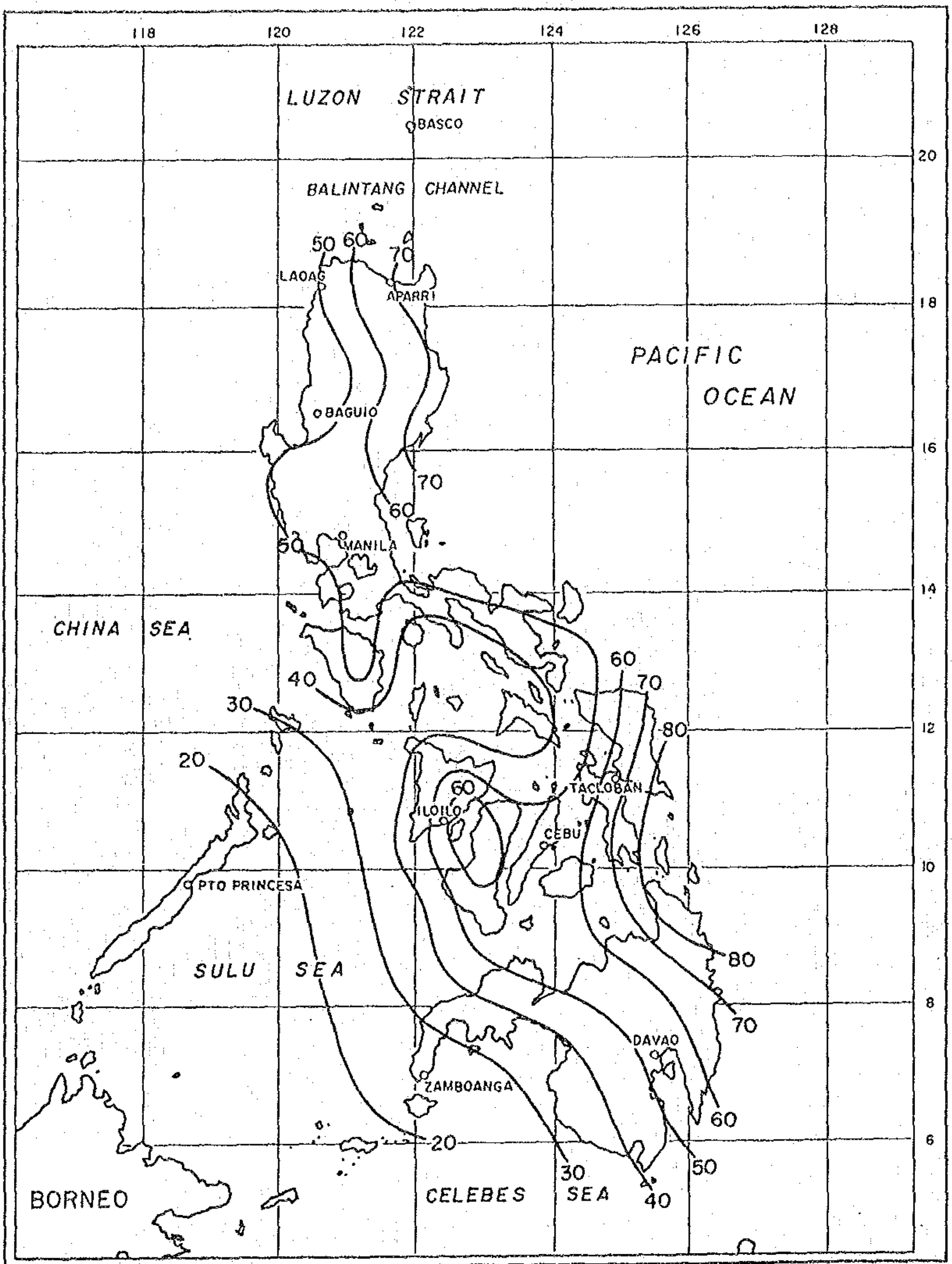


Fig.2.5 Distribution of Mean Annual Number of Days with Thunderstorm in the Philippines

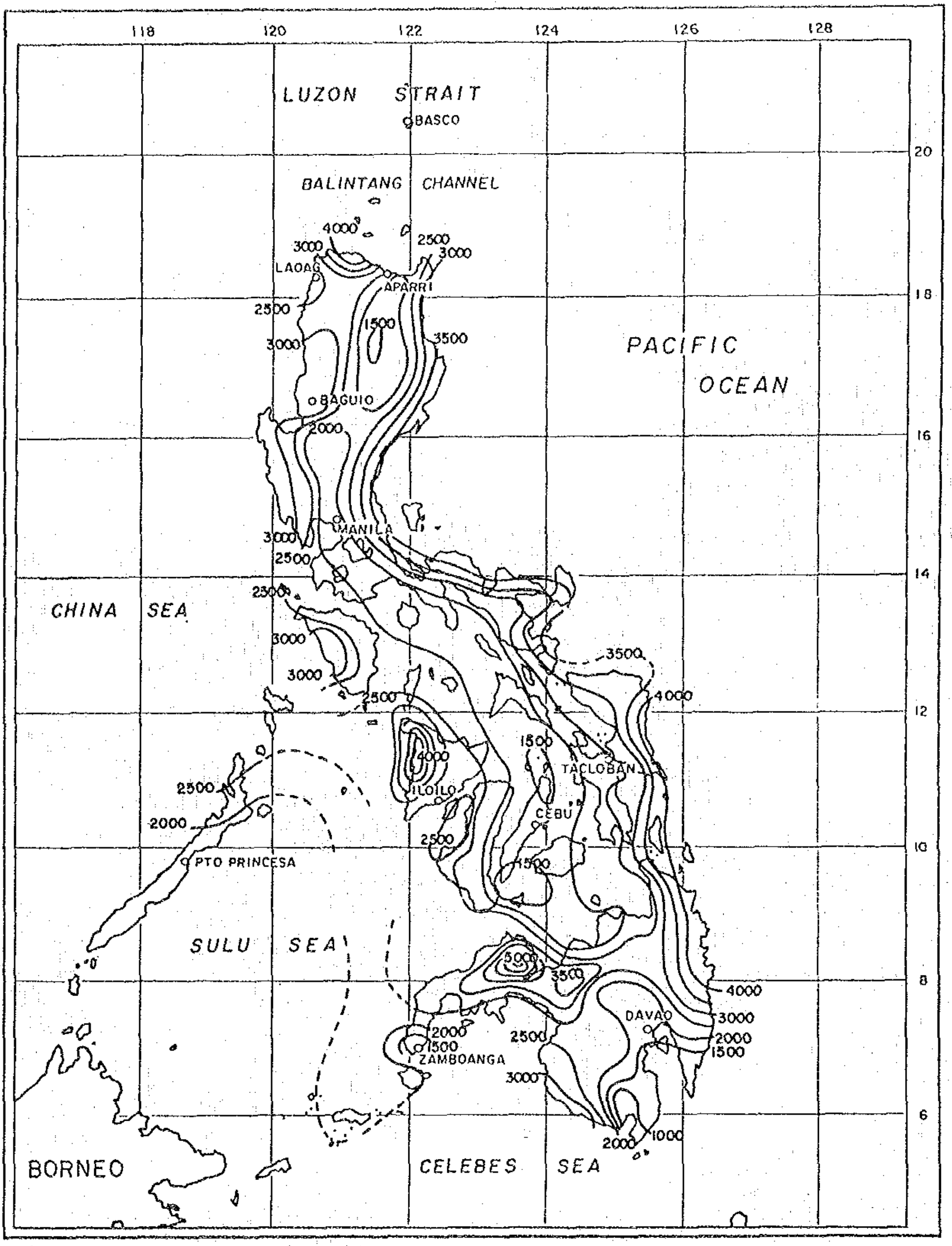


Fig.2.6 Distribution of Mean Annual Rainfall(mm) in the Philippines

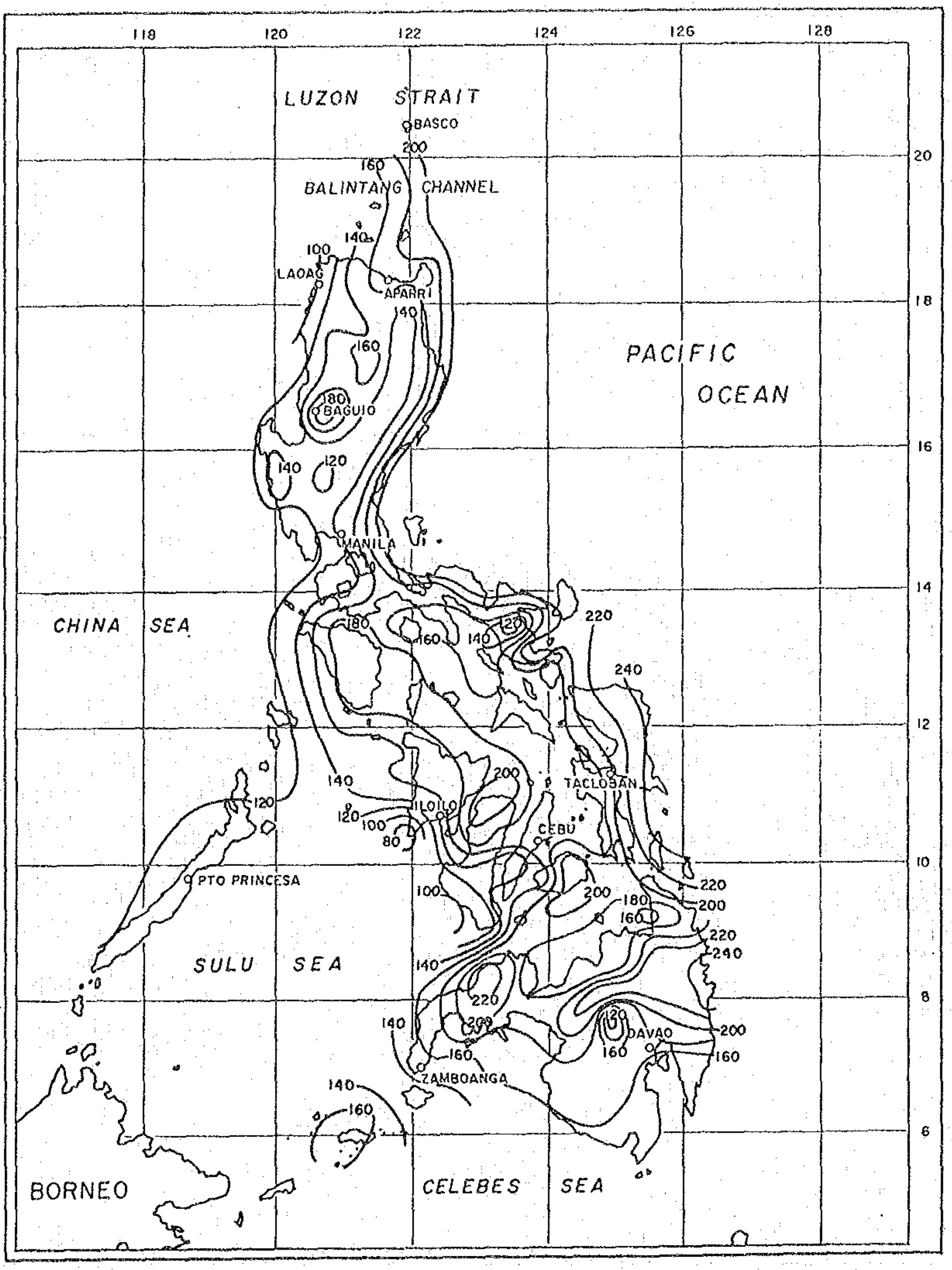


Fig.2.7

Distribution of Mean Annual Number of Rainy Days in the Philippines

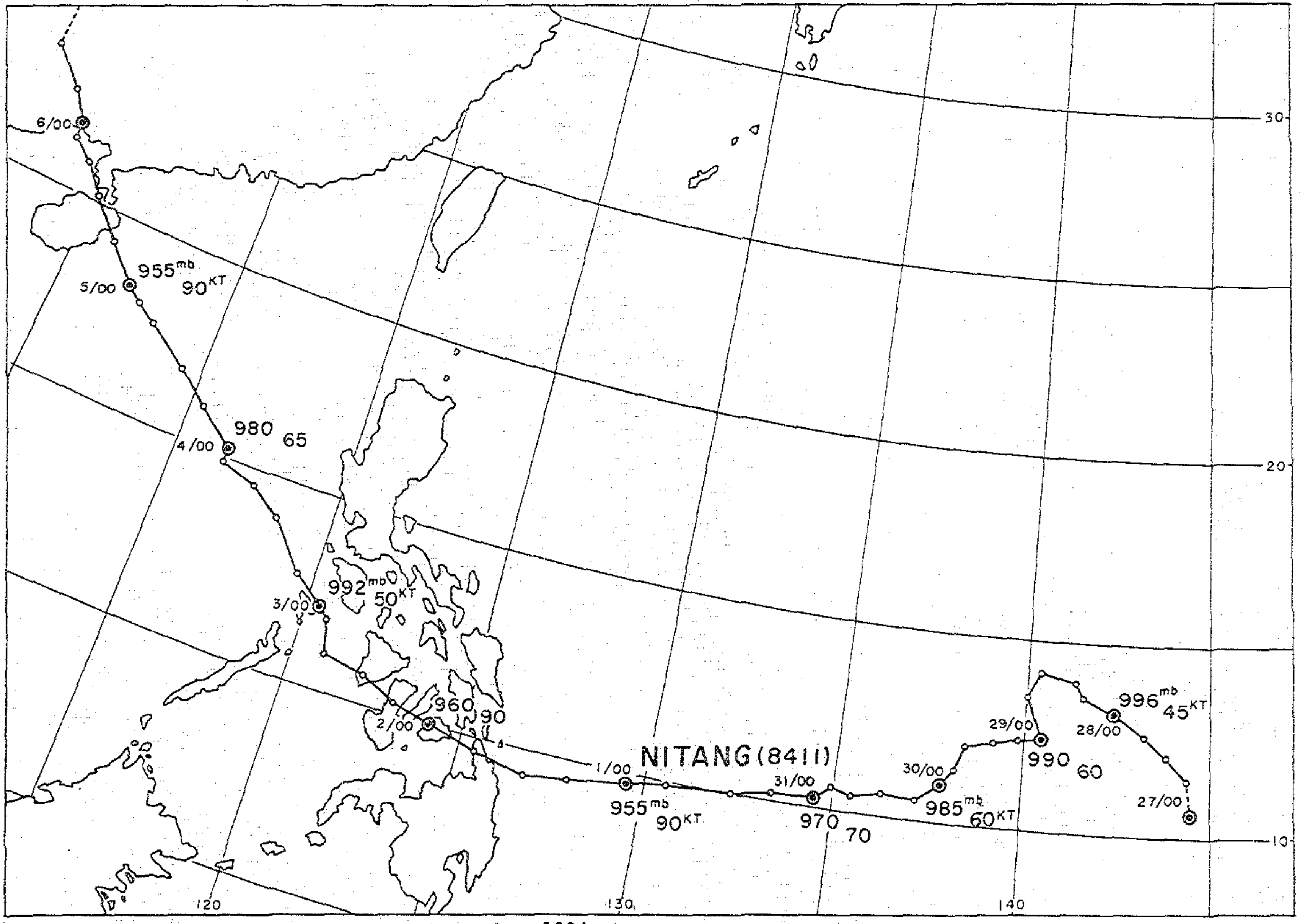


Fig. 2.9 Path of Typhoon Nitang September 1984

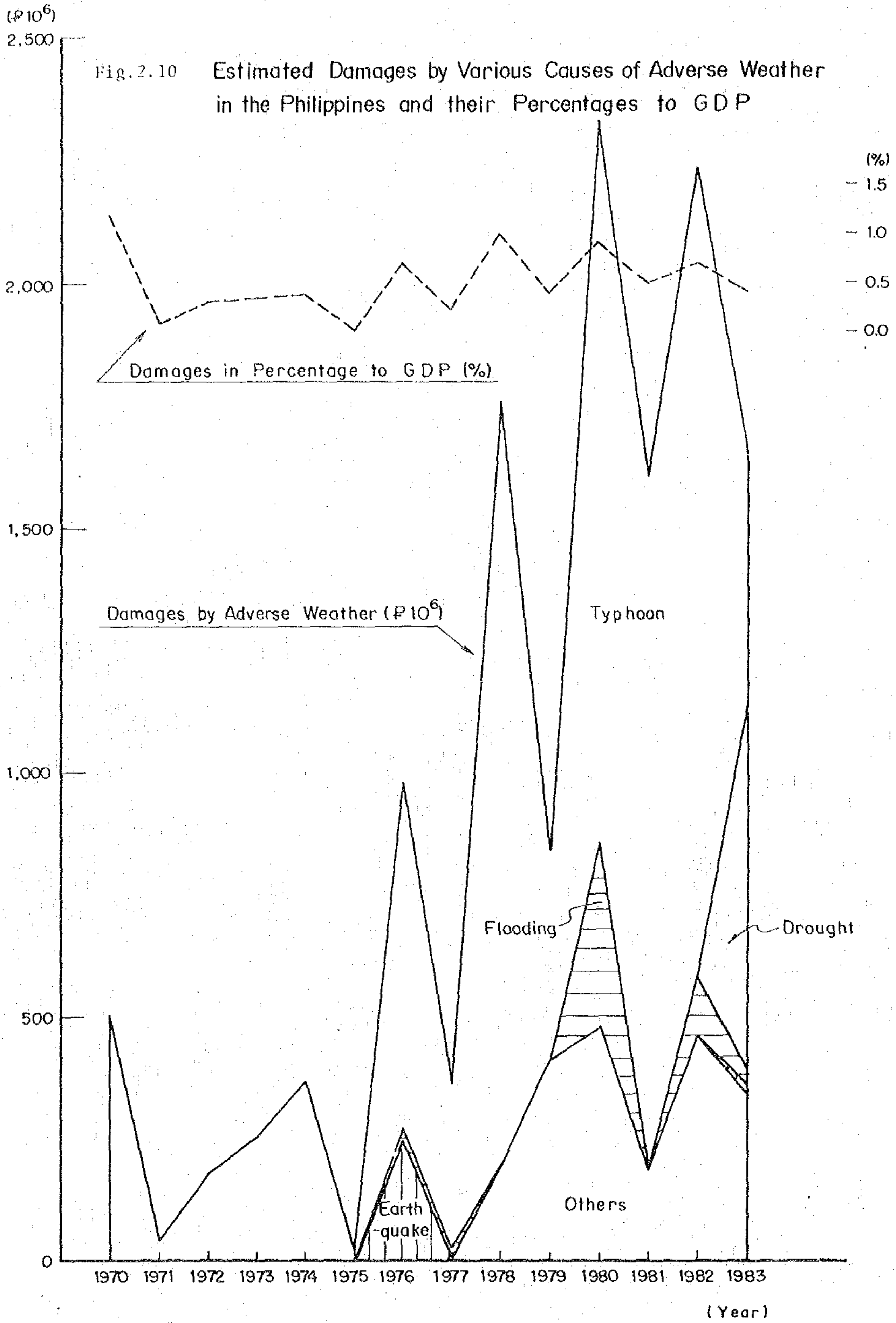


Fig.2.10 Estimated Damages by Various Causes of Adverse Weather in the Philippines and their Percentages to GDP

Fig.2.11 Correlation between Magnitude of each Typhoon and Number of Deaths and Missings for the Period of 1970 - 83

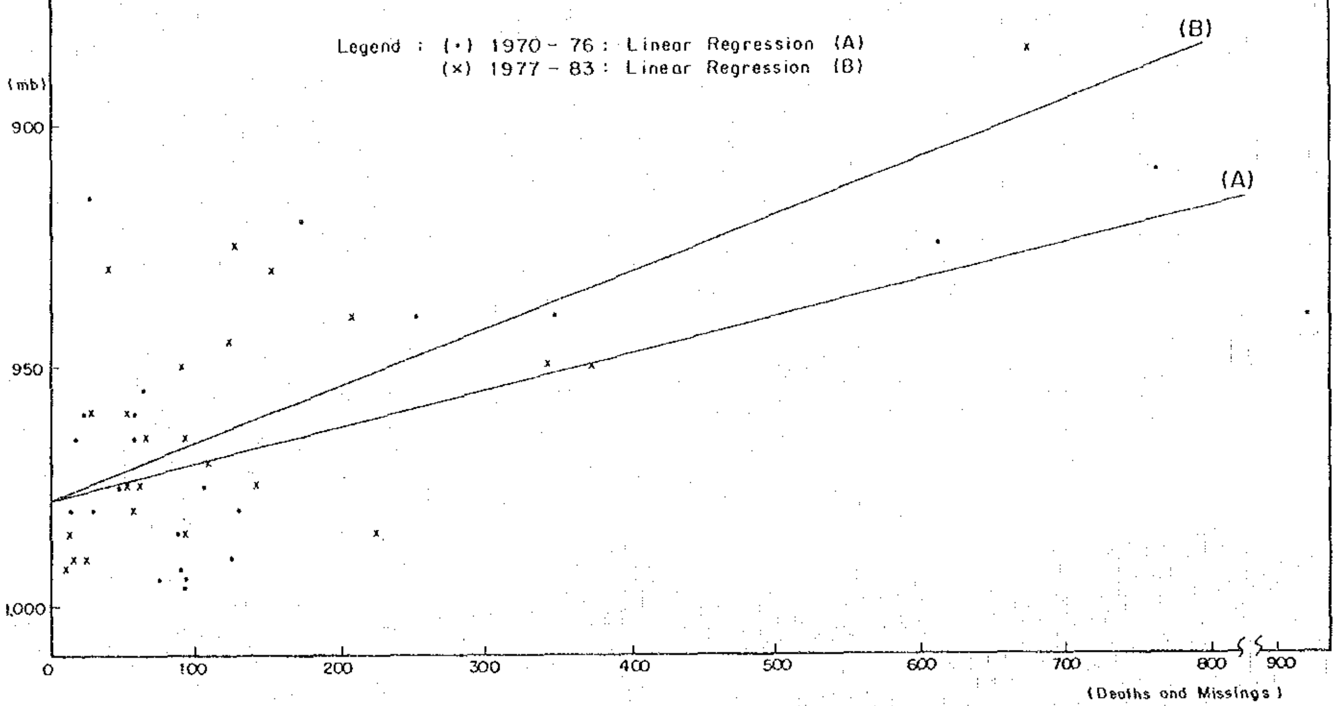


Fig.2.12 Correlation between Magnitude of each Typhoon and Number of Deaths and Missings

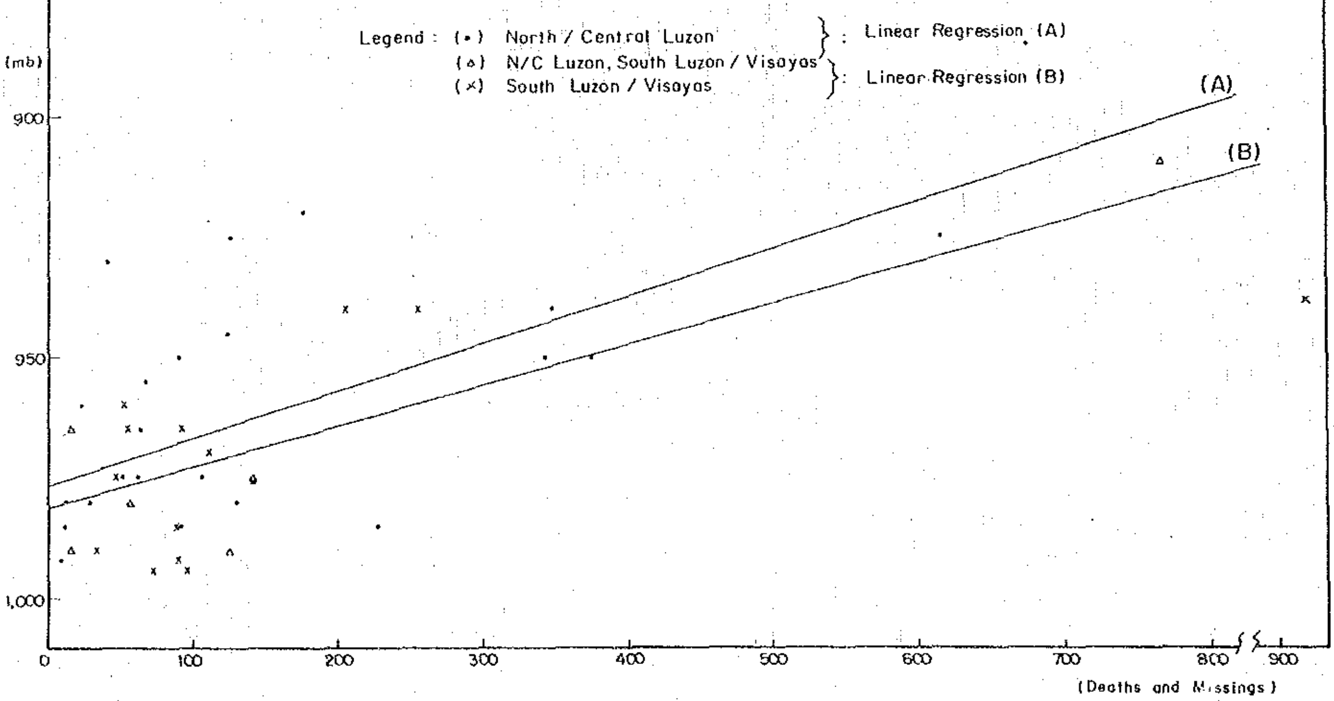
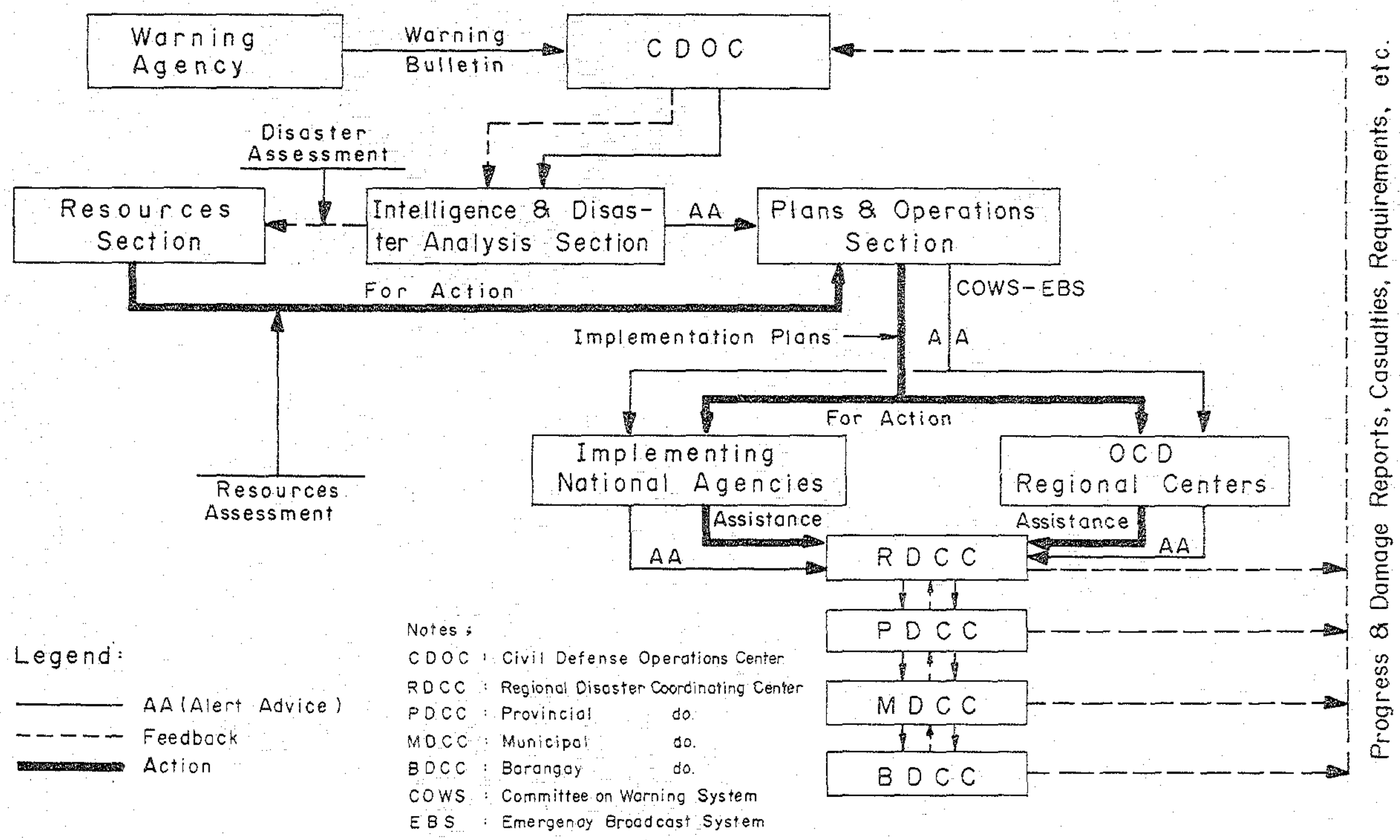


Fig. 2.13 Disaster Operations Flow Chart



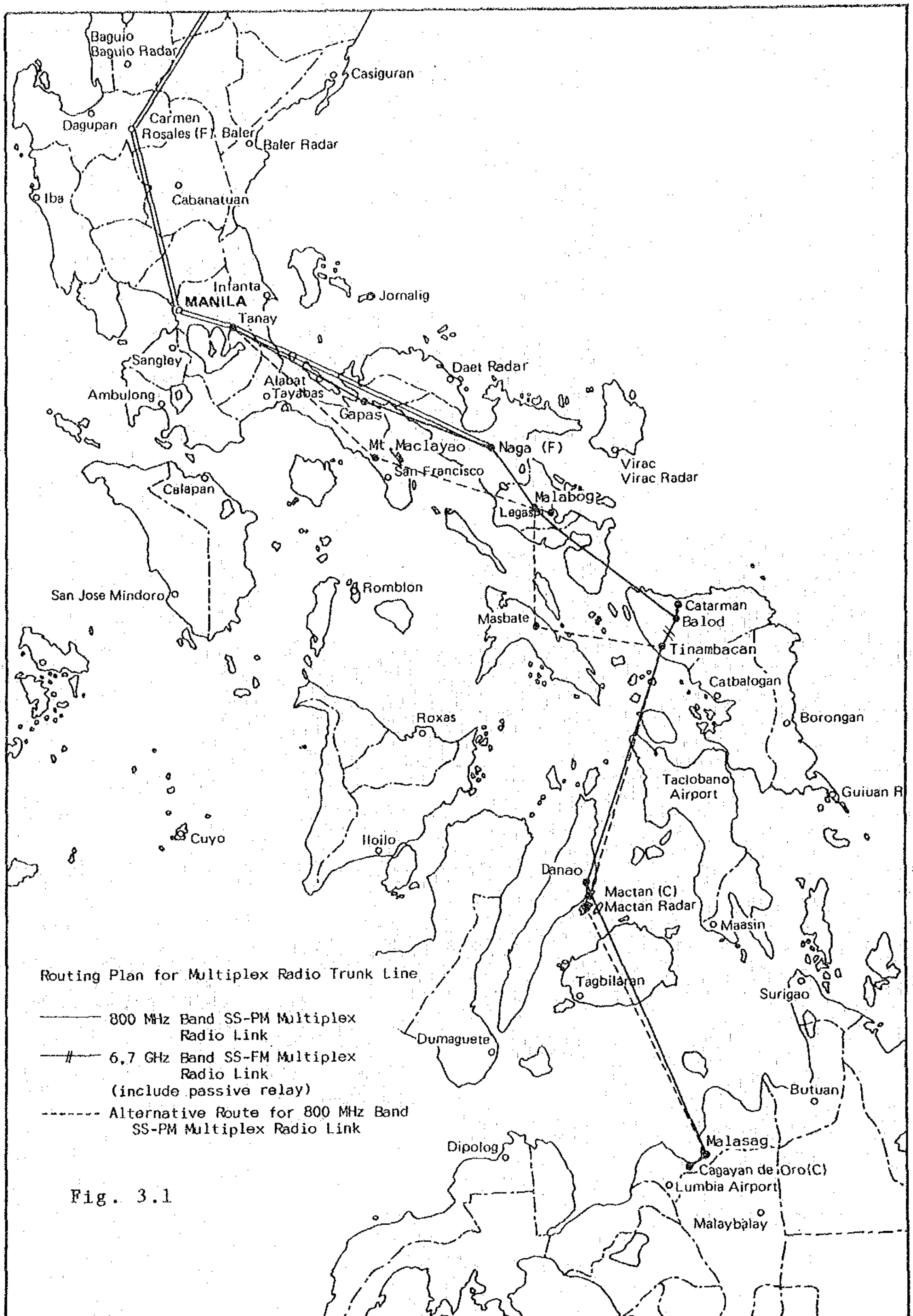

Baguio
Baguio Radar
Casiguran
Dagupan
Carmen
Rosales (F)
Baler
Baler Radar
Iba
Cabanatuan
Infanta
MANILA
Jomalig
Tanay
Sangley
Daet Radar
Alabat
Tayabas
Ambulong
Gapas
Mt. Maclayao
Naga (F)
Virac
Virac Radar
San Francisco
Calapan
Malabog
Legaspi
Romblon
San Jose Mindoro
Catarman
Balod
Masbate
Tinambacan
Catbalogan
Roxas
Borongan
Tacloban
Airport
Guiuan R
Cuyo
Iloilo
Danao
Mactan (C)
Mactan Radar
Maasin
Routing Plan for Multiplex Radio Trunk Line
Tagbilaran
Surigao
800 MHz Band SS-PM Multiplex Radio Link
6.7 GHz Band SS-FM Multiplex Radio Link (include passive relay)
Alternative Route for 800 MHz Band SS-PM Multiplex Radio Link
Dumaguete
Butuan
Malasag
Dipolog
Cagayan de Oro(C)
Lumbia Airport
Malaybalay

Fig. 3.1

Fig.3.2

Systematic Diagram of Propagation Test (OH)

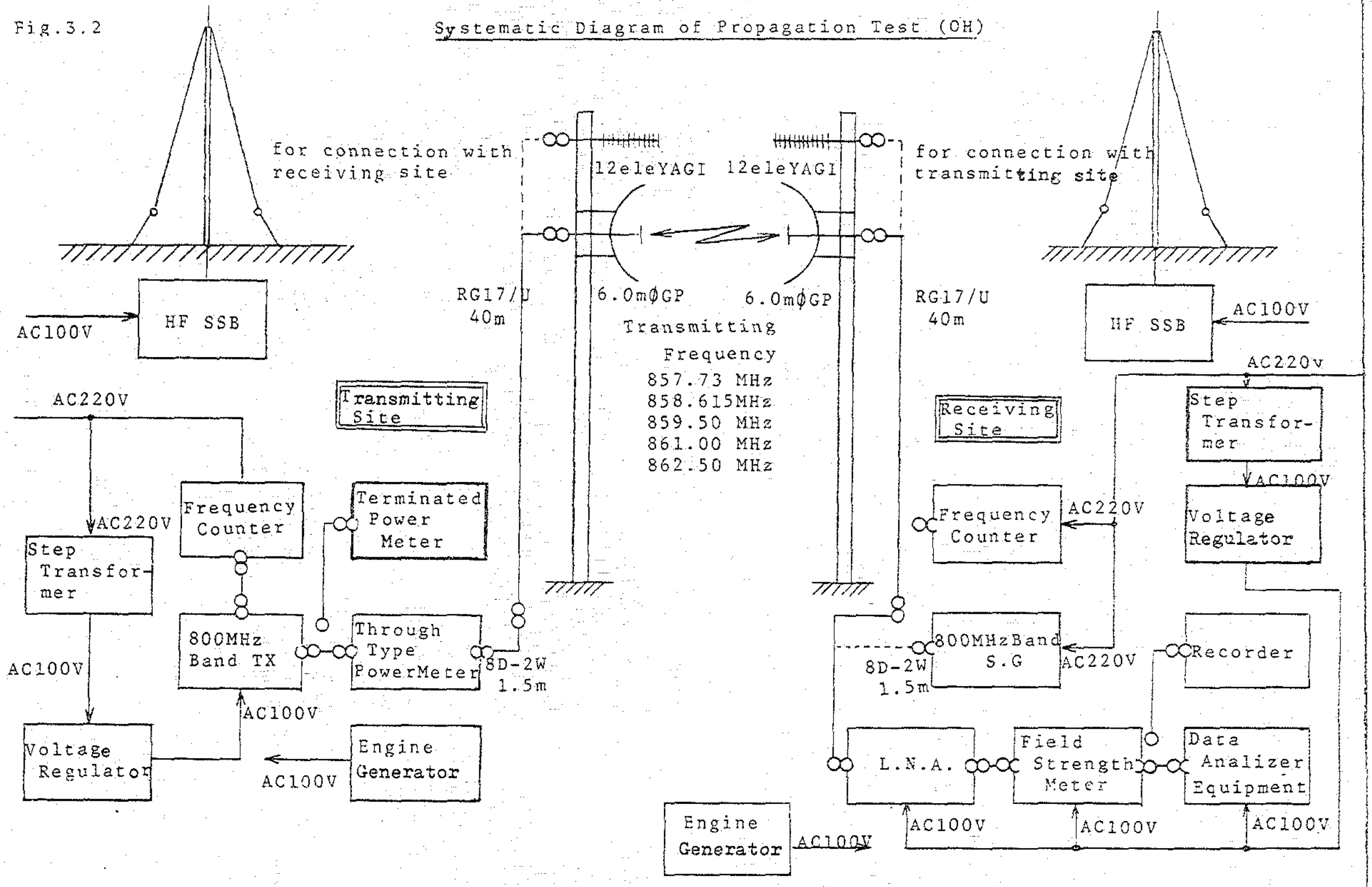


Fig.3.3

Figure of OH Propagation Test

Transmitting Site

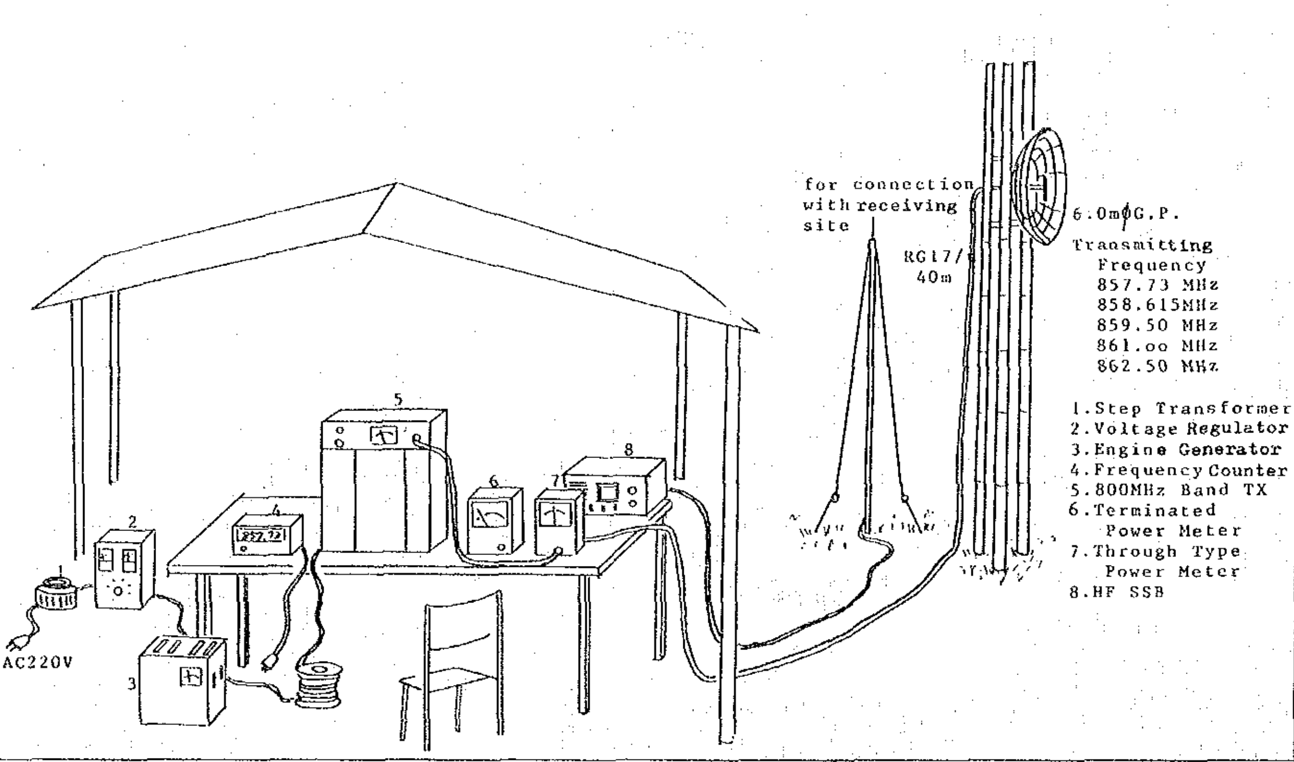
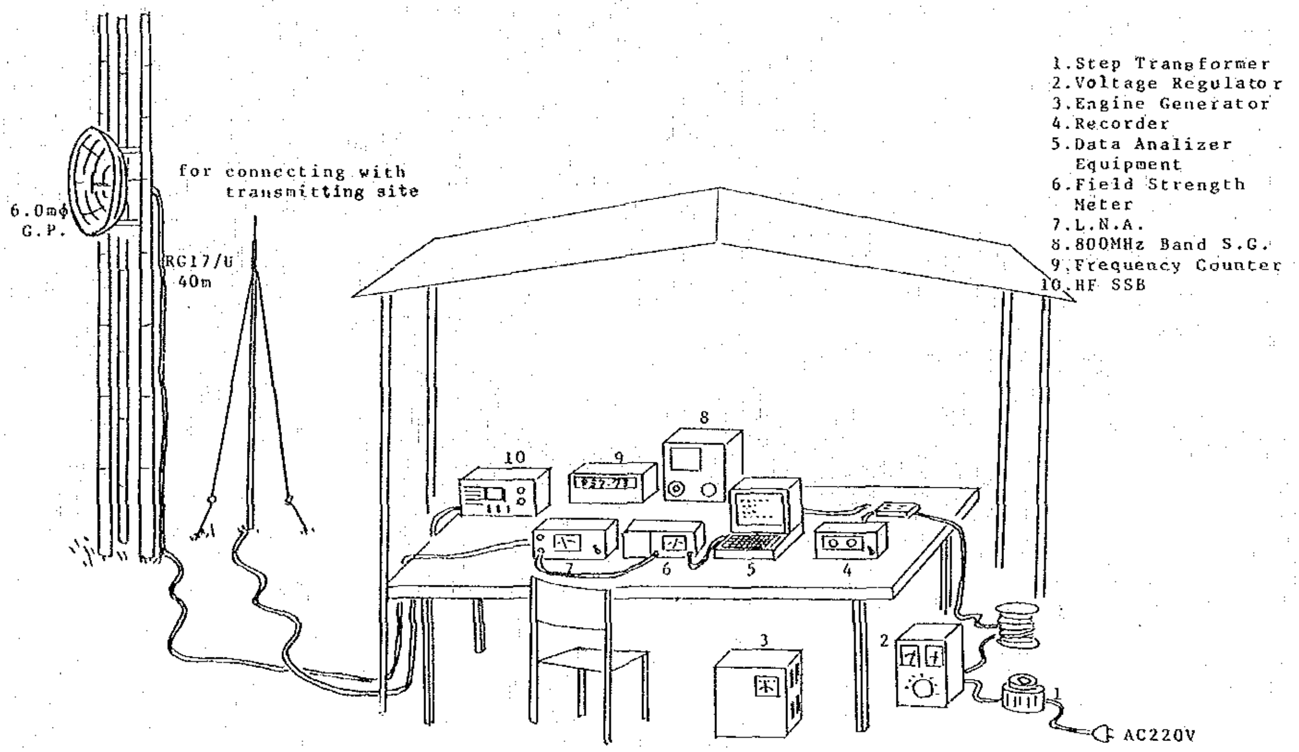


Fig.3.4

Receiving Site



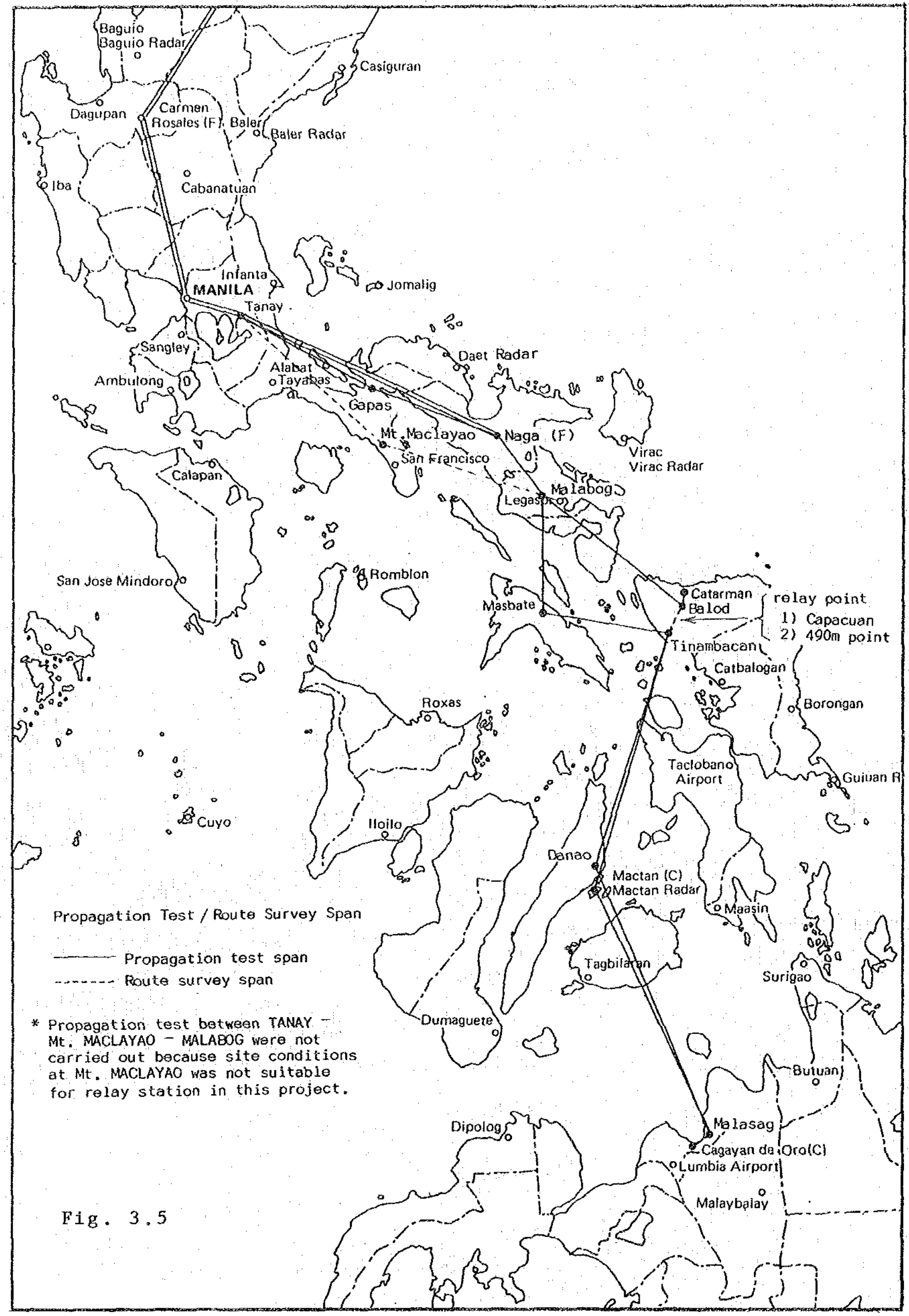

Baguio
Baguio Radar
Casiguran
Dagupan
Carmen
Rosales (F)
Baler
Baler Radar
Iba
Cabanatuan
Infanta
MANILA
Jomalig
Tanay
Sangley
Daet Radar
Alabat
Ambulong
Tayabas
Gapas
Mt. Maclayao
Naga (F)
San Francisco
Virac
Virac Radar
Calapan
Malabog
Legaspi
Romblon
San Jose Mindoro
Catarman
Balod
relay point
1) Capacuan
2) 490m point
Masbate
Tinambacan
Catbalogan
Roxas
Borongan
Tacloban Airport
Guiuan R
Cuyo
Iloilo
Danao
Mactan (C)
Mactan Radar
Maasin
Propagation Test / Route Survey Span
Propagation test span
Route survey span
Tagbilaran
Surigao
* Propagation test between TANAY - Mt. MACLAYAO - MALABOG were not carried out because site conditions at Mt. MACLAYAO was not suitable for relay station in this project.
Dumaguete
Butuan
Dipolog
Malasag
Cagayan de Oro(C)
Lumbia Airport
Malaybalay

Fig. 3.5

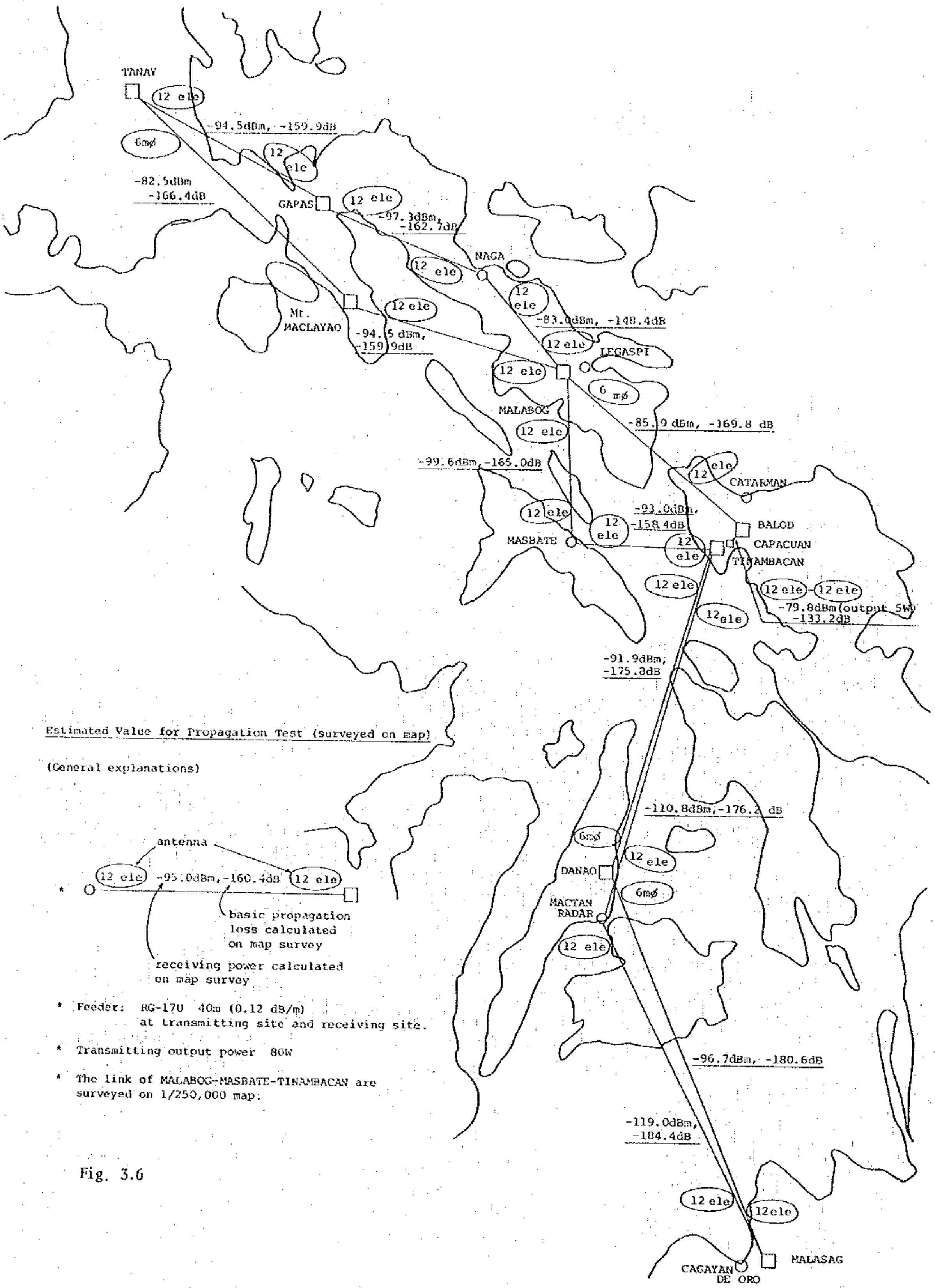

TANAY
12 ele
6mø
-94.5dBm, -159.9dB
-82.5dBm
-166.4dB
GAPAS
12 ele
-97.3dBm,
-162.7dB
NAGA
Mt.
MACLAYAO
-94.5 dBm,
-159.9dB
-83.0dBm, -148.4dB
LEGASPI
6 mø
MALABOG
-85.9 dBm, -169.8 dB
-99.6dBm, -165.0dB
CATARMAN
-93.0dBm,
-158.4dB
BALOD
CAPACUAN
MASBATE
TINAMBACAN
-79.8dBm(output 5W)
-133.2dB
-91.9dBm,
-175.8dB
Estimated Value for Propagation Test (surveyed on map)
(General explanations)
antenna
-95.0dBm, -160.4dB
basic propagation loss calculated on map survey
receiving power calculated on map survey
* Feeder: RG-17U 40m (0.12 dB/m) at transmitting site and receiving site.
* Transmitting output power 80W
* The link of MALABOG-MASBATE-TINAMBACAN are surveyed on 1/250,000 map.
-110.8dBm, -176.2 dB
DANAO
MACTAN
RADAR
-96.7dBm, -180.6dB
-119.0dBm,
-184.4dB
CAGAYAN
DE ORO
MALASAG

Fig. 3.6

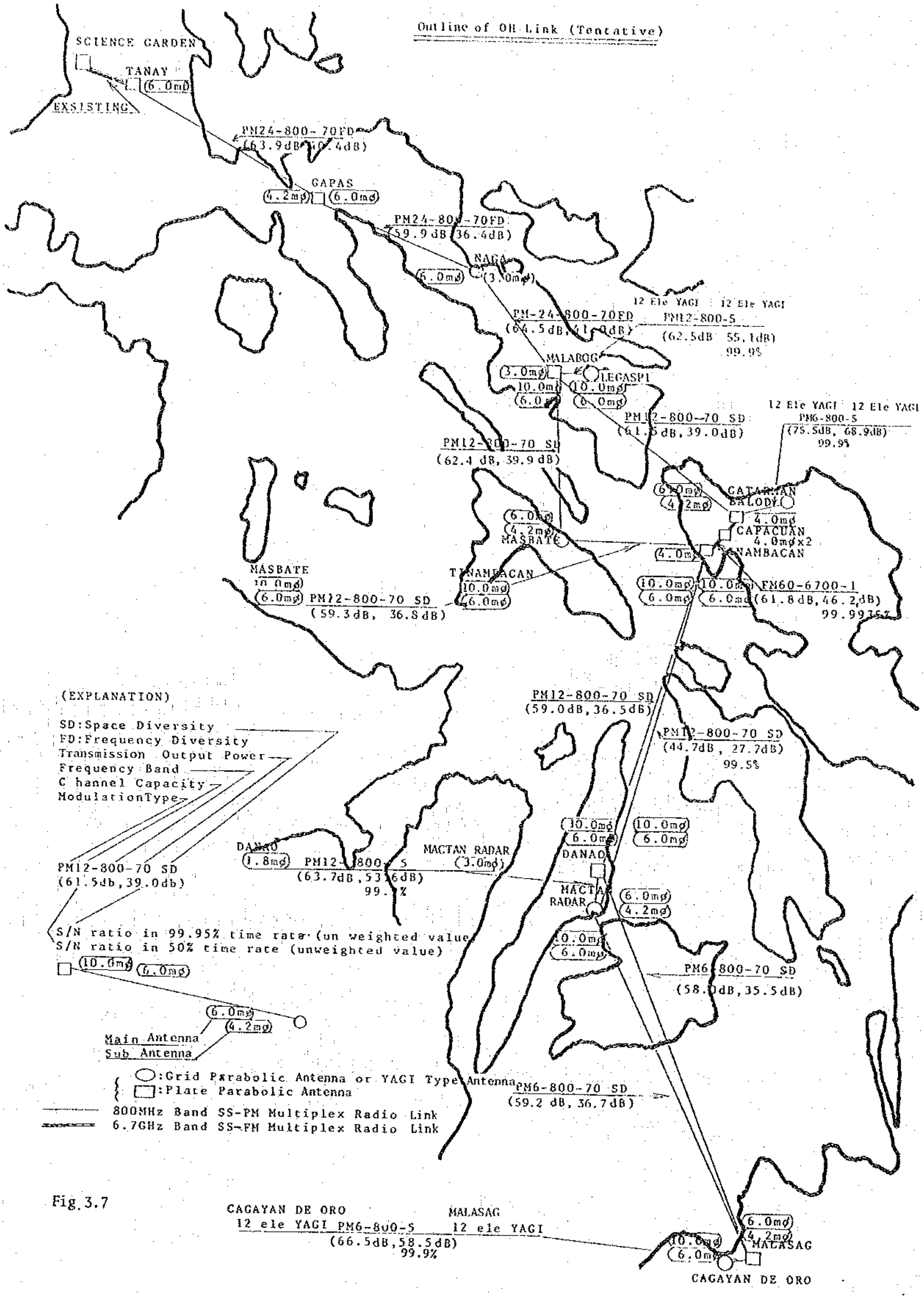

Outline of OH Link (Tentative)
SCIENCE GARDEN
TANAY
6.0mø
EXSISTING
PM24-800-70FD
(63.9dB, 40.4dB)
GAPAS
4.2mø
6.0mø
PM24-800-70FD
(59.9dB, 36.4dB)
NAGA
6.0mø
3.0mø
12 Ele YAGI
12 Ele YAGI
PM-24-800-70FD
(64.5dB, 41.0dB)
PM12-800-5
(62.5dB 55.1dB)
99.9%
MALABOG
LEGASPI
3.0mø
10.0mø
6.0mø
10.0mø
6.0mø
PM12-800-70 SD
(61.5dB, 39.0dB)
12 Ele YAGI
12 Ele YAGI
PM6-800-5
(75.5dB, 68.9dB)
99.9%
PM12-800-70 SD
(62.4 dB, 39.9 dB)
6.0mø
4.2mø
CATARMAN
SALOD
4.0mø
CAPACUAN
4.0mø×2
NAMBACAN
6.0mø
4.2mø
MASBATE
4.0mø
MASBATE
10.0mø
6.0mø
PM12-800-70 SD
(59.3dB, 36.8dB)
TINAMBACAN
10.0mø
6.0mø
10.0mø
6.0mø
10.0mø
6.0mø
PM60-6700-1
(61.8dB, 46.2dB)
99.995%
(EXPLANATION)
SD:Space Diversity
FD:Frequency Diversity
Transmission Output Power
Frequency Band
Channel Capacity
ModulationType
PM12-800-70 SD
(61.5db, 39.0db)
S/N ratio in 99.95% time rate (un weighted value)
S/N ratio in 50% time rate (unweighted value)
10.0mø
6.0mø
6.0mø
4.2mø
Main Antenna
Sub Antenna
◯:Grid Parabolic Antenna or YAGI Type Antenna
□:Plate Parabolic Antenna
800MHz Band SS-PM Multiplex Radio Link
6.7GHz Band SS-FM Multiplex Radio Link
PM12-800-70 SD
(59.0dB, 36.5dB)
PM12-800-70 SD
(44.7dB, 27.7dB)
99.5%
10.0mø
6.0mø
10.0mø
6.0mø
DANAO
DANAO
1.8mø
PM12-800-5
(63.7dB, 53.6dB)
99.9%
MACTAN RADAR
3.0mø
MACTAN RADAR
6.0mø
4.2mø
10.0mø
6.0mø
PM6-800-70 SD
(58.0dB, 35.5dB)
PM6-800-70 SD
(59.2 dB, 36.7dB)
CAGAYAN DE ORO
12 ele YAGI PM6-800-5
(66.5dB, 58.5dB)
99.9%
MALASAG
12 ele YAGI
6.0mø
4.2mø
10.0mø
6.0mø
MALASAG
CAGAYAN DE ORO

Fig. 3.7

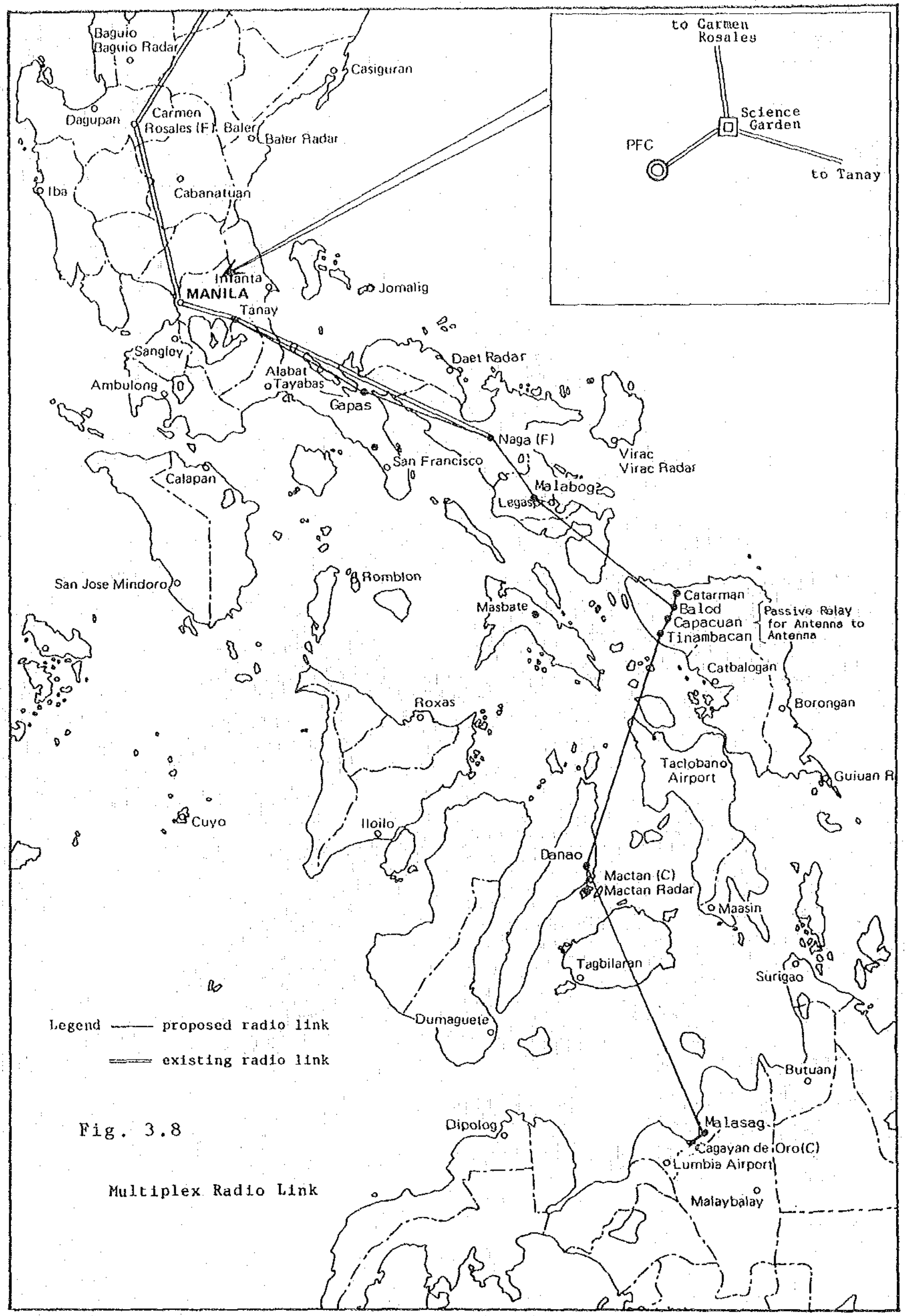


Fig. 3.8

Multiplex Radio Link

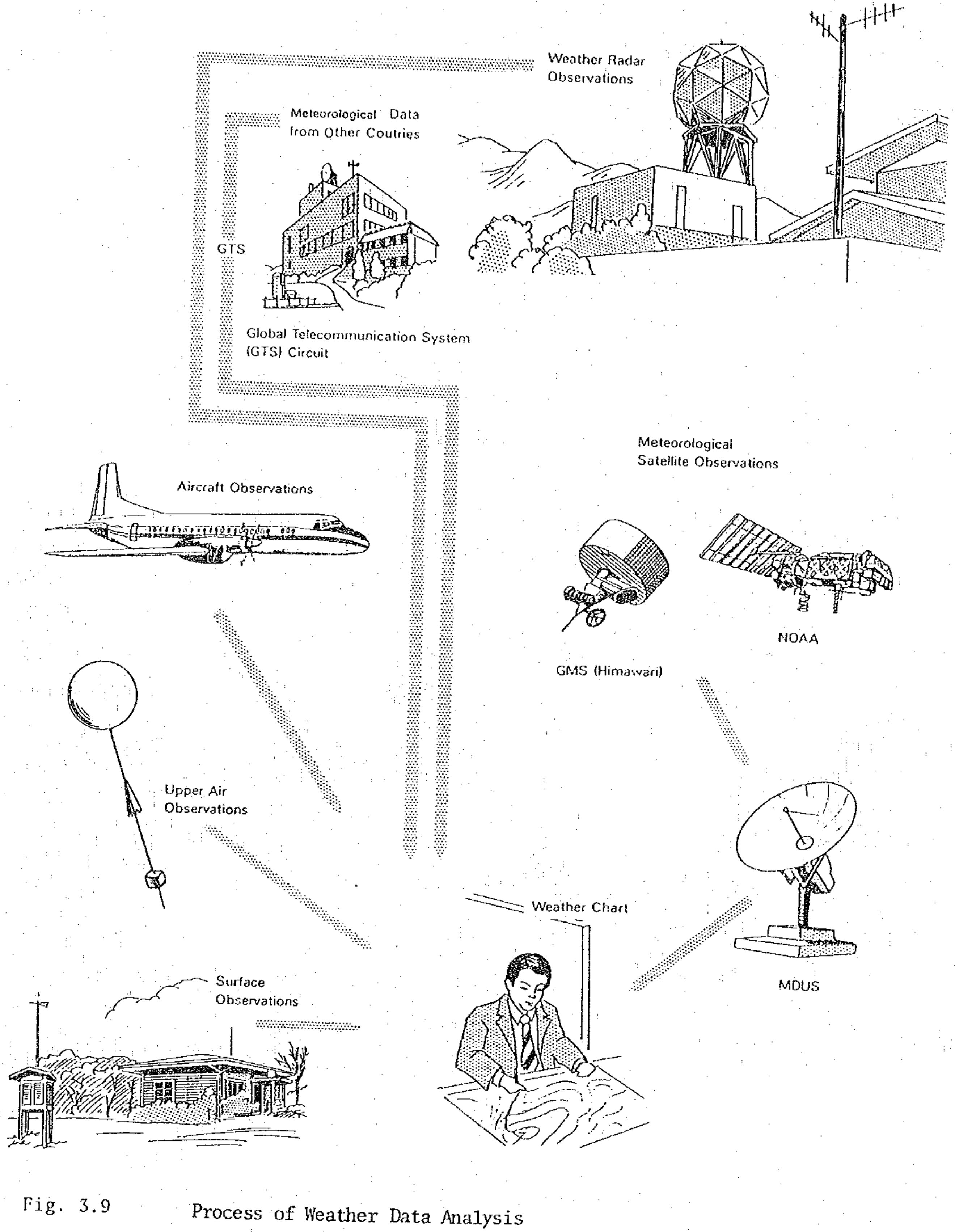


Fig. 3.9 Process of Weather Data Analysis

Fig. 3.10 PAGASA
Dissemination and Information Network

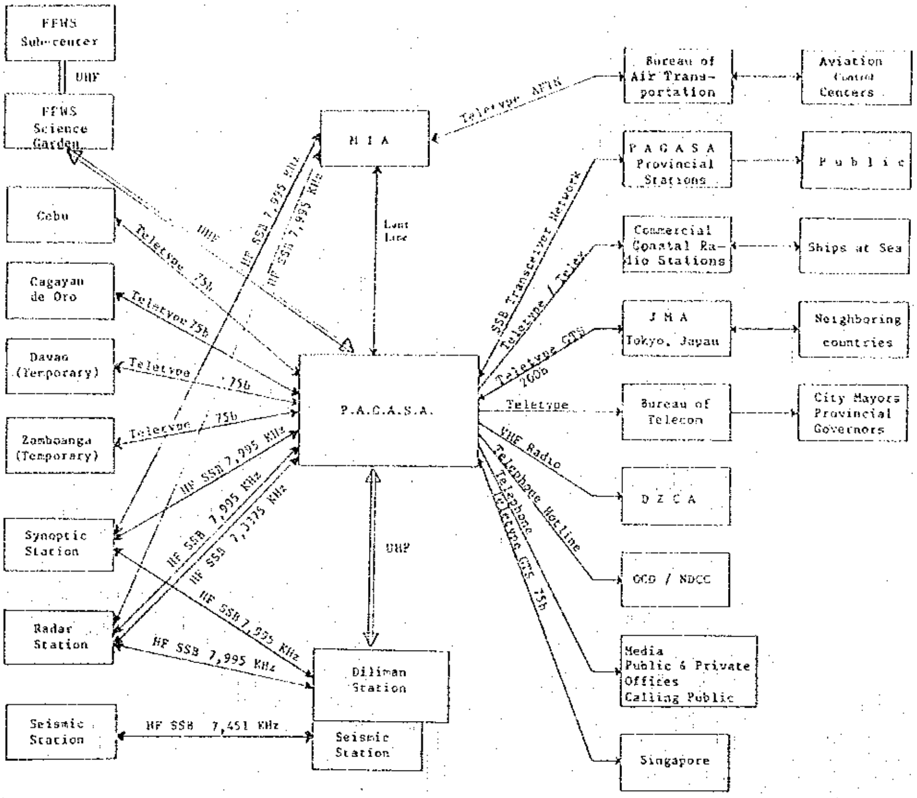


Fig. 3.11 **STORM WARNING SIGNALS**

1 Signal No. 1


One Blast

MEANING: Disturbance existing. Winds of up to 60 kilometers per hour may be expected in the locality within the next 24 to 36 hours. Be on the alert for further developments. Tune in to any of the radio stations for further information.

2 Signal No. 2


Two Blasts

MEANING: Disturbance approaching or affecting the locality. Winds of 60-100 kilometers per hour may be expected within the locality within the next 24 hours. Strengthen houses of light materials. Children are advised to stay indoors. Suspension of classes is optional and upon the advice of higher authorities.

3 Signal No. 3


Three Blasts

MEANING: Disturbance is dangerous to the locality. Winds in excess of 100 kilometers per hour would be expected in the locality within the next 12 to 24 hours. Everybody is advised to stay indoors. Classes are automatically suspended.

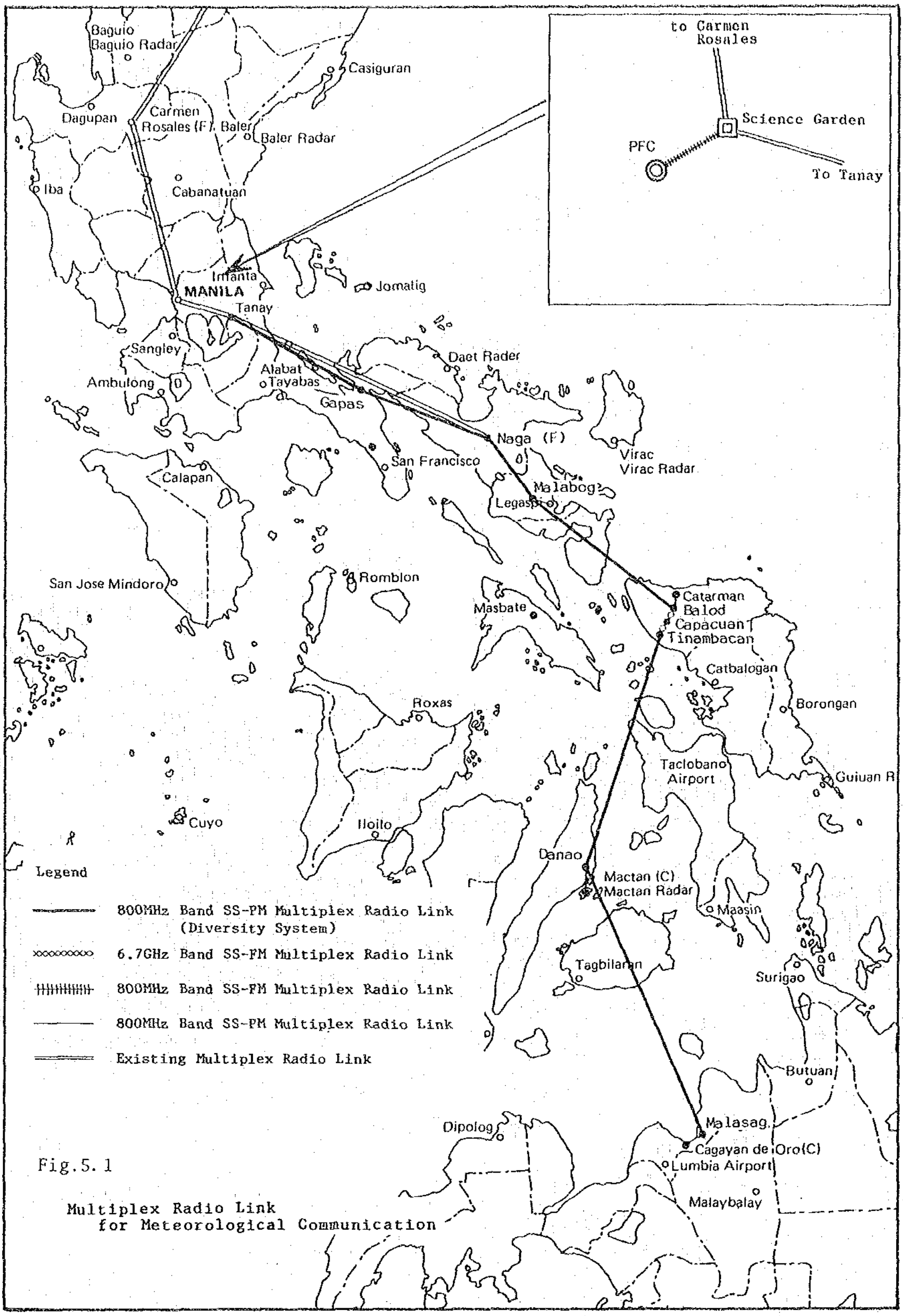


Fig.5.1

Multiplex Radio Link for Meteorological Communication

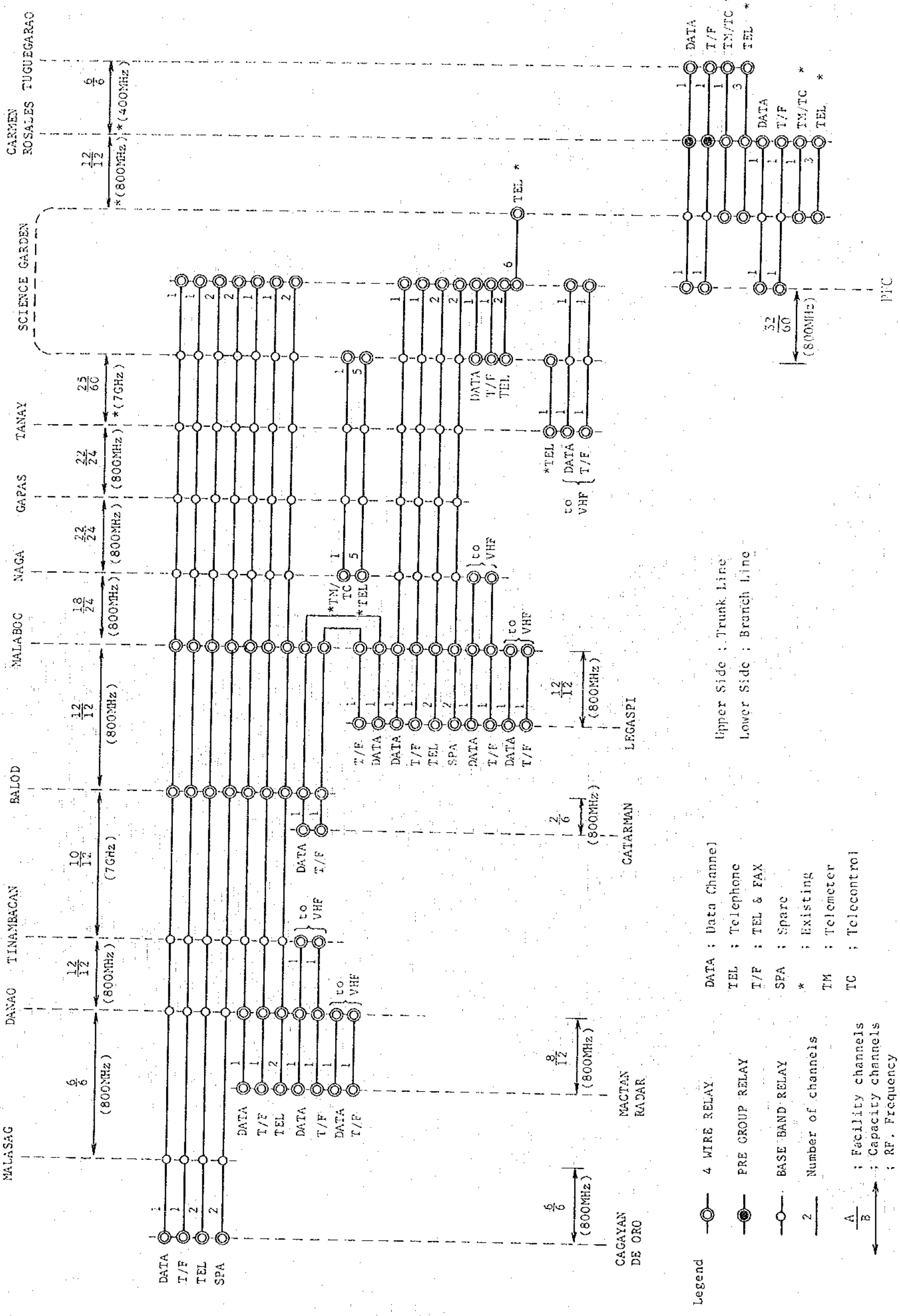
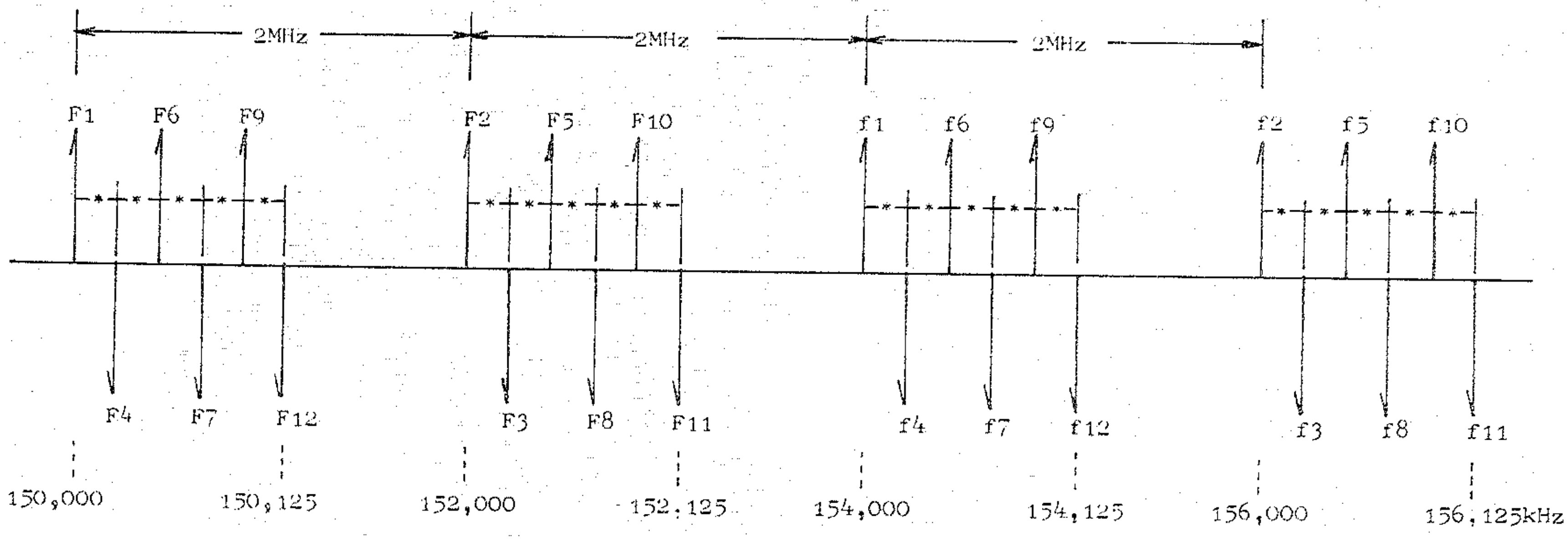


Fig.5.2 Trunking Plan



Note 1. * : 25kHz

Note 2. Frequencies are shown in case of F1 = 150,000kHz.

Note 3. Frequencies should be allocated as follows:

Transmitting : 150,000 to 150,125kHz and 154,000 to 154,125kHz

Receiving : 152,000 to 152.125kHz and 156,000 to 156,125kHz

Note 3. In case of that one VHF radio channel (single channel) is used per link. F1 to F12 are used.

Fig.5.3 Allocation Plan of VHF

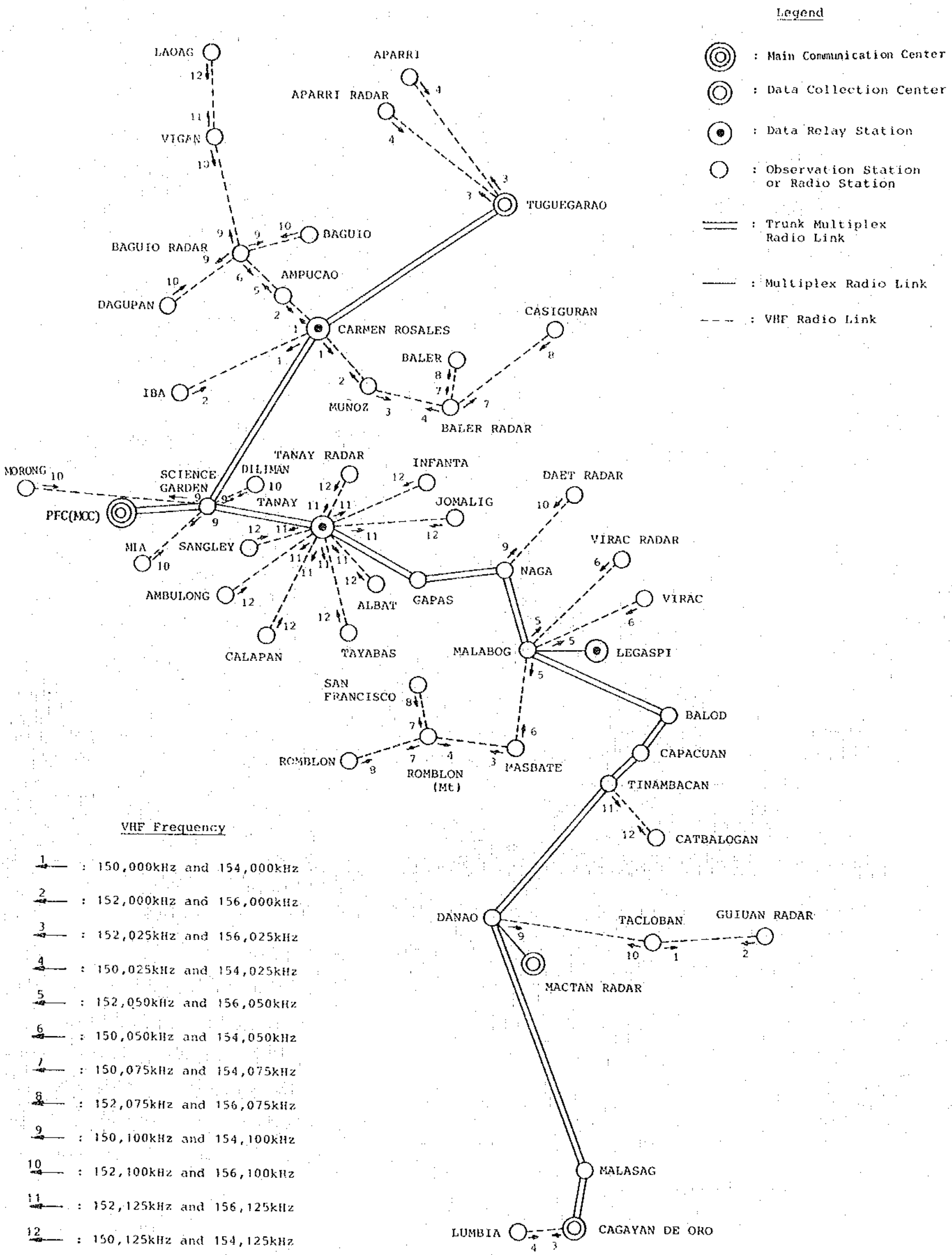
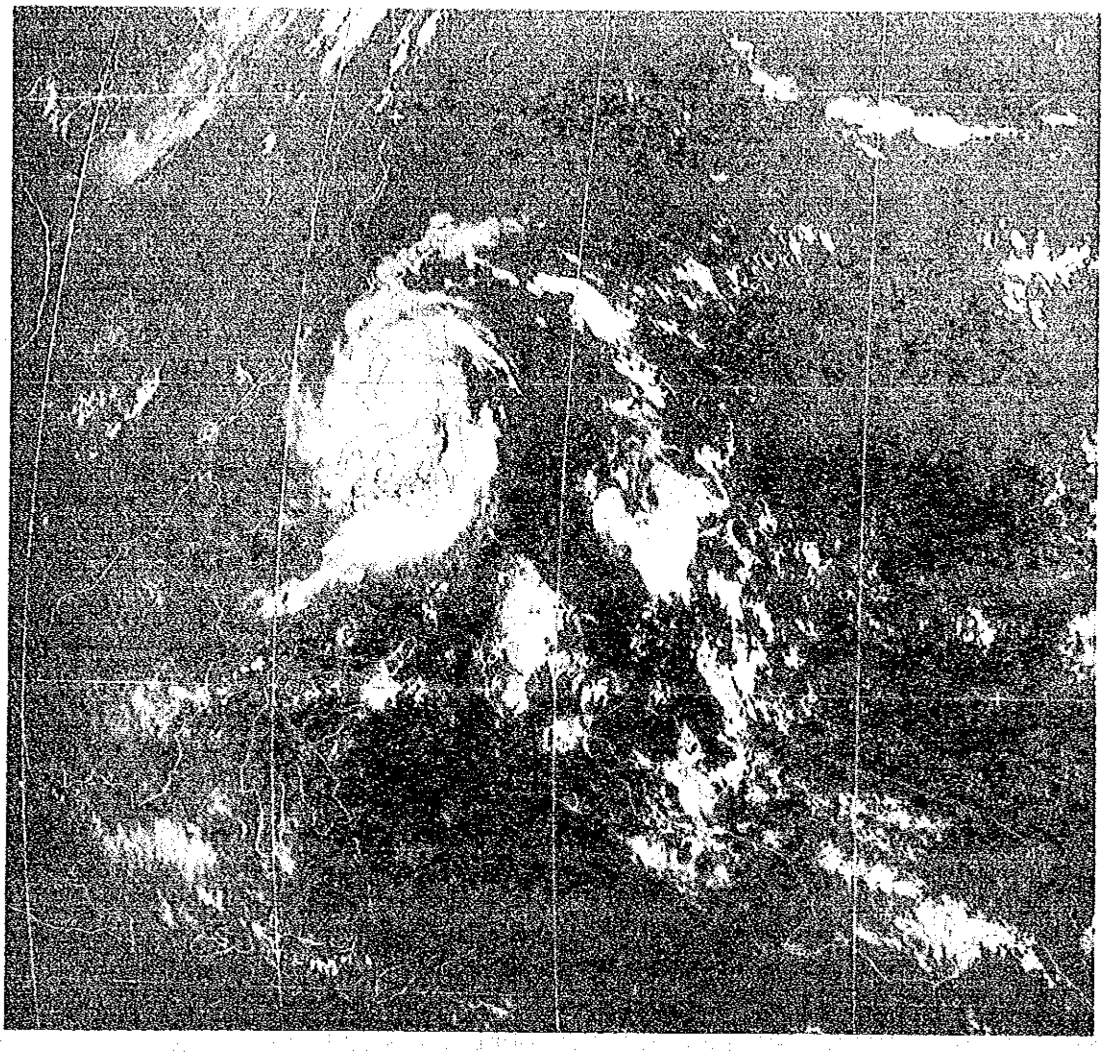


Fig. 5.4 Plan of Frequency Allotment (VHF)



Photograph 1 Photograph of Geostational Meteorological Satellite
Typhoon NITANG (8411), (2nd. Sept. 1984 00Z)

Table

Table 1.1

Member of the JICA Study Team

Name	Organization	Assignment
Dr. Eizo Maruyama	Japan Weather Association	Meteorology. System Plan (General Manager)
Dr. Jutaro Kobayashi	"	Meteorology. System Plan Test Evaluation
Mr. Hideo Kato	"	Meteorology. Propagation Test Evaluation
Mr. Eiichi Kimura	"	Meteorology. Propagation Test Evaluation
Mr. Teruo Kobari	"	Meteorology. System Design Test Evaluation
Mr. Masashi Nakayama	"	Meteorology. Propagation Test Evaluation
Mr. Takefumi Okesha	"	Meteorology. Propagation System Design
Mr. Kazuo Muroi	"	Meteorology. Propagation
Mr. Shusho Yonaha	"	Meteorology. Propagation
Mr. Hiroshi Sasaki	"	Meteorology. Multiplex System Design
Mr. Takashi Saito	"	Meteorology. Multiplex System Design
Mr. Kei Ito	Nippon Koei Co., Ltd.	Meteorology. Facilities
Mr. Ken Yamada	"	Meteorology. Facilities
Mr. Kimihiko Yanagizawa	"	Project Evaluation

Table 1.2

Main Staff of PAGASA

Name	Assignment
Dr. Roman L. Kintanar	Administrator
Mr. Juanito F. Lirios	Director of National Weather Office
Mr. Ernesto V. Calpo	Director of National Geophysical and Astronomical Office
Mr. Manuel C. Bonjoc	Director of National Institute of Climatology
Mr. Catalino P. Arafiles	Director of National Institute of Atmospheric Sciences
Mr. Cipriano C. Ferraris	Director of National Flood Forecasting Office
Mr. Jesus F. Flores	Director of Typhoon Moderation and Research Office
Mr. Juan F. Asuncion	Asst. Chief of Weather Services, National Weather Office
Mr. Jovencion R. Guevarra	Chief of Financial Management Service
Miss Zenada L. Damasco	Project Coordinator of Special Infrastructure Group
Mr. Vincente M. Tio, Jr.	Chief of Technical Services
Mr. Ruben N. Encarnacion	Chief of Meteorological Communication Division

Table 1.3

Member of the Supervisory Committee

Name	Organization
Mr. Mitsuo Narui (Chairman)	Director Radio Communication Division Forecast Department Japan Meteorological Agency
Mr. Shigesaburo Kaneda	Chief of International Cooperation Office Planning Division Administration Department Japan meteorological Agency
Mr. Takeo Saito	Assistant Director Radio Communication Division Forecast Department Japan Meteorological Agency
Mr. Mamoru Ito	Researcher Radio Communication Division Forecast Department Japan Meteorological Agency
Mr. Mitsuo Igarashi	Technical Officer Radio Communication Division Forecast Department Japan Meteorological Agency

Table.1.4

The Schedule of The Study

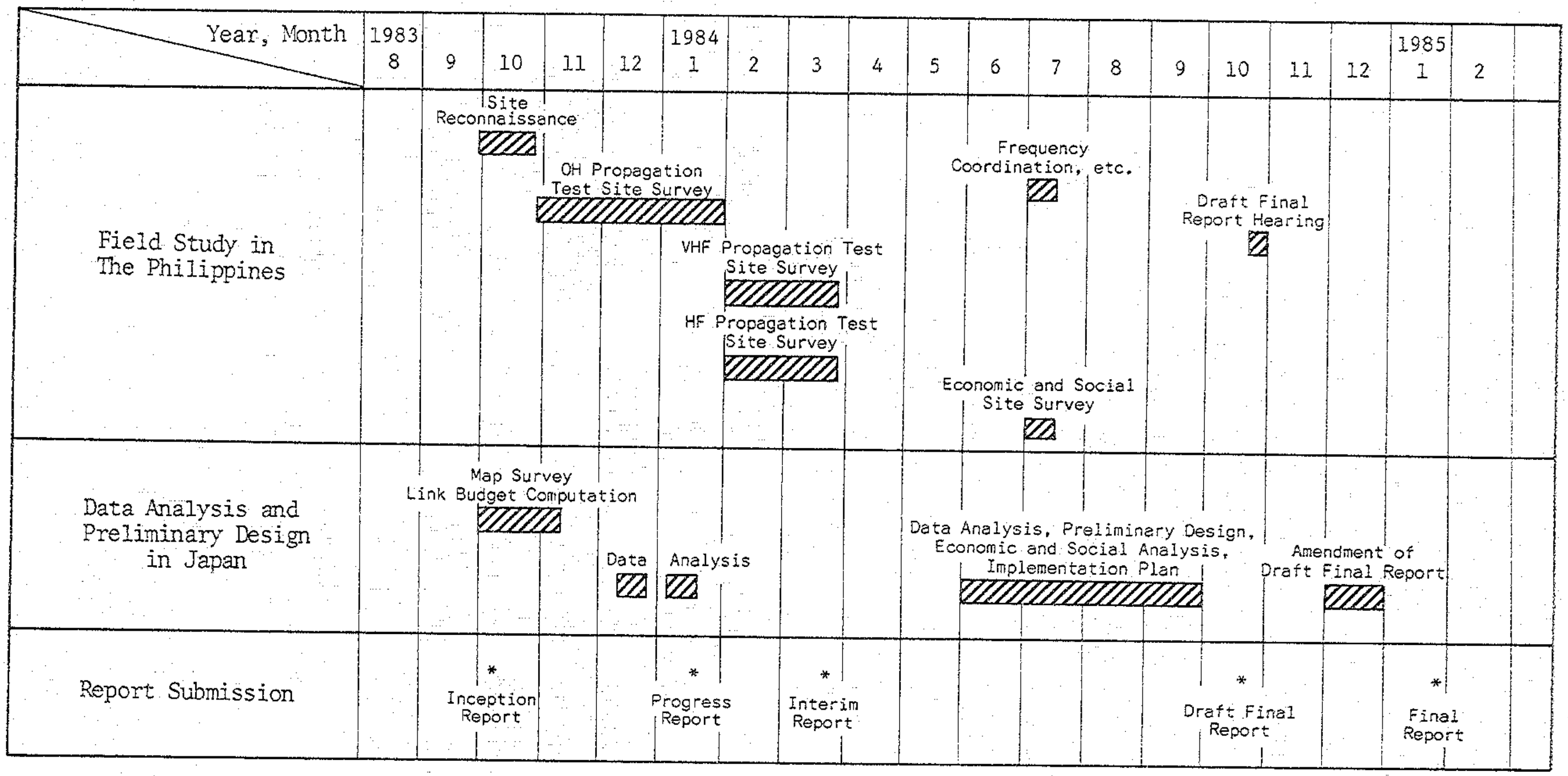


Table 2.1 (1/2) Socio-Economic Data in the Philippines

Population	1970 (10^3)	1975 (10^3)	1980 (10^3)	Growth (1970-80) (%p.a.)	Density (Persons/km^2)
Metropolitan Manila Area	3,967	4,970	5,926	4.1	9,317.4
Region 1	2,991	3,269	3,541	1.7	164.2
Region 2	1,691	1,933	2,215	2.7	60.9
Region 3	3,615	4,210	4,803	2.9	263.4
Region 4	4,457	5,214	6,119	3.2	130.4
Region 5	2,967	3,194	3,477	1.6	197.2
Region 6	3,618	4,146	4,526	2.3	223.8
Region 7	3,033	3,387	3,787	2.2	253.3
Region 8	2,381	2,600	2,799	1.6	130.6
Region 9	1,869	2,048	2,528	3.1	135.3
Region 10	1,953	2,314	2,759	3.5	97.4
Region 11	2,201	2,715	3,347	4.3	105.6
Region 12	1,941	2,070	2,271	1.6	97.5
Philippines	36,684	42,071	48,098	2.7	160.3

Gross Domestic Products	1970	1975	1980	1981	1982	1983
GDP at current price (P10^9)	42.45	114.60	266.01	305.27	340.26	380.82
Composition of GDP (P10^9)						
Agriculture, fisher & forestry	11.78	32.99	61.75	69.35	76.32	n.a.
Industrial sector	12.58	38.69	98.16	111.58	122.24	n.a.
Service sector	18.08	42.91	106.08	123.83	139.95	n.a.
GDP at 1980 price	145.37	196.56	266.01	276.51	285.93	288.93
Average annual growth at 1980 price (%)	6.2	6.2	3.9	3.4	1.0	
Per capita GDP at current price (Peso)	1,157	2,723	5,530	6,163	6,705	7,329 (US$660)
Composition on GDP by Industrial Group						
Agriculture, forestry & fishery (%)	28	28	23	23	23	n.a.
Industrial sector (%)	30	34	37	37	36	n.a.
Service sector	44	38	40	40	41	n.a.

Table 2.1 (2/2) Socio-Economic Data in the Philippines

	1970	1975	1980	1981	1982	1983
International Trade						
Composition of value of exports(%)						
Traditional exports	75	71	46	40	37	n.a.
Non-traditional exports	25	29	54	60	63	n.a.
Composition of value of imports(%)						
Consumer goods	11	16	18	20	22	n.a.
Capital goods	42	33	26	24	23	n.a.
Intermediate goods	47	51	56	56	55	n.a.
Foreign Reserves						
(10^6 US$ at end of year)	195	1,314	2,846	2,199	1,720	786
Exchange Rate						
(P/U.S.$, Period Average)	5.9	7.2	7.5	7.9	8.5	11.1
Balance of Payments (US$$10^6$)						
Exports	1,142	2,294	5,788	5,722	4,995	n.a.
Imports	1,159	3,459	7,727	7,946	7,800	n.a.
Overall balance	23	-521	-381	-560	-1,135	n.a.
Labor Force Employment						
Unemployed rate (%)						
Total employed (10^3 persons)	11,775	14,517	14,238	14,334	16,118	n.a.
Agriculture, forestry and fishery (%)	54	54	54	52	52	n.a.
Industrial sector (%)	16	15	15	14	14	n.a.
Service sector (%)	30	31	31	34	34	n.a.
Price Indices						
Wholesale price (1980=100)	22.9	57.8	100.0	113.1	125.2	142.4
Consumer price (1980=100)	27.8	57.9	100.0	113.3	125.7	139.4

Source: (1) 1983 Philippine Statistical Yearbook (NEDA)

(2) International Financial Statistics (IMF)

Table 2.2 Data on Agricultural Production

	1970	1975	1980	1981	1982
Composition of agricultural production (value)					
Food crops (%)	59	67	63	63	70
Commercial crops (%)	41	33	37	37	30
Mean yield in metric tons per hectare					
Food crops					
Palay (rice)	1.68	1.59	2.15	2.23	2.36
Corn	0.83	0.84	0.98	0.98	0.98
Commercial crops					
Cocunut	0.92	1.20	1.46	1.46	1.20
Sugarcane	7.09	6.13	7.35	7.59	7.23
Gross value added in agricultural crops (₱10⁶ at current price)					
Palay	1,938	5,616	9,078	10,901	12,335
Corn	599	2,041	3,481	4,288	4,993
Coconut including copra	1,003	2,808	3,036	3,066	2,840
Sugarcane	730	2,601	2,699	3,182	3,675
Banana	715	1,896	4,845	5,141	5,370
Other crops	1,512	5,604	13,189	13,776	15,193
Agricultural crops	6,497	20.566	36,328	40,354	44,406

Source: 1983 Philippine Statistical Yearbook

Table 2.3 GDP of Industrial Sector

Industrial sector (at current price P10^6)	1970	1975	1980	1981	1982
Mining and quarring	1,181	2,000	8,095	6,849	5,443
Manufacturing	9,574	28,544	65,993	75,151	83,126
Construction	1,515	7,060	21,331	26,238	29,658
Electricity, gas and water	311	1,088	2,763	3,344	4,015
Total	12,581	38,692	98,162	111,582	122,242

Table 2.4 GDP Composition of Selected Manufacturing by Industry Group

Industry group (at current price P10^6)	1970	1975	1980	1981	1982
Foods	2,660	7,231	20,026	23,694	27,189
Petroleum and coal	738	3,526	9,535	10,651	11,617
Chemical	813	3,530	5,918	5,983	5,992
Textile	553	1,687	4,622	5,161	5,261
Others	4,810	12,570	25,832	29,662	33,067
Total	9,574	28,544	65,933	75,151	83,126

Source: 1983 Philippine Statistical Yearbook

Table 2.5 Telecommunication Facilities for Public Service (1982)

	Telecommunication facilities			Broadcasting stations	
	Telephone	Telegraph	Telex	Radio	TV
Philippines	219	2,153	122	326	22
Manila area	19	158	39	35	5
Region I	22	161	10	38	0
" II	9	122	5	13	0
" III	41	192	14	22	1
" IV	41	276	7	18	0
" V	16	159	6	25	1
" VI	14	197	11	35	4
" VII	9	204	8	29	4
" VIII	9	181	6	15	0
" IX	6	103	3	16	2
" X	10	162	6	28	1
" XI	19	136	4	23	3
" XII	4	102	3	19	1

Table 2.6 Number of Licensed Radio Stations by Type from 1975 to 1982

	1975	1976	1977	1978	1979	1980	1981	1982
Television stations	27	27	25	30	31	32	43	52
Coastal stations	203	153	143	166	171	241	162	244
Aircraft "	820	820	829	830	515	729	590	702
Land base radio stations	679	679	708	722	650	867	1,295	1,920
Ship stations	n.a.	n.a.	2,729	1,750	1,076	1,628	1,930	2,934

Source; 1983 Philippine Statistical Yearbook

Table 2.7 Projected Regional Per Capita Output (1978-1987)

Unit: ₱x10³

	1978	1979	1980	1981	1982	1987	Annual increase rate for 1978-1987 (%)
Luzon	2,108	2,193	2,279	2,391	2,495	3,148	4.6
Visayas	1,569	1,663	1,751	1,841	1,938	2,523	5.4
Eastern Visayas	990	1,052	1,115	1,185	1,282	1,764	6.6
Mindanao	1,333	1,394	1,463	1,533	1,629	2,115	5.3
Philippines	1,804	1,885	1,967	2,064	2,163	2,756	4.8

Source: Five-year Philippine Development Plan, 1978 - 1982, Regional Development Framework, NEDA, Nov., 1977.

Table 2.8

Mean Monthly and Annual Frequency of Tropical Cyclones in the Philippines (1944 - 1983)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1944	1						1		1	2			5
45							2	1	2				5
46				1	1	1			2	1	1		7
47						1			1	1	2	1	6
48							2		3	1		2	8
49	1						1		1	2	1	2	8
50									1	1	1	1	4
51					1		1	2	2		1	1	8
52						1	2	1	1	3	2	1	11
53		1				2		1	1	1	1		7
54			1		1			1		1	4	1	9
55	1							1	1		1		4
56			1	1			1	1	2	2	2	1	11
57	1			2			1		3		1		8
58				1					2	1			4
59			1							1	1	1	4
60				1	1	2				2		1	7
61					2		1		1	1		1	6
62		1			2		1	1	2	1	2		10
63						2	1	1	1	1		2	8
64						1	2	2	5	3	4		17
65	1		1	1	1	2	2	2					10
66				1	1		2	1		1	2	1	9
67		1	1	1		1		1		1	2		8
68						1	2	1	1				5
69				1			2	1		1			5
70		1				1	1	1	1	4	2		11
71				1	1	1	5		1	3			12
72	1					1	1		3		1		7
73						1	1	2	2	2	2		10
74						1	1	1		4	2	2	11
75	1								1	1	1	1	5
76					1	1	1	2	1		1	1	8
77						3		1	4		1	1	10
78					1	1		1	3	3			9
79	1			1	1		1		1	1	2	1	9
80					2	1	2		1	1	1		8
81						2	1		1	2	1		7
82			2		1		1	1	2	1		1	9
83							1	2	1	2	2		8
Total	8	4	7	12	17	27	40	29	55	50	45	24	318
Frequency (%)	3	1	2	4	5	8	13	9	17	16	14	8	100

Table 2.9

Mean Monthly and Annual Rainfall for Stations (mm) in the Philippines (1951 - 1970)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
LUZON													
Ambulong	26.4	15.2	15.4	33.6	139.3	220.1	241.4	287.8	268.5	206.8	156.6	95.5	1706.4
Aparri	148.3	88.8	39.7	38.9	86.3	183.3	201.8	259.3	306.9	331.6	409.0	224.0	2317.9
Baguio	11.0	11.3	38.7	104.8	288.4	476.3	576.8	817.5	670.9	254.7	142.5	26.6	3422.2
Laoag	4.2	0.8	2.5	13.7	122.2	436.0	404.3	565.8	389.6	65.6	50.0	11.9	2067.2
Vigan	0.9	1.7	7.1	21.9	127.8	420.1	474.3	704.3	407.0	79.3	40.5	10.8	2295.7
Dagupan	4.0	8.3	22.2	86.5	211.5	346.5	433.9	541.6	370.3	140.6	64.9	17.2	2247.7
Basco	177.0	141.3	119.7	94.2	119.1	290.4	245.7	354.0	393.0	264.3	335.6	283.9	2818.2
Tuguegarao	20.4	18.8	37.4	54.3	103.6	192.8	211.5	248.9	220.4	226.3	280.1	105.4	1700.3
Cabanatuan	4.9	6.3	12.0	38.0	148.0	267.6	272.4	394.2	317.9	149.5	130.6	39.1	1780.5
Iba	2.6	1.6	10.8	38.0	261.0	602.9	717.1	939.1	733.6	163.7	75.0	28.6	3674.0
Legaspi	301.6	176.2	207.6	172.7	182.2	205.4	229.8	282.9	247.3	307.3	478.3	466.3	3257.6
Daet	361.8	191.7	165.2	131.7	137.2	163.9	206.1	275.7	270.3	494.7	614.1	537.6	3550.0
Baler	181.2	151.7	193.4	236.6	311.7	247.7	230.7	262.0	259.3	362.1	467.7	303.4	3207.5
Casiguran	230.8	180.5	198.6	143.3	239.3	226.5	239.3	266.8	265.0	351.7	637.5	457.3	3436.6
Manila	15.5	4.9	4.3	16.8	104.5	255.6	306.2	420.4	348.7	172.7	120.5	57.8	1827.9
Infanta	379.4	241.6	183.5	192.0	199.3	216.7	236.6	227.7	297.3	503.5	572.8	537.4	3787.8
Virac	232.0	138.3	119.2	131.6	188.1	183.1	214.0	203.1	226.8	374.2	484.4	430.7	2925.5
Average of Luzon	123.6	81.1	81.1	91.1	174.7	290.3	320.1	414.7	352.5	267.5	295.0	213.7	2705.4
VISAYAS													
Calapan	113.6	60.0	54.9	85.9	172.8	201.3	205.9	222.7	180.4	272.3	247.8	207.0	2024.6
Coron	27.1	6.7	4.6	18.8	180.2	380.3	489.8	562.3	456.1	276.0	177.9	103.2	2683.0
Pto. Princesa	58.9	33.0	40.9	53.9	168.2	197.9	220.7	194.8	240.5	267.2	274.6	235.7	1985.5
Cuyo	18.4	3.6	7.4	37.6	177.1	388.9	465.4	423.3	361.0	276.5	151.8	53.4	2364.4
Masbate	170.9	74.9	64.3	42.5	105.6	141.4	179.5	205.2	181.2	224.8	239.1	227.9	1857.3
Roxas	107.4	52.7	54.7	43.5	167.1	277.6	280.6	249.3	234.6	354.1	239.4	176.8	2237.8
Iloilo	42.0	20.0	33.7	38.6	137.7	258.7	280.1	332.8	242.6	212.9	184.0	95.4	1878.5
Cebu	100.2	70.3	53.9	58.2	114.8	178.1	208.7	189.5	178.1	191.1	161.9	133.3	1638.1
Mactan	110.5	80.6	33.0	28.6	66.2	139.2	184.4	143.7	216.8	138.6	133.0	150.8	1425.4
Dumaguete	81.3	52.0	66.8	40.6	82.6	134.8	157.9	111.5	112.8	163.2	176.4	126.4	1306.3
Borongan	605.9	414.7	306.5	265.2	332.5	220.5	210.9	209.2	190.7	305.3	512.7	670.5	4244.4
Guiuan Radar	237.8	291.4	149.9	175.9	120.0	300.9	178.2	132.3	208.7	162.9	310.8	362.7	2631.5
Tacloban	246.5	201.2	131.1	115.5	149.4	137.5	151.6	128.9	135.8	172.4	243.0	288.0	2000.7
Catarman	394.1	226.5	205.6	161.3	156.7	155.4	202.9	177.6	195.4	421.6	548.3	490.0	3346.4
Catabalogan	214.7	133.4	125.2	107.4	192.1	178.4	235.9	263.7	238.1	323.2	335.7	324.6	2672.3
Average of Visayas	165.6	114.1	88.8	84.9	154.9	219.4	243.5	236.5	231.5	250.8	262.4	243.0	2295.4
MINDANAO													
Zamboanga	48.8	29.1	43.5	58.5	94.7	142.9	122.7	147.3	144.0	177.7	118.9	84.5	1212.6
Dipolog	145.1	74.4	92.2	90.6	222.8	265.1	252.2	234.5	244.9	279.2	322.6	295.1	2518.7
Cagayan de Oro	95.1	71.3	45.6	31.9	118.7	204.3	219.0	207.3	215.6	169.7	127.7	119.5	1625.7
Lumbia	39.7	70.8	6.4	29.0	116.8	253.5	200.4	225.8	159.4	222.6	107.0	98.4	1529.8
Surigao	606.0	479.4	369.4	247.1	188.1	133.8	177.7	155.6	170.7	267.6	411.5	607.3	3814.2
Davao	124.7	109.9	86.0	139.6	226.0	162.2	195.5	153.0	171.5	171.3	149.9	114.7	1804.3
General Santos	65.5	69.5	44.3	51.1	103.3	104.5	101.0	82.0	78.4	85.9	88.2	70.0	943.7
Hinatuan	714.2	542.2	450.6	323.7	285.6	267.9	209.2	193.3	208.8	207.7	337.4	619.7	4360.3
Cotabato	71.3	90.9	95.3	131.8	257.2	251.4	248.9	323.7	238.3	253.6	176.7	98.7	2237.8
Jolo	95.5	89.7	93.2	163.3	249.6	258.0	205.4	146.6	181.8	240.9	202.9	144.6	2071.5
Average of Mindanao	200.6	162.7	124.9	126.7	186.3	204.4	193.2	217.9	181.3	207.6	204.3	225.3	2235.2

Table 2.10

Mean Monthly and Annual Number of Rainy Days for Stations in the Philippines (1951 - 1970)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
LUZON													
Ambulong	6	5	3	4	10	17	20	21	20	16	13	10	145
Aparri	15	11	7	5	8	13	12	15	16	18	20	19	160
Baguio	4	3	5	10	19	23	26	27	25	17	9	5	173
Laoag	2	1	2	2	8	16	19	21	18	7	6	2	98
Vigan	1	1	1	2	8	17	20	22	17	6	5	2	99
Dagupan	2	3	4	7	13	18	22	24	21	11	6	3	129
Basco	20	15	14	11	12	16	17	21	21	20	20	21	207
Cabanatuan	2	2	3	4	12	18	20	24	22	12	10	6	130
Iba	2	2	2	5	12	18	24	25	22	14	7	4	132
Tuguegarao	6	4	5	5	10	13	14	15	15	14	15	11	127
Legaspi	21	17	17	17	14	16	19	20	20	20	21	23	225
Daet	24	18	14	14	13	15	17	19	19	24	24	27	225
Baler	16	16	18	19	19	18	18	19	18	18	18	17	214
Casiguran	18	15	15	15	16	15	17	18	18	18	20	20	203
Manila	4	2	4	4	12	19	23	24	23	17	14	9	148
Infanta	25	20	16	17	16	17	18	19	19	25	24	27	244
Virac	21	16	16	17	16	16	18	16	17	21	22	23	221
Average of Luzon	11	8	9	9	13	17	19	21	19	17	15	12	169
VISAYAS													
Calpan	18	12	10	10	13	17	16	18	16	18	19	21	188
Coron	3	2	2	2	9	19	22	22	21	16	10	7	130
Pto. Princesa	4	3	4	6	12	15	16	17	16	15	13	8	127
Cuyo	4	2	3	3	13	21	23	22	20	18	9	6	137
Masbate	15	11	10	6	8	14	16	17	15	16	16	16	159
Roxas	15	10	9	6	12	17	18	18	17	20	18	17	175
Iloilo	8	6	6	5	12	18	19	20	19	17	15	12	159
Cebu	13	11	11	8	12	16	18	17	16	20	15	16	173
Mactan	11	9	5	4	7	14	14	11	16	14	12	14	131
Dumaguet	14	10	8	6	9	15	16	15	14	17	15	16	155
Borongan	25	22	22	22	20	18	17	15	16	20	22	26	246
Guiuan Radar	21	17	16	18	12	22	16	13	18	18	23	24	218
Tacloban	20	18	17	16	15	16	18	15	16	18	20	22	210
Catarman	22	19	16	16	14	16	17	15	15	20	23	25	216
Catabalogan	18	15	15	15	16	17	19	18	17	20	21	22	213
Average of Visayas	14	11	10	10	12	17	18	16	17	18	17	17	176
MINDANAO													
Zamboanga	7	6	7	8	14	15	15	15	13	14	14	10	140
Dipolog	10	8	7	7	12	14	14	13	12	12	12	10	204
Cagayan de Oro	10	8	7	6	12	18	19	19	18	15	12	12	155
Lumbia	8	6	2	6	7	19	17	14	15	16	8	11	129
Surigao	26	22	22	19	15	13	16	14	14	18	21	26	227
Davao	18	14	12	11	15	19	18	17	17	19	21	21	174
General Santos	10	8	7	7	12	14	14	13	12	12	12	11	132
Hinatuan	25	24	25	22	20	18	18	16	16	17	19	25	245
Cotabato	10	11	10	14	20	19	21	20	19	21	19	14	198
Jolo	9	8	9	11	17	17	17	15	14	17	17	14	165
Average of Mindanao	13	12	11	11	14	17	17	16	15	16	14	15	177

Table 2.11

Mean Monthly and Annual Temperatures for Stations (°C) in the Philippines (1951 - 1979)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
LUZON													
Ambulong	26.0	26.9	27.9	29.2	29.3	28.3	27.6	27.3	27.4	27.4	27.1	26.3	27.5
Aparri	23.3	24.0	25.9	27.6	29.1	29.2	28.8	28.5	27.9	26.9	25.5	24.7	26.7
Baguio	17.8	18.3	19.5	20.3	20.4	19.8	19.4	19.0	19.1	19.4	18.9	18.4	19.2
Laoag	24.4	24.8	26.4	28.0	28.9	28.2	27.7	27.4	27.2	27.2	26.5	25.4	26.8
Vigan	25.5	26.0	27.2	28.4	28.9	27.8	27.3	26.8	26.8	27.3	26.8	26.1	27.1
Dagupan	26.1	26.7	28.3	29.6	29.7	28.8	28.3	27.8	27.9	28.2	27.4	26.7	28.0
Basco	21.9	22.7	24.3	26.2	27.8	28.1	28.3	27.9	27.5	26.4	24.9	23.1	25.8
Tuguegarao	24.5	25.5	27.7	29.5	30.5	29.9	29.1	29.0	28.6	27.5	26.1	24.9	27.7
Cabanatuan	25.9	26.3	27.8	29.3	29.7	28.6	28.1	27.5	27.6	27.6	26.8	26.2	27.6
Iba	25.8	25.9	27.1	28.3	28.6	27.6	27.1	26.7	26.9	27.3	27.1	26.3	27.1
Legaspi	25.5	25.7	26.4	27.3	28.2	28.3	27.8	27.7	27.6	27.2	26.7	26.0	27.0
Daet	25.3	25.6	26.4	27.5	28.5	28.6	28.1	28.1	27.8	27.2	26.8	26.0	27.2
Virac	25.5	26.0	27.2	28.4	28.9	27.8	27.3	26.8	26.8	27.3	26.8	26.1	27.0
Baler	24.6	24.8	25.8	27.1	28.1	28.5	28.3	28.1	28.0	27.1	26.1	25.3	26.8
Casiguran	23.6	23.8	24.9	26.2	27.4	27.8	27.5	27.4	27.2	26.4	25.4	24.5	26.0
Manila	25.9	26.4	27.7	29.1	29.6	28.4	28.0	27.5	27.5	27.8	27.2	26.3	27.6
Infanta	24.6	24.9	25.9	27.2	28.2	28.5	28.1	28.1	27.7	26.9	26.3	25.3	26.8
Average of Luzon	24.5	25.0	26.3	27.6	28.3	27.9	27.5	27.6	27.0	26.8	25.6	25.1	26.6
VISAYAS													
Calapan	25.4	25.6	26.8	28.1	28.4	28.0	27.5	27.4	27.3	27.1	26.6	25.6	26.9
Coron	27.1	27.3	28.1	28.9	28.9	27.7	26.8	26.8	26.9	27.4	27.5	27.3	27.6
Pto. Princesa	26.1	26.3	27.1	28.0	27.9	27.3	27.1	27.2	27.0	26.9	26.7	26.3	27.0
Cuyo	26.9	27.0	27.7	28.8	28.9	28.1	27.6	27.6	27.6	27.7	27.8	27.4	27.8
Masbate	26.3	26.6	27.5	28.7	29.4	29.3	28.5	28.6	28.5	28.3	27.6	26.9	28.0
Roxas	26.7	26.9	27.7	29.0	29.4	29.0	28.5	28.5	28.4	28.2	27.9	27.3	28.1
Iloilo	25.7	25.9	26.8	28.1	28.5	27.9	27.4	27.2	27.2	27.3	26.9	26.2	27.1
Cebu	26.5	26.6	27.3	28.4	28.8	28.1	27.5	27.6	27.6	27.5	27.3	26.8	27.5
Mactan	26.7	26.8	27.6	28.6	29.1	28.6	28.4	28.6	28.1	28.1	28.2	27.2	28.0
Dumaguete	26.7	26.7	27.6	28.6	28.8	28.3	27.8	28.0	28.0	27.8	27.6	27.2	27.8
Borongan	25.9	25.9	26.6	27.4	27.8	27.9	27.7	28.0	28.0	27.4	26.8	26.3	27.1
Guiuan Radar	26.1	26.0	26.7	27.4	28.2	27.7	27.6	28.2	27.8	27.8	27.2	26.4	27.3
Tacloban	26.0	26.0	26.7	27.5	28.0	28.0	27.8	28.1	28.1	27.8	27.2	26.5	27.3
Catabelogan	26.1	26.2	27.0	27.9	28.5	28.5	28.1	28.3	28.3	27.6	27.1	26.5	27.5
Catarman	25.2	25.3	25.9	26.6	27.4	27.7	27.3	27.6	27.5	26.7	26.4	25.8	26.6
Average of Visayas	26.2	26.3	27.1	28.1	28.5	28.1	27.7	27.8	27.2	27.6	27.3	26.6	27.4
MINDANAO													
Zamboanga	26.6	26.8	27.2	27.5	27.6	27.1	26.8	26.9	27.0	27.0	27.0	26.7	27.0
Dipolog	26.9	27.1	27.7	28.5	28.4	28.0	26.7	27.7	27.7	27.7	27.6	27.2	27.7
Cagayan de Oro	25.9	26.1	26.7	27.5	28.1	27.7	27.3	27.5	27.4	27.3	27.0	26.4	27.1
Lumbia	25.6	25.3	26.2	27.4	28.0	26.7	26.3	26.9	26.7	26.4	26.5	25.9	26.5
Surigao	25.6	25.6	26.2	27.0	27.7	27.8	27.5	27.9	27.9	27.3	26.7	26.1	26.9
Davao	26.3	26.6	27.3	27.9	27.8	27.3	26.9	27.1	27.2	27.4	27.3	26.8	27.2
General Santos	26.8	27.1	27.6	28.0	27.5	26.8	26.3	26.3	26.5	26.8	27.0	27.0	27.0
Hinatuan	25.5	25.2	25.9	26.5	27.1	27.1	27.1	27.3	27.3	27.1	26.7	26.2	26.6
Cotabato	26.9	27.2	27.8	28.2	27.9	27.4	27.0	26.9	27.0	27.3	27.2	27.1	27.3
Average of Mindanao	26.2	26.3	26.3	27.6	27.8	27.3	26.2	26.5	26.5	26.4	26.3	26.6	27.0

Table 2.12 Natural Disasters in the Philippines for the Period from 1970 to 1983

Items	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1. Typhoons														
a. No. of Typhoons entered the PAR/1	15	27	17	12	23	15	22	18	25	21	23	20	18	23
Destructive	8	6	4	4	9	2	6	7	8	9	9	7	8	4
b. Casualties														
Dead	1,328	89	298	74	53	39	313	99	663	69	143	696	337	126
Missing	495	110	5	89	89	8	188	23	395	68	29	342	223	28
Injured	1,917	72	33	24	118	8	37	118	834	79	55	1,996	347	168
c. Affected														
Families (10^3)	18	-	-	2	97	5	1,505	137	520	156	308	306	266	141
Persons (10^3)	110	-	-	12	444	27	2,744	23	2,853	924	1,667	1,750	1,569	747
d. Houses Destroyed														
Totally (10^3)	n.a.	n.a.	n.a.	n.a.	1.4	0.7	3.9	15.8	520.4	155.9	307.6	305.9	266.5	140.6
Partially (10^3)	n.a.	n.a.	n.a.	n.a.	4.6	1.5	4.9	16.1	2.853.1	924.3	1,667.0	1.750.1	1,569.0	747.2
e. Cost of Damage (₱10^6)	500.6	40.3	178.3	250.4	365.1	18.9	724.8	335.1	1.575.2	417.2	1,471.7	1.419.0	1,650.5	522.1
f. Cost of Assistance (₱10^6)	n.a.	n.a.	n.a.	0.4	1.5	0.2	4.0	0.6	5.5	1.2	0.2	5.5	5.0	2.1
2. Droughts														
a. Agr'l Areas Affected (10^3 ha)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-	-	-	-	987
b. Farmer Affected									2,829	-	-	-	-	22,765
c. Production Losses (₱10^6)									n.a.	-	-	-	-	763
d. Assistance extended (₱)									7,566	-	-	-	-	101

Note: /1 Philippine Area of Responsibility

Items	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
3. Flooding														
a. No. of Occurrence	n.a.	n.a.	n.a.	2	1	4	3	6	2	3	5	4	2	6
b. No. of Province Affected				7	1	1	3	7	–	–	12	–	–	–
c. Casualties														
Dead				3	–	–	18	5	3	1	336	125	27	41
Missing				–	–	–	3	–	8	–	4,298	122	1	–
Injured				–	–	–	–	–	–	–	48	95	21	45
d. Affected														
Families (10^3)				5.0	1.8	0.1	14.6	1.5	0.4	16.6	126.5	0.7	99.6	5.5
Persons (10^3)				30.2	9.1	0.5	73.4	9.3	1.8	96.9	762.7	3.7	532.6	n.a.
e. Houses Destoyed				–	22	516	60	98	43	100	–	9	15	–
f. Cost of Damage (₱10^6)				3.3	0.0	0.8	12.3	16.2	–	5.2	366.3	4.2	115.1	12.6
g. Cost of Assistance (₱10^6)				–	–	–	0.1	–	–	–	–	4.2	2.0	0.1
4. Earthquakes														
a. No. of Occurrence	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	8	9	1	8	5	15
Minor							1	–	8	9	1	8	5	15
Major							–	–	–	–	–	–	–	–
b. No. of Province Affected							21	–	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
c. Casualties														
Dead							3,792	1	5	–	511	–	–	19
Missing							1,937	–	–	–	–	–	–	–
Injured							9,240	9	2	–	–	–	–	176
d. Affected														
Families (10^3)							60.4	–	–	–	9.2	–	–	0.5
Persons (10^3)							362.1	–	–	–	50.2	–	–	3.0

Items	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
e. Cost of Damage (₱10^6)							246.9	5.1	–	–	2.5	–	–	14.8
f. Cost of Assistance (₱10^6)							–	–	–	–	–	–	–	0.0
5. Tornado														
a. No. of Occurrence	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	17	24	7	1	–	4
b. Casualties														
Dead									–	2	8	–	–	2
Missing									–	–	–	–	–	1
Injured									22	–	54	–	–	5
c. Cost of Damage (₱10^6)									0.5	1.5	0.8	4.2	–	0.8
6. Land Slides														
a. No. of Occurrence	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4	3	2	3	3	1
b. Casualties														
Dead									26	–	–	5	–	–
Missing									7	–	–	2	5	–
Injured									11	–	–	2	–	–
c. Cost of Damage (₱10^3)									0.0	0.0	–	–	–	–
7. Sea Mishaps														
a. No. of Occurrence	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	–	3	10	9	15	10
b. Casualties														
Dead									–	5	20	15	31	3
Missing									–	11	–	6	49	–
Injured									–	–	18	22	13	–
8. Air Mishaps														
a. No. of Occurrence	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2	1	5	4	6	1
b. Casualties														
Dead									3	–	–	8	3	–
Missing									–	–	7	–	–	–
Injured									–	–	133	3	10	–

Source: Office of Civil Defense, Ministry of National Defense

Table 2.13 Estimated Damages by Various Causes of Alverse Weather in the Philippines

Unit: ₱10⁶

Items	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1. Typhoons	500.6	40.3	178.3	250.4	365.1	18.9	724.8	335.1	1,575.2	417.2	1,471.7	1,419.0	1,650.5	522.1
2. Droughts	na	na	na	na	na	na	na	na	na	–	–	–	–	763.1
3. Flooding	na	na	na	3.3	0.0	0.8	12.3	16.2	–	5.2	366.3	4.2	115.1	12.6
4. Earthquakes	na	na	na	na	na	na	246.9	5.1	–	–	2.5	–	–	14.8
5. Tornado	na	na	na	na	na	na	na	na	0.5	1.5	0.8	4.2	–	0.8
6. Land Slides	na	na	na	na	na	na	na	na	0.0	0.0	–	–	–	–
7. Others/1	na	na	na	na	na	na	na	na	188.6	411.0	484.0	177.5	460.9	338.3
Total (A)	500.6	40.3	178.3	253.7	365.1	19.7	984.0	356.4	1,764.3	834.9	2,325.3	1,604.9	2,226.5	1,651.7
cf. GDP (₱10⁹)(B)/2	42.4	50.1	56.1	71.8	99.6	114.6	133.9	155.6	178.6	220.5	266.0	304.8	338.5	375.9/3
(A/B x 10³) (%)	1.18	0.08	0.32	0.35	0.37	0.02	0.73	0.23	0.99	0.38	0.87	0.53	0.66	0.44

Notes; /1 Includes big waves, ship collisions and fire incidents.
/2 At current prices.
/3 Estimate assuming the same growth as 1981-1982.

Source; Office of Civil Defense, Ministry of National Defense.

Table 2.14 Natural Disasters in Japan for the Period from 1977 to 1982

Items	1977	1978	1979	1980	1981	1982
1) Deaths & Missing (Persons)	174	153	208	163	232	524
2) House & Building						
Totally destroyed (Number)	1,707	1,671	509	351	371	1,386
Partially destroyed (Number)	2,114	7,495	3,075	654	894	2,353
3) Cost of Damage (¥ billion)	484	734	960	1,385	1,556	1,848
4) GNP (¥ billion)	188,804	206,763	222,043	240,647	253,811	267,351
5) Ratio to GNP ((3)/(4))(%)	0.26	0.35	0.43	0.58	0.61	0.69

Note; Natural disasters comprise typhoon, heavy rain, storm, high tide, earthquake, tidal wave and heavy snow.

Source; National Land Agency, Government of Japan.

Table 2.15 Monthly Frequency of Passage of Tropical Cyclone Centers over Regions in the Philippines from 1948 to 1977

Month / Region	Jan. D S T	Feb. D S T	Mar. D S T	Apr. D S T	May D S T	June D S T	July D S T	Aug. D S T	Sept. D S T	Oct. D S T	Nov. D S T	Dec. D S T	Total D S T	Ave./ Year	Rank
1	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 1 / 1	1 1 1 / 3	2 1 3 / 6	3 2 4 / 9	2 2 3 / 7	4 2 5 / 11	2 2 7 / 11	1 2 6 / 9	1 1 2 / 4	16 13 32 / 61	2.03	2nd
2	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 1 / 1	2 1 2 / 5	2 1 3 / 6	2 2 5 / 9	1 2 5 / 8	4 4 7 / 15	2 2 8 / 12	1 1 6 / 8	1 0 2 / 3	15 13 39 / 67	2.23	1st
3	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	1 1 0 / 2	0 0 4 / 4	1 1 1 / 3	3 0 0 / 3	3 1 1 / 5	2 2 3 / 7	1 3 7 / 11	0 1 1 / 2	11 9 17 / 37	1.23	6th
4	1 0 1 / 2	0 0 0 / 0	0 0 1 / 1	0 1 1 / 2	1 1 2 / 4	1 1 1 / 3	1 2 2 / 5	0 1 1 / 2	2 1 1 / 4	2 1 5 / 8	2 4 4 / 10	1 2 5 / 8	11 14 24 / 49	1.63	3rd
5	1 0 0 / 1	0 0 0 / 0	0 0 0 / 0	0 1 0 / 1	1 1 2 / 4	1 1 2 / 4	2 2 1 / 5	0 0 1 / 1	2 1 1 / 4	3 1 3 / 7	1 7 2 / 10	1 2 3 / 6	12 16 15 / 43	1.43	5th
6	1 0 1 / 2	0 0 0 / 0	0 1 1 / 2	0 2 0 / 2	1 1 1 / 3	1 1 0 / 2	0 2 1 / 3	0 0 1 / 1	0 0 0 / 0	1 0 2 / 3	2 5 4 / 11	2 2 3 / 7	8 14 14 / 36	1.20	7th
7	1 0 1 / 2	0 0 0 / 0	0 1 1 / 2	0 2 0 / 2	0 1 0 / 1	0 0 0 / 0	0 1 1 / 2	0 0 0 / 0	0 0 0 / 0	0 0 2 / 2	2 2 6 / 10	2 1 3 / 6	5 8 14 / 27	0.90	8th
8	1 0 1 / 2	0 0 0 / 0	0 1 1 / 2	0 2 0 / 2	2 1 2 / 5	1 1 1 / 3	0 2 3 / 5	0 1 0 / 1	0 0 0 / 0	2 0 3 / 5	1 6 4 / 11	3 3 4 / 10	10 17 19 / 46	1.53	4th
9	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 1 / 1	1 0 0 / 1	0 0 0 / 0	1 0 1 / 2	0.07	11th
10	2 0 1 / 3	0 0 0 / 0	0 1 0 / 1	0 1 0 / 1	1 1 0 / 2	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 1 / 1	3 3 3 / 9	2 2 2 / 6	8 8 7 / 23	0.77	9th
11	1 0 1 / 2	0 0 0 / 0	0 1 0 / 1	0 1 0 / 1	1 1 0 / 2	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 1 / 1	2 1 1 / 4	1 1 1 / 3	5 5 4 / 14	0.47	10th
12	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 0 / 0	0 0 1 / 1	1 0 0 / 1	0 0 0 / 0	1 0 1 / 2	0.07	12th
Total	8 0 6 / 14	0 0 0 / 0	0 5 4 / 9	0 10 3 / 13	11 10 10 / 31	8 6 14 / 28	9 14 18 / 41	6 6 11 / 23	15 9 15 / 39	14 8 37 / 59	18 34 43 / 95	14 15 26 / 55	103 117 187 / 407		

Notes: D-Tropical Depression
S-Storm
T-Typhoon

(Source: Philippine Crop Insurance Corporation)

Table 2.16 (1/2) Data on Typhoon entered the Philippine Area of Responsibility for the Period of 1970-1983

Year	No.	Name/1	Period of Typhoon/2	Major Affected Area	Min. Pressure in PAR(mb)	Min. Pressure in the Lifetime(mb)	Number of Deaths	Number of Missing	Number of Total
1970	1	GEORGIA	9/10-9/12	Central Luzon	920	905	95	80	175
	2	JOAN	10/12-10/15	South Luzon Leyte, Samar	910	905	575	193	768
	3	KATE	10/16-10/23	South Mindanao	940	940	631	284	915
	4	PATSY	11/18-11/20	Central Luzon	925	910	230	381	611
1971	5	WANDA	4/24-4/28	Visayas	994	980	56	39	95
	6	DINAN	5/25-5/27	Leyte, Samar	965	960	13	44	57
	7	ELAINE	10/3-10/5	Leyte, Samar Visayas	985	965	10	80	90
1972	8	KIT	1/5-1/9	Leyte, Samar	940	940	204	5	254
	9	ORA	6/23-6/26	South Luzon	980	980	131	-	131
	10	THERESE	12/1-12/8	North Mindanao	992	-	90	-	90
1973	11	VERA	11/19-11/24	Leyte, Samar	994	990	56	21	77
1974	12	DINAH	6/8-6/11	Central Luzon	975	965	73	33	106
	13	IUY	7/19-7/21	North Luzon	955	950	20	46	66
	14	BESS	10/9-10/12	North Luzon	980	975	26	3	29
	15	CARMEN	10/14-10/17	North Luzon	980	975	13	-	13
	16	ELAINE	10/26-10/29	North Luzon	960	940	23	-	23
1975	17	LOLA	1/22-1/25	North Mindanao Visayas	975	975	39	8	47
1976	18	OLGA	5/18-5/26	North Luzon	940	940	200	147	347
	19	RUBY	6/22-7/1	Saman North Luzon	965	935	3	13	16
	20	NOKA	12/2-12/7	Samar South Luzon	990	990	110	15	125

Table 2.16 (2/2) Data on Typhoon entered the Philippine Area of Responsibility for the Period of 1970-1983

Year	No.	Name /1	Period of Typhoon /2	Major Affected Area	Min. Pressure in PAR(mb)	Min. Pressure in the Lifetime(mb)	Number of Deaths	Missing	Total
1977	21	SARAH	7/16-7/18	Samar South Luzon	990	970	4	11	15
	22	DINAH	9/15-9/20	North Luzon	965	965	54	11	65
	23	KIM	11/11-11/17	Central Luzon	930	920	40	-	40
1978	24	OLIVE	4/19-4/26	Leyte, Samar	970	955	66	45	111
	25	ELAINE	8/21-8/26	North Luzon	975	965	47	16	63
	26	LOLA	9/25-9/28	Samar South Luzon	980	965	32	25	57
	27	NINA	10/8-10/14	Central Luzon	975	975	24	29	53
	28	RITA	10/25-10/28	Central Luzon	885	880	444	230	674
1979	29	CECIL	4/14-4/19	Leyte, Visayas	965	965	30	63	93
	30	MAC	9/16-9/20	South Luzon	992	985	8	2	10
1980	31	KIM	7/23-7/26	North Luzon	950	910	36	55	91
	32	BELLY	11/2-11/6	North Luzon	925	925	103	25	128
1981	33	KELLY	6/29-7/2	South Luzon	985	975	210	19	229
	34	IRMA	11/25-11/26	Central Luzon	950	905	261	114	375
	35	LEE	12/24-12/27	Central Luzon	950	950	180	162	342
1982	36	MAMIE	3/19-3/22	North Midanao	990	990	25	8	33
	37	NELSON	3/23-3/29	Visayas	940	935	115	91	206
	38	WINONA	7/13-7/16	Central Luzon	985	985	10	2	12
	39	FAYE	8/20-8/26	Visayas	960	960	29	23	52
	40	IRVING	9/6-9/11	South Luzon	985	850	65	29	94
	41	NANCY	10/13-10/15	North Luzon	945	935	96	30	126
1983	42	VERA	7/12-7/16	Samar South Luzon	975	965	115	27	142

Notes: The typhoons caused deaths and missing of less than 10 persons were excluded.

/1 Denominated by U.S. Navy

/2 Period during crossing Philippine Area of Responsibility

Table 2.17 Damages by the Biggest Typhoon in Each Year from 1978 to 1983

Items / Name of Typhoon/1/Year	Kading 1978	Bebeng 1979	Osang 1980	Anding 1981	Welding 1981	Bebeng 1983	Average
I. Casualties (in Number)							
(1) Death and Missing	724	93	40	409	126	142	256
(2) Injured	749	73	55	116	183	145	220
II. Population Affected (in Number)							
(1) Family Affected	237,736	111,929	58,731	166,948	51,532	120,811	124,615
(2) Persons Affected	1,236,435	672,025	264,116	932,994	301,431	628,985	672,664
III. Houses Destroyed (in Number)							
(1) Totally destroyed	45,465	47,248	10,451	49,110	12,464	29,045	32,297
(2) Partially destroyed	65,040	57,087	18,279	98,324	34,111	76,346	58,198
IV. Damage to Properties (in P10^3)							
(1) Agricultural Crops	338,271)	) 122,727		) 449,895	201,942	129,860 }	} 300,436
(2) Livestocks	41,336)				1,784	1,633 }	
(3) Fishponds				–	–	214,734 }	
(4) Government Properties							
(i) Public Works							
a) Port, Pier or Sea Wall						7,650 }	
b) School Building						27,861 }	
c) Public Building	) 190,871	) 13,487			) 282,860	111,457 }	
d) Flood Control Facilities				) 190,797		8,895 }	
e) Irrigation Facilities						2,245 }	} 306,453
f) Other Public Facilities						2,464 }	
(ii) Road and Bridge	84,311	53,538			6,257	44,880 }	
(iii) Others	8,810	5,647				1,017 }	
(5) Private Houses	357,722	71,718		9,246	135,394	15,136 }	
Total from (1) to (5)	1,021,321	267,118	101,708	649,938	628,237	467,832	606,889
Percentage Share to Total Damage (%)							
Primary Products (Total from (1) to (3))	37.2	45.9	n.a.	69.2	32.4	74.1	49.5
Properties (Total of (4) & (5))	62.8	54.1	n.a.	30.8	67.6	25.9	50.5

Note: /1 Local names denominated by PAGASA

Source: Office of Civil Defense, Ministry of National Defense

Table 2.18 Yearly Marine Protests Filed by Classification (1972 - 1982)

(Unit: Number of Protest)

Nature	72	73	74	75	76	77	78	79	80	81	82	Total
* Grounding	6	7	6	2	8	0	3	3	2	2	12	51
* Allision	13	6	3	4	6	1	1	7	5	6	8	60
* Collision	8	10	9	6	7	4	8	7	6	2	2	69
* Sinking	7	15	14	9	6	9	9	4	7	8	8	96
Fire on Board	0	9	10	4	2	4	2	4	0	5	6	46
Damage to Pier	0	4	11	2	6	0	0	1	1	1	2	28
Damage to Fish Net	2	3	14	1	0	0	0	0	0	0	0	20
Death on Board	6	4	3	0	2	0	1	1	0	0	1	18
Jumping overboard	1	1	3	0	1	1	2	3	0	0	3	15
* Capsizing	1	0	0	2	0	0	0	0	0	0	4	7
Injury to Passenger	2	0	0	1	0	0	0	1	0	0	0	4
Prof. Misconduct	5	21	15	3	5	1	1	1	1	5	5	63
Others	0	16	8	3	1	0	0	4	6	1	2	41
Total	51	96	96	37	44	20	27	36	28	30	53	518
Boisterous Weather	109	34	311	164	41	150	237	253	185	146	106	1736
Grand Total	160	130	407	201	85	170	264	289	213	176	159	2254

Note: *: Weather related mishaps other than "Boisterous weather"

Source: Board of Marine Inquiry, Ministry of Finance.

Table 3.1

Presumed Radio Link Design

Span	Distance	Antenna	Model of Equipment	Basic Propagation Loss at 800 MHz	S/N at Standard Condition	Presumed Fading Value at 99.95%	S/N at 99.95%
TANAY ~ GAPAS	131.9 km	6.0mφ G.P 4.2mφ G.P	PM24-800-70 FD	-165.9 dB	62.7 dB	23.5 dB	39.2 dB
GAPAS ~ NAGA	91.0 km	4.2mφ G.P 6.0mφ G.P	PM24-800-70 FD	-168.7 dB	59.9 dB	23.5 dB	36.4 dB
NAGA ~ MALABOG	74.2 km	3.0mφ G.P 3.0mφ G.P	PM24-800-70 FD	-154.4 dB	64.7 dB	23.5 dB	41.2 dB
MALABOG ~ BALOD	130.5 km	10.0mφ G.P (6.0mφ G.P) 6.0mφ G.P (4.2mφ G.P)	PM12-800-70 SD	-175.8 dB	61.4 dB	22.5 dB	38.9 dB
BALOD ~ TINAMBACAN	km 20.0+25.7	3.0mφ P.P 6m×8m×2 (Reflector) 4.0mφ P.P	FM60-6700-1	-275.6 dB	62.2 dB	15.6 dB (99.99 %)	46.6 dB (99.99 %)
TINAMBACAN ~ DANAO	183.9 km	6.0mφ G.P (4.2mφ G.P) 10.0mφ G.P (6.0mφ G.P)	PM12-800-70 SD	-181.8 dB	55.4 dB	22.5 dB	32.0 dB
DANAO ~ MALASAG	239.3 km	6.0mφ G.P 10.0mφ G.P	PM6-800-70 FD	-186.6 dB	58.6 dB	23.5 dB	35.1 dB
MALABOG ~ LEGASPI	7.0 km	12 ele YAGI 1.8mφ G.P	PM12-800-5	-119.4 dB	62.8 dB	7.4 dB (99.9 %)	55.4 dB (99.9 %)
BALOD ~ CATARMAN	2.9 km	12 ele YAGI 12 ele YAGI	PM6-800-5	-106.3 dB	75.5 dB	6.6 dB (99.9 %)	68.9 dB (99.9 %)
DANAO ~ MACTAN RADAR	20.5 km	1.8mφ G.P 3.0mφ G.P	PM12-800-5	-131.7 dB	63.7 dB	10.1 dB (99.9 %)	53.6 dB (99.9 %)
MALASAG ~ CAGAYAN DE ORO	Approx. 10.0 km Line of Sight (presumed)	12 ele YAGI 12 ele YAGI	PM6-800-5	-116.5 dB	66.5 dB	8.0 dB (99.9 %)	58.5 dB (99.9 %)
TANAY ~ Mt. MAGLAYAO	165.4 km	10.0mφ G.P 6.0mφ G.P	PM24-800-70 FD	-172.4 dB	60.7 dB	23.5 dB	37.2 dB
Mt. MAGLAYAO ~ MALABOG	138.7 km	4.2mφ G.P 6.0mφ G.P	PM24-800-70 FD	-165.9 dB	59.7 dB	23.5 dB	36.2 dB
MALABOG ~ MASBATE	88.7 km	6.0mφ G.P (4.2mφ G.P) 4.2mφ G.P (3.0mφ G.P)	PM12-800-70 SD	-171.0 dB	61.7 dB	22.5 dB	39.2 dB
MASBATE ~ TINAMBACAN	102.9 km	4.2mφ G.P (3.0mφ G.P) 4.2mφ G.P (3.0mφ G.P)	PM12-800-70 SD	-164.4 dB	61.8 dB	22.5 dB	39.3 dB
TINAMBACAN ~ MACTAN RADAR	204.6 km	6.0mφ G.P (4.2mφ G.P) 10.0mφ G.P (6.0mφ G.P)	PM12-800-70 SD	-182.2 dB	55.0 dB	22.5 dB	32.5 dB
MACTAN RADAR ~ MALASAG	222.0 km	10.0mφ G.P 10.0mφ G.P	PM6-800-70 FD	-190.4 dB	58.8 dB	23.5 dB	35.3 dB

(* Basic propagation loss includes the presumed corrective value 6dB.)

Modulation Index
6 ch : 0.8 rad rms
12 ch : 0.4 rad rms
24 ch : 0.2 rad rms
IF band width : 460 kHz / 3 dB

Table 3.2

SCHEDULE OF SITE RECONNAISSANCE

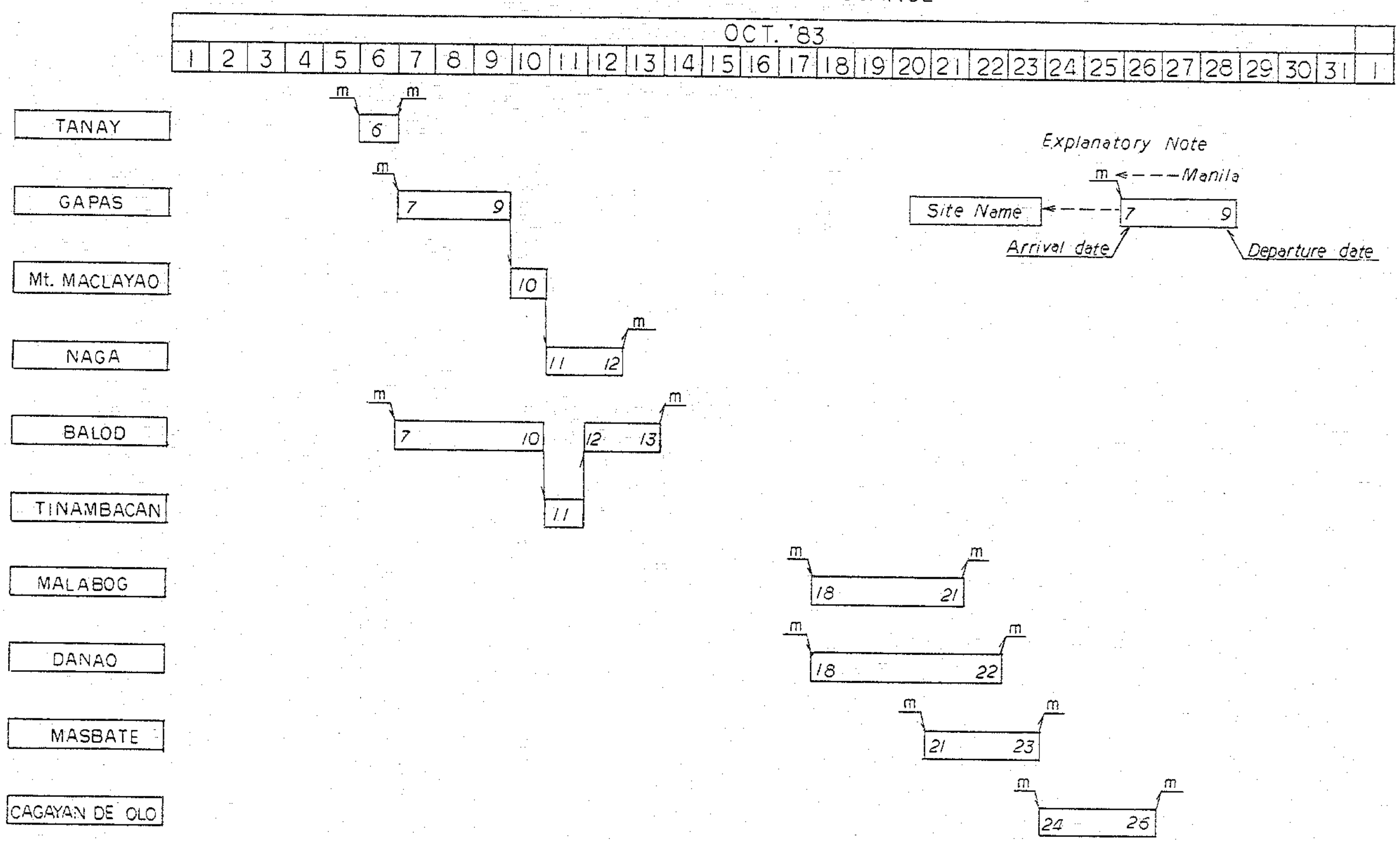


Table 3.3 Result of Site Survey at New OH Relay Station

NAME OF STATION	TANAY	GAPAS	NAGA	MALABOG	BALOD	CAPACUAN	TINAMBACAN	DANAO	MALASAG
LOCATION									
FIGURE	Attached	Attached	Attached	Attached	Attached	Attached	Attached	Attached	Attached
COORDINATES	14° 33' 53" N 21° 21' 07" E	13° 57' 10" N 122° 23' 28" E	13° 37' 16" N 123° 09' 56" E	13° 9' 55" N 123° 39' 48" E	12° 28' 41" N 124° 38' 19" E	12° 14' 50" N 124° 36' 06" E	12° 5' 9" N 124° 31' 14" E	10° 30' 33" N 124° 05' 40" E	8° 27' 52" N 124° 41' 25" E
ELEVATION	530 m (above sea level)	135 m (above sea level)	5 m (above sea level)	295 m (above sea level)	55 m (above sea level)	310 m (above sea level)	140 m (above sea level)	65 m (above sea level)	308 m (above sea level)
TOPOGRAPHY AT SITE	Top of a hilly terrain	Top of the mountain	Good condition. Station existing.	Near mountain top, rugged path	Terraced hills	Top of the mountain	Top of the mountain	Terraced hill	Terraced hills
SOIL CONDITION	Clay	Clay	Clay and Gravel	Loam and clay soil	Red clay	Sandy soil Red clay	Sandy soil	Lime stone	Red clay
LAND OWNER	Government	Private	Government	Private	Private	Private	Private	Private	Government
ACCESS ROAD									
DISTANCE FROM EXISTING ROAD	100 m	900 m	0 m	20 m	170 m	2000 m	920 m	420 m	200 m
TRAVEL TIME (BY WALKING)	1 min. (By vehicle)	30 mins.	0 min.	2 mins.	10 mins.	50 mins.	30 mins.	15 mins.	10 mins.
CONDITION OF THE ROAD	No Path existing (Slippery)	Mountain path (Slippery)	Good Pavement	Bad Narrow path	Mountainous path	Mountainous path	Mountainous path	Mountainous path	Mountainous path
DISTANCE FROM WATER SOURCE	DISTANCE: 150 m STATUS: Well	DISTANCE: 0 m STATUS: Well	DISTANCE: 1500 m Status: Water Service	DISTANCE: 100 m STATUS: Well	DISTANCE: 100 m STATUS: Spring	DISTANCE: 500 m STATUS: River	DISTANCE: 300 m STATUS: Spring	DISTANCE: 800 m STATUS: Well	DISTANCE: 160 m STATUS: Water Service
MEANS OF TRANSPORTATION	Vehicle	Items may be handcarried or by cableway	Vehicle	Vehicle	Cableway or by handcarry	Cableway or by helicopter	Cableway or by handcarry	Cableway or by handcarry	Cableway or by handcarry
POWER SUPPLY INFORMATION									
DISTANCE FROM EXISTING SERVICE WIRE	Existing 0 m	900 m	Existing 0 m	50 m	160 m	1800 m	700 m	900 m	200 m
OTHER REQUIREMENTS	None	Transformer and generator required	None	Transformer and generator required	Transformer and generator necessary	Transformer and generator necessary	Transformer and generator necessary	Transformer and generator necessary	Transformer and generator necessary
REMARKS	Station is existing. Generator is existing.	Difficult to reach access road. Transport by cable car of items for hand-carry.	Station is existing. Generator is existing.	Vehicle can pass through the summit. Dangerous during rainy weather. 40m span available for S.D.	Ideal site for S.D. antenna is under further study.	Construction of access road for installation of 13000V power line is needed.	Ideal site for S.D. antenna is under further study.	Volume of water source is little.	Ideal site for S.D. antenna is under further study.

Table 3.4 (1/4)

SCHEDULE OF OH PROPAGATION TEST

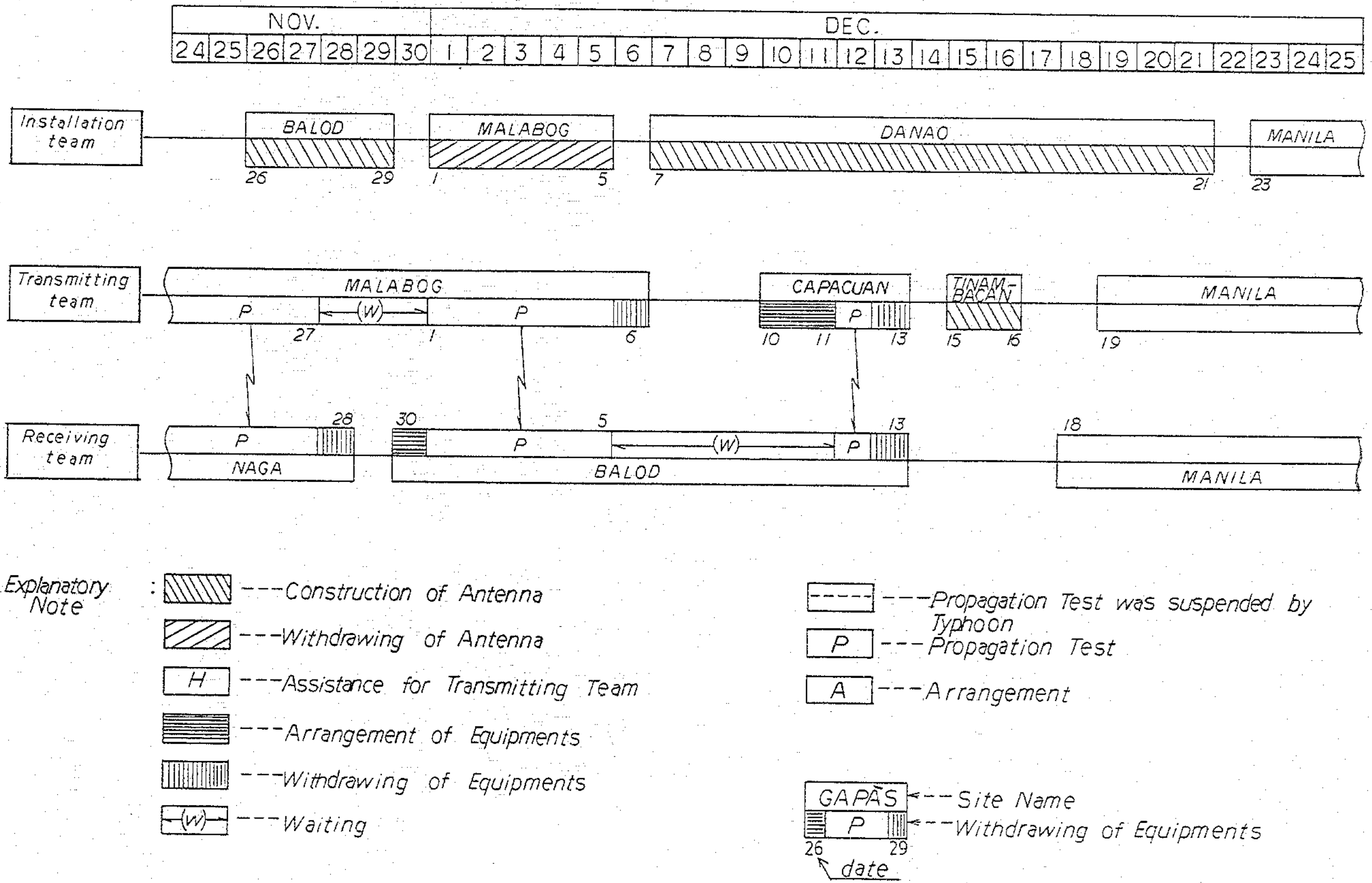


Table 3.4 (2/4)

SCHEDULE OF OH PROPAGATION TEST

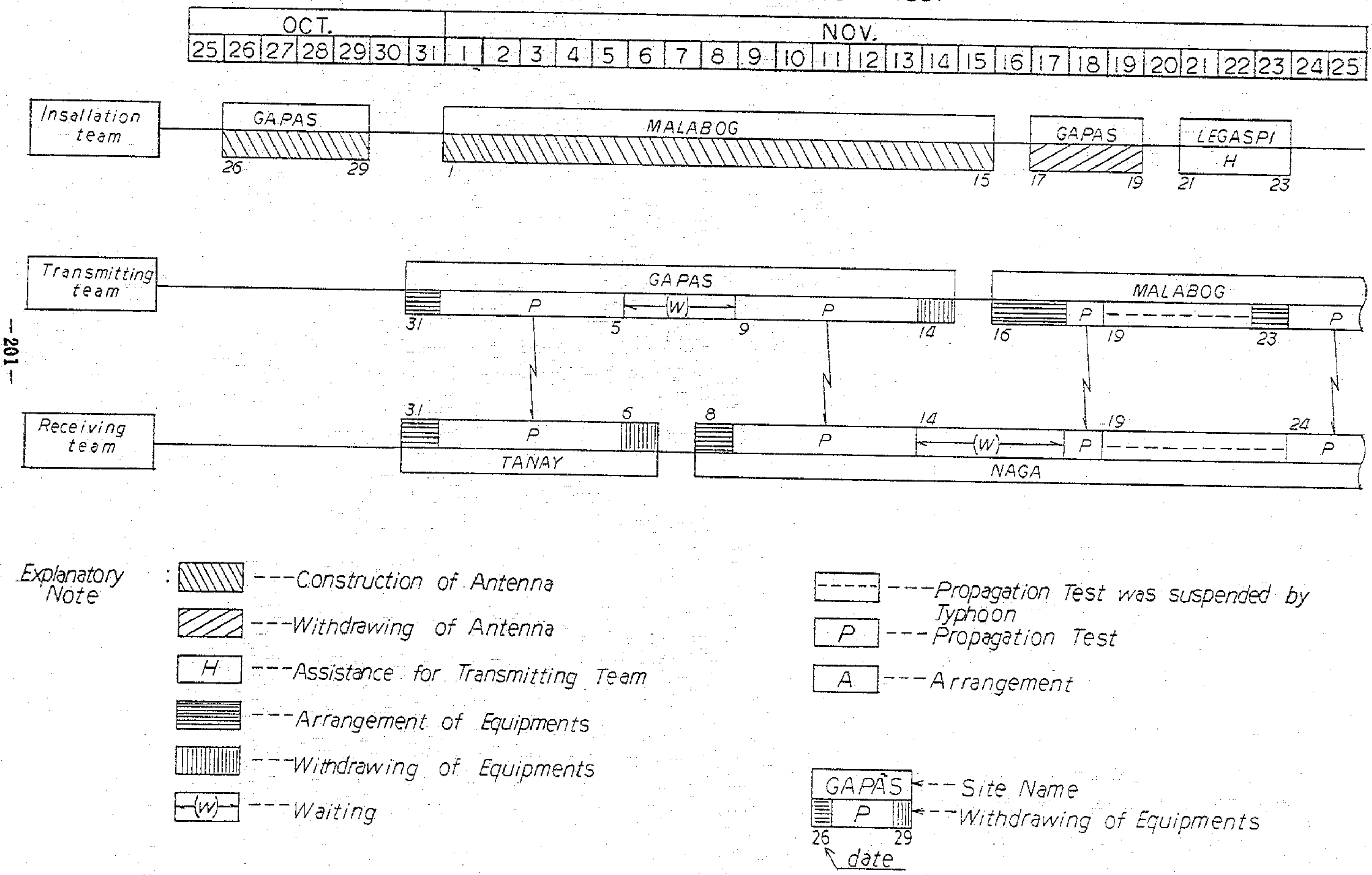


Table 3.4 (3/4)

SCHEDULE OF OH PROPAGATION TEST

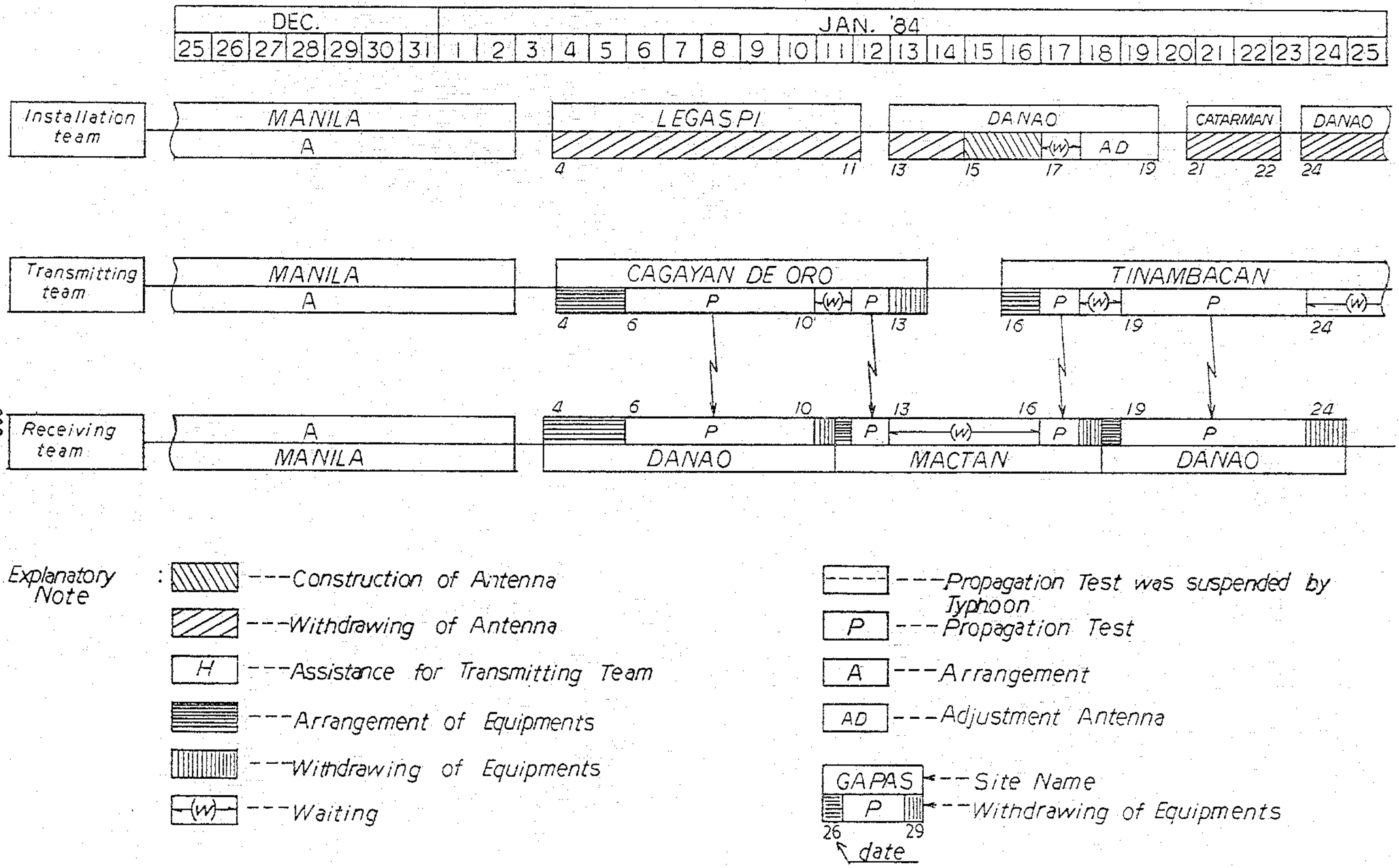


Table 3.4 (4/4)

SCHEDULE OF OH PROPAGATION TEST

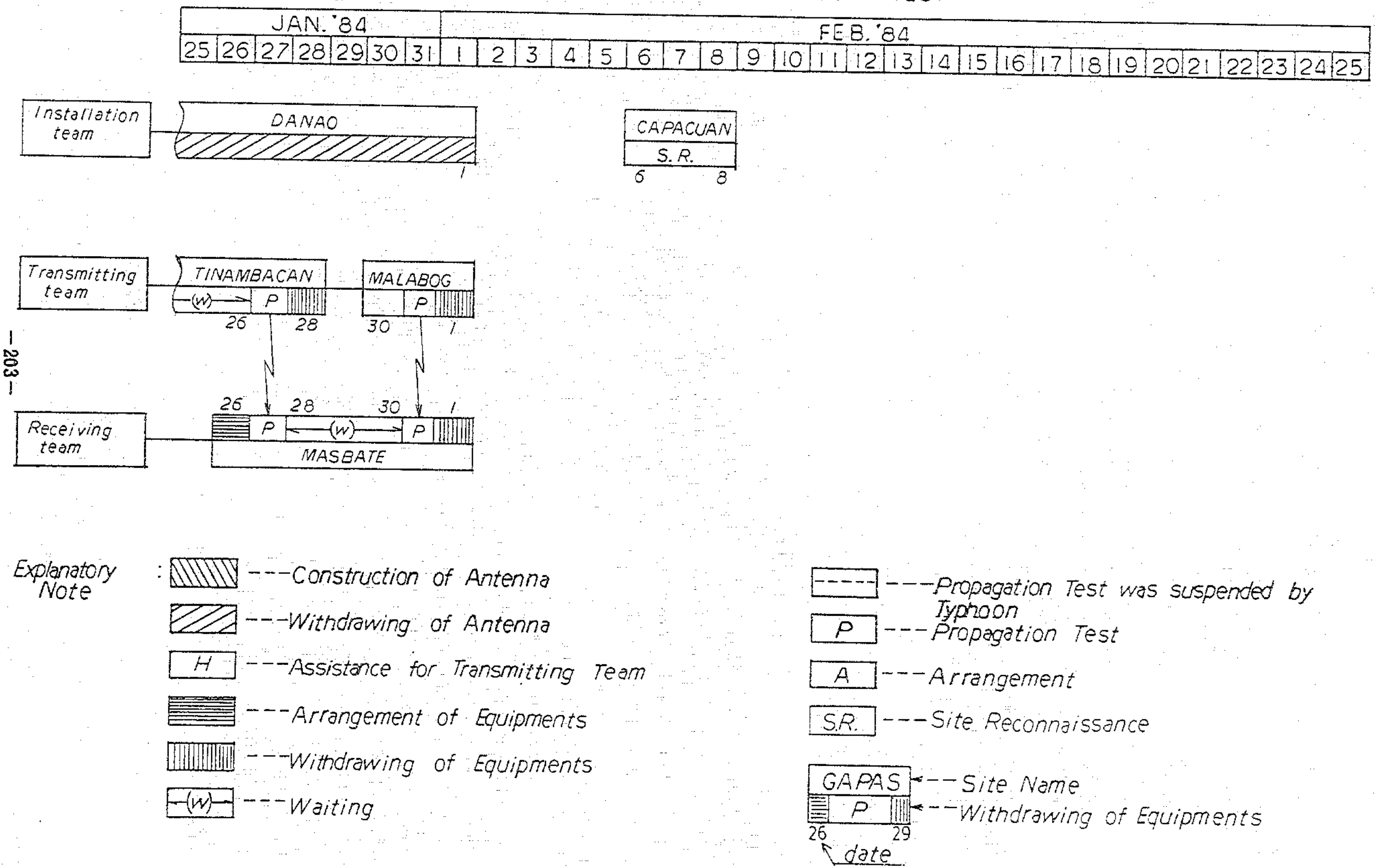


Table 3.5

Outline of Test Equipment

1	Propagation Test Equipment of 800 MHz Band	NAF-141	JRC	Transmission Power: 80W Transmission Frequency: 857.73 MHz 858.615 MHz 859.50 MHz 861.00 MHz 862.50 MHz One of equipped 5 waves is selectively used. All is transistorized.
2	Low Noise Amplifier at 800 MHz Band	NAF-149R	JRC	Noise Figure: below 3 dB Gain of Amplifier: above 30 dB
3	Measuring Instrument for Electric Field Strength and Frequency Converter (attached External Stabilizing Oscillator)	ML 518 A6 and MH 650A	Anritsu	Selectivity: 7.5 KHz/6dB Width
4	Grid Parabola Antenna of 6.0mϕ for 800 MHz Band	MAU-803-060B	Anten Ind. Co.	Diameter: 6.0 mϕ Gain : above 31.5 dB
5	800 MHz Band Yagi Antenna with 12 Elements	MAU-804-12	"	Gain: above 13.0 dB

Table 3.6

Test Results of OH Link

Observed Term	Span	Average Receiving Power		Corrective Value	Propagation Loss at 800 MHz
		Estimated	Measured		
1983 Nov. 1 - Nov. 5	TANAY —— GAPAS	- 91.8 dBm	- 93.3 dBm	- 1.5 dB	-161.4 dB
1983 Nov. 9 - Nov. 12	GAPAS —— NAGA	- 97.0 dBm	-102.9 dBm	- 5.9 dB	-168.5 dB
1983 Nov. 23 - Nov. 27	NAGA —— MALABOG	- 88.0 dBm	- 90.6 dBm	- 2.6 dB	-151.0 dB
1983 Dec. 1 - Dec. 5	MALABOG —— BALOD	- 88.4 dBm	- 93.5 dBm	- 5.1 dB	-174.9 dB
1984 Jan. 19 - Jan. 23	TINAMBACAN —— DANAO	- 90.6 dBm	- 96.5 dBm	- 5.9 dB	-181.7 dB
1984 Jan. 6 - Jan. 10	DANAO —— MALASAG	- 95.4 dBm	- 95.5 dBm	- 0.1 dB	-180.7 dB

Note: Average Receiving Power is the level when the 50% of sample is beyond this level.

Table 3.7

Test Result of OH Alternative Route

S P A N	Observed Term	Average Receiving Power		Corrective Value	Propagation Loss at 800 MHZ	Number of Acqired Data
		Estimaed	Measured			
MALABOG —— MASBATE	1984 Jan 31	-104.8 dBm	-108.8 dBm ∿ -110.2dBm	-1.5 dB	-174.5 dB	5
MASBATE —— TINAMBACAN	1984 Jan 27	-112.1 dBm	-101.6 dBm ∿ -114.5dBm	-1.3 dB	-181.6 dB	7
TINAMBACAN —— MACTAN RADAR	1984 Jan 17	-122.5 dBm	-125.3 dBm ∿ -129.8dBm	-5.5 dB	-196.2 dB	4
MACTAN RADAR —— MALASAG	1984 Jan 11,12	-116.2 dBm	-117.2 dBm ∿ -123.1dBm	-3.3 dB	-187.7 dB	8

Table 3.8 (1/2)

Study of BALOD to TINAMBACAN Route

Span	Frequency band Relay system Radio equipment characteristics S/N at average receiving power	BALOD	TINAMBACAN	Relay Point	
		Antenna and Antenna Height	Antenna and Antenna Height	for BALOD Antenna and Antenna Height	for TINAMBACAN Antenna and Antenna Height
(a) BALOD CAPACUAN TINAMBACAN	6.7 GHz band Plane reflector FM 60 - 6700 - 1 63.2 dB	3.0 mϕ P.P 60.6 m height	3.0 mϕ P.P 10.0 m height	4m X 6m Plane reflector 2 sets (foot length is 5 m)	
(b) BALOD CAPACUAN TINAMBACAN	6.7 GHz band Back to back coupling parabolic antenna FM 60 - 6700 - 1 61.8 dB	4.0mϕ P.P 40.4m height	4.0mϕ P.P 10 m height	4.0mϕ P.P 15 m height	4.0mϕ P.P 15 m height
(c) BALOD CAPACUAN TINAMBACAN	800 MHz band Active relay station with solar battery PM12 - 800 - 0.5 (NF3dB) 62.4 dB + 62.8 dB	3.0 mϕ G.P. 23 m height	1.8 mϕ G.P 10 m height	3.0 mϕ G.P 15 m height	1.8 mϕ G.P 15 m height
(d) BALOD 490m Peak TINAMBACAN	6.7 GHz band Plane reflector FM 60 - 6700 - 1 60.6 dB	3.0 mϕ P.P 59.7m height	3.0 mϕ P.P 43.8m height	4m X 6m Plane reflector (foot length is 5m)	
(e) BALOD 490m Peak TINAMBACAN	6.7 GHz Back to back coupling parabolic antenna FM 60 - 6700 - 1 60.2 dB	4.0 mϕ P.P 31.3m height	4.0 mϕ P.P 33.8m height	4.0 mϕ P.P 15m height	4.0 mϕ P.P 15m height

Table 3.8 (2/2)

Superiority or Inferiority List for BALOD - TINAMBACAN Route

Route	Frequency Band and Relay System	Maintenance	Scale for antenna and reflector plate	Scale for Antenna tower	Site condition for passive Repeater point	Total Judgement
BALOD - CAPACUAN - TINAMBACAN	6.7 GHz Band FM60-6700-1 Reflector Plate	O	X	X	O	-
	6.7 GHz Band FM60-6700-1 Antenna to antenna Coupling System	O	Δ	Δ	O	O
	800 MHz Band PM12-800-0.5 Active relay with Solar battery	X	O	O	O	-
BALOD - 490m point - TINAMBACAN	6.7 GHz Band FM60-6700-1 Reflector Plate	O	X	X	X	-
	6.7 GHz Band FM60-6700-1 Antenna to antenna Coupling System	O	Δ	Δ	X	-

* The sign "O" is superiority, next is "Δ" and "X" is inferiority.

Table 3.9 (1/2) Test Results for Main Route and Alternative Routes

Span			Propagation Test	Route Survey	Basis Propagation Loss at 800 MHz	Radio Equipment's Model Antenna (Sub-antenna) Required Min. Antenna Height	S/N Ratio Time Rate 50%	S/N Ratio Time Rate 99.95%
MALABOG ~ TINAMBACAN	Main Route	MALABOG ~ BALOD	o	-	-174.9 dB	PM12-800-70 SD 10.0mø (6.0mø) - 6.0mø (4.2mø) 15 m 21.3 m	61.5 dB	39.0 dB
		BALOD~CAPACUAN~TINAMBACAN	-	o	-	FM60-6700-1 4.0mø - 4.0mø, 4.0mø - 4.0mø 40.4 m 15 m 10 m	61.8 dB	46.2 dB
	Alternative Route	MALABOG ~ MASBATE	o	-	-174.5 dB	PM12-800-70 SD 10.0mø (6.0mø) - 6.0mø (4.2mø)	62.4 dB	39.9 dB
		MASBATE ~ TINAMBACAN	o	-	-181.6 dB	PM12-800-70 SD 10.0mø (6.0mø) - 10.0mø (6.0mø) 10.5 m 10 m	59.3 dB	36.8 dB
TINAMBACAN ~ MALASAG	Main Route	TINAMBACAN ~ DANAO	o	-	-181.7 dB	PM12-800-70 SD 10.0mø (6.0mø) - 10.0mø (6.0mø) 10 m 15.3 m	59.0 dB	36.5 dB
		DANAO ~ MALASAG	o	-	-180.7 dB	PM6-800-70 SD 6.0mø (4.2mø) - 6.0mø (4.2mø) 15.3 m 10 m	58.0 dB	35.5 dB
	Alternative Route	TINAMBACAN ~ MACTAN RADAR	o	-	-196.2 dB	PM12-800-70 SD 10.0mø (6.0mø) - 10.0mø (6.0mø) 10 m 7.9 m	44.7 dB	27.7 dB (99.5%)
		MACTAN RADAR ~ MALASAG	o	-	-187.7 dB	PM6-800-70 SD 10.0mø (6.0mø) - 10.0mø (6.0mø) 10 m 10 m	59.2 dB	36.7 dB

Table 3.9 (2/2) Superiority or Inferiority List for Main and Alternative Routes

Route			Scale of radio equipment and antenna	Reliability of radio link	Scale of antenna tower	Propagation condition	Site condition for radio station	Condition for commercial power	Traffic network to MANILA	Total Judgement
MALABOG~TINAMBACAN	Proposed Route	MALABOG | BALOD | CAPACUAN (Passive Ref.) | TINAMBACAN	O	O	Δ BALOD: approx. 45m CAPACUAN: approx. 20m	O	Δ	Δ	O	O
	Alternative Route	MALABOG | MASBATE | TINAMBACAN	Δ Required antenna system BALOD-TINAMBACAN 4.0møP.P.x4 MASBATE-TINAMBACAN 10.0møG.P.x2 6.0møG.P.x2	O	O	O	O	X Commercial power does not turn for the better in future.	Δ	Δ
TINAMBACAN~MALASAG	Proposed Route	TINAMBACAN | DANAO | MALASAG	O	O	O	O	Δ	O	O	O
	Alternative Route	TINAMBACAN | MACTAN | MALASAG	Δ	X TINAMBACAN - MACTAN RADAR : S/N 44.7dB	O	X TINAMBACAN - MACTAN RADAR : reflection by sea	O	O	O	Δ

* The sign "O" is superiority, next is "Δ" and "X" is inferiority.

Table 3.10 (1/2)

VHF Link Budget Estimation Value

No.	Hops	Distance (Km)	Free Space Loss (dB)	Additional Loss (dB)	Fading (dB)	Receiving Power (dBw)	Standard S/N (dB)	Remarks
V-1	APARRI – TUGUEGARAO	79.4	113.0	35.4	8.0	-116.2	49.7	
V-2	APARRI RADAR – "	81.5	114.2	33.0	8.0	-116.2	49.7	
V-3	LAOAG – VIGAN	70.0	112.9	28.5	7.0	-110.4	55.5	
V-4	BAGUIO RADAR – "	135.8	118.6	5.0	13.6	-92.6	> 60	
V-5	" – BAGUIO	8.1	94.0	29.0	0.8	-92.0	> 60	
V-6	" – DAGUPAN	38.9	108.0	10.0	3.9	-87.0	> 60	
V-7	" – AMPUCAO	11.4	97.3	5.0	1.1	-71.3	> 60	
V-8	AMPUCAO – CARMEN ROSALES	49.1	109.8	11.0	4.9	-89.8	> 60	
V-9	IBA – "	96.5	115.8	39.2	9.7	-120.8	45.1	
V-10	MUÑOZ – "	38.0	107.6	35.0	3.8	-111.6	54.3	
V-11	" – BALER RADAR	78.0	113.8	40.2	7.8	-123.0	42.9	
V-12	BALER – "	6.5	93.0	5.0	0.6	-66.2	> 60	
V-13	CASIGURAN – "	79.3	114.0	36.4	7.9	-119.4	46.5	
V-14	SANGLEY – TANAY	48.2	109.2	10.0	4.8	-88.2	> 60	
V-15	AMBULONG – "	61.5	111.7	24.0	6.2	-104.7	> 60	

Table 3.10 (2/2)

VHF Link Budget Estimation Value

No.	Hops	Distance (Km)	Free Space Loss (dB)	Additional Loss (dB)	Fading (dB)	Receiving Power (dBw)	Standard S/N (dB)	Remarks
V-16	CALAPAN – TANAY	127.0	118.0	33.0	12.7	-115.0	50.9	
V-17	TAYABAS – "	63.9	112.1	29.4	6.4	-110.5	55.4	
V-18	ALABAT – "	88.4	114.9	36.5	8.8	-120.4	45.5	
V-19	JOMALIG – "	116.6	117.3	31.0	11.7	-117.3	48.6	
V-20	INFANTA – "	38.3	107.6	50.5	3.8	-127.1	38.8	
V-21	NAGA – DAET RADAR	99.0	115.9	47.5	9.9	-132.4	33.5	
V-22	VIRAC RADAR – MALABOG	87.8	114.8	14.0	8.8	-97.8	> 60	
V-23	VIRAC – "	76.8	113.7	25.0	7.7	-107.7	58.2	
V-24	MASBATE – "	88.6	114.9	37.5	8.9	-121.4	44.5	
V-25	" – ROMBLON (Mt.)	147.5	119.3	34.0	14.8	-122.3	43.6	
V-26	SAN FRANCISCO – "	89.0	114.9	5.0	8.9	-88.9	> 60	
V-27	TINAMBACAN – CATBA-LOGAN	52.9	110.4	9.0	5.3	-88.4	> 60	
V-28	DANAO – TACLOBAN	124.3	117.9	35.0	12.4	-121.9	44.0	
V-29	GUIUAN RADAR – "	80.7	114.1	9.7	8.1	-123.1	42.8	
V-30	BAGUIO RADAR – LAOAG	202.5	122.1	38.0	20.2	-129.1	36.9	
V-31	MORONG – SCIENCE GARDEN	79.3	114.0	36.0	8.0	-119.2	43.9	

Table 3.11 (1/2)

SCHEDULE OF VHF PROPAGATION TEST

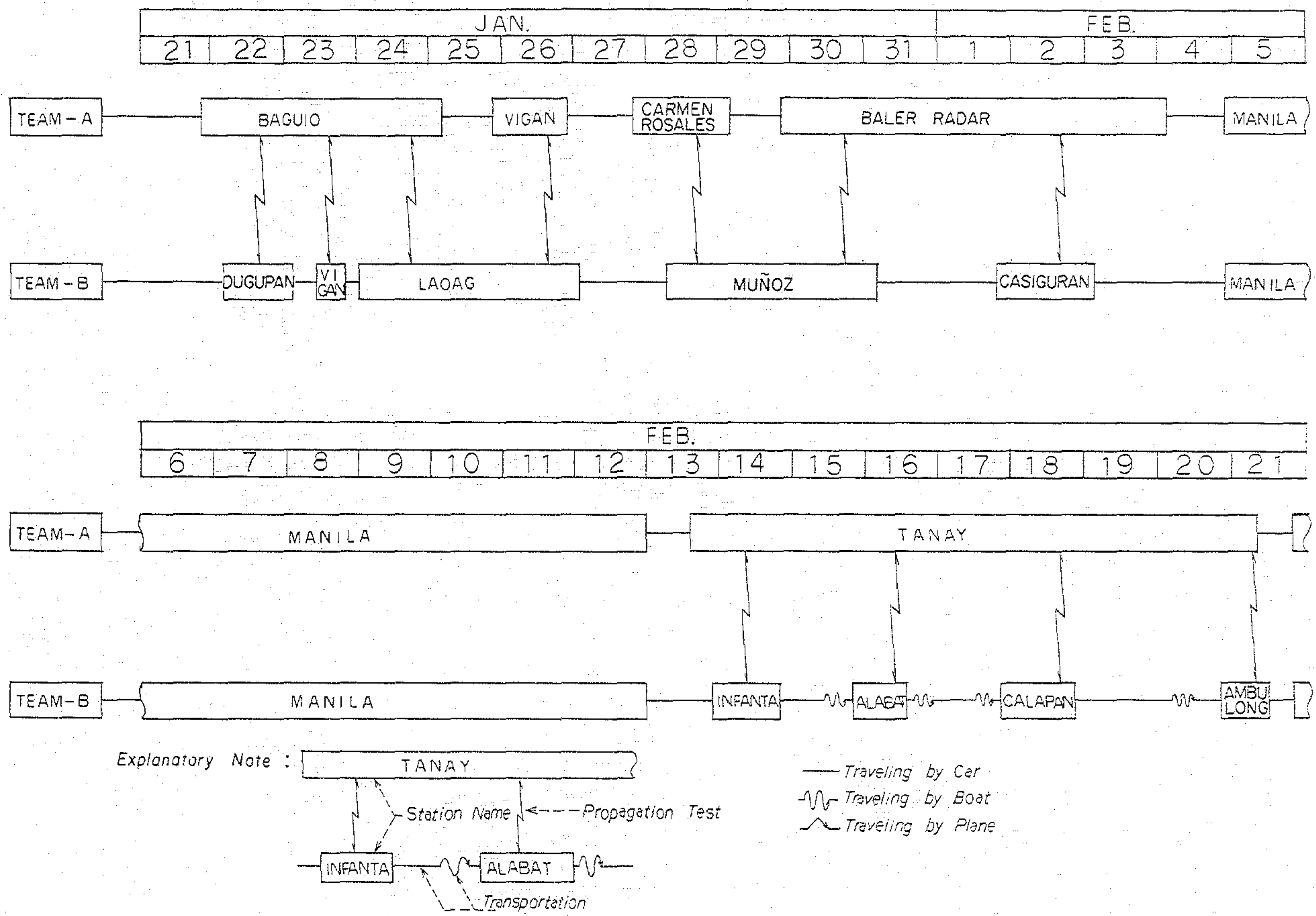


Table 3.11 (2/2)

SCHEDULE OF VHF PROPAGATION TEST

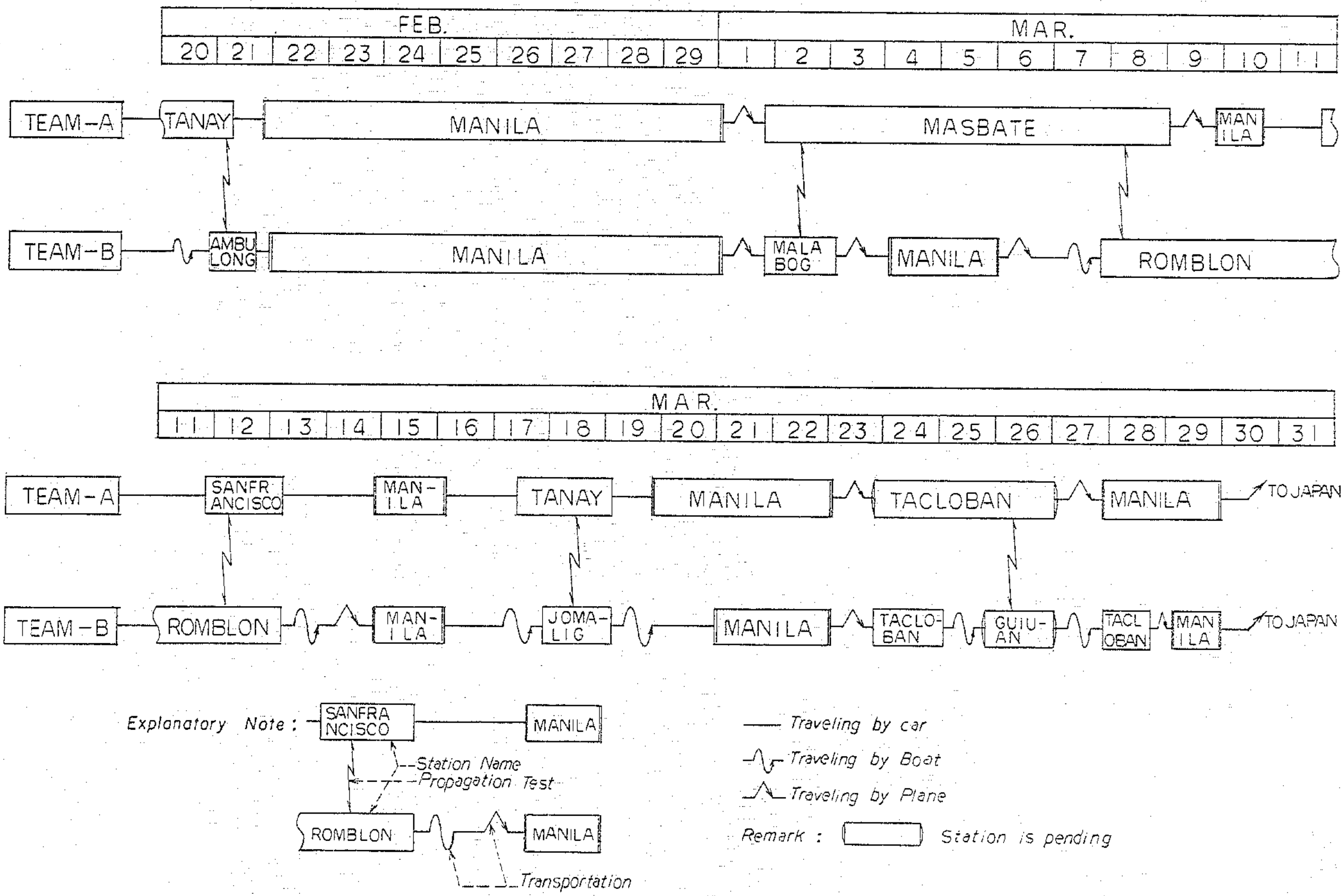


Table 3.12 Equipment for VHF Propagation Test

Items	Number	Standard	Remarks
VHF Transceiver	1	150 MHz 25 W	JHV-225
CM Watt meter	1	50 W	TKP-50W
Battery	1	12 V 35 A	
Field strength meter	1		ML-518A
VHF Antenna	1	150 MHz 8 EL	V8F-1530
Antenna pole	1	15 m	
Antenna elevator	1		MSA-15
Feeder	1	25 m	8D2V
Portable generator	1	200 V 1.5 KVA	EF-1400
Transformer	1	100 : 200 V	KD-1000
Cord reel	1	50 m	VDT-20

Table 3.13 Test Results of VHF Link

Span		Propagation Loss (dB)			S/N (dB)		Evaluation
		Estimated	Measured	Difference	Estimated	Measured	
BAGUIO RADAR	DAGUPAN	118.0	110.5	-7.5	> 60.0	> 60.0	M
BAGUIO RADAR	VIGAN	123.6	117.5	-6.1	> 60.0	> 60.0	M
BAGUIO RADAR	LAOAG	160.1	169.0	+8.9	32.4	29.0	C
VIGAN	LAOAG	141.4	150.7	+9.3	55.5	47.0	M
CARMEN ROSALES	MUÑOZ	142.0	142.5	+0.5	51.9	55.0	M
MUÑOZ	BALER RADAR	154.0	150.5	-3.5	40.5	47.0	M
BALER RADAR	CASIGURAN	150.4	142.0	-8.4	44.1	55.0	M
TANAY	AMBULONG	138.2	149.4	+11.2	56.3	48.0	M
TANAY	CALAPAN	151.0	152.4	+1.4	43.5	45.0	M
TANAY	ALABAT	151.4	151.4	0	43.1	46.0	M
TANAY	JOMALIG	148.3	152.8	+4.5	46.2	43.0	M
TANAY	INFANTA	158.1	151.4	-6.7	36.4	46.0	M
MALABOG	MASBATE	152.4	150.0	-2.4	42.1	48.0	M
MASBATE	ROMBLON (Mt.)	153.3	146.4	-6.9	41.2	48.0	M
ROMBLON (Mt.)	SAN FRANCISCO	119.9	123.8	-3.9	> 60.0	> 60.0	M
TACLOBAN	GUIUAN RADAR	154.1	146.8	-7.3	40.7	47.0	M

Remarks : 1. Estimated propagation loss includes corrective value at 5 dB, except BAGUIO RADAR — DAGUPAN and BALER — CASIGURAN.

2. S/N is estimated value by the test equipment.

3. External noise is assumed negligible.

Table 3.14

Transmitting Test Message
(Sample)

2 5 7 0 1	2 4 3 4 6	4 4 3 5 1	5 8 6 7 9
0 9 8 2 8	3 3 6 5 5	6 8 7 9 0	1 2 1 2 3
9 7 1 5 6	7 5 7 6 7	8 7 6 5 4	3 8 8 4 0
0 8 2 4 7	1 2 4 3 4	9 0 1 2 9	0 9 7 5 6
1 9 0 3 2	5 4 3 6 3	5 6 7 8 0	1 2 9 0 1
H G A D A	M Z X Y W	M E K L S	M Z A C J
I F B E C	P O N U V	D E H F G	X Y D B F
J K C L B	P Q R S T		

Table 3.15

Q Code

Code	Grade	1	2	3	4	5
QSA	Signal strength	Rarely audible	Poor	Fair	Good	Excellent
QRM	Degrading effect of interference	Extreme	Severe	Moderate	Slight	Nil
QRN	Degrading effect of noise	Extreme	Severe	Moderate	Slight	Nil

Table 3.16 (1/2)

Results of HF SSB Propagation Test

Frequency: 7995 kHz

Date	Time (GMT)	Link	QSA 1	QSA 2	QSA 3	QSA 4	QSA 5	QRN 1	QRN 2	QRN 3	QRN 4	QRN 5	QRM 1	QRM 2	QRM 3	QRM 4	QRM 5	Receiving Message Error (%) <5	6-10	11-15	16-20	21-25	26-30	30 <	Time Needed for Receiving (Min.) <5	6-10	11-15	16-20	21-25	26-30	30<
March 1	09 35	PFC → GUIUAN RADAR			○				○					○					○								○				
2	09 20	TACLOBAN				○			○					○								○				○					
3	09 25	SAN JOSE			○				○					○				○							○						
4	09 13	PTO. PRINCESA				○			○					○				○							○						
5	09 30	ILOILO			○				○									○							○						
6	09 30	DAVAO		○							○					○		○										○			
7	09 33	ZAMBOANGA				○		○						○				○							○						
1	09 58	MACTAN RADAR → GUIUAN RADAR				○			○					○				○										○			
2	09 30	TACLOBAN				○			○					○				○								○					
3	09 30	SAN JOSE			○				○					○				○							○						
4		PTO. PRINCESA																													
5	09 17	ILOILO			○				○									○							○						
6	10 00	CAGAYAN DE ORO → DAVAO			○				○					○				○									○				
7	09 40	ZAMBOANGA				○		○						○				○								○					
		Total		1	6	6		2	10		1			10		1		11	1			1			6	3	2	2			
1	21 10	PFC → GUIUAN RADAR		○						○					○			○										○			
2	21 00	TACLOBAN	○									○					○							*							
3	21 00	SAN JOSE										○					○							*							
4	20 50	PTO. PRINCESSA																						*							
5	21 00	ILOILO		○							○													*							
6	21 00	DAVAO																						*							
7	21 09	ZAMBOANGA		○					○							○		○											○		
1	22 00	MACTAN RADAR → GUIUAN RADAR															○							*							
2	23 05	TACLOBAN	○									○					○	○									○				
3	21 00	SAN JOSE										○					○							*							
4	20 50	PTO. PRINCESA																						*							
5	21 00	ILOILO		○							○													*							
6	21 00	CAGAYAN DE ORO → DAVAO																						*							
7	21 50	ZAMBOANGA															○							*							
		Total	2	4					1	1	2	4			1	1	6	3						11			1	1	1		

* Impossible to contact

Table 3.16 (2/2)

Results of HF SSB Propagation Test

Frequency: 7995 kHz

Date	Time (GMT)	Link	QSA					QRN					QRM					Receiving Message Error (%)							Time Needed for Receiving (Min.)						
			1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	<5	6-10	11-15	16-20	21-25	26-30	30<	<5	6-10	11-15	16-20	21-25	26-30	30<
March 1	09 30	GUIUAN RADAR → PFC			○					○					○				○											○	
2	09 30	TACLOBAN					○		○				○					○								○					
3	09 30	SAN JOSE					○	○					○					○								○					
4	09 30	PTO. PRINCESA			○				○						○				○							○					
5	09 30	ILOILO				○			○					○				○								○					
6	09 30	DAVAO			○				○					○				○								○					
7	09 30	ZAMBOANGA				○			○						○			○								○					
1	09 30	GUIUAN RADAR → MACTAN RADAR		○						○				○				○												○	
2	09 30	TACLOBAN				○			○				○					○												○	
3	09 30	SAN JOSE					○		○				○					○												○	
4	09 30	PTO. PRINCESA	○								○				○									*							
5	09 30	ILOILO																○												○	
6	10 00	DAVAO → CAGAYAN DE ORO				○				○					○			○												○	
7	09 00	ZAMBOANGA				○				○					○			○												○	
		Total	1	1	3	5	3	1	7	4	1		4	3	6			11	2					1		6				7	
1	21 00	GUIUAN RADAR → PFC																						*							
2	21 00	TACLOBAN																						*							
3	21 00	SAN JOSE																						*							
4	21 00	PTO. PRINCESA																						*							
5	21 00	ILOILO																						*							
6	21 00	DAVAO																						*							
7	21 00	ZAMBOANGA		○							○					○						○						○			
1	21 00	GUIUAN RADAR → MACTAN RADAR	○							○				○										*							
2	22 30	TACLOBAN	○								○			○				○												○	
3	21 00	SAN JOSE	○								○				○									*							
4	21 00	PTO. PRINCESA									○													*							
5	21 00	ILOILO																						*							
6	21 00	DAVAO → CAGAYAN DE ORO	○								○					○								*							
7	21 00	ZAMBOANGA	○								○					○								*							
		Total	5	1						1	6			2	1	3		1				1		12				1		1	

* Impossible to contact

Table 3.17

List of Instruments at Weather Stations

Observation	Element	Instrument
Surface (0, 3, 6, --- --- 18, 21GMT)	Air Pressure	Aneroid Barometer Microbarograph (Fortin Barometer)
	Air Temperature	Sling Thermometer Maximum/Minimum Thermometer
	Humidity	Dry-Wet Bulb Thermometer Hygrothermograph
	Wind	Windmill-type Anemometer Cup Anemometer
	Rain	Rain Gauge
Upper-Air (0, 6, 12, 18 GMT)	Air Pressure Air Temperature Humidity	Radiosonde Press. : Aneroid Barometer Temp. : Bimetallic Thermometer Humid. : Hair Hygrometer Gas : Hydrogen Brand (Mactan) Sonde · Vaisala Balloon: To-Tex (350g)
Radar (0, 3, 6, --- ---18, 21GMT)	R a i n	Radar Brand (Mactan): Raytheon Pulse Radar "S" BAND Frequency : 2700 - 2900 MHz Wave Length 10.5 cm Peak Power : 50 KW Pulse Repetition Rates: 600 - 100 PPS *Steel Photograph Observation
Seismography	Earthquake	Short Period Seismograph Brand TELEDYNE GEOTECH Helicorder Magnification 125,000K