

CHAPTER 2



CHAPTER 2 BACKGROUND OF PROJECT

2.1 Economic Situation of Paraguay

2.1.1 Geography

The Republic of Paraguay is situated in the central part of the South American Continent, bordered by Bolivia on the north, Brazil on the east and by Argentine on the south and the west, with a total territorial area of 406,700 km². The Paraguay River running from the north to the south divides the country into the Western Paraguay and the Eastern Paraguay. The Western Paraguay is a scarcely inhabited prairie called "Chaco District", and occupies an area equal to 61% of the total national territory. The Eastern Paraguay where CPS and Asuncion, the national capital, are situated, occupies the balance of 39% of the total area of the Republic. The climate of the country is subtropical and has four seasons, namely spring from September through October, summer from November through March, autumn from April through May and winter from June through August. The annual mean temperature is 22°C, while the mean temperatures of the summer and the winter months are 31.5°C and 16°C respectively.

2.1.2 Population

The population of Paraguay, according to the governmental estimation, was 2.805 million in 1977. The annual growth rate of population in the 10 years between 1967 and 1977 was 2.8%, while that in the last 5 years was 2.9% (Appendix 2-1). The mean density of the entire country is 6.5 persons/km², but as much as 97% of the total national population concentrates in the Eastern Paraguay, with 62% existing in Asuncion, the Capital.

The labor force accounts for 31.5% of the total population, with 47.8% of the working population belonging to the agricultural sector, 14.1% to the industrial sector, and 29.4% to the services sector.

The future annual growth rate of population through the year 1985 is estimated by the Government at 2.9%.

2.1.3 Gross Domestic Product

Gross domestic product of Paraguay has steadily increased with annual growth rate of 6.3% in real terms during the 10-year period between 1967 and 1977. Real GDP per capita has grown by 3.4% per year during the same period.

The real GDP and that per capita in 1977 were 142,858 million guaranies and 50,935 guaranies respectively in 1972 price. (Appendix 2-1)

The primary industry, though its share is slightly on a decline, accounted for one-third of GDP in 1977, while the secondary and tertiary industries accounted for about 20% and 47% respectively in the same year.

2.1.4 Exports and Imports

The primary industry products accounted for about 56% of the total export value of the country in 1976. The main export items are lumber, beef, vegetable oil, cotton, tobacco, etc. (Appendix 2-2). On the other hand, the country heavily depends on imports for the supply of consumer goods and intermediate goods. The main import items are machinery, vehicles, petroleum and its processed goods, etc. (Appendix 2-3).

2.1.5 Tourism

Tourism industry plays an important role in foreign exchange earnings of the country, and the total income in tourism industry in 1977 amounted to 35.4 million US dollars, accounting for 12% of the total foreign exchange earnings. The total number of visitors to Paraguay in the same year amounted to 153,500 persons, and the value consumed per visitor amounted to 230 US dollars (Appendix 2-4). As for the region of origin of visitors, Argentine and Brazil together accounted for about 80% (Appendix 2-5) of the total. A total of 30 hotels existed in Paraguay in 1977, with a total of 2,279 rooms and 5,314 beds, of which 68% and 76% respectively were in Asuncion. (Appendix 2-6)

2.2 Transportation System of Paraguay

2.2.1 Road Transport

The total length of serviceable roads in Paraguay in 1977 was 8,815 km, 13% of which being paved (Appendix 2-7). The most important trunk roads are Ruta 1 running 370 km between Asuncion and Encarnacion, 134-kilometer Ruta 2 connecting between Asuncion and Cnel Oviedo and Ruta 7 running 193 km between Cnel Oviedo and CPS, all of which are paved. The principal road network is shown in Fig. 2.1. Road accounted for 19.3% of the total tonnage of international cargo transported in 1977.

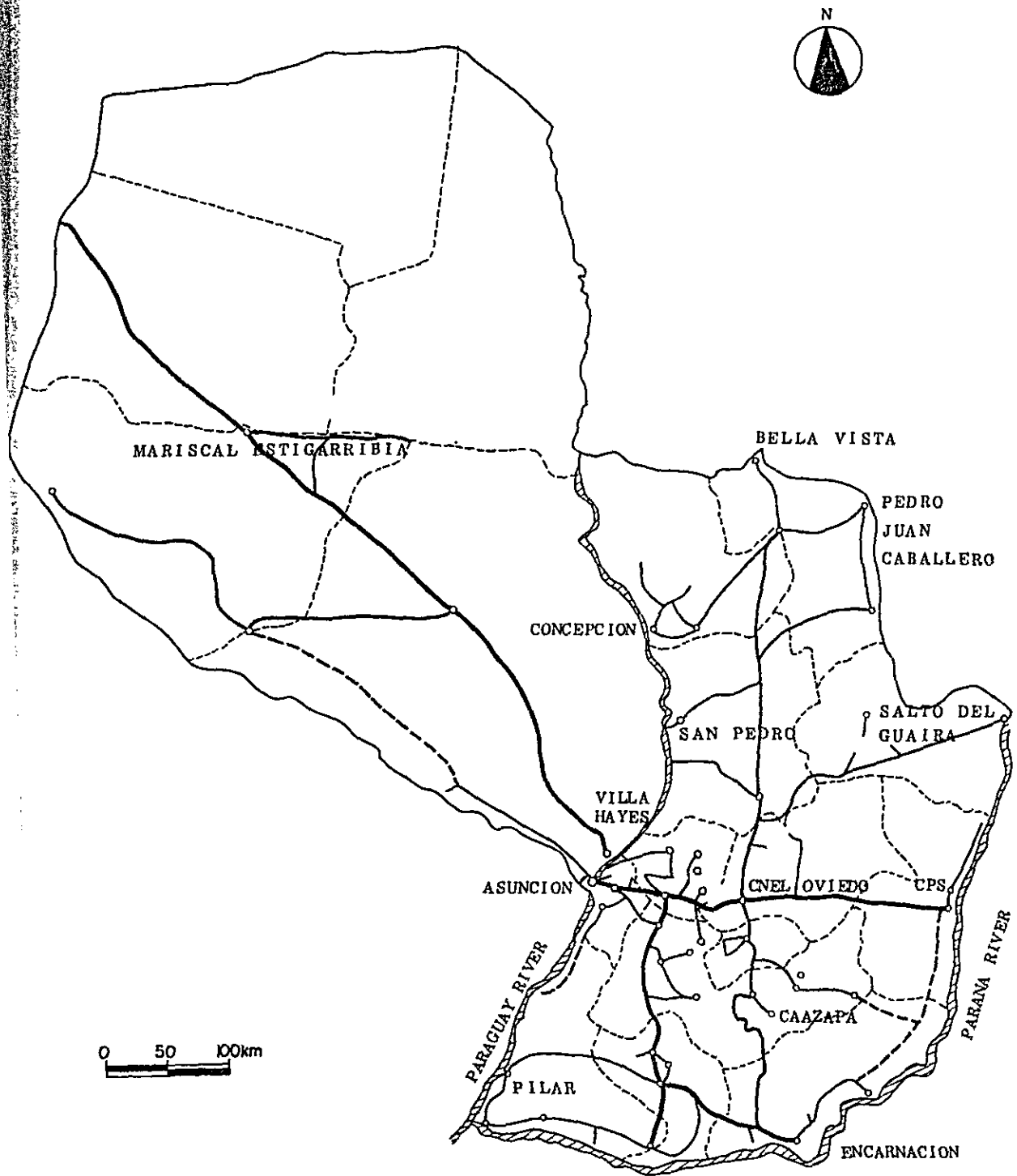


Fig. 2.1 PRINCIPAL ROAD NETWORK AS OF 1977

With the development of roads and increase in the national income, the number of registered cars has increased year after year, a total of 52,071 being registered in 1975 (Appendix 2-8).

2.2.2 Railway Transport

The railway network of the country consists of 490 km of the national railways and 670 km of private railways. The main route of the national railways is the one of 376 km connecting between Asuncion and Encarnacion. Most of the private railways, having been established mainly for transporting lumber and sugar cane, are in the "Chaco District" but only a few of them are now in operation. The total number of passengers and cargo tonnage transported by the national railways in 1975 was 186.6 thousand persons and 96.5 thousand tons respectively. (Appendix 2-9)

2.2.3 River Transport

As the Republic of Paraguay is landlocked, the Paraguay River and the Parana River play an important role in the transportation system of the country, especially as a means to connect to the Argentine market and to the oceanic transport on the Atlantic. The river transport accounted for 75% of the total international cargo tonnage transported in the country in 1977. (Table 2.1)

2.2.4 Air Transport

There are presently a total of 286 aerodromes in Paraguay, of which 23 including the only international airport of Asuncion serve scheduled flights. The foreign airlines serving regular international flights at the Asuncion International Airport are Aerolineas Argentinas, Branif International,

Table 2.1 INTERNATIONAL CARGO TONNAGE BY MODE OF TRANSPORT

| Year | Total Tonnage | River | | Railway | | Air | | Road | |
|------|---------------|---------|------|---------|------|---------|-----|---------|------|
| | | Tonnage | % | Tonnage | % | Tonnage | % | Tonnage | % |
| 1964 | 672,922 | 646,812 | 96.1 | 25,566 | 3.8 | 544 | 0.1 | - | - |
| 1965 | 816,754 | 766,810 | 96.3 | 28,826 | 3.6 | 889 | 0.1 | - | - |
| 1966 | 774,791 | 740,276 | 95.5 | 30,695 | 3.9 | 900 | 0.2 | 2,920 | 0.4 |
| 1967 | 756,669 | 714,676 | 94.4 | 30,455 | 4.0 | 1,192 | 0.2 | 10,346 | 1.4 |
| 1968 | 750,744 | 688,772 | 91.5 | 42,933 | 5.7 | 1,137 | 0.1 | 19,902 | 2.7 |
| 1969 | 718,845 | 635,476 | 88.4 | 55,877 | 7.8 | 1,337 | 0.2 | 26,155 | 3.6 |
| 1970 | 856,178 | 752,249 | 87.9 | 63,618 | 7.4 | 1,601 | 0.2 | 38,710 | 4.5 |
| 1971 | 776,079 | 669,264 | 86.2 | 58,700 | 7.6 | 1,663 | 0.2 | 46,452 | 6.0 |
| 1972 | 747,151 | 591,893 | 79.2 | 97,713 | 13.1 | 1,803 | 0.2 | 55,742 | 7.5 |
| 1973 | 809,211 | 629,306 | 77.8 | 78,427 | 9.8 | 1,242 | 0.2 | 100,236 | 12.2 |
| 1974 | 1,055,200 | 792,424 | 75.1 | 96,054 | 9.1 | 3,166 | 0.3 | 163,556 | 15.5 |
| 1975 | 917,800 | 739,282 | 80.5 | 65,629 | 7.2 | 2,753 | 0.3 | 110,136 | 12.0 |
| 1976 | 1,056,551 | 812,716 | 76.9 | 44,296 | 4.2 | 2,780 | 0.3 | 196,759 | 18.6 |
| 1977 | 1,220,830 | 913,249 | 74.8 | 68,923 | 5.7 | 2,948 | 0.2 | 235,710 | 19.3 |

Source: Banco Central del Paraguay

Iberia, Ladeco, Lloyd A. Boliviano, Lufthansa, Pluna and Varig. Lineas Aereas Paraguayas (LAP), national airline of Paraguay, flies B-707 and L-188 type aircraft for international services to and from the big cities of the neighboring countries, U.S.A. and Europe. Fig. 2.2 shows the present international air route network centered at Asuncion. Transporte Aerea Militar (TAM) provides domestic service and flies DC-3 type aircraft. Fig. 2.3 shows the present domestic air route network of Paraguay.

2.3 Air Traffic in Paraguay

2.3.1 International Air Passenger Traffic

1) Embarking and disembarking passengers

The number of international embarking and disembarking passengers in the country has steadily increased at an annual growth rate of 10.4% during the 10-year period of 1968-1978, amounting to 234,300 in 1978. This trend is attributable to the increase in individual income resulting from the steady growth of GDP and the brisk economic interchange with the neighboring countries during the same period. In terms of demand by origin/destination, that of Saõ Paulo and Rio de Janeiro showed the remarkable annual growth rates of 22.3% and 23.5% respectively (Appendix 2-10). The Government at present prohibits foreign airlines to fly passenger charter flights in and out of the Asuncion International Airport.

2) Transit passengers

The number of international transit passengers at the Asuncion International Airport is relatively small, accounting for about 11% of that of embarking and disembarking passengers in 1977.

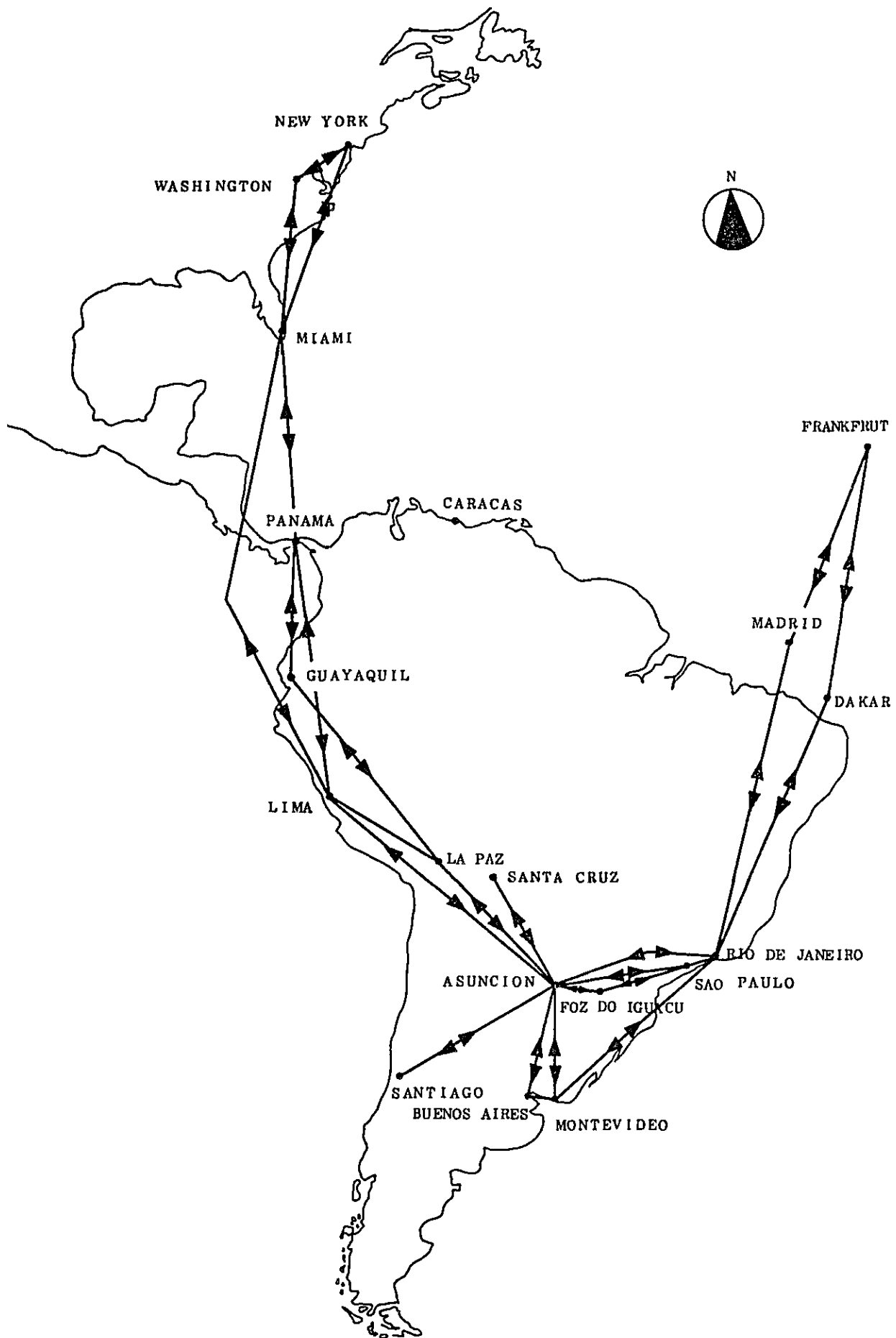


Fig. 2.2 EXISTING INTERNATIONAL AIR ROUTE NETWORK (AS OF MAY 1979)

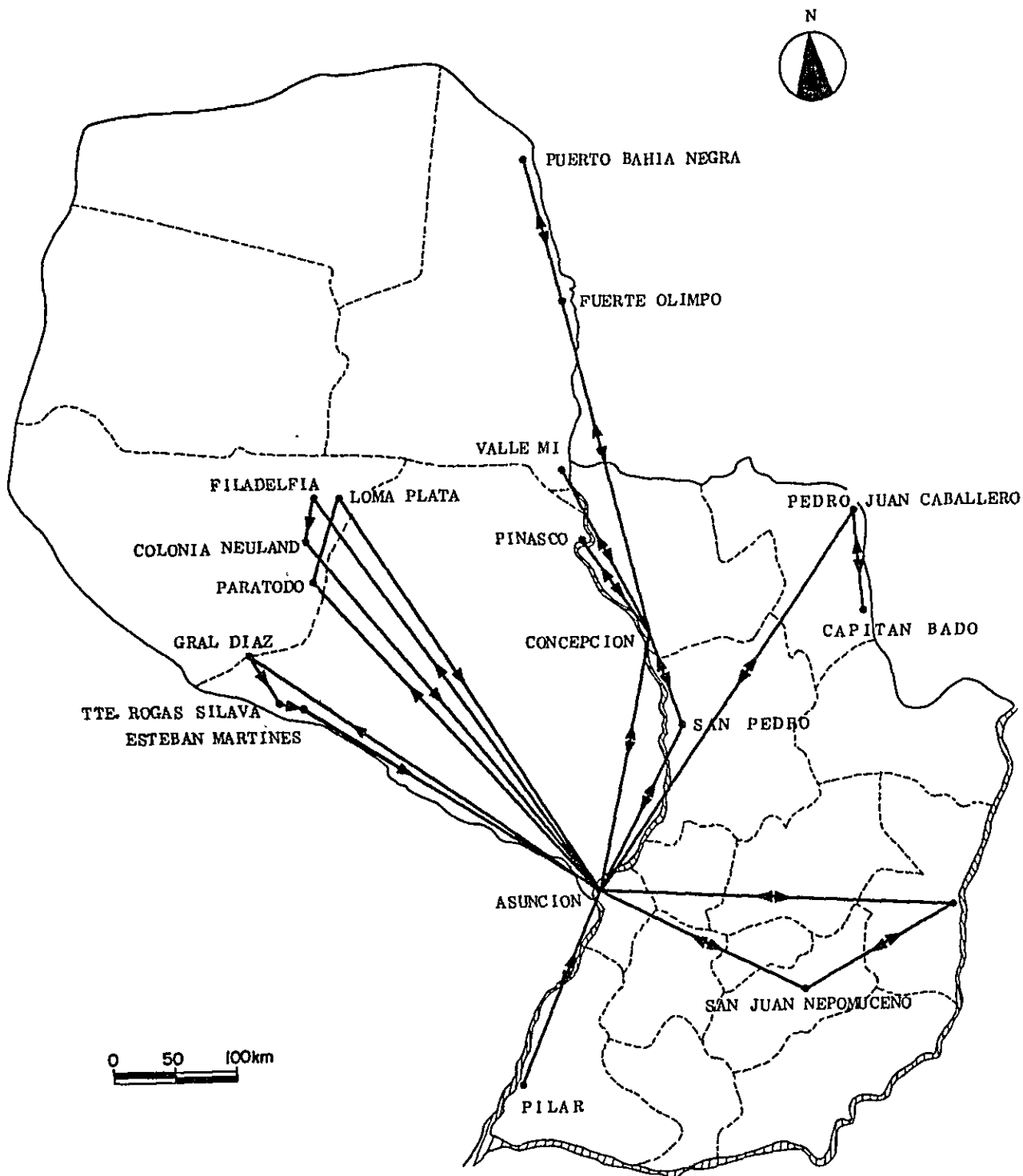


Fig. 2.3 EXISTING DOMESTIC AIR ROUTE NETWORK (TAM)
(AS OF MAY 1979)

2.3.2 Domestic Air Passenger Traffic

The number of domestic embarking and disembarking passengers at Asuncion airport has been fluctuating between 40,000 and 70,000 during the 10-year period of 1968-1978. This tendency is considered attributable mostly to the poor usability of the local airports under bad weather conditions on one hand, and to the improvement of the road network in the country on the other, resulting in a significant reduction in the competitiveness of certain domestic air routes as a transport means.

2.3.3 International Air Cargo Traffic

The international air cargo traffic of the country has steadily increased at an annual growth rate of 8.6% during the 10-year period of 1968-1978 amounting to 2,607 tons in 1978. As for the traffic by origin/destination that of Buenos Aires, Frankfurt and Madrid accounted for 30.9%, 12.4% and 8.8% respectively of the total cargo tonnage handled at Asuncion airport in 1978 (Appendix 2-11). As much as 73.1% of the total international cargo tonnage handled at Asuncion airport was inbound in 1978.

2.3.4 Domestic Air Cargo Traffic

The domestic air cargo traffic at Asuncion airport has been fluctuating between 200 tons and 400 tons per year during the 10-year period of 1968-1978, due to similar reasons to those mentioned above for the domestic air passenger traffic (Appendix 2-12).

2.4 Existing CPS Airport

The existing CPS Airport is situated on the west within the CPS and is closely surrounded by residential areas. The city plans to develop the entire area around the existing CPS

Airport into residential and industrial areas, and consequently there hardly is room for future expansion of the airport. The airport suffer from frequent occurrence of heavy fogs because of the nearby lake, Lago de la República, and the Parana River, and regularity of scheduled flights is seriously disturbed.

The existing CPS Airport has the following main facilities and its layout is given in Fig. 2.4.

(1) Runway

| | |
|-------------|----------------|
| Designation | 17/35 |
| Orientation | 162°/342° True |
| Length | 1,100 m |
| Width | 45 m |
| Surface | grass |

(2) Apron

| | |
|-----------|--------------|
| Dimension | 105 m x 25 m |
| Surface | grass |

(3) Terminal building

| | |
|------------|-------------|
| Floor Area | |
| Arrivals | 6 m x 11 m |
| Departures | 9.5 m x 9 m |

(4) Lighting

| | |
|-------------------|---|
| Obstruction light | One on top of the control room on the terminal building |
|-------------------|---|

(5) Aeronautical telecommunications facility

VHF Air-to-Ground

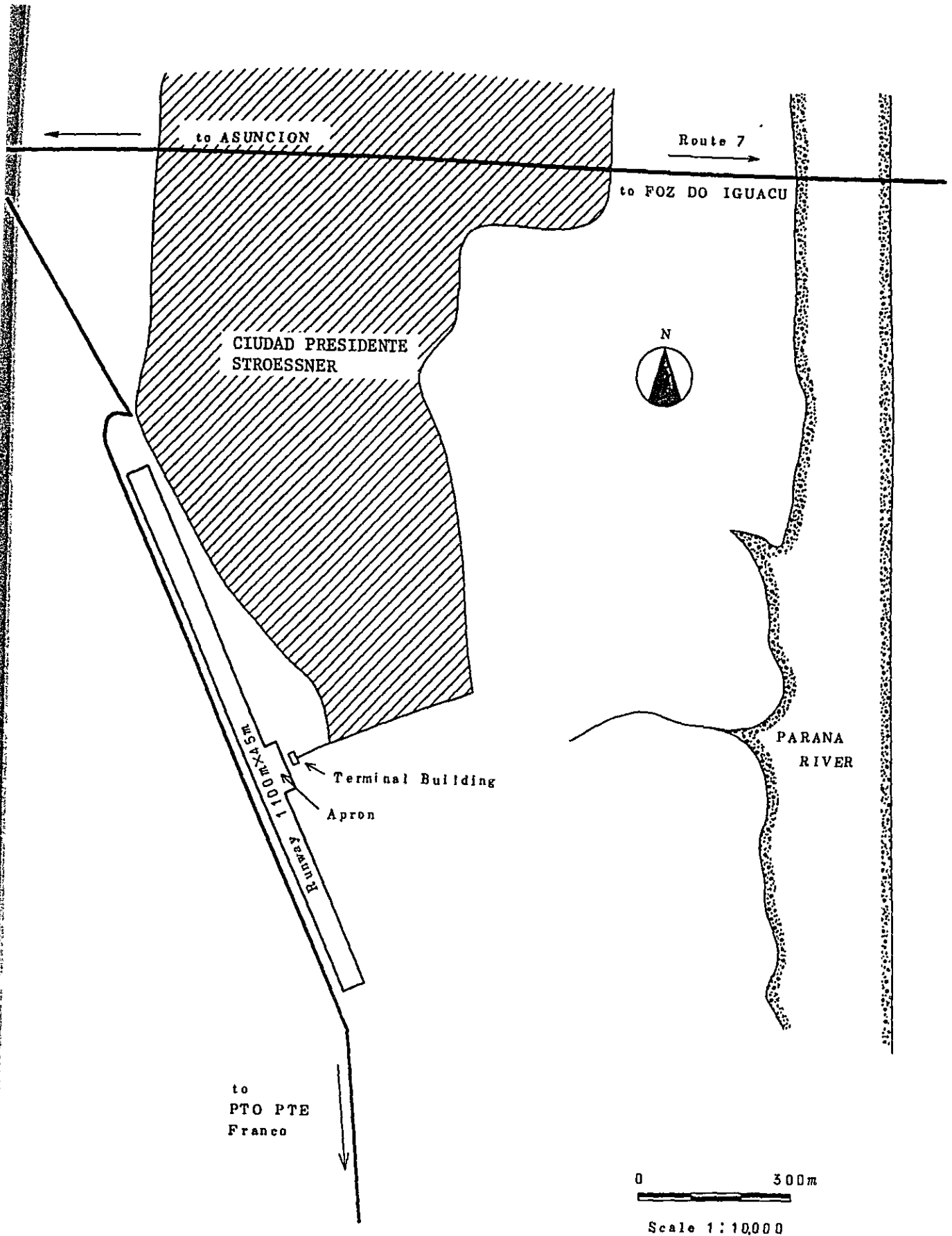


Fig. 2.4 EXISTING CPS AIRPORT LAYOUT

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2.5 Needs for New Airport in CPS

"PLAN NACIONAL DE DESARROLLO ECONOMICO Y SOCIAL 1976-1981" published by PRESIDENCIA DE LA REPUBLICA indicates that Alto Parana District centered around CPS is the potential center of the industrial, agricultural and tourism development of the country as well as of trade.

The Itaipu Dam, the biggest dam in the world, is now under construction at a point about 14 km to the north of CPS, and the new power plant will be in service in 1983. Various types of industry utilizing the abundant electric energy are expected to grow around CPS, which will generate brisk traffic both of people and of goods.

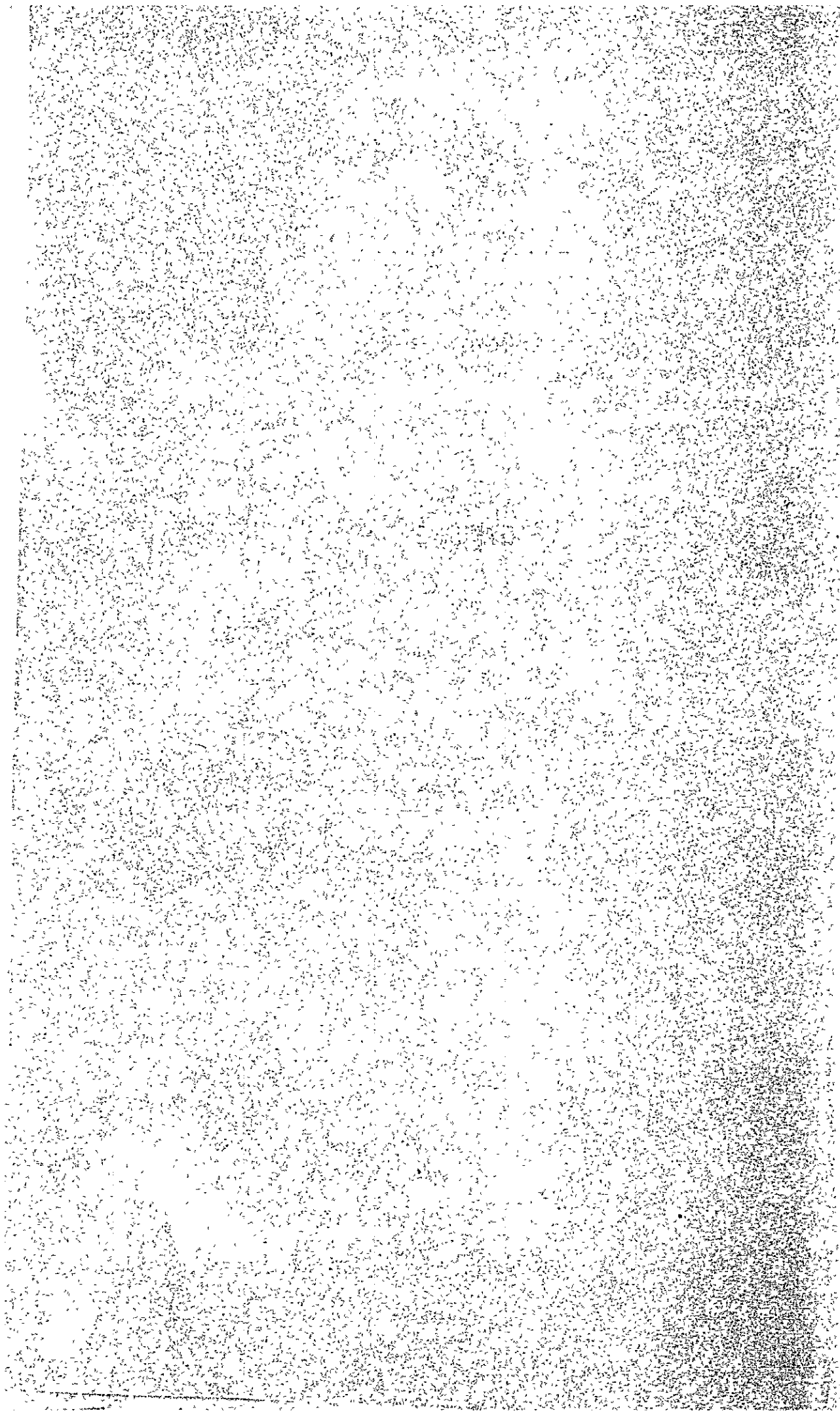
Alto Parana District is the most fertile land of the Republic, where the government is giving preferred priority in the development of agriculture and related industries. This will also cause increasing traffic demand in the future.

CPS is blessed with abundant tourism resources in its vicinity such as the Iguacu Fall in Brazil, a huge artificial lake which is a by-product of the Itaipu Dam Project, the Monday Fall, the Acaray Valley, the Ñacunday Valley, the Lake of the Republic, the Guayaquí National Park, etc. together with the rich tradition of folk dance and music. With the future improvement of the tourism infrastructure in this area rapid increase of tourists, both international and domestic, is expected.

Besides, CPS is linked with Foz do Iguacu in Brazil by the Bridge of Friendship built in 1966, and with the port of Paranaguá in the Atlantic coast by a paved road, and plays an important role in the international trade activities as the east gateway to Paraguay.

Construction of a new airport that would both meet and generate growing transport demand of the area would be indispensable to ensure development of this region to its full potential as mentioned above. Also not to be underestimated is the significance of the new airport which is to become the first alternate airport in its own country to serve the capital gateway of Asuncion International Airport.

CHAPTER 3



CHAPTER 3 AIR TRAFFIC FORECAST

3.1 Methodology and Conditions of Forecast

3.1.1 Outline of Methodology

Air transport demand both of the entire Paraguay and of the CPS area is considered to have a close relationship with the level of economic activities of the country. Gross domestic product of Paraguay being regarded one of the best economic indices of the level of economic activities of the country, was used as the independent variable in regression models of air traffic forecasting in this study. Sequence of the forecasting procedures is outlined in Fig. 3.1.

3.1.2 Conditions of Forecast

The basic conditions on which the forecast was made are established as follows based on the results of analyses made in Chapter 2.

1) Extent of improvement of major local airports

The 7 major local airports of Paraguay, namely Bahia Negra, Mcal. Estigarribia, Filadelfia, P.J.C., Concepcion, Pilar and Encarnacion, are all assumed to be improved in the manner as planned in "PLAN NACIONAL DE DESARROLLO ECONOMICO Y SOCIAL".

2) Period of forecast

Forecast is made for a period of 20 years starting from 1984 through the ultimate design year of 2004 established for the purpose of this feasibility study.

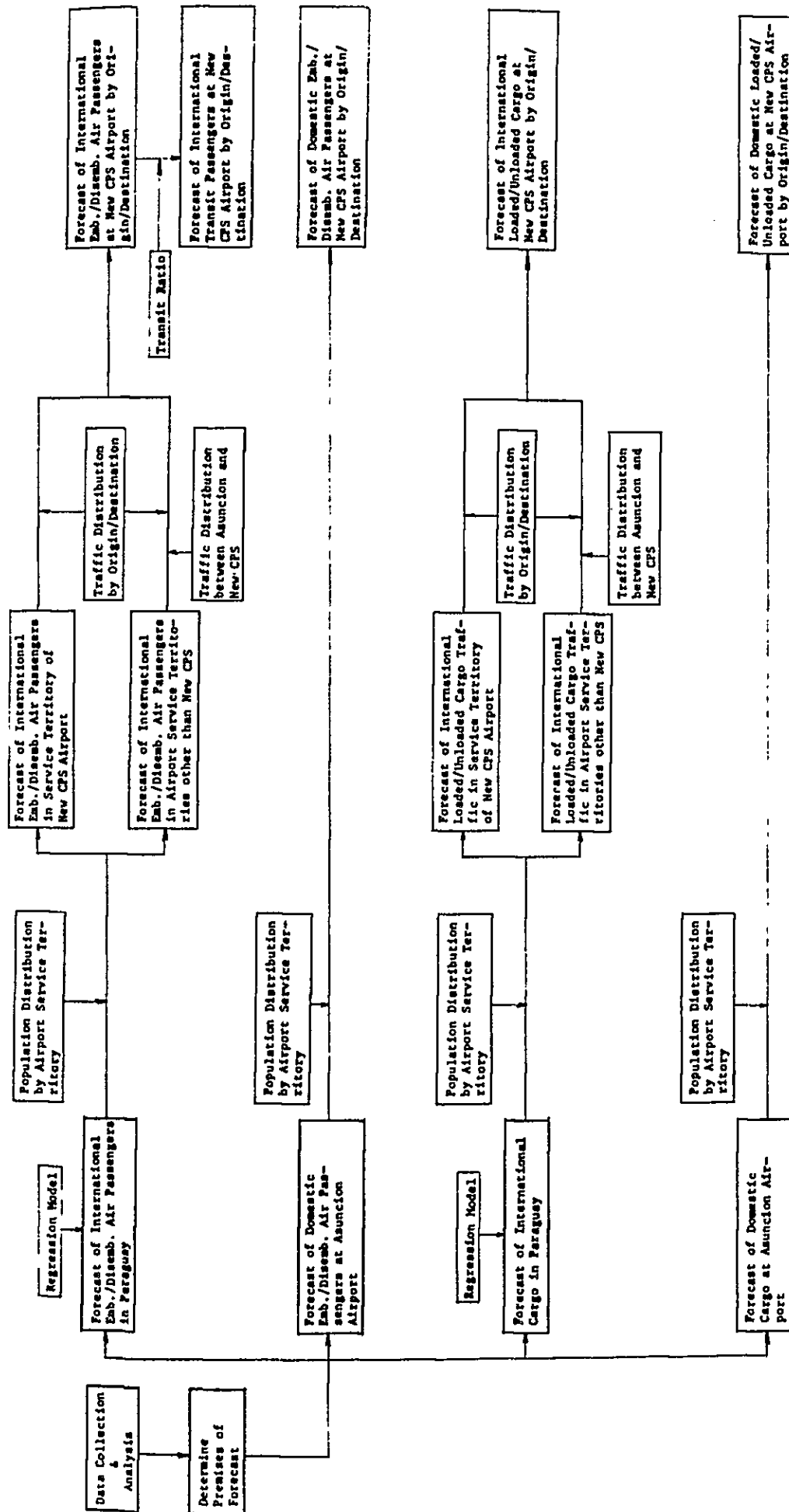


Fig. 3-1 SEQUENCE OF AIR TRAFFIC FORECAST PROCEDURES

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3) Origins/destinations

The origins/destinations considered in the forecast are projected as follows:

International Service

Miami
Madrid
Frankfurt
Rio de Janeiro
Sao Paulo
Montevideo
Buenos Aires
Santiago
Lima
La Paz
Santa Cruz
Panama

Domestic Service

Bahia Negra
Pedro Juan Caballero
Mcal Estigarribia
Filadelfia
Concepcion
Asuncion
Pilar
Encarnacion

4) Airport service territory

The entire Paraguay is divided into 9 blocks for the purpose of traffic demand forecasting, each one of which is assumed to be served by one of the 8 existing airports of Paraguay including Asuncion airport and the new CPS airport. Each one of such blocks is referred to hereunder as airport service territory.

5) Population

Population of Paraguay is estimated by SECRETARIA TECNICA DE PLANIFICACION to reach 3,540 thousand in 1985 with an average annual growth rate of 2.9% during the 5-year period between 1980 and 1985, and its breakdown by region and by prefecture is given in Appendix 3-1. The population of Alto Parana prefecture shows a relatively higher growth rate due to the exceptionally high future growth possibility of the CPS area as mentioned in Section 2.5 in the previous chapter. In this study, the population of each region during the 10-year period of 1985-1995 is assumed to continue to grow at the same respective growth rates as those of the said 5-year period. For the ensuing 10-year period the prefectural distribution ratio of the national population as of 1994 is assumed to remain unchanged through the year 2004 in view of the expected tendency for levelling off of the regional difference in growth rate. The population of the country in 2004 is thus estimated to be 5,799,800 with a lower average growth rate of 2.3% per annum during the 9-year period of 1995-2004. The distribution of the population by airport service territory as defined above is shown in Appendix 3-2 and 3-3 for the years 1994 and 2004 respectively.

6) Gross domestic product

"PLAN NACIONAL DE DESARROLLO ECONOMICO Y SOCIAL (1977-1981)" envisages a 7.6% annual growth rate of GDP in real terms. The actual growth of GDP during the 1977-1978 period, however, showed as high a rate as 10.3%, while the World Bank estimate shows the growth rate of 7% up to the year 1995. Taking all these into account, the annual growth rate in real terms of

GDP of the country is assumed to be 7.0% for the 16-year period of 1979-1995, and 6.0% for the rest of the forecast period in expectation of a duller growth tendency. The estimate of GDP based on these assumptions are given in Table 3.1.

Table 3.1 ESTIMATED FUTURE REAL GDP OF PARAGUAY

| Year | Real GDP (100 million \$) |
|------|---------------------------|
| 1984 | 236.5 |
| 1989 | 331.7 |
| 1994 | 465.3 |
| 1999 | 628.5 |
| 2004 | 841.1 |

3.2 International Air Passenger Traffic Forecast

3.2.1 International Embarking and Disembarking Passengers of Paraguay

Regression analysis was made between the gross domestic product of Paraguay and the transport demand per origin/destination at Asuncion Airport, and the result is shown in Fig. 3.2. The regression model employed in the analysis is given in Appendix 3-4 - 3-6.

3.2.2 International Embarking and Disembarking Passengers at CPS Airport

The number of passengers by origin/destination obtained as mentioned above is each distributed over the 9 airport service territories according to the distribution ratio of the population as explained in Section 3.1.2. The air passenger traffic demand by origin/destination of each service territory other than those of Asuncion and CPS was

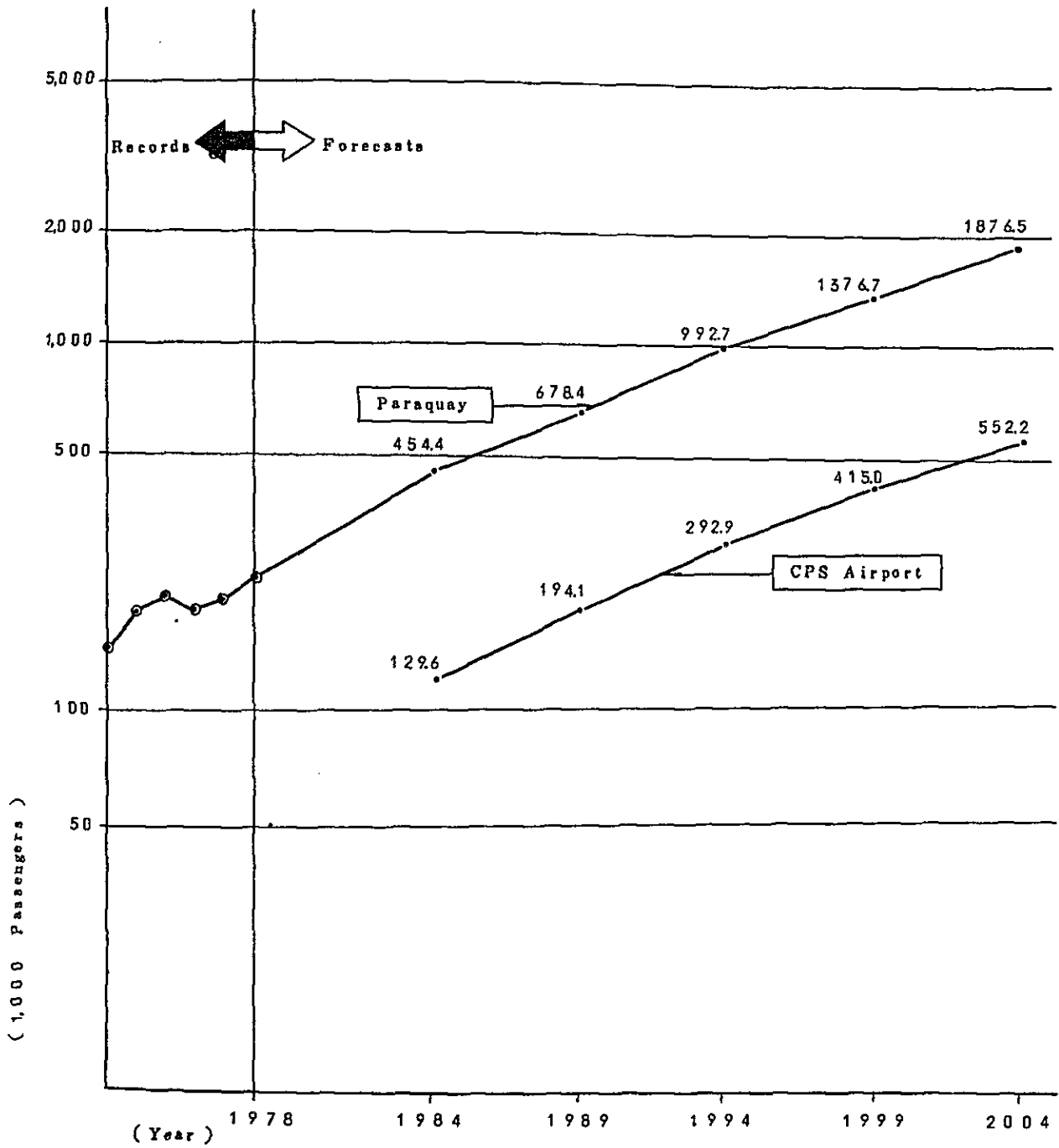


Fig. 3.2 FORECASTS OF INTERNATIONAL EMBARKING AND DISEMBARKING AIR PASSENGERS IN PARAGUAY AND AT CPS AIRPORT

then distributed between the two international airports based on the relative geographical position of each service territory to the two airports, and the traffic thus distributed to CPS Airport from each such territory was added together to obtain the international air passenger demand by origin/destination at the new airport. The result is given in Table 3.2.

3.2.3 International Transit Passengers at CPS Airport

The number of international transit passengers at CPS Airport was estimated at 11% of the international embarking and disembarking passengers, based on the average ratio of the past three years at Asuncion Airport.

3.3 Domestic Air Passenger Traffic Forecast

3.3.1 Domestic Embarking and Disembarking Passenger Traffic at Asuncion Airport

As a first step of forecasting the CPS traffic, the domestic air transport demand in the service territory of Asuncion Airport was calculated in relation to the projected growth of the gross domestic product of the country throughout the period of forecast, with the result as shown in Fig. 3.3.

3.3.2 Domestic Embarking and Disembarking Passenger Traffic at CPS Airport

The domestic passenger traffic forecast for the service territory of Asuncion Airport was distributed over the entire domestic air routes originating/terminating at Asuncion Airport based on the population distribution ratio of each territory. Then, using the passenger traffic of the Asuncion-CPS route as a basis of calculation, traffic of all the air routes originating/terminating at CPS Airport was developed pro rata

Table 3.2 FORECAST OF INTERNATIONAL PASSENGER TRAFFIC BY ORIGIN/DESTINATION AT CPS AIRPORT

(1,000 passengers)

| Origin/Destination | | 1984 | 1989 | 1994 | 1999 | 2004 |
|------------------------|----------------|-------|-------|-------|-------|-------|
| MIA | Emb. & Disemb. | 5.9 | 9.5 | 14.7 | 21.2 | 28.7 |
| | Transit | 0.7 | 1.1 | 1.6 | 2.3 | 3.2 |
| | Total | 6.6 | 10.6 | 16.3 | 23.5 | 31.9 |
| PTY | Emb. & Disemb. | 1.1 | 1.8 | 2.9 | 4.5 | 6.1 |
| | Transit | 0.1 | 0.2 | 0.3 | 0.5 | 0.6 |
| | Total | 1.2 | 2.0 | 3.2 | 5.0 | 6.7 |
| LIM | Emb. & Disemb. | 9.8 | 15.5 | 24.0 | 34.4 | 46.4 |
| | Transit | 1.0 | 1.7 | 2.6 | 3.8 | 5.1 |
| | Total | 10.8 | 17.2 | 26.6 | 38.2 | 51.5 |
| SRZ | Emb. & Disemb. | 4.1 | 6.4 | 10.0 | 14.5 | 19.3 |
| | Transit | 0.5 | 0.7 | 1.1 | 1.6 | 2.1 |
| | Total | 4.6 | 7.1 | 11.1 | 16.1 | 21.4 |
| LPB | Emb. & Disemb. | 4.6 | 7.2 | 10.8 | 15.4 | 20.4 |
| | Transit | 0.5 | 0.8 | 1.2 | 1.7 | 2.3 |
| | Total | 5.1 | 8.0 | 12.0 | 17.1 | 22.7 |
| RIO | Emb. & Disemb. | 13.8 | 22.5 | 36.0 | 51.9 | 70.7 |
| | Transit | 1.5 | 2.5 | 4.0 | 5.7 | 7.8 |
| | Total | 15.3 | 25.0 | 40.0 | 57.6 | 78.5 |
| SAO | Emb. & Disemb. | 21.8 | 35.4 | 55.4 | 80.1 | 108.2 |
| | Transit | 2.4 | 3.9 | 6.1 | 8.8 | 11.9 |
| | Total | 24.2 | 39.3 | 61.5 | 88.9 | 120.1 |
| MAD | Emb. & Disemb. | 10.5 | 15.9 | 24.0 | 34.0 | 45.3 |
| | Transit | 1.2 | 1.8 | 2.6 | 3.7 | 5.0 |
| | Total | 11.7 | 17.7 | 26.6 | 37.7 | 50.3 |
| FRA | Emb. & Disemb. | 2.0 | 3.1 | 4.7 | 7.1 | 9.4 |
| | Transit | 0.2 | 0.3 | 0.5 | 0.8 | 1.0 |
| | Total | 2.2 | 3.4 | 5.2 | 7.9 | 10.4 |
| BUE | Emb. & Disemb. | 45.8 | 65.4 | 94.6 | 130.3 | 170.1 |
| | Transit | 5.0 | 7.2 | 10.4 | 14.3 | 18.7 |
| | Total | 50.8 | 72.6 | 105.0 | 144.6 | 188.8 |
| MVD | Emb. & Disemb. | 8.2 | 11.3 | 15.8 | 21.6 | 27.6 |
| | Transit | 0.9 | 1.2 | 1.7 | 2.4 | 3.0 |
| | Total | 9.1 | 12.5 | 17.5 | 24.0 | 30.6 |
| SCL | Emb. & Disemb. | (1.6) | (2.5) | (3.8) | (5.3) | (7.2) |
| | Transit | - | - | - | - | - |
| | Total | (1.6) | (2.5) | (3.8) | (5.3) | (7.2) |
| Total (exclude SCL) | Emb. & Disemb. | 127.6 | 194.1 | 292.9 | 415.0 | 552.2 |
| | Transit | 14.0 | 21.3 | 32.1 | 45.6 | 60.7 |
| | Total | 141.6 | 215.4 | 325.0 | 460.6 | 612.9 |

Note: 1) As explained in Section 4.1 of Chapter 4 the forecast traffic of Santiago origin/destination is considered too small to warrant an international service, and was, therefore, assumed to be accommodated at Asuncion. This traffic is accounted for as domestic traffic between Asuncion and CPS.

2) The forecast traffic of Miami origin/destination includes those of Asian countries, and that of Frankfurt includes those of other European countries.

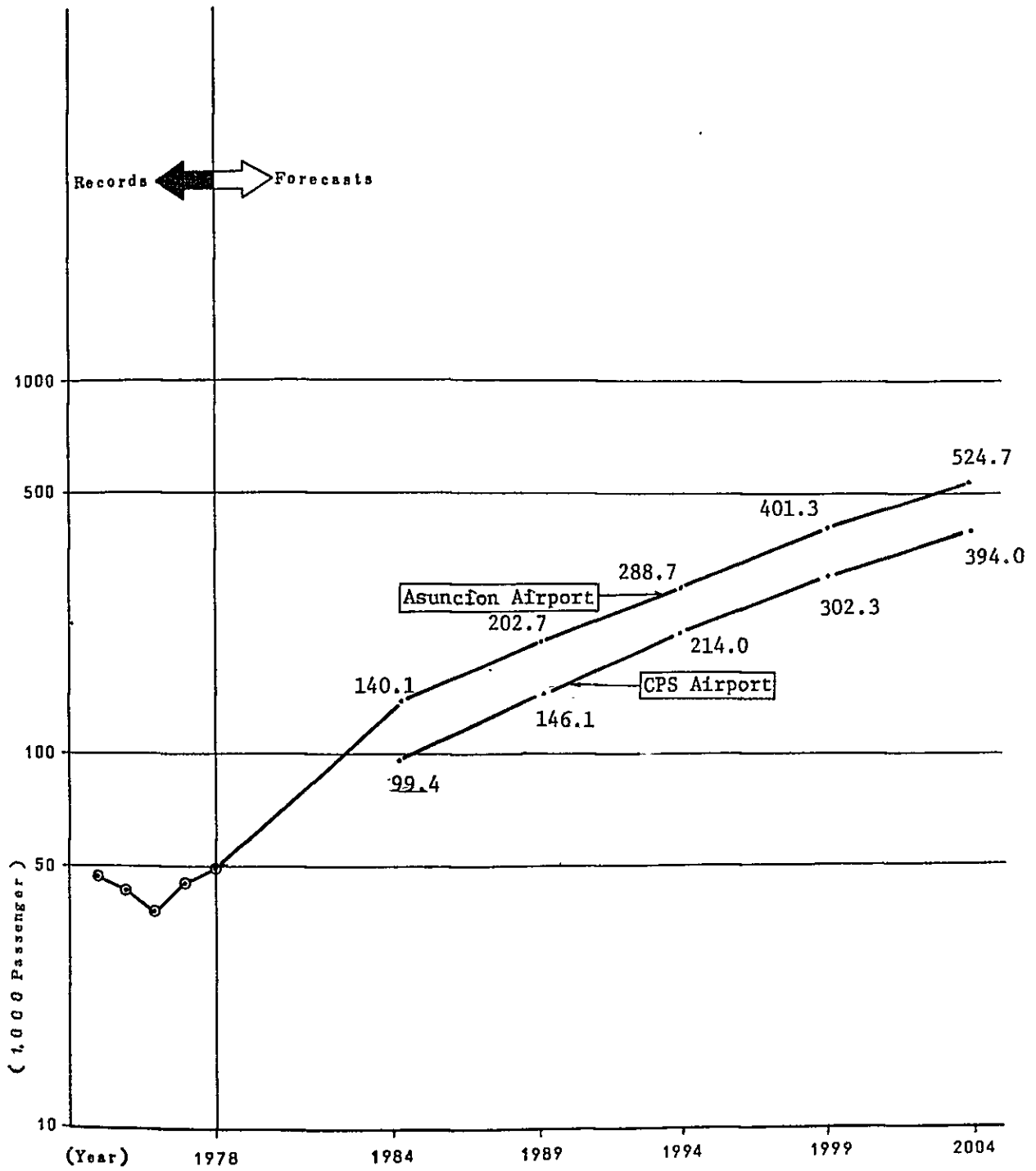


Fig. 3.3 FORECAST OF DOMESTIC AIR PASSENGERS AT ASUNCION AIRPORT AND CPS AIRPORT

according to the distribution ratio of population of each territory, and the traffic of all these air routes was added together to obtain the domestic embarking and disembarking passenger traffic at CPS airport. The result is given in Table 3.3.

3.4 International Air Cargo Traffic Forecast

3.4.1 International Loaded and Unloaded Cargo Traffic of Paraguay

Regression analysis was made between the gross domestic product of the country and the cargo traffic demand per origin/destination at Asuncion Airport. The regression model employed in the analysis is given in Appendix 3-7 and the result is shown in Fig. 3.4.

3.4.2 International Loaded and Unloaded Cargo Traffic at CPS Airport

Considering that the international cargo traffic at Asuncion as forecast above represents the total national traffic of the same category, a similar subsequent method to that used in the international embarking and disembarking passenger traffic forecast was employed to obtain the corresponding international cargo traffic at the new airport, with the result as shown in Table 3.4.

3.5 Domestic Air Cargo Traffic Forecast

Taking into account the growth trend of domestic cargo traffic and the domestic-international cargo traffic ratio recorded at Asuncion for the past three years, the domestic cargo traffic at Asuncion was projected as a first step, and then by applying an identical procedure to that employed in domestic embarking and disembarking passenger traffic fore-

Table 3.3 . FORECAST OF DOMESTIC PASSENGER TRAFFIC BY ORIGIN/
DESTINATION AT NEW GPS AIRPORT

(1,000 passengers)

| Origin/Destination | 1984 | 1989 | 1994 | 1999 | 2004 |
|--------------------|------|-------|-------|-------|-------|
| Filadelfia | 3.2 | 5.7 | 8.4 | 11.5 | 14.0 |
| Bahia Negra | 3.0 | 5.0 | 7.4 | 10.1 | 12.8 |
| Mcal. Estigarribia | 1.1 | 1.5 | 2.3 | 3.1 | 4.1 |
| P.J.C. | 10.1 | 17.4 | 28.9 | 40.5 | 55.0 |
| Concepcion | 20.0 | 30.0 | 43.8 | 60.2 | 77.7 |
| Pilar | 7.3 | 10.3 | 14.7 | 19.6 | 26.6 |
| Encarnacion | 24.4 | 32.8 | 45.4 | 73.4 | 81.3 |
| Asuncion | 30.0 | 43.4 | 63.1 | 83.9 | 122.5 |
| Total | 99.4 | 146.1 | 214.0 | 302.3 | 394.0 |

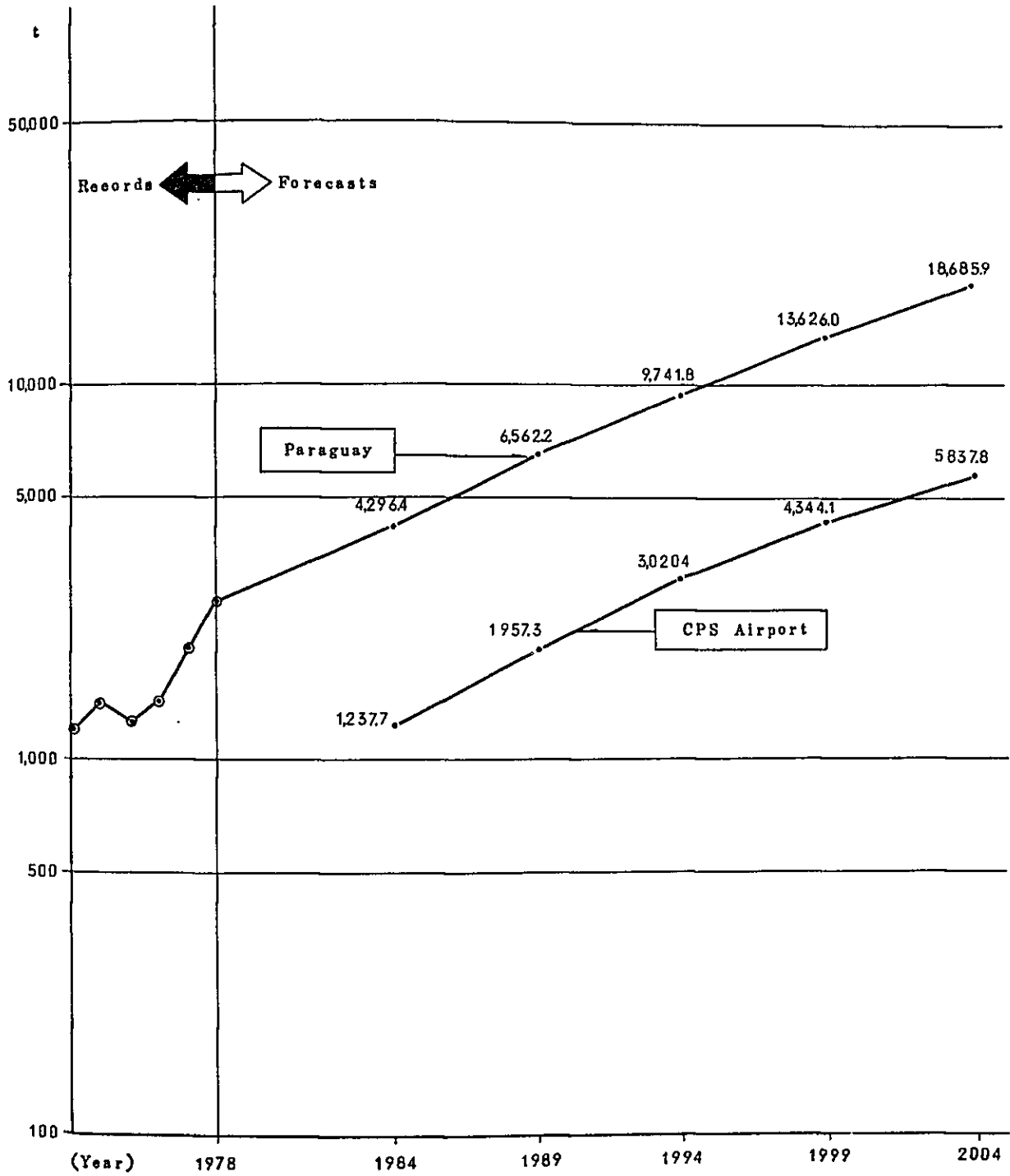


Fig. 3.4 FORECASTS OF INTERNATIONAL LOADED AND UNLOADED AIR CARGO IN PARAGUAY AND AT CPS AIRPORT



Table 3.4 FORECAST OF INTERNATIONAL LOADED & UNLOADED CARGO
TRAFFIC BY ORIGIN/DESTINATION AT CPS AIRPORT

(Ton)

| Origin/Destination | 1984 | 1989 | 1994 | 1999 | 2004 |
|--------------------|---------|---------|---------|---------|---------|
| MIA | 121.2 | 191.8 | 296.0 | 425.8 | 572.1 |
| PTY | 28.5 | 45.0 | 69.5 | 99.9 | 134.3 |
| LIM | 61.9 | 97.8 | 151.0 | 217.2 | 291.9 |
| SRZ | 21.0 | 33.3 | 51.4 | 73.8 | 99.2 |
| LPB | 29.7 | 47.0 | 72.5 | 104.3 | 140.1 |
| RIO | 96.5 | 152.7 | 235.6 | 338.8 | 455.3 |
| SAO | 74.3 | 117.4 | 181.2 | 260.6 | 350.3 |
| MAD | 116.4 | 184.0 | 283.9 | 408.4 | 548.8 |
| FRA | 174.5 | 276.0 | 425.9 | 612.5 | 823.1 |
| BUE | 73.1 | 115.5 | 178.2 | 256.3 | 344.4 |
| MVD | 440.6 | 696.8 | 1,075.2 | 1,546.5 | 2,078.3 |
| SCL | (58.8) | (94.8) | (149.6) | (211.3) | (294.0) |
| Total * | 1,237.7 | 1,957.3 | 3,020.4 | 4,344.1 | 5,837.8 |

* Note: Excludes traffic originating/terminating at SCL
(See note to Table 3.2)

casting, corresponding domestic cargo traffic at CPS was calculated, with the result as shown in Fig. 3.5 and Table 3.5.

3.6 Number of Small Aircraft

Due to insufficiency of available data on the past and present activities of general aviation in Paraguay, the number of small aircraft to be based at the new CPS Airport was estimated to be 150 and 200 respectively for the years 1994 and 2004, by referring to the number registered at Asuncion Airport as of 1977.

3.7 Number of Airport Employees

Based on the number of employees by work category recorded at Asuncion Airport in 1977 and taking into account the expected improvement in labor productivity in the future, the number of employees at the new airport is projected to be 1,234 and 1,992 persons respectively for the years 1994 and 2004.

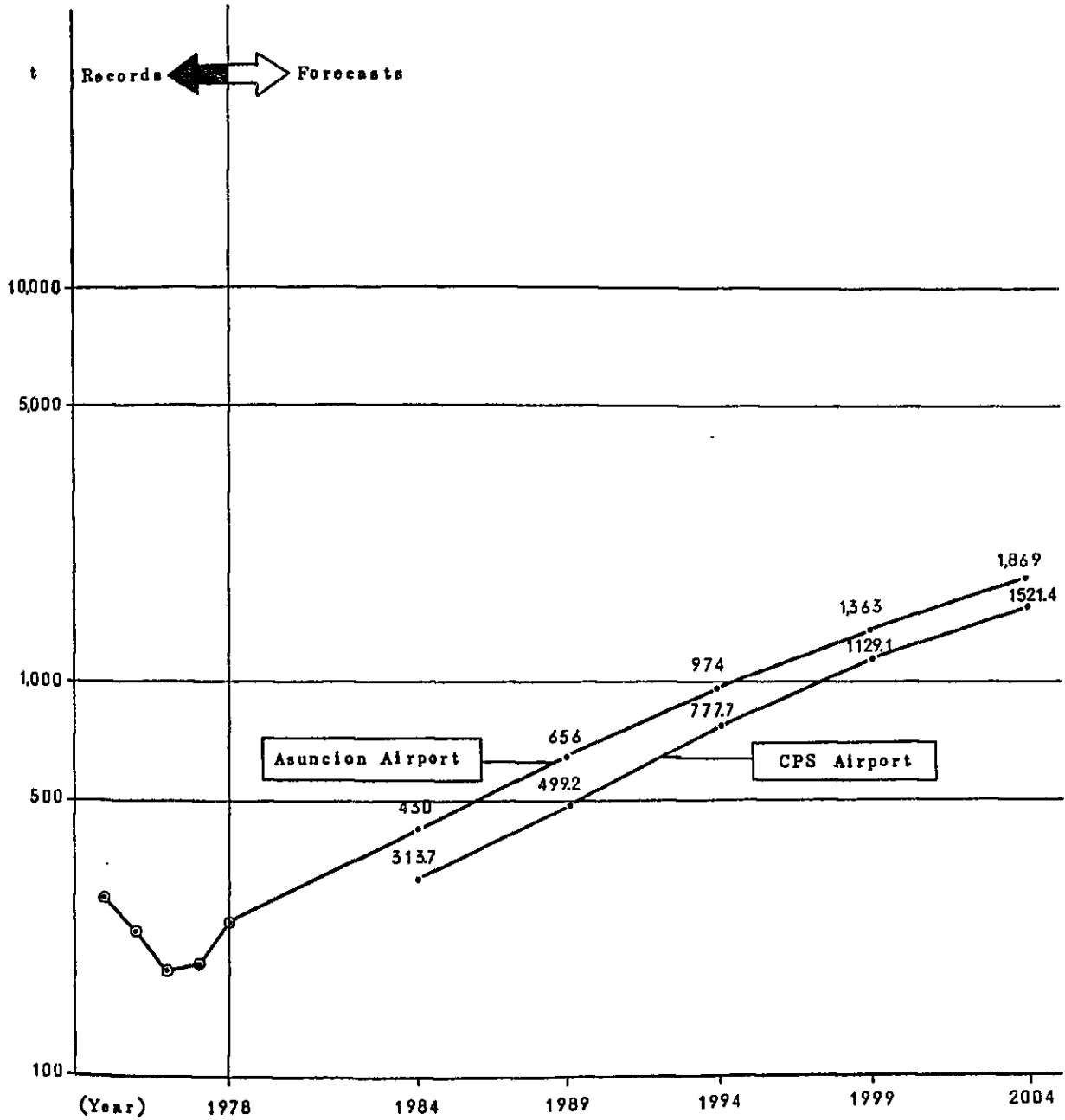


Fig. 3.5 FORECASTS OF DOMESTIC LOADED AND UNLOADED AIR CARGO AT ASUNCION AIRPORT AND CPS AIRPORT

Table 3.5 FORECAST OF DOMESTIC CARGO TRAFFIC BY
ORIGIN/DESTINATION AT CPS AIRPORT

(Ton)

| Origin/Destination | 1984 | 1989 | 1994 | 1999 | 2004 |
|--------------------|--------------|----------------|----------------|----------------|----------------|
| Filadelfia | 28.5 | 52.6 | 79.1 | 111.4 | 135.3 |
| Bahia Negra | 26.2 | 46.9 | 70.2 | 99.0 | 125.6 |
| Mcal. Estigarribia | 9.0 | 13.7 | 20.5 | 29.1 | 39.6 |
| P. J. C. | 93.2 | 162.3 | 276.8 | 397.6 | 543.6 |
| Concepcion | 174.7 | 274.8 | 412.5 | 581.8 | 777.7 |
| Pilar | 63.2 | 92.9 | 135.7 | 186.6 | 254.6 |
| Encarnacion | 217.9 | 307.6 | 437.1 | 722.0 | 830.0 |
| Asuncion | 224.2 | 353.9 | 547.9 | 777.6 | 1,078.8 |
| Total | 836.9 | 1,304.5 | 1,979.8 | 2,905.1 | 3,785.2 |

CHAPTER 4



CHAPTER 4 AIRPORT FACILITY REQUIREMENTS

As a result of the discussions with the officials concerned of the Government of the Republic, the facility requirements to accommodate the air transport demand forecast in the previous chapter were developed in 2 stages, namely Stage I for 1994 and Stage II for 2004, in conformity with the ICAO standards and/or the FAA regulations with due considerations for the local peculiarities and practices. The sequence of this work as outlined below is shown in the flowchart in Fig. 4.1.

4.1 Projected Air Route Network

Taking into consideration the amount of traffic of each origin/destination forecast in the previous chapter, a projected air route network was established to accommodate the entire traffic of Paraguay as shown in Figs. 4.2(a), (b) and (c), covering respectively the international service common in Stages I and II, domestic service in Stage I and that in Stage II. As mentioned in the previous chapter the traffic forecast between CPS and Santiago is not large enough to justify direct international service and is, therefore, channeled through Asuncion Airport and counted as domestic traffic between Asuncion and CPS. The entire international and domestic traffic by route is presented in Tables 4.1 and 4.2 respectively.

4.2 Airfield Facilities

4.2.1 Runway Strip

The width of runway strip shall be 300 m throughout its entire length so as to accommodate a precision approach runway.

4.2.2 Runway

The runway length requirement was determined based on the following design conditions:

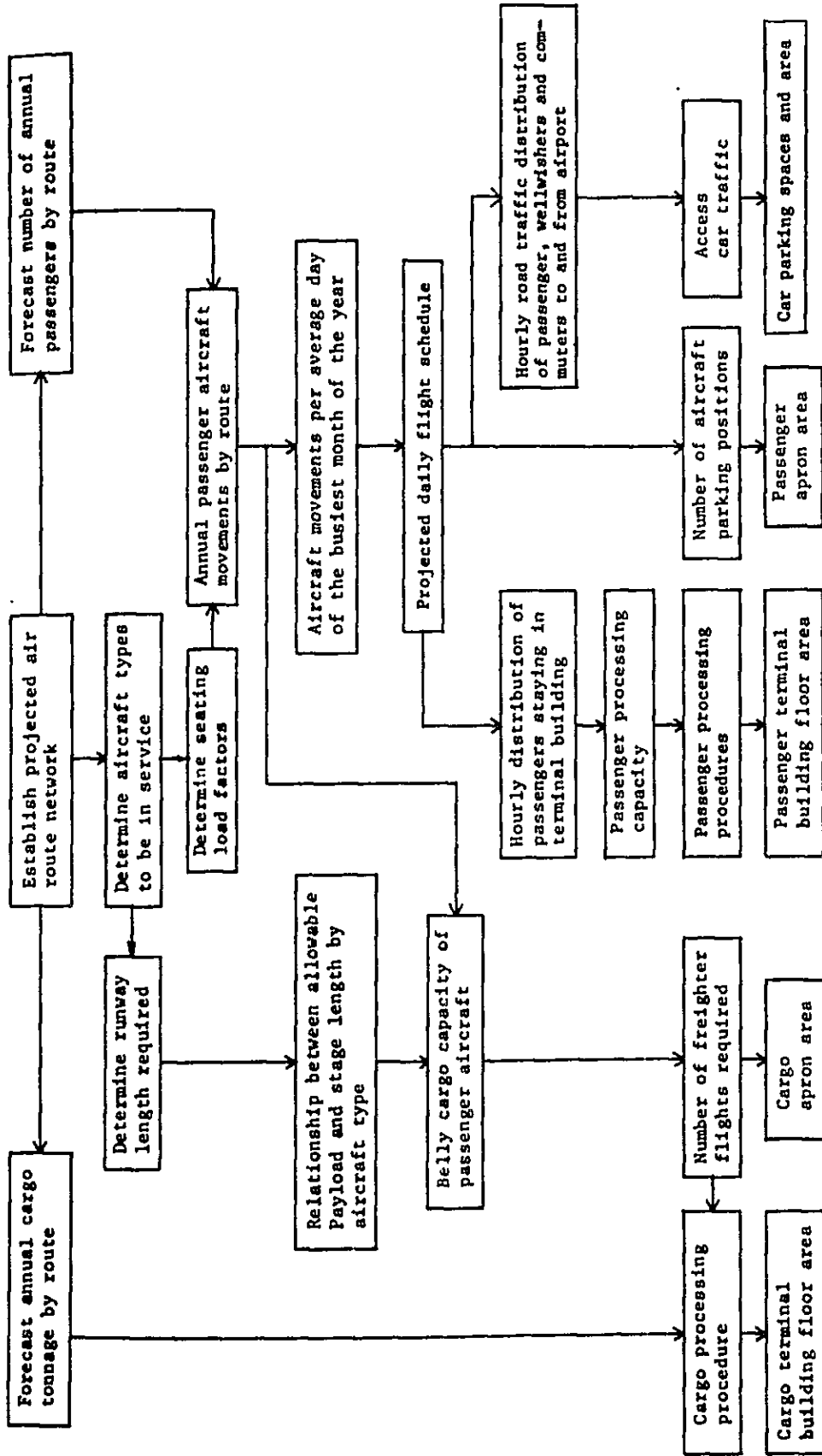


Fig. 4.1 SEQUENCE OF FACILITY REQUIREMENTS ANALYSIS

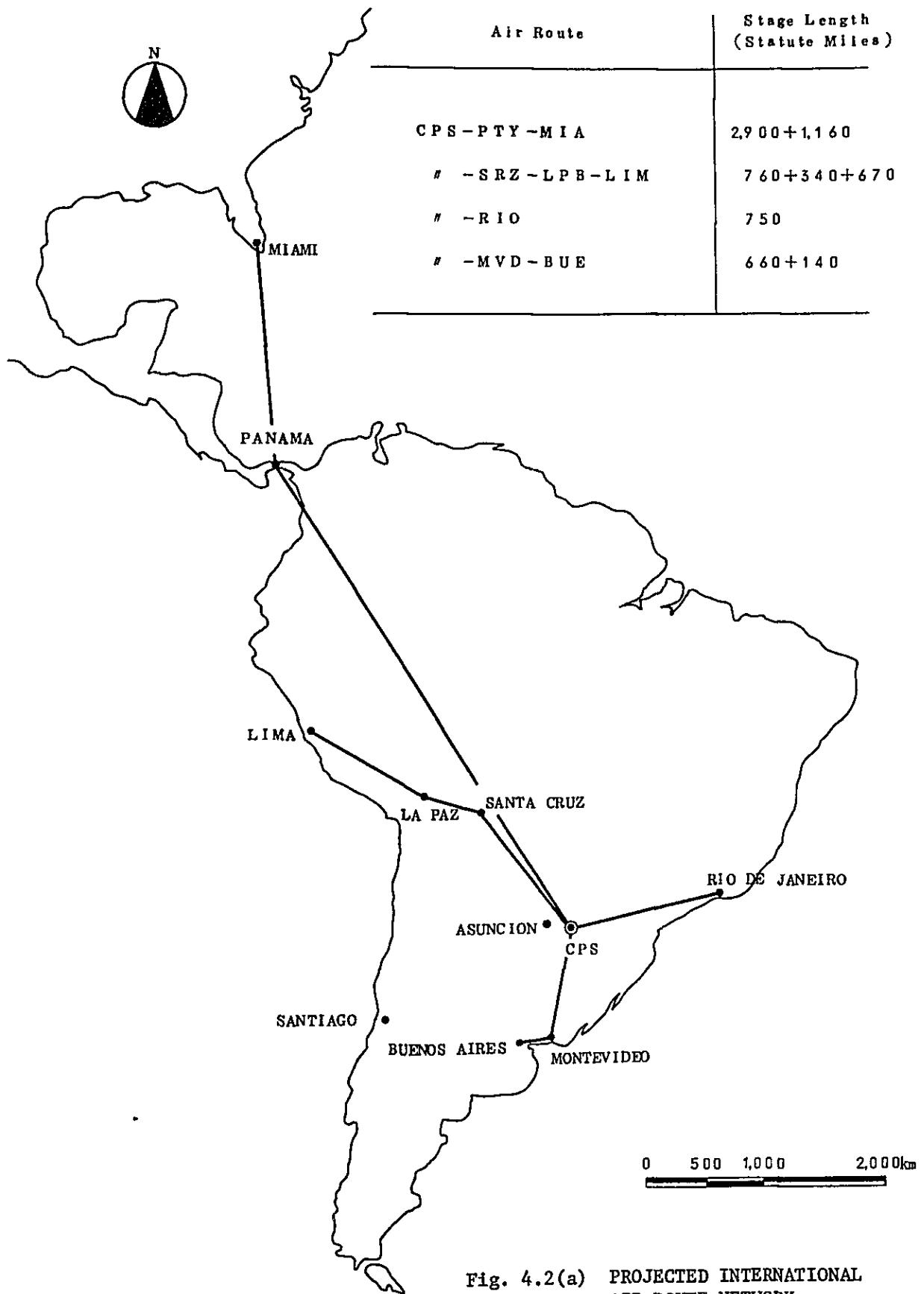


Fig. 4.2(a) PROJECTED INTERNATIONAL AIR ROUTE NETWORK - STAGES I & II (1994 AND 2004)

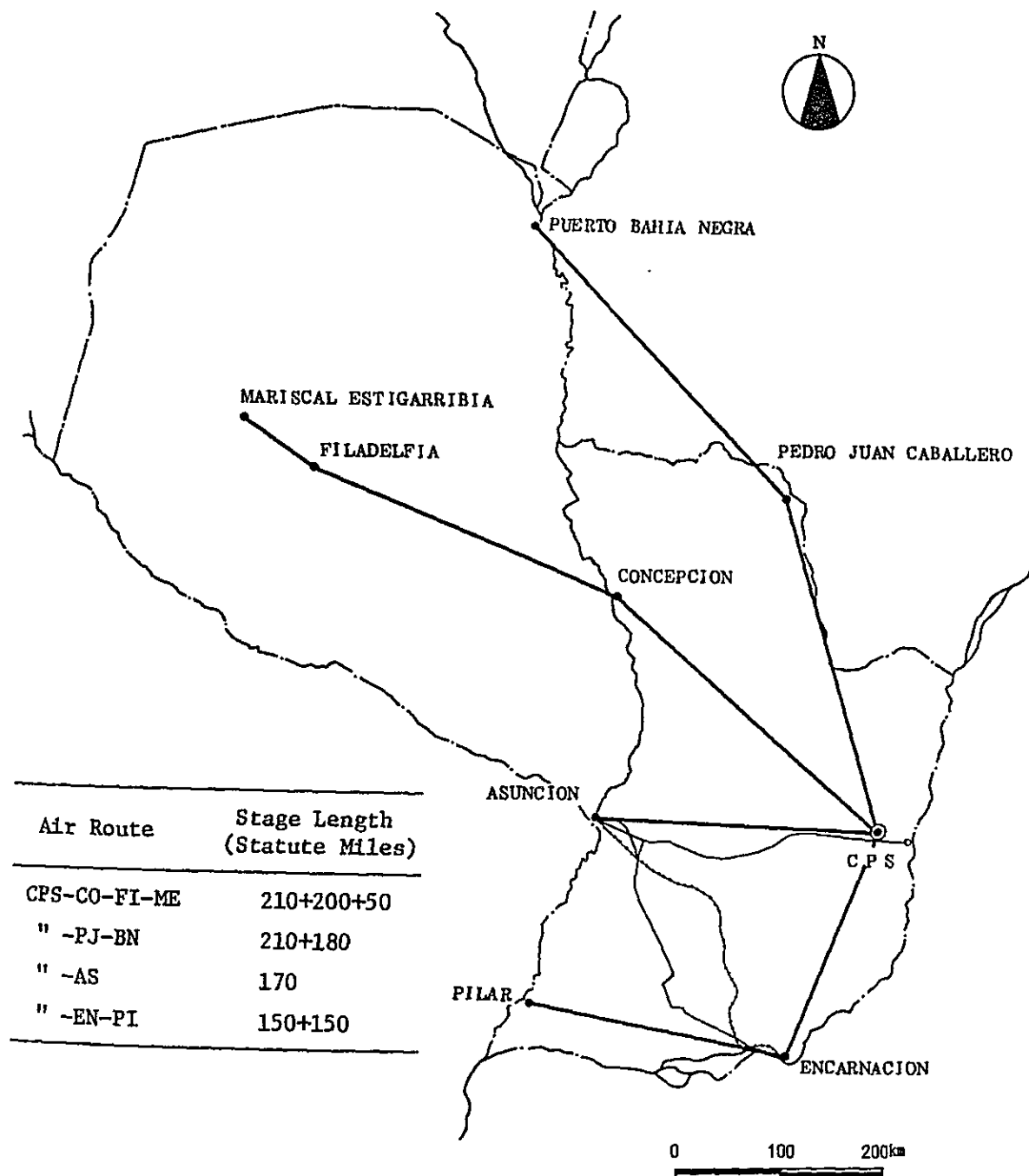


Fig. 4.2(b) PROJECTED DOMESTIC AIR ROUTE NETWORK - STAGE I (1994)

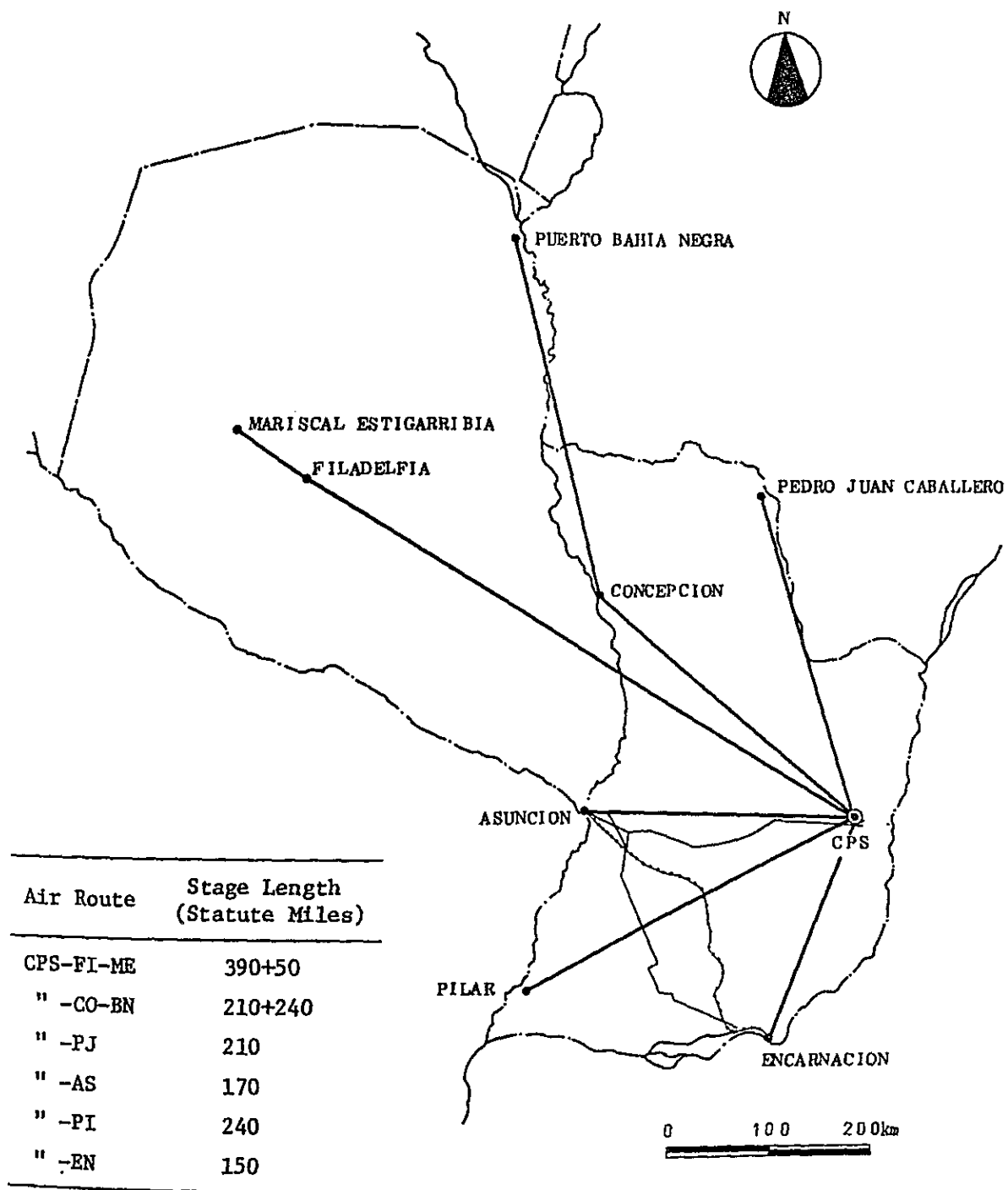


Fig. 4.2(c) PROJECTED DOMESTIC AIR ROUTE NETWORK - STAGE II (2004)

Table 4.1(a) INTERNATIONAL PASSENGER TRAFFIC BY ROUTE AND BY ORIGIN/DESTINATION - STAGES I & II (1994 & 2004)

(In thousand persons)

| Route | O/D | 1994 | | 2004 | |
|-----------------|---------|---------|----------|----------|----------|
| | | by O/D | by Route | by O/D | by Route |
| CPS-PTY-MIA | PTY | 1) 1.7 | | 1) 3.7 | |
| | | 2) 1.2 | | 2) 2.4 | |
| | | 3) 0.3 | 1) 10.6 | 3) 0.6 | 1) 21.3 |
| | MIA | 1) 8.9 | 2) 7.0 | 1) 17.6 | 2) 13.5 |
| | | 2) 5.8 | 3) 1.9 | 2) 11.1 | 3) 3.8 |
| | | 3) 1.6 | | 3) 3.2 | |
| CPS-SRZ-LPB-LIM | SRZ | 1) 6.0 | | 1) 11.8 | |
| | | 2) 4.0 | | 2) 7.5 | |
| | | 3) 1.1 | | 3) 2.1 | |
| | LPB | 1) 6.5 | 1) 27.0 | 1) 12.5 | 1) 52.7 |
| | | 2) 4.3 | 2) 17.8 | 2) 7.9 | 2) 33.4 |
| | | 3) 1.2 | 3) 4.9 | 3) 2.3 | 3) 9.5 |
| LIM | 1) 14.5 | | 1) 28.4 | | |
| | 2) 9.5 | | 2) 18.0 | | |
| | 3) 2.6 | | 3) 5.1 | | |
| CPS-RIO | SAO | 1) 33.3 | | 1) 66.2 | |
| | | 2) 22.1 | | 2) 42.0 | |
| | | 3) 6.1 | | 3) 11.9 | |
| | RIO | 1) 21.6 | | 1) 43.3 | |
| | | 2) 14.4 | 1) 72.2 | 2) 27.4 | 1) 142.9 |
| | | 3) 4.0 | 2) 47.9 | 3) 7.8 | 2) 90.7 |
| MAD | 1) 14.4 | 3) 13.2 | 1) 27.7 | 3) 25.7 | |
| | 2) 9.6 | | 2) 17.6 | | |
| | 3) 2.6 | | 3) 5.0 | | |
| FRA | 1) 2.9 | | 1) 5.7 | | |
| | 2) 1.8 | | 2) 3.7 | | |
| | 3) 0.5 | | 3) 1.0 | | |
| CPS-MVD-BUE | MVD | 1) 9.5 | | 1) 16.9 | |
| | | 2) 6.3 | 1) 66.4 | 2) 10.7 | 1) 121.0 |
| | | 3) 1.7 | 2) 44.0 | 3) 3.0 | 2) 76.7 |
| | BUE | 1) 56.9 | 3) 12.1 | 1) 104.1 | 3) 21.7 |
| | | 2) 37.7 | | 2) 66.0 | |
| | | 3) 10.4 | | 3) 18.7 | |

- 1) Emb./Disemb. passengers
- 2) Transfer passengers
- 3) Transit passengers

Note: Transfer passengers are those who transfer to or from domestic flights.

Table 4.1(b) INTERNATIONAL CARGO TRAFFIC BY ROUTE AND BY
ORIGIN/DESTINATION - STAGES I & II (1994 & 2004)

(In Tons)

| Route | O/D | 1994 | | 2004 | |
|-----------------|-----|----------|----------------------|------------|------------------------|
| | | by O/D | by Route | by O/D | by Route |
| CPS-PTY-MIA | PTY | 1) 41.8 | 1) 220.0 2) 145.5 | 1) 82.3 | 1) 432.5 2) 273.9 |
| | | 2) 27.7 | | 2) 52.0 | |
| | MIA | 1) 178.2 | | 1) 350.2 | |
| | | 2) 117.8 | | 2) 221.9 | |
| | SRZ | 1) 31.0 | | 1) 60.7 | |
| | | 2) 20.4 | | 2) 38.5 | |
| CPS-SRZ-LPB-LIM | LPB | 1) 43.6 | 1) 165.5 2) 109.4 | 1) 85.8 | 1) 325.2 2) 206.0 |
| | | 2) 28.9 | | 2) 54.3 | |
| | LIM | 1) 90.9 | | 1) 178.7 | |
| | | 2) 60.1 | | 2) 113.2 | |
| | SAO | 1) 109.1 | | 1) 214.5 | |
| | | 2) 72.1 | | 2) 135.8 | |
| CPS-RIO | RIO | 1) 141.8 | 1) 678.2 2) 448.4 | 1) 278.7 | 1) 1,333.1 2) 844.4 |
| | | 2) 93.8 | | 2) 176.6 | |
| | MAD | 1) 170.9 | | 1) 336.0 | |
| | | 2) 113.0 | | 2) 212.8 | |
| | FRA | 1) 256.4 | | 1) 503.9 | |
| | | 2) 169.5 | | 2) 319.2 | |
| CPS-MVD-BUE | MVD | 1) 107.3 | 1) 754.6 2) 498.8 | 1) 210.8 | 1) 1,483.2 2) 939.5 |
| | | 2) 70.9 | | 2) 133.6 | |
| | BUE | 1) 647.3 | | 1) 1,272.4 | |
| | | 2) 427.9 | | 2) 805.9 | |

- 1) Loaded/Unloaded Cargo
- 2) Transfer Cargo

Note: Transfer cargo is that which is transferred to or from domestic flights.

Table 4.2(a) DOMESTIC PASSENGER & CARGO TRAFFIC BY ROUTE AND BY ORIGIN/DESTINATION - STAGE I (1994)

| Route | O/D | Passenger Traffic (In thousand persons) | | Cargo Traffic (In Tons) | | |
|--------------|---------|--|----------|----------------------------|----------|-------|
| | | by O/D | by Route | by O/D | by Route | |
| | | | 1) | 2) | 3) | 4) |
| CPS-PJC-BN | PJC | 1) | 5.8 | 3) | 38.6 | |
| | | 2) | 23.1 | 4) | 238.2 | |
| | BN | 1) | 7.4 | 3) | 49.6 | |
| | | 2) | 28.9 | 4) | 297.4 | |
| CPS-CO-FI-ME | CO | 1) | 11.0 | 3) | 74.0 | |
| | | 2) | 32.8 | 4) | 338.5 | |
| | FI | 1) | 2.1 | 3) | 14.2 | |
| | | 2) | 6.3 | 4) | 64.9 | |
| | ME | 1) | 0.6 | 3) | 3.9 | |
| | | 2) | 1.7 | 4) | 16.6 | |
| | CPS-ASU | ASU | 1) | 63.1 | 3) | 547.9 |
| | | | 2) | - | 4) | - |
| EN | | 1) | 8.8 | 3) | 59.0 | |
| | | 2) | 36.6 | 4) | 378.1 | |
| PI | 1) | 4.3 | 3) | 29.1 | | |
| | 2) | 10.4 | 4) | 106.6 | | |

Notes: 1) Emb./Disemb. passengers
2) Transfer passengers
3) Loaded/Unloaded cargo
4) Transfer cargo

Table 4.2(b) DOMESTIC PASSENGER & CARGO TRAFFIC BY ROUTE AND BY ORIGIN/DESTINATION - STAGE II (2004)

| Route | O/D | Passenger Traffic (In thousand persons) | | Cargo Traffic (In Tons) | |
|-----------|-----|--|----------|----------------------------|----------|
| | | by O/D | by Route | by O/D | by Route |
| | | | 1) | 2) | 3) |
| CPS-PJC | PJC | 1) | 10.9 | 3) | 77.4 |
| | | 2) | 44.1 | 4) | 466.2 |
| CPS-CO-BN | CO | 1) | 17.6 | 3) | 142.4 |
| | | 2) | 60.1 | 4) | 635.3 |
| | BN | 1) | 20.4 | 3) | 162.5 |
| | | 2) | 70.1 | 4) | 740.8 |
| CPS-FI-ME | FI | 1) | 3.5 | 3) | 24.8 |
| | | 2) | 10.5 | 4) | 110.5 |
| | ME | 1) | 4.6 | 3) | 32.5 |
| | | 2) | 13.5 | 4) | 142.4 |
| CPS-ASU | ASU | 1) | 122.5 | 3) | 1,070.8 |
| | | 2) | - | 4) | - |
| CPS-PI | PI | 1) | 7.8 | 3) | 55.7 |
| | | 2) | 18.8 | 4) | 198.9 |
| CPS-EN | EN | 1) | 13.5 | 3) | 114.5 |
| | | 2) | 67.8 | 4) | 715.5 |

Notes: 1) Emb./Disemb. passengers
2) Transfer passengers
3) Loaded/Unloaded cargo
4) Transfer cargo

- a. Critical aircraft: B747 - 200B.
- b. Maximum stage length: 3,920 statute miles, equal to that between CPS and Miami, Florida in U.S.A.
- c. Desired payload: 72,894 kg, equal to the maximum structural payload.
- d. Alternate airport: New CPS airport - Asuncion. Miami International Airport - Nassau, Tampa and West Palm Beach.
- e. Effective runway gradient: 0.5%.
- f. Normal maximum temperature: 33°C, based on data for the last three years of the existing CPS Airport.
- g. Airport elevation: 250 m above sea level.

The required length of runway calculated on the basis of the above design conditions is 3,300 m, and after correction for the gradient as mentioned in Chapter 6 hereunder, is established at 3,400 m. The relationship between the stage lengths and the permissible payload of each aircraft type on the said runway length is shown in Appendix 4-1 through 4-7.

The width of runway shall be 45 m in accordance with the ICAO recommendations for the corresponding runway category.

4.2.3 Taxiway

Since the aircraft movements forecast for the year 2004 do not justify provision of a full parallel taxiway, a parallel taxiway of a limited length connected with the runway by exit taxiways at both ends shall be provided in the first stage along the central portion of the runway to ensure smooth connection among all categories of aircraft parking aprons at the new airport through the year 2004.

4.2.4 Passenger Loading Apron

1) Type of aircraft to be in service

The types of aircraft to be in service for different air routes projected are classified into the categories coded A, B, C, D and E for the purpose of this study as shown in Table 4.3(a) and 4.3(b).

2) Average seating load factors

The average seating load factors for international flights and domestic flights are estimated to be 60% and 70% respectively.

3) Annual passenger aircraft movements by route

Based on the above-mentioned conditions the annual passenger aircraft movements by route are calculated as tabulated in Table 4.4(a) and 4.4(b).

4) Busiest month passenger peaking coefficient

The busiest month peaking coefficient for international passengers and domestic passengers is estimated to be 1.2 and 1.35 respectively.

5) Busiest day passenger aircraft movements

The busiest day passenger aircraft movements by route are calculated as tabulated in Table 4.4(a) and 4.4(b).

6) Daily flight schedule

The following basic conditions were taken into account in establishing the possible flight schedules as shown in Appendix 4-8 and 4-9.

- a. The new airport shall be equipped to permit night time operation, and shall operate for 17 hours from 6:00 to 23:00.

Table 4.3(a) AIRCRAFT CATEGORY BY ROUTE - STAGE I (1994)

| Air Route | Aircraft |
|-----------------------|--|
| International Service | CPS-PTY-MIA Category B ... 180 seater jet |
| | CPS-SRZ-LPB-LIM CPS-RIO Category C ... 150 seater jet CPS-MVD-BUE |
| | CPS-ASU CPS-PJ-BN Category E ... 55 seater non-jet CPS-CO-FI-ME CPS-EN-PI |

Table 4.3(b) AIRCRAFT CATEGORY BY ROUTE - STAGE II (2004)

| Air Route | Aircraft |
|-----------------------|---|
| International Service | CPS-PTY-MIA Category A ... 250 seater jet |
| | CPS-SRZ-LPB-LIM CPS-RIO Category C ... 150 seater jet CPS-MVD-BUE |
| | CPS-ASU Category D ... 120 seater jet |
| Domestic Service | CPS-CO-BN CPS-PJ Category E ... 55 seater non-jet CPS-FI-ME CPS-EN CPS-PI |

Table 4.4(a) PROJECTED AIRCRAFT MOVEMENTS BY ROUTE AND
BY AIRCRAFT CATEGORY IN YEAR 1994

| Route | Number of Passengers (1,000) | Aircraft Movements | | | | | | | | | | | |
|-----------------|------------------------------------|--------------------|------------------|----------------|----------------|------------------|----------------|-------------------|------------------|----------------|--|--|--|
| | | 180 seater jet | | | 150 seater jet | | | 55 seater non-jet | | | | | |
| | | Annual | Busiest Month | Busiest Day | Annual | Busiest Month | Busiest Day | Annual | Busiest Month | Busiest Day | | | |
| CPS-PTY-MIA | 19.5 | 300 | 30 | 1 | | | | | | | | | |
| CPS-SRZ-LPB-LIM | 49.7 | | 600 | 60 | 2 | | | | | | | | |
| CPS-RIO | 133.3 | | 1,500 | 150 | 5 | | | | | | | | |
| CPS-MVD-BUE | 122.5 | | 1,500 | 150 | 5 | | | | | | | | |
| Sub Total | 325.0 | 300 | 30 | 1 | 3,600 | 360 | 12 | | | | | | |
| CPS-ASU | 63.1 | | | | | | | 1,620 | 180 | 6 | | | |
| CPS-PJ-BN | 36.3 | | | | | | | 1,080 | 120 | 4 | | | |
| CPS-CO-FI-ME | 54.5 | | | | | | | 1,620 | 180 | 6 | | | |
| CPS-PI-EN | 60.1 | | | | | | | 1,620 | 180 | 6 | | | |
| Sub Total | 214.0 | | | | | | | 5,940 | 660 | 22 | | | |
| Total | 539.0 | 300 | 30 | 1 | 3,600 | 360 | 12 | 5,940 | 660 | 22 | | | |

Table 4.4(b) PROJECTED AIRCRAFT MOVEMENTS BY ROUTE AND BY AIRCRAFT CATEGORY IN YEAR 2004

| Route | Number of Passengers (1,000) | Aircraft Movements | | | | | | | | | | | | | | |
|-----------------|------------------------------|--------------------|---------------|----------------|---------------|----------------|---------------|-------------------|---------------|---------------|-------------|-------------|-------------|--|--|--|
| | | 250 seater jet | | 150 seater jet | | 120 seater jet | | 55 seater non-jet | | Busiest Month | | Busiest Day | | | | |
| | | Annual | Busiest Month | Annual | Busiest Month | Annual | Busiest Month | Annual | Busiest Month | Annual | Busiest Day | Annual | Busiest Day | | | |
| CPS-PTY-MLA | 38.6 | 300 | 30 | 1 | | | | | | | | | | | | |
| CPS-SRZ-LPB-LIM | 95.6 | | | | 1,200 | 120 | 4 | | | | | | | | | |
| CPS-RIO | 259.3 | | | | 3,000 | 300 | 10 | | | | | | | | | |
| CPS-MVD-BUE | 219.4 | | | | 2,400 | 240 | 8 | | | | | | | | | |
| Sub Total | 612.9 | 300 | 30 | 1 | 6,600 | 660 | 22 | | | | | | | | | |
| CPS-ASU | 122.5 | | | | | | | 1,620 | 180 | 6 | | | | | | |
| CPS-CO-BN | 90.5 | | | | | | | | | | 2,160 | 240 | 8 | | | |
| CPS-PJ | 55.0 | | | | | | | | | | 1,620 | 180 | 6 | | | |
| CPS-FI-ME | 18.1 | | | | | | | | | | 540 | 60 | 2 | | | |
| CPS-EN | 81.3 | | | | | | | | | | 1,890 | 210 | 7 | | | |
| CPS-PI | 26.6 | | | | | | | | | | 810 | 90 | 3 | | | |
| Sub Total | 394.0 | | | | | | | 1,620 | 180 | 6 | 7,020 | 780 | 26 | | | |
| Total | 1,006.9 | 300 | 30 | 1 | 6,600 | 660 | 22 | 1,620 | 180 | 6 | 7,020 | 780 | 26 | | | |

- b. The number of aircraft to serve the projected air routes shall be minimized so as to ensure the airlines' payability.
- c. Aircraft parking time is assumed to be as follows according to the characteristics and past performances of each aircraft type.

Table 4.5 AIRCRAFT PARKING TIME

| Aircraft Category | Through Flights | Turn-around Flights |
|-------------------|-----------------|---------------------|
| A | 30 minutes | 60 minutes |
| B | 30 " | 60 " |
| C | 30 " | 60 " |
| D | 30 " | 45 " |
| E | 30 " | 30 " |

7) Number of passenger aircraft parking positions

Based on the hourly requirements of aircraft parking positions obtainable from the projected flight schedules as per Appendix 4-8 and 4-9, it is considered necessary to provide the new airport with the following number of aircraft parking positions.

Table 4.6 NUMBER OF PASSENGER AIRCRAFT PARKING POSITIONS

| | Aircraft Category | International Flights | Domestic Flights | Reserve | Total |
|------------------|-------------------|-----------------------|------------------|----------|----------|
| Stage I 1994 | B | 1 | 0 | 1 | 2 |
| | C | 1 | 0 | 0 | 1 |
| | E | 0 | 3 | 0 | 3 |
| | Total | 2 | 3 | 1 | 6 |
| Stage II 2004 | A | 1 | 0 | 1 | 2 |
| | C | 2 | 0 | 0 | 2 |
| | D | 0 | 1 | 0 | 1 |
| | E | 0 | 3 | 0 | 3 |
| | Total | 3 | 4 | 1 | 8 |

4.2.5 Cargo Loading Apron

- 1) Distribution of cargo traffic between freighter and passenger aircraft

The entire cargo traffic volume projected for the year 1994 is assumed to be transported in belly, as the amount of cargo traffic volume projected for each air route is rather small.

As for Stage II, although the analysis of the projected total belly cargo capacity has shown that the entire cargo traffic volume projected for the year 2004 can be transported in belly, the inbound cargo traffic of the three international air routes, namely CPS-PTY-MIA, CPS-RIO and CPS-BUE-MVD, is assumed to be distributed 50/50 between belly and freighter for the purpose of establishing the fac-

ility requirements, in view of the expected worldwide future trend for greater increase in freighter traffic than in belly cargo traffic in international service. Cargo traffic on the routes other than the three mentioned above is assumed to be transported 100% in belly because of its small amount.

2) Freightler load factor

The average load factor is assumed to be 70% of the maximum permissible payload.

3) Projected annual cargo tonnage and freighter movements

The annual tonnage and freighter movements by route are estimated as shown in Table 4.7.

4) Freightler parking position required

Based on the above assumption, it is determined that one parking position for B707-320C type freighter is needed for the year 2004.

4.3 Passenger Terminal Building

4.3.1 Hourly Distribution of Passengers Staying in Terminal Building.

The hourly distribution of passengers staying in the terminal building was analysed by applying the average stay time of passengers of each category estimated as shown in Table 4.8 to the projected passenger movements according to the daily flight schedule established above, with the result as shown in Appendix 4-10 and 4-11.

Table 4.7 PROJECTED ANNUAL CARGO TONNAGE AND FREIGHTER MOVEMENTS

| | Air Route | Cargo Tonnage(t) | | Belly Cargo Tonnage(t) | Freighter Cargo Tonnage(t) | Freighter Movements | |
|------------------|-----------------------|------------------|----------|------------------------|----------------------------|---------------------|----|
| | | Loaded | Unloaded | | | | |
| In the year 1994 | International Service | CPS-PTY-MIA | 103.1 | 267.4 | 365.5 | - | - |
| | | CPS-SRZ-LPB-LIM | 168.0 | 106.9 | 274.9 | - | - |
| | | CPS-RIO | 392.1 | 735.4 | 1,126.6 | - | - |
| | | CPS-MVD-BUE | 243.2 | 1,010.2 | 1,253.4 | - | - |
| | Total | | 906.4 | 2,114.0 | 3,020.4 | - | - |
| | Domestic Service | CPS-ASU | | 547.9 | 547.9 | - | - |
| | | CPS-PJ-BN | | 347.0 | 347.0 | - | - |
| | | CPS-CO-FI-ME | | 512.1 | 512.1 | - | - |
| | | CPS-EN-PI | | 572.8 | 572.8 | - | - |
| | Total | | | 1,979.8 | 1,979.8 | - | - |
| In the year 2004 | International Service | CPS-PTY-MIA | 199.2 | 507.2 | 452.8 | 253.6 | 10 |
| | | CPS-SRZ-LPB-LIM | 324.6 | 206.6 | 531.2 | - | - |
| | | CPS-RIO | 757.8 | 1,419.7 | 1,467.6 | 709.9 | 26 |
| | | CPS-MVD-BUE | 470.0 | 1,952.7 | 1,446.3 | 976.4 | 35 |
| | Total | | 1,751.6 | 4,086.2 | 3,907.0 | 1,930.8 | 71 |
| | Domestic Service | CPS-ASU | | 1,078.8 | 1,078.8 | - | - |
| | | CPS-CO-BN | | 903.3 | 903.3 | - | - |
| | | CPS-PJ | | 543.6 | 543.6 | - | - |
| | | CPS-FI-ME | | 174.9 | 174.9 | - | - |
| | | CPS-EN | | 830.0 | 830.0 | - | - |
| CPS-PI | | | 254.6 | 254.6 | - | - | |
| Total | | | 3,785.2 | 3,785.2 | - | - | |

Note: Freighter B707-320C class

Table 4.8 AVERAGE STAY TIME OF PASSENGERS

| Passenger Category | Stay Time per Passenger |
|----------------------|----------------------------|
| International | |
| Departing | 60 minutes until departure |
| Arriving | 30 minutes after arrival |
| Domestic | |
| Departing | 30 minutes until departure |
| Arriving | 15 minutes after arrival |

4.3.2 Passenger Processing Capacity Requirements

Based on the hourly distribution of passengers staying in the terminal building as estimated above, the number of passengers to be processed during the peak half-hour period is determined as follows.

Table 4.9 PASSENGER PROCESSING CAPACITY REQUIRED

| Passenger Category | Number of Passengers | |
|----------------------|----------------------|------------|
| | 1994 | 2004 |
| International | | |
| Departing | 90 | 180 |
| Arriving | 90 | 180 |
| Transit | 9 | 9 |
| Sub Total | 189 | 369 |
| Domestic | | |
| Departing | 76 | 160 |
| Arriving | 76 | 160 |
| Sub Total | 152 | 320 |
| Total | 341 | 689 |

4.3.3 Terminal Design Concept

Taking into account the number of aircraft parking positions and passenger processing capacity requirements as established above, centralized passenger processing system and a linear terminal configuration are considered suitable.

4.3.4 Floor Area Required

Through analyses of all relevant factors, the following floor area requirements are established for the passenger terminal building.

Table 4.10 FLOOR AREA REQUIREMENTS OF PASSENGER TERMINAL BUILDING (m²)

| Service Category | 1994 | 2004 |
|------------------|-------|--------|
| International | 5,000 | 9,800 |
| Domestic | 2,000 | 4,800 |
| Total | 7,000 | 14,600 |

4.4 Cargo Terminal Building

4.4.1 Busiest Day Cargo Tonnage Processed

Daily cargo processing capacity required is estimated as shown in Table 4.11 based on the projected busiest day cargo traffic.

Table 4.11 CARGO PROCESSING CAPACITY (Tons/Day)

| Cargo Category | 1994 | 2004 |
|----------------|------|------|
| International | | |
| Outbound | 3.8 | 7.3 |
| Inbound | 8.8 | 37.0 |
| Sub Total | 12.6 | 44.3 |
| Domestic | 7.3 | 14.0 |
| Total | 19.9 | 58.0 |

1

2

3

4.4.2 Cargo Processing Concept

Cargo processing of the proposed new airport is to be basically manual, and the processing concept is developed based on the following assumed conditions;

1) Processing of international cargo

Outbound cargo shall be processed on the same day as received. Inbound cargo shall stay for seven days in bonded warehouse.

2) Processing of domestic cargo

All domestic cargo both inbound and outbound shall be processed on the same day as received.

4.4.3 Floor Area Required

The floor area required of the cargo terminal building including the bonded warehouse is established as follows.

Table 4.12 FLOOR AREA OF CARGO TERMINAL BUILDING

| Service Category | (m ²) | |
|------------------|-------------------|-------|
| | 1994 | 2004 |
| International | 1,200 | 4,500 |
| Domestic | 400 | 800 |
| Total | 1,600 | 5,300 |

4.5 Access Road and Car Parking

4.5.1 Access Road

Access road traffic of passengers and well-wishers to and from the airport occurs with certain time difference in relation to the corresponding flight schedule. Taking this time difference into consideration, the hourly distribution of passengers and well-wishers passing through the airport entrance and exit is estimated, and is converted into hourly distribution of road traffic volume in terms of the number of cars, to which is added the commuter traffic of airport employees to arrive at the total access road traffic to be expected.

The peak hour road traffic volume thus obtained is summarized as follows:

Table 4.13 PEAK HOUR ROAD TRAFFIC VOLUME

| | | (cars/hour) | |
|--------------------|---------------------------|-------------|------|
| Traffic Categories | | 1994 | 2004 |
| Private Car | Passengers & Well-wishers | 36 | 36 |
| | Employees | 157 | 251 |
| Taxi | | 50 | 64 |
| Bus | Passengers | 7 | 7 |
| | Employees | 6 | 9 |
| Total | | 256 | 367 |

The number of lanes of the access road shall be one in each direction.

4.5.2 Car Parking

Number of cars expected to stay within the airport at any given point in time is obtainable from the cumulative differences of the incoming and outgoing access traffic. In this study, the number of cars existing on airport during every half-hour period is calculated from the half-hourly distribution of the peak day incoming and outgoing car traffic already projected above, and the peak half-hour cars of the peak day thus obtained is adopted as the car parking capacity to be accommodated at the new airport.

Table 4.14 NUMBER OF PARKING SPACES AND AREA REQUIRED

| Car Categories | 1 9 9 4 | | 2 0 0 4 | |
|---------------------------|---------|------------------------|---------|------------------------|
| | Cars | Area (m ²) | Cars | Area (m ²) |
| Private Cars | | | | |
| Passengers & Well-wishers | 36 | 1,260 | 68 | 2,380 |
| Employees | 314 | 10,990 | 502 | 17,570 |
| Sub Total | 350 | 12,250 | 570 | 19,950 |
| Taxis | 79 | 2,765 | 91 | 3,185 |
| Buses | 18 | 1,890 | 28 | 2,940 |
| Total | 447 | 16,905 | 689 | 26,075 |

4.6 Fire Fighting and Rescue Facilities

The number of fire fighting vehicles required is determined in conformity with the requirements of Aerodrome Category 7 of the ICAO recommendations (Table 4.15), and the total area needed to accommodate the facilities are established as given in Table 4.16.

Table 4.15 NUMBER OF FIREFIGHTING VEHICLES REQUIRED

| Type | Number | Remarks |
|----------------------------|--------|----------------------|
| Rapid Intervention Vehicle | 1 | 1,890 liter/min/tank |
| Major Vehicle | 2 | 2,500 liter/min/tank |
| Rescue Vehicle | 1 | |
| Commander Vehicle | 1 | |

Table 4.16 FIRE STATION AREA REQUIRED
(m²)

| 1994 | 2004 |
|------|------|
| 450 | 450 |

4.7 Fuel Storage Facilities

The amount of aviation fuel supply required per day is calculated based on the projected daily flight schedule. Since it is planned to provide the airport with a 7-day supply capacity, the fuel storage requirements amount to as shown in Table 4.17.

Table 4.17 FUEL STORAGE REQUIREMENTS

| Item | 1994 | 2004 |
|----------------------------------|----------------------|----------------------|
| Amount of Daily Fuel Consumption | 150 k1 | 250 k1 |
| 7-day Storing Capacity | 1,050 k1 | 1,750 k1 |
| Area Required | 5,000 m ² | 6,500 m ² |

4.8 Radio Navigational Aids, Telecommunications and Meteorological Service Facilities

Available observation records of visibility and ceiling at the existing CPS Airport are not in sufficient frequency or detail to indicate the probability of occurrence of weather below weather-minima for different aircraft approach categories. The runway usability under the weather-minima for non-precision approach is, however, estimated to be as low as about 90%, based on the analysis of the available observation data with four readings a day for the three-year period 1976-1978 at the existing airport. Radio navigational aids facilities are, therefore, determined so as to satisfy at least the CAT-1 ILS operation, and the facility requirements of telecommunications and meteorological service facilities are determined taking into account the ICAO Air Navigation Plan of Asuncion Airport and of the airports in the neighboring countries.

4.9 Airfield Lighting System

Airfield lighting system is to satisfy the requirements of precision approach runway CAT-1 as specified in Annex 14, ICAO.

