REPUBLIC OF HONDURAS

# NEW TEGUCIGALPA AIRPORT DEVELOPMENT

# FEASIBILITY STUDY

## FINAL REPORT
## (SITE SELECTION ANALYSIS)

SEPTEMBER 1978

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

REPUBLIC OF HONDURAS

# NEW TEGUCIGALPA AIRPORT DEVELOPMENT

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INTERIM REPORT

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JAPAN INTERNATIONAL COOPERATION AGENCY

FEASIBILITY STUDY FOR THE NEW TEGUCIGALPA
INTERNATIONAL AIRPORT DEVELOPMENT

- INTERIM REPORT -

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MINISTERIO DE COMUNICACIONES OBRAS PUBLICAS Y TRANSPORTE

INSTITUTO GEOGRÁFICO NACIONAL

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ELEVACIONES EN METROS SOBRE EL NIVEL MEDIO DEL MAR

PROYECCIÓN UNIVERSAL TRANSVERSAL DE MERCATOR

DATO HORIZONTAL NORTEAMERICANO 1927

DIAGRAMA INFORMATIVO DEL GRADO DE EXACTITUD DEL MAPA POR REGIONES

A MAPAS TOPOGRÁFICOS BÁSICOS, ESCALA 1:50 000

B Y C DATOS Y CORRECCIONES APLICADOS EN EL TERRENO POR MEDIO DE LAS AEROFOTOGRAFÍAS

6ª EDICIÓN IMPRESA EN EL INSTITUTO GEOGRAFICO NACIONAL TEGUCIGALPA, D. C. HONDURAS, C. A. 1976

SÍMBOLOS CONVENCIONALES

CAPITAL DE LA REPÚBLICA
CABECERA DEPARTAMENTAL
CABECERA MUNICIPAL
ALDEA
CASERÍO
LÍMITE INTERNACIONAL
LÍMITE DEPARTAMENTAL
ELEVACIONES

CARRETERA PAVIMENTADA
CARRETERA TRANSITABLE EN TODO TIEMPO
CARRETERA TRANSITABLE EN TIEMPO SECO
SENDERO
FERROCARRILES
AEROPUERTOS, CAMPOS DE ATERRIZAJE
PUERTOS, EMBARCADEROS

# CONCLUSIONS AND RECOMMENDATIONS

# CONCLUSIONS AND RECOMMENDATIONS

During the initial stage of the present site selection study commenced in December 1977 as part of the feasibility study for the New Tegucigalpa International Airport Development Project, 2 alternative sites, namely one at El Pedregal situated 8 Km west of Tegucigalpa, and another at Talanga 42 Km north-north-east of the capital, have been selected for detailed site selection study through preliminary screening of the 18 potential sites initially chosen from among those considered in previous studies and other relevant documents. The details of the evaluation results are summarized below.

1. Access

Road is the only existing means of access for both sites, the distance from Tegucigalpa being 16 Km to PEDREGAL site and 60 Km to TALANGA site.

2. Air Transport Demand Forecast

By taking into account the differences in access conditions, etc., the air traffic in the ultimate design year of 2005 is forecast individually for the 2 alternative sites, namely 2.65 million international and domestic passengers and 65 kilotons of cargo for PEDREGAL, and 2.56 million passengers and 62 kilotons of cargo for TALANGA (Table S-1).

3. Facility Requirements

Major facility requirements of the 2 sites calculated on the basis of the respective traffic forecast are outlined in Table S-2. Runway lengths at PEDREGAL and TALANGA sites are 2,770 m and 2,650 m respectively.

4. Estimated Construction Cost

PEDREGAL site requires a huge amount of earthwork including costly blasting in excavation on account of its topographical and geological conditions, and consequently requires a longer construction period, while TALANGA site is considered to be free of any such problems. Preliminary construction cost estimate for PEDREGAL site amounts to about L.494 million, or 2.7 times that of TALANGA site, which amounts to about L184 million (Table S-2).

5. Cost-Benefit Analysis

Preliminary cost-benefit analysis has shown a significant difference in internal rate of return between the two sites, i.e. 9.2% for PEDREGAL and 16.9% for TALANGA, indicating that TALANGA site is economically more advantageous than PEDREGAL site (Table S-2).

6. Expansion Possibilities

TALANGA site is free from any restrictions as regards future expansion of the airport facilities should it become necessary, while PEDREGAL site is prohibitingly handicapped in this respect due to the extreme limitations in its topography.

Based on the foregoing findings, the most desirable site for the New Tegucigalpa International Airport is concluded to be TALANGA site. Early decision on the selection of site on the part of the Government of Honduras is recommended in the interest of due completion of the feasibility study in accordance with the timing of implementation stipulated in the Scope of Work.

Table S-1 RESULTS OF AIR TRAFFIC FORECAST AND FACILITY REQUIREMENTS

| Item | | | | Site: Pedregal | Site: Talanga |
|---|---|---|---|---|---|
| Access | Road distance and travel time from Tegucigalpa | | | 60 km<br>60 minutes | 16 km<br>30 minutes |
| Air Traffic Forecast | Passenger (1,000 persons) | International | Emb. & Disemb. | 1,402 | 1,356 |
| | | | Transit | 702 | 702 |
| | | | Total | 2,104 | 2,058 |
| | | Domestic | Emb. & Disemb. | 391 | 851 |
| | | | Transfer | 151 | 151 |
| | | | Total | 542 | 502 |
| | Cargo (tons) | International | | 62,300 | 59,800 |
| | | Domestic | | 2,460 | 2,200 |
| Facility Requirements | Airfield Facilities | Runway Strip | | 2,890m x 300m | 2,770m x 300m |
| | | Runway | Orientation | N 12° E | N 73° W |
| | | | Elevation | 1,500m | 760m |
| | | | Length & Width | 2,770m x 45m | 2,650m x 45m |
| | | Taxiway | | 23m wide parallel taxiway | 23m wide parallel taxiway |
| | | Passenger Loading Apron (Number of Aircraft Parking Positions) | | 14 | 14 |
| | | Cargo Loading Apron (Number of Aircraft Parking Positions) | | 2 | 2 |
| | Buildings | Passenger Terminal | | 19,550m$^2$ | 17,850m$^2$ |
| | | Cargo Terminal | | 11,700m$^2$ | 11,200m$^2$ |
| | Radio Navigational Aids, Telecommunications, and Meteorological Service Facilities | | | Cat-I ILS, VOR/DME, NDB etc. | |
| | Airfield Lighting Facilities | | | Facilities to meet Cat-I ILS* | |
| | Parking Lot (Number of Cars) | | | 860 | 750 |
| | Others | | | Fire Fighting and Rescue Facilities, Fuel Storage Facilities, Utilities | |

* Approach Lighting System is not installed at Pedregal Site

Table S-2 CONSTRUCTION COST ESTIMATE AND RESULTS OF COST-BENEFIT ANALYSIS

| | Works | Cost | |
|---|---|---|---|
| | | Pedregal | Talanga |
| Construction Cost Estimate (Unit: Thousand Lempiras) | 1. Civil Engineering Works | 350,740 | 76,780 |
| | 2. Building Works | 42,100 | 42,080 |
| | 3. Lighting Works | 7,740 | 7,600 |
| | 4. Radio Nav-Aids, Telecommunications Aids, Meteorological Facilities | 4,660 | 4,660 |
| | 5. Utilities and Refueling Facilities | 18,460 | 17,460 |
| | 6. Sub Total | 423,700 | 148,580 |
| | 7. Engineering Services | 25,420 | 14,860 |
| | 8. Land Acquisition | 240 | 4,000 |
| | 9. Contingency | 44,940 | 16,360 |
| | 10. Grand Total | 494,300 | 183,800 |
| Results of Cost Benefit Analysis | Internal Rate of Return | 9.2% | 16.9% |

Note: 1) Costs of items available in Honduras are estimated based on the market prices in Honduras as of March 1978.

2) Costs of items not available in Honduras are estimated based on the market prices in Japan as of March 1978.

3) Conversion between Yen and Lempira is based on the exchange rate as of March 1978 of: L1 = US$0.5 = ¥120.

# CHAPTER 1. GENERAL

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## 1.1 Identification of Study

In response to the request of the Government of Honduras, the Government of Japan agreed to extend cooperation, as part of its overseas technical cooperation program, in making a feasibility study for the development of the new Tegucigalpa International Airport, and the study is conducted by the Japan International Cooperation Agency (JICA). Upon decision to undertake the study, the JICA sent a preliminary survey mission to Honduras in October 1977 in order to ascertain the basic requirements of the development project through conference with the officials concerned of the Government of Honduras (Appendix 1A). The actual implementation of the feasibility study was officially initiated with the site selection study commencing in December 1977.

## 1.2 Interim Report

The feasibility study is conducted in the manner described in the Inception Report accepted by the Government of Honduras upon its presentation by the JICA survey mission in February 1978. The present interim report is prepared to summarize the results of the site selection study based on the preparatory home office study and on the findings of the subsequent field survey carried out from February 18 to March 25, 1978, with a recommendation on a most suitable site for the construction of the proposed New Tegucigalpa International Airport.

# CHAPTER 2. BACKGROUND OF PROJECT

# CHAPTER 2 BACKGROUND OF PROJECT

To identify the general background of the Project, analysis is made of the population, gross domestic product, exports and imports, as well as tourism of Honduras, which constitute the principal factors of air transport demand of the country, followed by an analysis of the present situation and roles of highways, railways, ports and aviation, which comprise the transportation system of the country.

Then the hinterland of Toncontin airport, its air transport demand and existing facilities are analysed, and the problems of the existing airport are reviewed from various aspects.

## 2.1 Economic Development of Honduras

### 2.1.1 Geographical situation of the country

The Republic of Honduras is situated close to the center of Central America, and has an area of 112,000 $Km^2$. The Central American Mountain System runs through the country in the northwest-southeast direction, and many branch mountain systems stretch over the country mainly towards the south, the mountainous area occupying about 65% of the total area of the country. Honduras, however, is the only country in Central America that has not experienced earthquakes. Plains spread out along the Caribbean coast in the north, and along the Pacific coast in the south of the country. The climate in the coastal plains is tropical with high temperature and humidity, while that of the plateau area is comfortable with the mean temperature of 20°C. The rainy season is from June to November, and the dry season is from December to May.

### 2.1.2 Population

The population of Honduras is estimated by the government at 3.3 million in 1977 (Appendix Table 2A-1). The annual growth rate of population between the census years of 1961 and 1974 was 2.7%, which was slightly below the average rate of 3.1% of the 5 Central American countries for the same period.

The labor force accounts for 28.4% of the total population, with 60% of the working population belonging to the agricultural sector, 15% to the industrial sector, and 25% to the services sector. According to the 1974 census, 65.8% of the total population still live in rural areas (Appendix Table 2A-2), while the population in urban areas has remarkably increased with an average annual growth rate of 5.8%. This shows that people have emigrated from rural areas into urban areas, seeking jobs and better conditions of living. Of the principal cities of the country, only two cities, namely Tegucigalpa, the capital, and San Pedro Sula, the industrial center, have the population of more than 100 thousand (Appendix Table 2A-3). According to the estimation by the government, the annual growth rate of the population is 3.5% for the next 10 years.

### 2.1.3 Gross domestic product

Gross domestic product of Honduras has slowly but steadily increased with an annual growth rate of 4.6% in real terms during the 17-year period between 1960 and 1977. Real GDP per capita has grown by 1.4% per year during the same period (Appendix Table 2A-1). This trend can be explained by the fact that Honduran economy has remained predominantly an agricultural economy, and the slow development of the Republic's economy has been a reflection of slow agricultural growth. The agricultural sector, though its share has been on a decline, still accounted for one-third of GDP in 1977 (Appendix Table 2A-4 and 2A-5). Banana production has been the major determinant of economic growth in the past. During the 2-year

period of 1973 - 1975, real GDP stagnated due to the reduction of banana production caused by the hurricane in 1974. However, real GDP growth has recovered since 1976, and in 1976 and 1977 showed increases by 6.6% and 7.9% respectively. This can be attributed to the recovery of banana production and to the doubling of coffee export prices. Nominal GDP in 1977 prices amounted to 2,940 million lempiras and GDP per capita to 886 lempiras.

The National Development Plan (1974 - 1978) has set a goal of 6% annual growth in real GDP during the plan period, which is to be achieved by diversification of domestic products, modernization of domestic industries and increase in value added, with the agricultural sector and the manufacturing sector being named as the two strategic industries.

### 2.1.4 Exports and imports

The primary industry products account for about 75% of the total export value of the country (Appendix Table 2A-6). Banana is still one of the main export items, accounting for 27% of the total export value in 1976, though it suffered a decline in 1974 due to the hurricane. Coffee has gained an important position in exports with a 26% share in 1976 second only to banana, due to the high international prices in recent years.

Commodities whose production is expected to grow in the future are shrimps, lobsters, cotton and wooden products.

On the other hand, the country depends on imports, for the large part, for the supply of consumer goods and intermediate goods (Appendix Table 2A-7). The import, therefore, is expected to increase yearly commensurate with the increase of GDP, because of its close relationship with the level of investments and the standard of living of the country.

### 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 1976 amounted to 23,000 thousand lempiras, accounting, however, for only 1% of GDP. The main tourism attractions in Honduras are the natural beauty of the Caribbean coastline and the Bahia Islands, the Maya Ruins of Copán and the cultural properties existing around Tegucigalpa City, etc.

The total number of visitors to Honduras in 1976 amounted to 183 thousand persons, 46% of which is transit passengers and 45% tourists (Table 2-1). As for the mode of transport used by the visitors, road transport accounted for 73% in 1976, but its share is declining. Air transport, on the other hand, accounted for 26% but its share is increasing (Table 2-2). As for the region of origin of visitors, Central America accounts for 63%, but its share is on a decrease. Shares of North America, South America and Europe are steadily growing (Table 2-3), and the increase in the use of air transport can be attributed to the increase in the visitors from those regions.

The number of hotels in Honduras in 1977 amounted to 97, with a total of 2,511 rooms and 4,666 beds, but the level of accommodation of only 20% of the total reaches the international standard.

In order to cope with the increase of visitors to the country, it will, therefore, be necessary to promote considerable improvement of hotel accommodations.

Table 2-1 VISITORS TO HONDURAS BY PURPOSE OF TRIP

| Purpose | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|
| | (%) | (%) | (%) | (%) | (%) |
| Transit | 84,195(58) | 90,909(55) | 60,679(40) | 83,612(51) | 84,231(46) |
| Tourism | 43,345(30) | 55,218(33) | 77,059(51) | 62,413(38) | 81,798(45) |
| Business | 13,697( 9) | 14,816( 9) | 9,826( 6) | 13,601( 8) | 11,809( 6) |
| Others | 4,881( 3) | 4,823( 3) | 3,930( 3) | 4,836( 3) | 5,299( 3) |
| Total | 146,118(100) | 165,765(100) | 151,494(100) | 164,462(100) | 183,137(100) |

Source: INSTITUTO HONDURENO DE TURISMO

Table 2-2 VISITORS TO HONDURAS BY MODE OF TRANSPORT

| Mode | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|
| | (%) | (%) | (%) | (%) | (%) |
| Air | 31,225(21) | 36,618(22) | 41,343(27) | 41,329(25) | 48,000(26) |
| Road | 114,104(78) | 128,469(77) | 108,864(72) | 122,146(74) | 134,093(73) |
| Marine | 789( 1) | 679( 1) | 1,287( 1) | 987( 1) | 1,044( 1) |
| Total | 146,118(100) | 165,766(100) | 151,494(100) | 164,462(100) | 183,137(100) |

Source: INSTITUTO HONDURENO DE TURISMO

Table 2-3 VISITORS TO HONDURAS BY REGION OF ORIGIN

| Region | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|
| | (%) | (%) | (%) | (%) | (%) |
| North America | 37,031(25) | 42,475(26) | 42,302(28) | 43,237(26) | 47,286(26) |
| Central America | 96,038(66) | 109,182(66) | 93,917(62) | 106,127(65) | 114,755(63) |
| South America | 4,632( 3) | 5,004( 3) | 5,757( 4) | 5,477( 3) | 7,623( 4) |
| Europe | 6,554( 5) | 7,087( 4) | 7,134( 5) | 7,384( 5) | 9,847( 5) |
| Others | 1,863( 1) | 2,018( 1) | 2,384( 1) | 2,237( 1) | 3,626( 2) |
| Total | 146,118(100) | 165,766(100) | 151,494(100) | 164,462(100) | 183,137(100) |

Source: INSTITUTO HONDURENO DE TURISMO

## 2.2 Transportation System of Honduras

### 2.2.1 Highways

Road is a very important transport mode in the country. It amounts to a total of 7,244 Km as of 1976, 20% of which being paved (Appendix Table 2A-8). The most important trunk road is the one running through the country from Jicaro Galán on the Pacific coast to Puerto Cortés on the Caribbean coast, via Tegucigalpa and San Pedro Sula. After its completion late in 1969, the travel time by road between Tegucigalpa and San Pedro Sula was considerably reduced, and the road has now become the main artery of the economic activities of Honduras.

It is estimated that road transport accounts for 85% of total tonnage of domestic cargo movements and 95% of domestic passenger movements in the country.

With the development of roads and increase in the national income, the number of registered cars is increasing year after year, amounting to a total of 43,337 in 1976 (Appendix Table 2A-9), the number per thousand people, however, still remaining at only 15.

### 2.2.2 Railways

The existing railway system was initially established by private companies for transporting bananas, but since 1958 has been operated by the government as the national railway. It extends to a total of 204 Km, connecting Puerto Cortés, the largest port in the country, with the San Pedro Sula valley, the agricultural center in the country, and transports all export bananas and other exported and imported commodities. Total cargo tonnage transported by rail in 1974 was about 450 thousand tons.

The railway passenger transport is operated between San Pedro Sula and Puerto Cortés, and between San Pedro Sula and Tela, and carried a total of about 96 thousand passengers in 1974.

### 2.2.3 Ports

Sea port plays a vital role in exports and imports of the country. There are a total of 6 ports, of which Puerto Cortés located at the Caribbean coast is the largest and also is one of the best ports in Central and Latin Americas. Puerto Cortés handled 718 thousand tons in exports and 779 thousand tons in imports, accounting for 70% of the total cargo handled at all 6 ports in 1976.

An industrial free zone is now under construction at Puerto Cortés, and after its completion it is expected to contribute to the economic development of the country.

### 2.2.4 Aviation

#### (1) Aviation system in Central America

International air transport in Central America is operated by 6 airlines of 5 countries in the region and 8 airlines of the countries outside the region (Table 2-4). The airlines of the region mainly operate short/medium-haul routes with B-737 or BAC-111 class aircraft. The airlines outside the region mainly operate long-haul routes with DC-8, B-707 or DC-10. This explains why the airlines of the regional countries together handle only 44.1% of the total air traffic of the region in terms of passenger-kilometers but in terms of the number of passengers carried, it accounts for 58.0% of the total. There are 6 international airports in the region, namely Toncontín (Tegucigalpa,

Honduras, Villeda Morales (San Pedro Sula, Honduras), La Aurora (Guatemala, Guatemala), Ilopango (San Salvador, El Salvador), Las Mercedes (Managua, Nicaragua), and Juan Santamaría (San José, Costa Rica). Historical traffic data of these airports are shown in Appendix Tables 2A-10 through 2A-13. Domestic air routes exist in 4 countries except in El Salvador, and Honduras has the greatest number of airports and air routes in the region.

Table 2-4 LIST OF INTERNATIONAL AIRLINES OPERATING IN CENTRAL AMERICAN REGION

| Name | Abbreviation | Country |
|---|---|---|
| Airlines of the countries of the region | | |
| 1. Servicio Aéreo de Honduras, S.A. | SAHSA | Honduras |
| 2. Transportes Aéreos Nacionales, S.A. | TAN | Honduras |
| 3. Empresa Guatemalteca de Aviación | AVIATECA | Guatemala |
| 4. Transportes Aéreos Centroamericanos, S.A. | TACA | El Salvador |
| 5. Lineas Aéreas de Nicaragua, S.A. | LANICA | Nicaragua |
| 6. Lineas Aéreas Costarricenses, S.A. | LACSA | Costa Rica |
| Airlines from outside the region | | |
| 7. Pan American World Airways | PAN AM | United States |
| 8. Compañia Panameña de Aviación | COPA | Panama |
| 9. Compañia Mexicana de Aviación | MEXICANA | Mexico |
| 10. Sociedad Aeronáutica de Medellin Consolidada, S.A. | SAM | Colombia |
| 11. Venezolana Internacional de Aviación | VIASA | Venezuela |
| 12, Lineas Aéreas de España | IBERIA | Spain |
| 13. Belgian World Airlines | SABENA | Belgium |
| 14. Belize Airways Ltd. | BAL | Belize |

(2) Aviation system of Honduras

Aviation plays an important role both as international and domestic transport means in Honduras. There are about 20 airports in the country, which are capable of accommodating operation of commercial aviation aircraft. Three of these, namely, Toncontín (Tegucigalpa), Villeda Morales (San Pedro Sula) and Golosón (La Ceiba) have facilities for international service. Other airports have facilities for domestic service only (Table 2-5).

International service is almost monopolized by the two Honduran airlines of TAN and SAHSA which hold each other's shares and are expected to merge in the near future. Only two foreign airlines, AVIATECA (Guatemala) and BAL (Belize), are operating international flights into Villeda Morales (San Pedro Sula). Existing international air routes are shown in Fig. 2-1.

Domestic services are provided by the four Honduran airlines of SAHSA, ANHSA, LANSA and Aeroservicios de Honduras, SAHSA possessing an overhelming majority of the traffic share (Table 2-6). Existing domestic air routes are shown in Fig. 2-2.

The demand analysis of air transport of the country is made in Subsection 2.3.3 in connection with that of Toncontín airport.

## 2.3 Existing Toncontín Airport

### 2.3.1 Outline of airport

Toncontín airport is located about 7 Km south of the center of Tegucigalpa City, the capital of Honduras, and is surrounded by residential areas (Fig. 2-3). It takes about

Table 2-5 PHYSICAL CHARACTERISTICS OF AIRPORTS IN HONDURAS

(1977)

| Airport | Runway Length (m) | Largest Aircraft in Service | Type of Runway Surface |
|---|---|---|---|
| Toncontín | 1,800 | Boeing 737 | Asphalt pavement |
| Villeda Morales | 2,900 | Boeing 707 | Asphalt pavement |
| Golosón | 3,000 | Boeing 707 | Asphalt pavement |
| Tela | 1,370 | Convair 440 | Asphalt pavement |
| Roatán | 940 | DC-3 | Earth |
| Utila | 640 | DC-3 | Earth |
| Guanaja | 750 | DC-3 | Earth |
| Trujillo | 750 | DC-3 | Earth |
| Tocoa | 675 | DC-3 | Earth |
| Victoria | 700 | DC-3 | Earth |
| La Unión | 830 | DC-3 | Earth |
| Olanchito | 780 | DC-3 | Earth |
| Juticalpa | 760 | DC-3 | Earth |
| Ruinas de Copán | 840 | DC-3 | Earth |
| Cata Camas | 850 | DC-3 | Earth |
| Choluteca | 850 | DC-3 | Earth |
| San Esteban | 750 | DC-3 | Earth |
| Comayagua | 750 | DC-3 | Earth |
| Puerto Lempira | 1,200 | DC-3 | Earth |

Source: DIRECCION GENERAL DE AERONAUTICA CIVIL

Table 2-6 NUMBER OF AIRCRAFT POSSESSED BY HONDURANEAN AIRLINES

| Aircraft Type \ Airline | TAN | SAHSA | ANHSA | LANSA | AEROSER-VICIOS | Total |
|---|---|---|---|---|---|---|
| Boeing B-737-200 | 1 | 1 | - | - | .... | 2 |
| Lockheed L-188 | 2 | 2 | - | - | .... | 4 |
| Convair CV-580 | - | 1 | 1 | - | .... | 2 |
| Douglas DC-6B | 1 | - | - | - | .... | 1 |
| Douglas DC-4 | - | - | - | 1 | .... | 1 |
| Douglas DC-3 | - | 5 | 1 | 4 | .... | 10 |
| Total | 4 | 9 | 2 | 5 | .... | 20 |

Source: DIRECCION GENERAL DE AERONAUTICA CIVIL

(....) Not Available

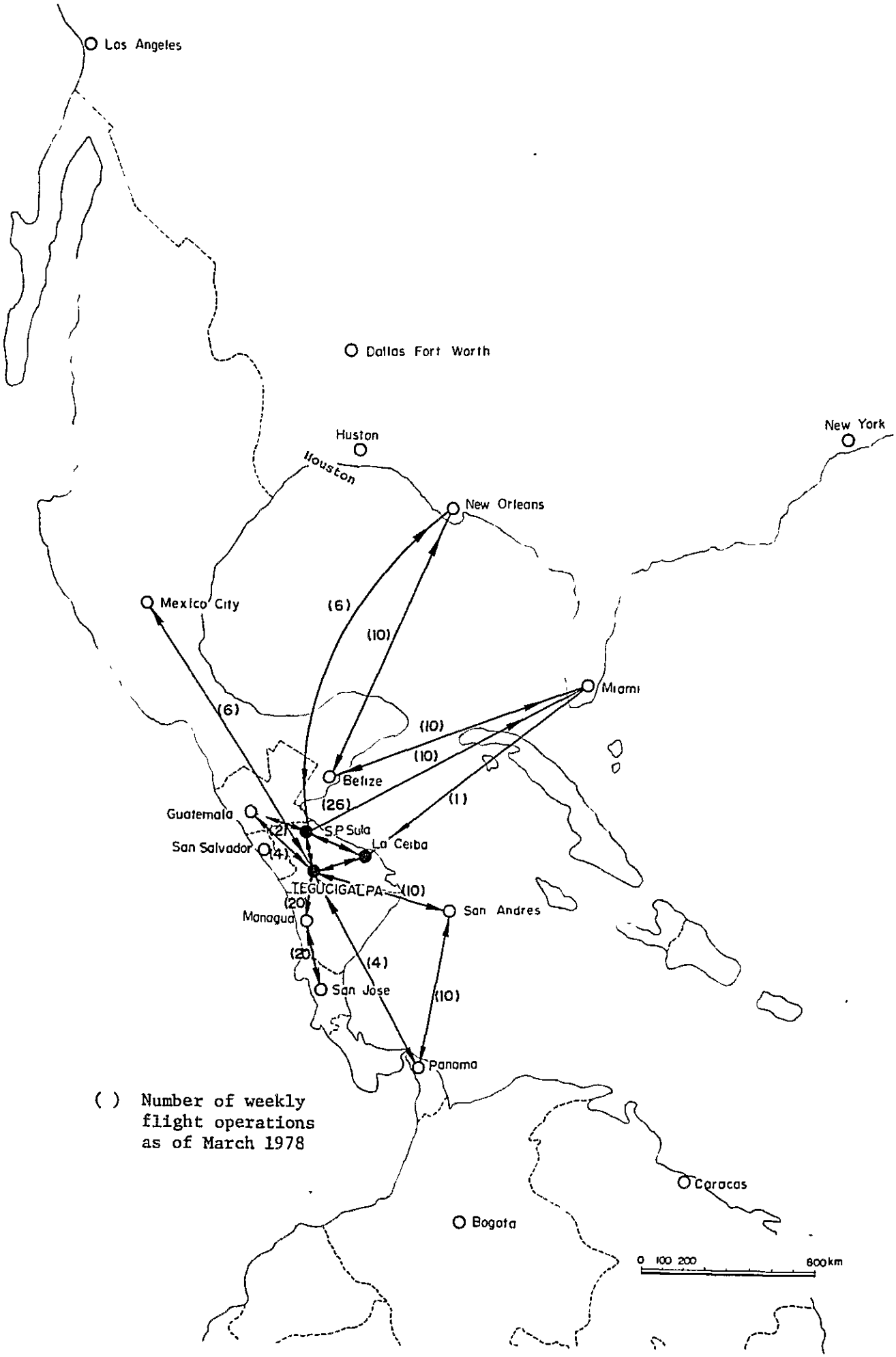
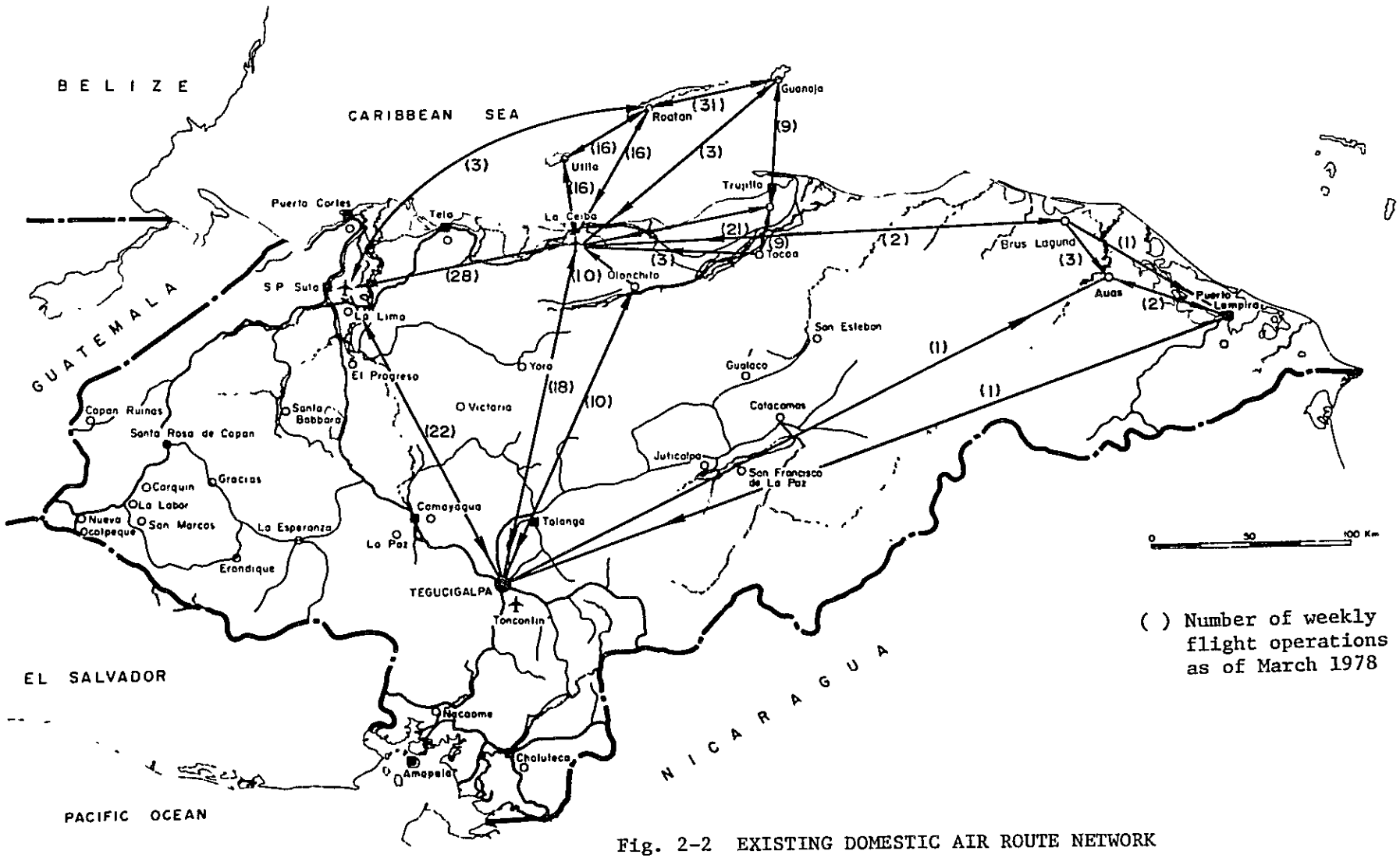



Fig. 2-1 EXISTING INTERNATIONAL AIR ROUTE NETWORK




( ) Number of weekly flight operations as of March 1978

Fig. 2-2 EXISTING DOMESTIC AIR ROUTE NETWORK

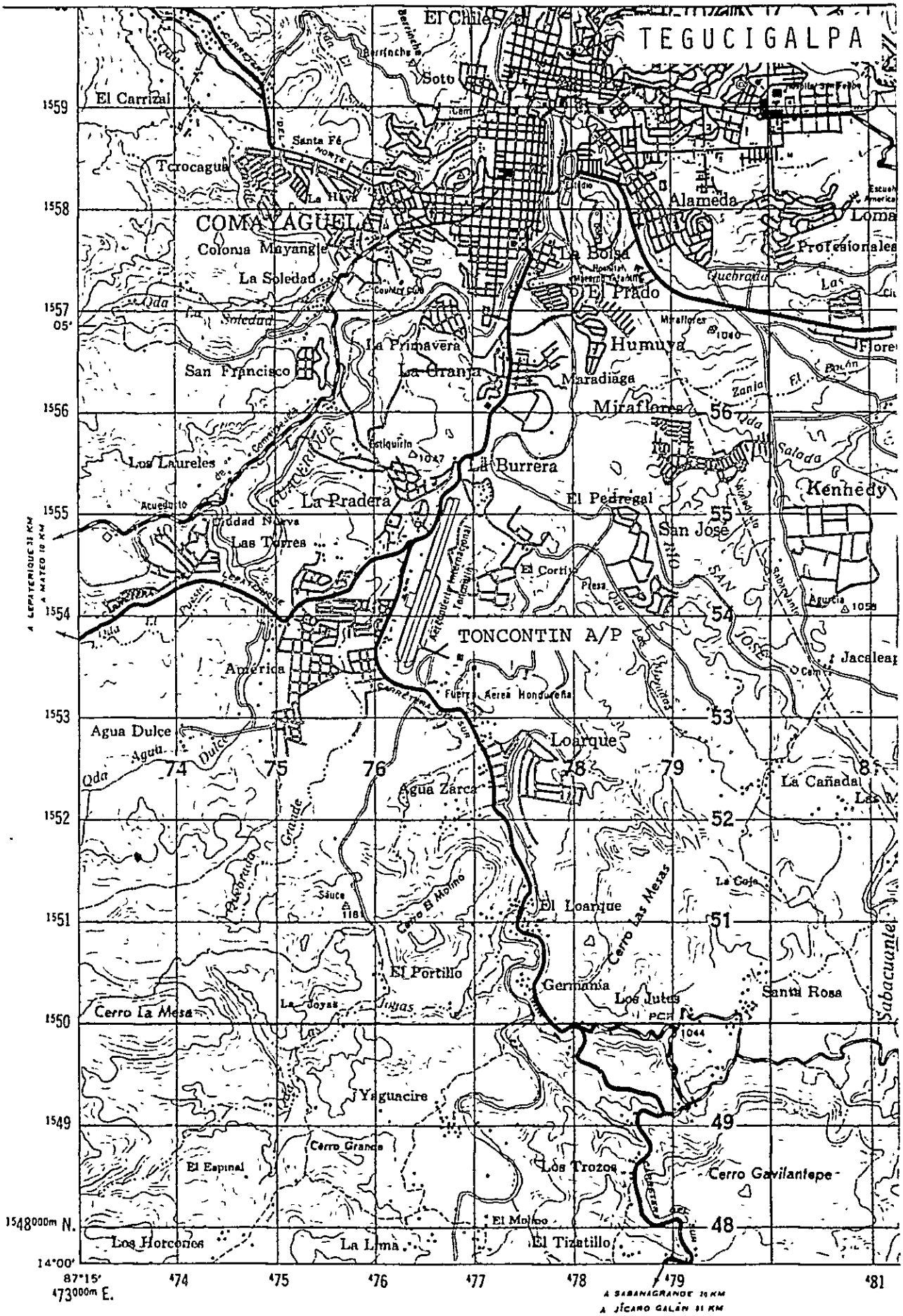



Fig. 2-3 LOCATION OF EXISTING TONCONTIN AIRPORT

15 minutes by car from downtown Tegucigalpa to the airport. The airport was inaugurated in 1948 as a civil aviation airfield, and combined international and domestic traffic of embarking and disembarking passengers in 1977 amounted to 165,748, and total cargo tonnage handled to 5,690 tons.

### 2.3.2 Hinterland, Tegucigalpa City

Tegucigalpa City, the capital, is the largest city in Honduras, where most of the governmental agencies are centered. The population is estimated to be about 320 thousand as of 1977, and the average annual growth rate during the 1961 - 1974 period was rather high at 5.6% (Appendix Table 2A-3), the reason being that people immigrated from rural areas to the city seeking jobs and better standard of living. It is estimated that the population of the capital city in the year 2000 will amount to about 1.1 million. As for the employment structure, the tertiary industry accounts for 60.8% of the total employment, comprising 16.1% belonging to governmental services, 17.6% to commerce, 4.3% to transport, and 22.8% to other services. The secondary industry occupies 26.6% of the total, comprising 18.1% belonging to manufacturing and 8.5% to construction. The primary industry accounts for only 12.6% of the total employment.

Tegucigalpa is a city developed on the slopes of mountains with an average elevation of 1,000 m centered around the downtown basin. The climate is comfortable throughout the year with the mean temperature of about 20°C.

The tourism resources of the city are the beautiful old towns of Santa Lucia, Valle de Angeles and Ojojona, etc.

There are, however, very few hotels with accommodations of international standard, and considerable improvement would be needed in this respect in order to develop the tourism industry of the city.

### 2.3.3 Air transport demand analyses

#### (1) International air passenger traffic

##### a. Embarking and disembarking passengers

The number of international embarking and disembarking passengers in the country has steadily increased at an annual growth rate of 9.1% during the 10-year period of 1967 - 1977, amounting to 202,950 in 1977. The growth rate of that of Toncontín airport during the same period averaged 9.2% per annum, and the number reached 112,473 in 1977 accounting for 55.4% of the national total (Appendix Table 2A-14, Fig. 2B-1). These trends are attributable to the increase in individual income and the brisk economic activities resulting from the steady growth of GDP during the same period, and also to the tourism resources of Honduras.

According to the air passenger survey conducted in 1975, the trip purposes of international passengers at Toncontín airport comprised 51% of business, 23% of tourism, 22% of personal and 4% of others. Along with the economic development of the country, international passenger traffic is expected to grow even faster than hitherto. The international traffic at Toncontín airport is served only by the two Honduran airlines, TAN and SAHSA, with no foreign airlines operating (Appendix Tables 2A-27 through 2A-28).

As for the demand by route, the medium to long haul routes, such as Tegucigalpa - Miami, Tegucigalpa - New Orleans, and Tegucigalpa - Panama have shown a tendency of a remarkable growth (Appendix Table 2A-18, Table 2A-29, Fig. 2B-5).

b. Transit passengers

The number of international transit passengers at Toncontín airport amounts to about 50% of the total number of embarking and disembarking passengers at the same airport. This is due to the fact that the airport is situated close to the center of Central America, and this ratio is expected to remain unchanged because of this geographical situation (Appendix Tables 2A-18, and 2A-26).

(2) Domestic air passenger traffic

The number of domestic embarking and disembarking passengers in the country steadily increased at an annual rate of 14.4% during the 10-year period of 1960 - 1970 (Appendix Table 2A-15, Fig. 2B-1). However, the traffic sharply declined from the year 1970 to 1975 with the decrease rate of 17% per annum.

The domestic passenger traffic at Toncontín airport showed a similar tendency to that of the entire country, declining at a rate of 20.3% annually during the same period. This is mainly because the travel time by road was greatly reduced due to the completion of the paved highway between Tegucigalpa and San Pedro Sula late in 1969. The domestic passenger transport demand, however, has rapidly recovered since 1975. The number of embarking and disembarking passengers in the country reached 282,528 in 1977 with the annual growth rate of 18.3% during the 2-year period of 1975 - 1977. Similarly, that of Toncontín airport reached 53,275 in 1977 with the annual growth rate of 11.4% during the same 2-year period. This can be largely attributed to the fact that the airlines, since late 1974, have been permitted to carry domestic passengers on international jet flights between

Tegucigalpa and San Pedro Sula, and also between Tegucigalpa and La Ceiba, resulting in reduced travel time between these points, as well as to the fact that GDP has escaped stagnation since 1976.

As for the demand by route of domestic traffic at Toncontín airport, the Tegucigalpa - San Pedro Sula route accounted for 44.5% of the total, and the Tegucigalpa - La Ceiba route for 30.3%, the two routes together accounting for 74.8% of the total domestic traffic in 1977 at the airport (Appendix Table 2A-19, Fig. 2B-6).

As for the trip purposes, according to the air passenger survey conducted in 1975 personal trips accounted for 55% of the total traffic, business trips 39%, and others 6%. This means that the domestic passenger traffic demand largely depends on the level of personal income and economic activities of the country.

(3) International air cargo traffic

The international air cargo traffic of the country has steadily increased at an annual growth rate of 9.7% during the 10-year period of 1967 - 1977, amounting to 10,770 tons in 1977. Similarly, that of Toncontín airport reached 5,112 tons in 1977 with the annual growth rate of 7.7% during the same period, accounting for 47.5% of the total cargo traffic of the country (Appendix Table 2A-13, Fig. 2B-3). This trend can be explained by the steady growth of exports and imports of the country during the same period. As much as 85% of the total international cargo tonnage handled at Toncontín airport was inbound, with only 15% outbound on an average during the past 3 years (Appendix Tables 2A-21 through 22). This may be explained by the fact that while there are quite

a few imported commodities that need to be airlifted safely and fast, such as electronic products and mechanical parts, etc., exported commodities suitable for air transport are limited to only a few valuables and some perishable goods. As for the cargo traffic by route, the Tegucigalpa - Miami route accounted for 45% of the total cargo handled at Toncontín airport in 1976 (Appendix Table 2A-20, Fig. 2B-7).

(4) Domestic air cargo traffic

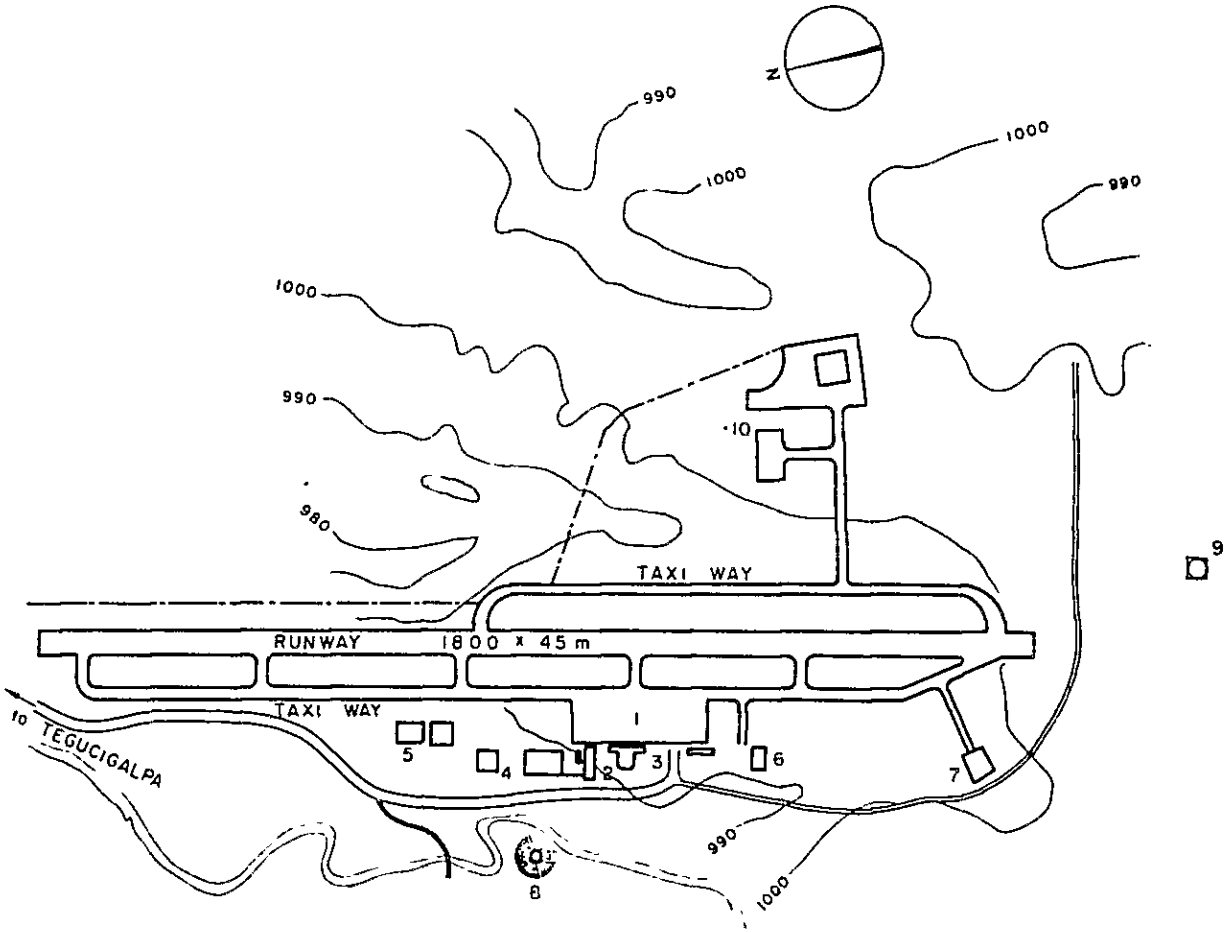
The domestic air cargo traffic of the country steadily increased during the 9-year period of 1960 - 1969, but since 1969 it has rapidly declined, registering 3,224 tons in 1977, only 14.6% of the peak traffic of 1969. Similarly, that of Toncontín airport has declined with the annual decrease rate of 23.3% during the same period, amounting to only 578 tons in 1977 (Appendix Table 2A-17, Fig. 2B-4). This trend can be attributed to the completion of the paved road between Tegucigalpa and San Pedro Sula, as in the case of domestic passenger traffic (Appendix Table 2A-23, Fig. 2B-8). It can, however, be expected that increasing volumes of valuables and perishables with high freight-bearing capacity will be transported by air as the standard of consumption in Honduras rises in the future.

### 2.3.4 Existing airport facilities

The airport layout plan and the general description of the airport and its facilities are given in Fig. 2-4 and Table 2-7 respectively.

(1) Runway

The runway 01-19 is oriented north, and has the length of 1,800 m, with the overrun of 60 m




SYMBOL

1. APRON (CIVIL)
2. PASSENGER TERMINAL BUILDING
3. PARKING LOTS
4. AIRLINE (SAHSA) FACILITIES
5. HANGAR (LANSA)
6. FUEL
7. HANGAR
8. NDB
9. VOR/DME
10. MILITARY AREA

Fig. 2-4 EXISTING TONCONTIN AIRPORT LAYOUT

Table 2-7 DESCRIPTION OF TONCONTIN AIRPORT AND ITS FACILITIES

| | |
|---|---|
| Location | 7km to SSW from Tegucigalpa |
| Reference Point Elevation | N14°02' W87°14'<br>1,007m (3,300 feet) |
| Operated by | La Direccion General de Aeronautica Civil |
| Daily Operation Hours | 12 hours (06:00 - 18:00) |

Reference Temperature 23°C

(C°)

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. | 25.4 | 27.6 | 29.5 | 30.2 | 29.8 | 28.5 | 27.7 | 28.5 | 28.7 | 27.3 | 25.8 | 25.0 |
| Min. | 14.2 | 14.5 | 15.4 | 16.8 | 17.7 | 18.2 | 17.8 | 17.5 | 17.5 | 17.4 | 16.1 | 14.7 |

| | |
|---|---|
| Airfield Facilities | Runway<br>Width : 45m<br>Length : 1,800m<br>Pavement : Asphalt concrete<br>Strength : AUW 18tons for single wheeled aircraft<br>AUW 46tons for dual wheeled aircraft<br>Shoulder : 5.25m wide of asphalt concrete pavement<br><br>Parallel Taxiway<br>Width : 15.0m<br>Pavement : Asphalt concrete<br>Number of exit taxiways : 6<br>Shoulder : Same as runway shoulder |

| | |
|---|---|
| Airfield Facilities | Apron<br>Area : 50m x 210m<br>Pavement : Asphalt concrete |
| Airfield Lighting Facilities | Runway lights, Taxiway lights, Threshold lights, Runway end lights, Apron flood lights, Aerodrome Beacon |
| Airfield Marking | Runway center line, Runway side stripe, Runway designation, threshold, Fixed distance, Taxiway center line, Taxiway holding position, Touch down zone, Overrun, Displaced threshold, etc. |
| Radio Navaid Facilities | NDB, VOR/DME |
| Communication Facilities | Aeronautical Fixed Service facilities<br>AFTN, ATS<br>Aeronautical Mobile Service facilities<br>VHF air-ground, HF air-ground |
| Terminal Buildings, etc. | Passenger terminal building, cargo terminal building, Administration office, Airlines' offices, hangers, Fuel storage and distribution facilities, Parking lot, etc. |

on the south and 63 m on the north end. The southern threshold is displaced 150 m to the north, which reduces the runway length for landing from the south to 1,650 m. The runway length of 1,800 m at the elevation of 1,000 m is equivalent to only around 1,300 m of the basic sea level length, which is actually causing weight restrictions on certain aircraft.

The runway pavement is of asphalt concrete, and the strength after the overlay work along the entire runway length completed in 1976 is sufficient to meet the all-up weight of 18 tons for single wheeled aircraft and 46 tons for dual wheeled aircraft.

(2) Taxiway

A 15-meter wide parallel taxiway with asphalt concrete pavement is provided along the entire runway length, with its center line 90 m away from that of the runway.

(3) Passenger loading apron

The apron area of 70,000 $m^2$ allows simultaneous parking of two B-737 type and one L-188 type aircraft, or one B-737 type and two L-188 type aircraft on self-manoeuvering system. The apron is provided with fuel hydrant system.

(4) Passenger terminal building

The terminal building is three storied, with a floor area of about 4,800 $m^2$ in total. The first floor is occupied by check-in counters, departure lobby, CIQ facilities, duty free shops, folkcraft shops, bank, etc. Restaurant, observation deck and

DGA office occupy the second floor, and COCESNA* occupies the third floor. The departure lobby and the CIQ area were expanded to the present sizes in 1976.

(5) Navigational aid facilities

The airfield lighting facilities consist of the runway lights installed in 1976 along the entire runway length, and the taxiway lights installed in 1977 along the southern half of the taxiway leading to the apron. The lighting systems are not meant for night operations but for operations under bad weather conditions during the day. Neither approach lights nor VASIS are installed because of the topographical condition of the approach area.

The VOR/DME is located about 800 m to the southeast from the southern end of the runway, and the NDB is located 400 m to the west from the runway center. No radar is installed.

(6) Other facilities

The automobile parking can accommodate only around 80 vehicles to park but has no space for expansion.

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* COCESNA (La Corporación Centroamericana de Servicios de Navegación Aérea) formed under agreement among the five Central American states plus Belize, is charged with the task of operation and maintenance of communication facilities as well as maintenance and management of air traffic control system and radio navigational aid facilities for the entire Central America.

The aircraft maintenance area is located on the north side of the passenger terminal building, where minor maintenance work of piston engine aircraft is made. Maintenance work of jet aircraft is being done at the Miami International Airport in USA.

The apron for general aviation is mostly unpaved.

### 2.3.5 Problems of existing Toncontín Airport

(1) Air space

The instrument landing procedures presently in operation to Runway 01 is either by NDB or by VOR/DME as shown in Fig. 2-5 and Fig. 2-6 respectively. Both procedures suffer from the obstruction of high mountains rising to about 5,000 feet above sea level both in the final approach area and the missed approach area, causing pilots uneasiness and requiring them to be thoroughly familiar with the surrounding topography. Fig. 2-7 shows the location of the objects projecting into the obstacle limitation surfaces specified by the ICAO standards, as well as the profile of the obstacles projecting into the take-off climb surface and the approach surface both for precision approach runway and for non-instrument approach runway specified by the ICAO standards. As these figures clearly indicate, installation of ILS to enable the airport to operate at night and in bad weather conditions is not practicable.

(2) Runway

The runway length for landing from the south is limited to 1,650 m as previously mentioned, and this might well have been the cause of the overrun accident

of a B-737 that took place in 1976. The length of 1,800 m often requires aircraft to reduce its take-off weight, which affects operational efficiency of aircraft and hence airlines' payability. Besides, elevation of the road which passes by the southern end of the runway is higher than that of the runway, and it once caused an approaching aircraft to touch an automobile on the road.

(3) Aircraft noise

With the expected increase in jet aircraft movements, aircraft noise is anticipated to become a social problem in the future.

(4) Expansion possibilities

The topographical conditions and the present land use around the airport are such that there is little possibility of the future expansion of the existing airport.

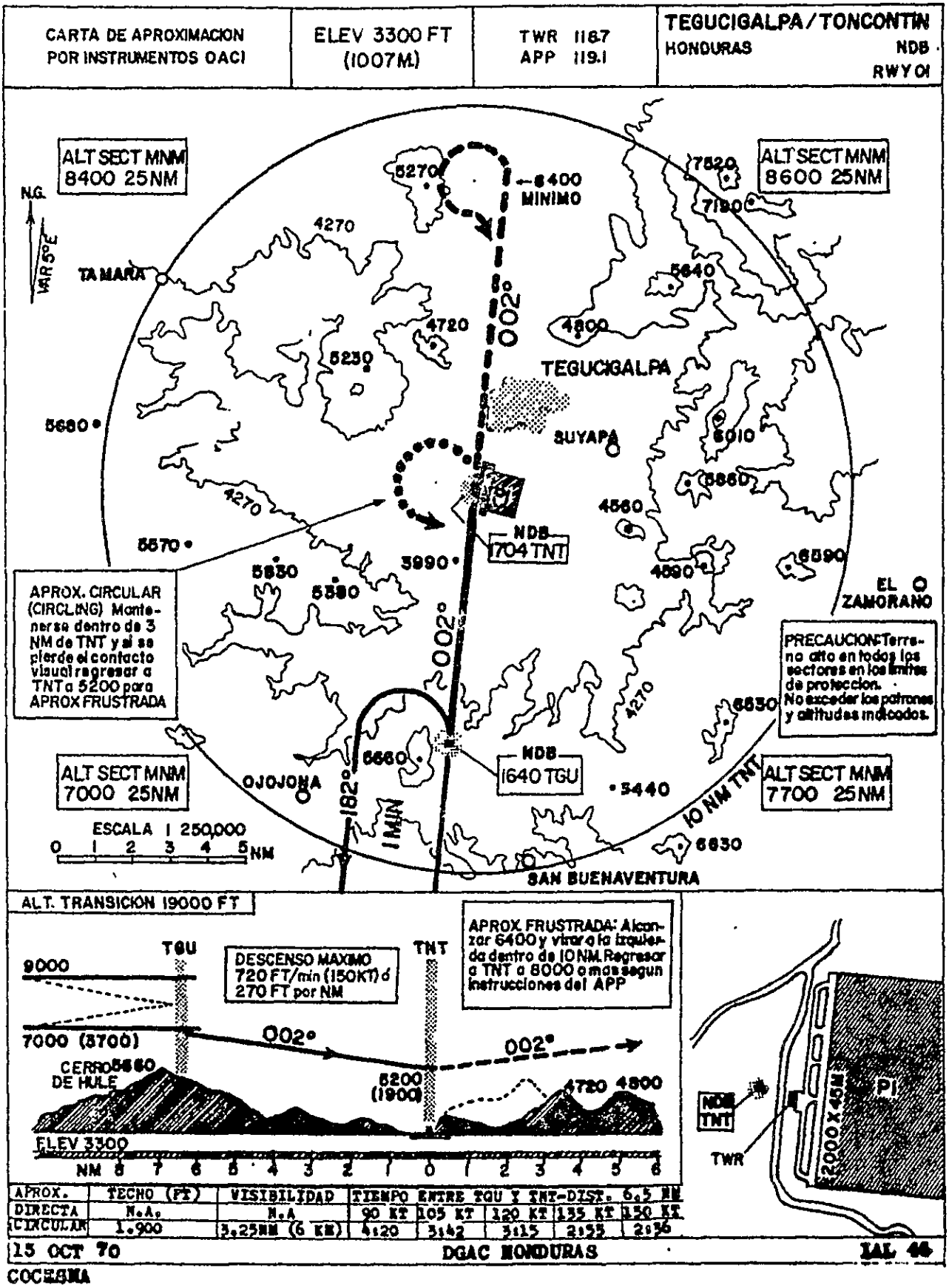



Fig. 2-5 NDB APPROACH PROCEDURE AT TONCONTIN AIRPORT

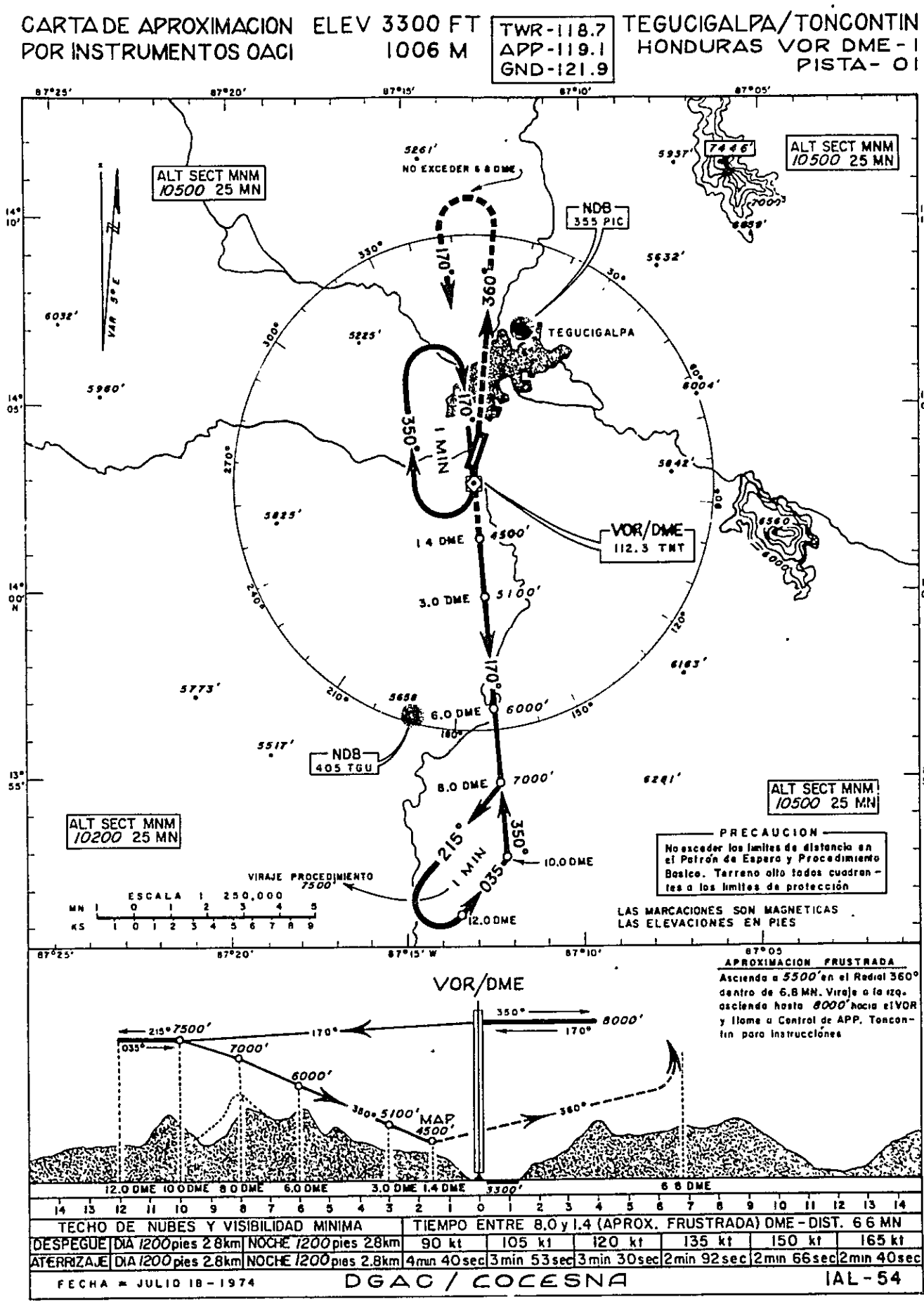



Fig. 2-6 VOR/DME APPROACH PROCEDURE AT TONCONTIN AIRPORT

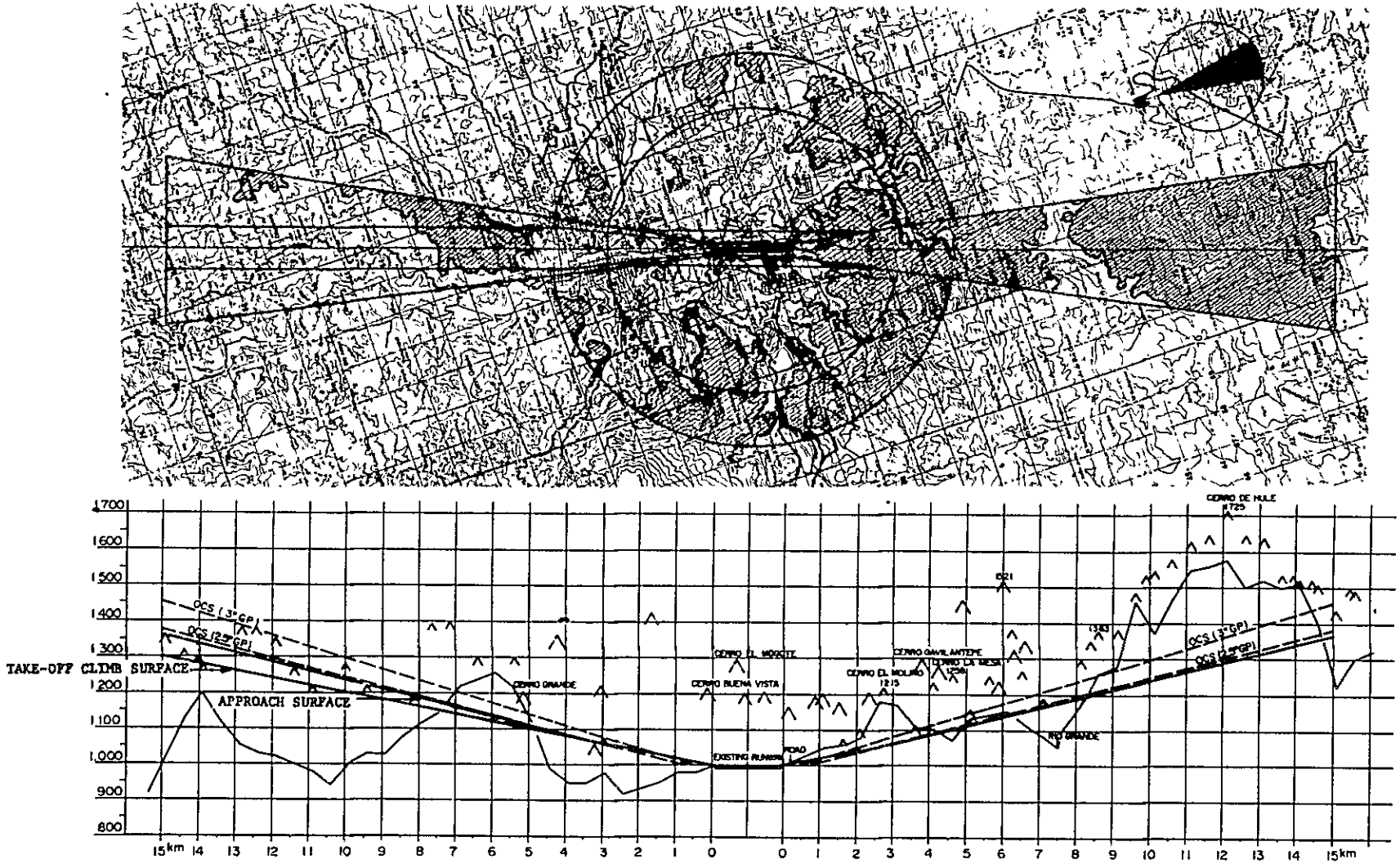



Fig. 2-7 LOCATION AND PROFILE OF EXISTING OBSTACLES AT TONCONTIN AIRPORT

# CHAPTER 3. PRELIMINARY SCREENING OF SITES

# CHAPTER 3 PRELIMINARY SCREENING OF SITES

Preliminary screening is made of the 18 potential sites initially chosen from among those analysed in previous studies and other relevant documents, through analyses of the conditions of each site in terms of aircraft operation and construction as per procedures illustrated in Fig. 3-1, based on the topographical maps (1:50,000) and meteorological data made available. The following are the 18 sites considered in the preliminary screening, and their locations are shown in Fig. 3-2.

- VALLE DE TALANGA - A
- " - B
- VALLE DE ILAMAPA - A
- " - B
- VALLE DE AMARATECA - A
- " - B
- SOROGUARA
- EL HATILLO
- LAGUNA EL PEDREGAL - A
- " - B
- TONCONTIN (Existing airport site)
- LA JOYA
- LAS SABANAS
- CERRO QUEMADO
- VALLE DE ZAMORANO
- CERRO DE HULE - A
- " - B
- COMAYAGUA

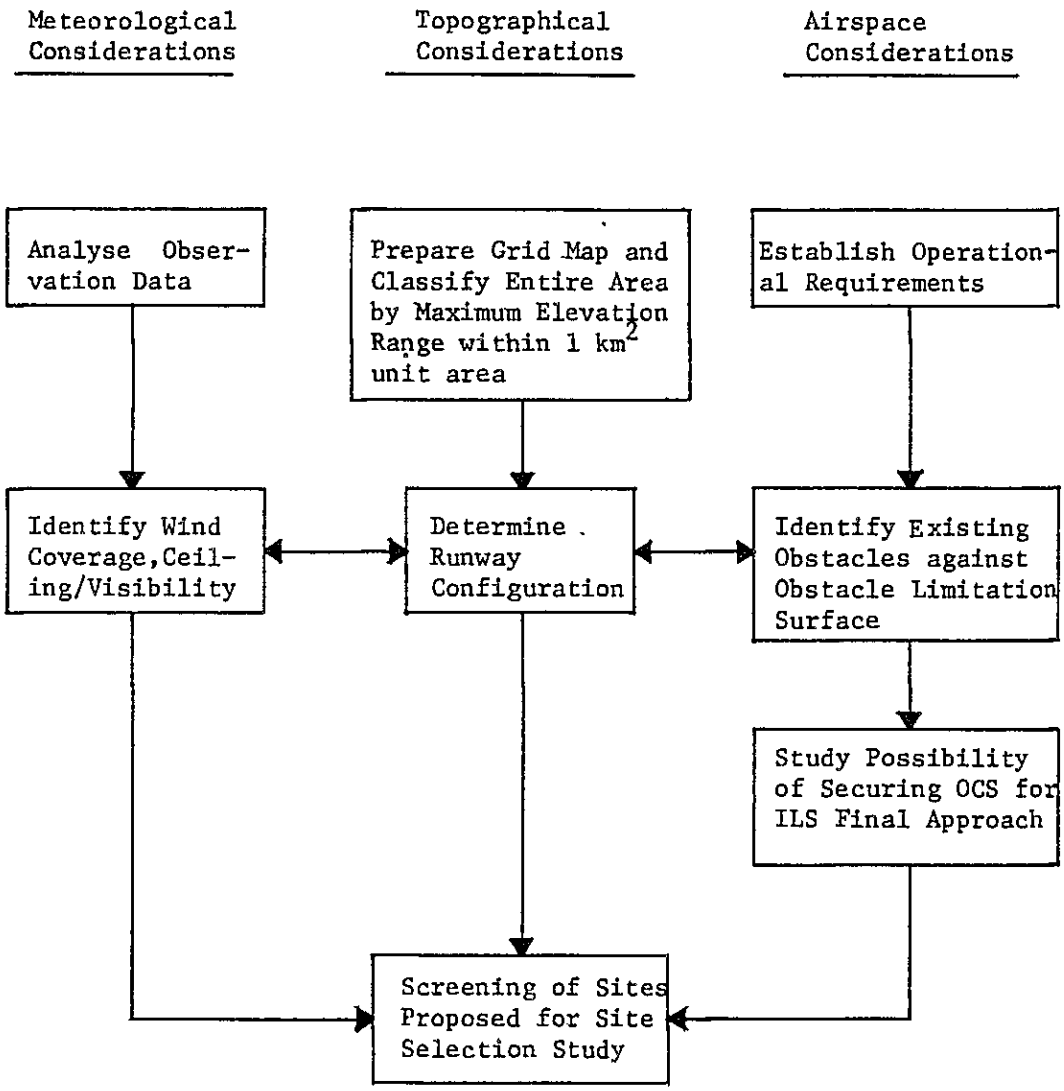



Fig. 3-1 SEQUENCE OF SCREENING OF SITES PROPOSED FOR SITE SELECTION STUDY

VALLE DE TALANGA

B

A

45 KM

ROUTE NO. 5 NEW

30 KM

B A

(MH)/D2

VALLE DE ILAMAPA

VALLE DE AMARATECA

B

A

60 KM

SOROGUARA

ROUTE NO. 1

EL HATILLO

B A

TEGUCIGALPA

LAGUNA EL PEDREGAL

(MH)/D3

TONCONTIN

(MH)/P4

LA JOYA

LAS SABANAS

ROUTE NO. 5

VALLE DE ZAMORANO

CERRO QUEMADO

B A

CERRO DE HULE

ROUTE NO. 1

N

1610

14°30'

1600

1590

14°20'

1580

1570

14°10'

1560

1550

14°00'

1540

1530

460

87°20'

470

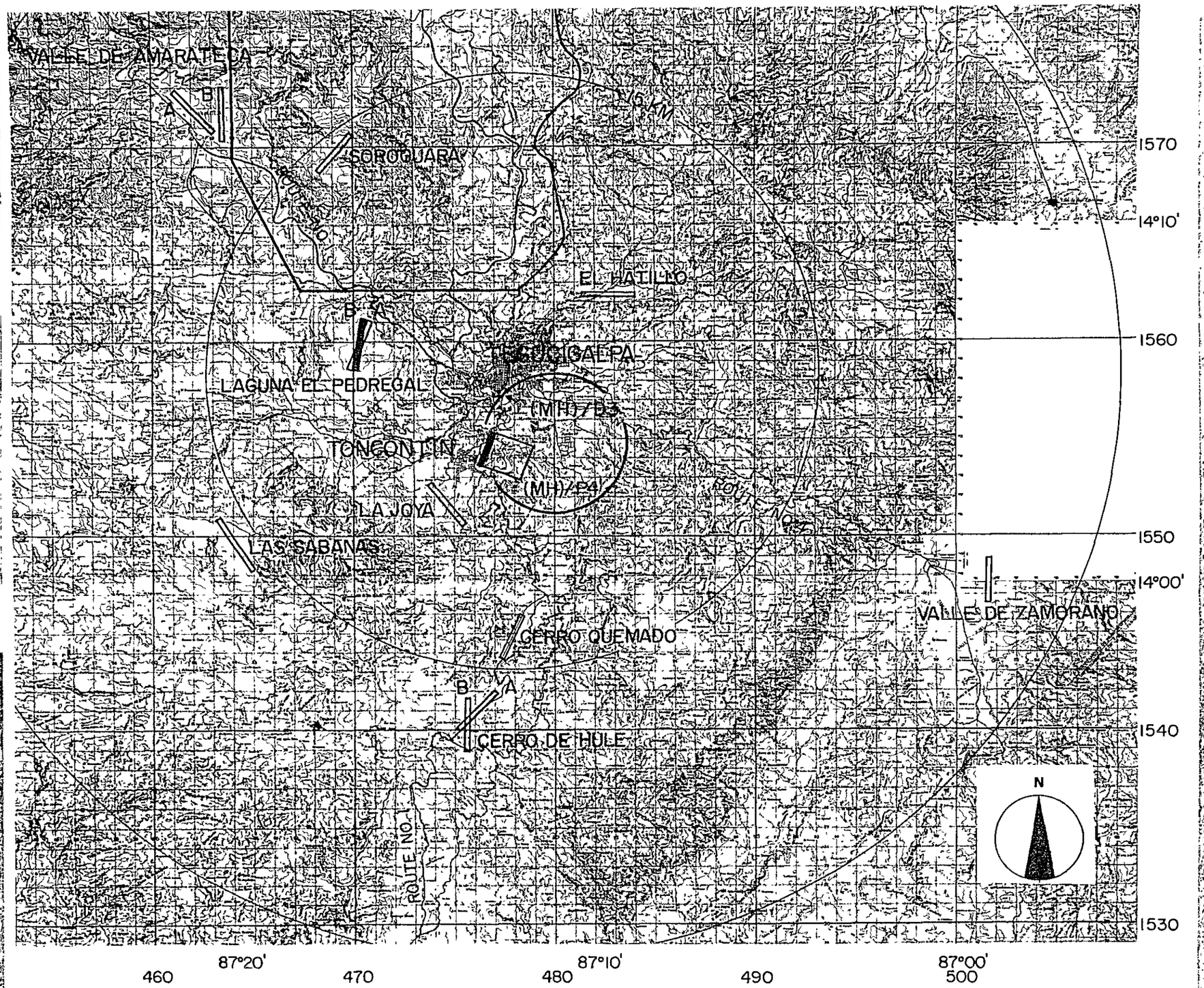
480

87°10'

490

500

NOTE : COMAYAGUA-SITE IS NOT SHOWN

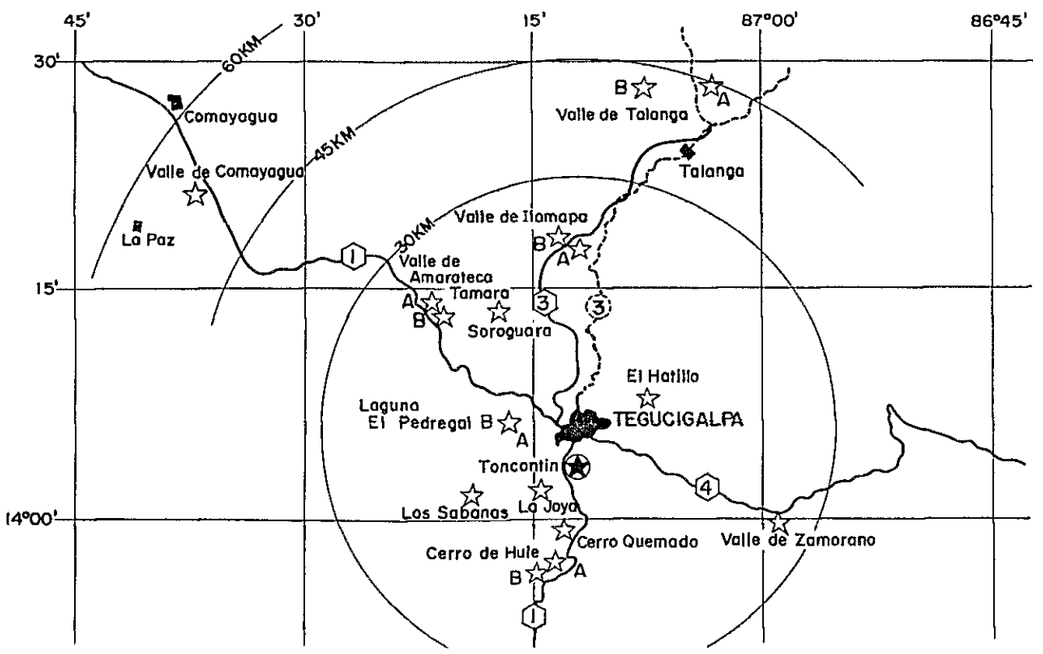



NOTE : COMAYAGUA-SITE IS NOT SHOWN
SCALE : 1 : 200,000

LEGEND :

POTENTIAL SITE (RUNWAY LOCATION)

(MH) / D or P — DANGER RESTRICTED OR WARNING AREA OR PROHIBITED AREAS




## AIRPORT POTENTIAL SITES

NEW TEGUCIGALPA AIRPORT DEVELOPMENT
HONDURAS, C.A.



Fig. 3-2 LOCATION OF POTENTIAL SITES

## 3.1 Screening Criteria

### 3.1.1 Topographical criteria

Based on the 1:50,000 topographical map of Tegucigalpa and its surrounding areas, comparison of the 18 sites is made in terms of the availability of the necessary land area to accommodate the basic facility requirements of the proposed new airport as discussed in Chapter 5 hereinafter, as well as in terms of the amount of earthwork involved, taking into consideration at the same time such fundamental factors as apparent interference with the existing communities or rivers, etc.

In order to obtain a rough, general idea of the amount of earthwork involved in the grading work of the potential sites, grid lines at 1 Km intervals are drawn on the topographical map in scale of 1:50,000, each grid unit showing the elevation of the highest point, and the maximum elevation range, namely the elevation difference between the highest and the lowest points existing within the 1 $Km^2$ unit area. Grids are then classified according to the magnitude of the maximum elevation range into the following three categories indicating different degrees of earthwork practicability (Appendix 3D).

| Maximum Elevation Range | Earthwork Practicability |
|---|---|
| 0 m - 60 m | No problem |
| 60 m - 120 m | Difficult |
| 120 m and over | Not practical |

### 3.1.2 Meteorological criteria

(1) Wind coverage

Sites are evaluated in the light of the possibility of obtaining the wind coverage of no less than 95% under the maximum cross-wind components of 15 KTS.

(2) Ceiling-visibility

Evaluation criteria on minimum ceiling-visibility are 200 ft - 800 m, which are the operating minima (DH-RVR) required by ICAO for Precision Approach Runway CAT-I.

3.1.3 Airspace criteria

Airspace is analysed on the basis of the operational requirements of Instrument Approach ILS CAT-I Operation.

(1) Obstacles

Examination is made on the maps in scale of 1:50,000 to identify the location and nature of objects constituting obstruction within the airspace defined by the obstacle limitation surfaces (see Fig. 3-3) required of an instrument approach runway or a precision approach runway Category I. (Ref. Annex 14 to the Convention on International Civil Aviation, Chapter 4, ICAO, and Airport Service Manual - Doc. 9137-AN/8981 - Part 6, ICAO).

(2) Operational limitations

After identifying the possible obstacles within the said airspace, the possibility of securing the obstacle clearance surfaces in the ILS final approach area (Ref. Procedures for Air Navigation Services - Doc. 8168-OPS/611/2, ICAO) is examined to determine the degree of limitations to be imposed in establishing the intended aircraft operation procedures.

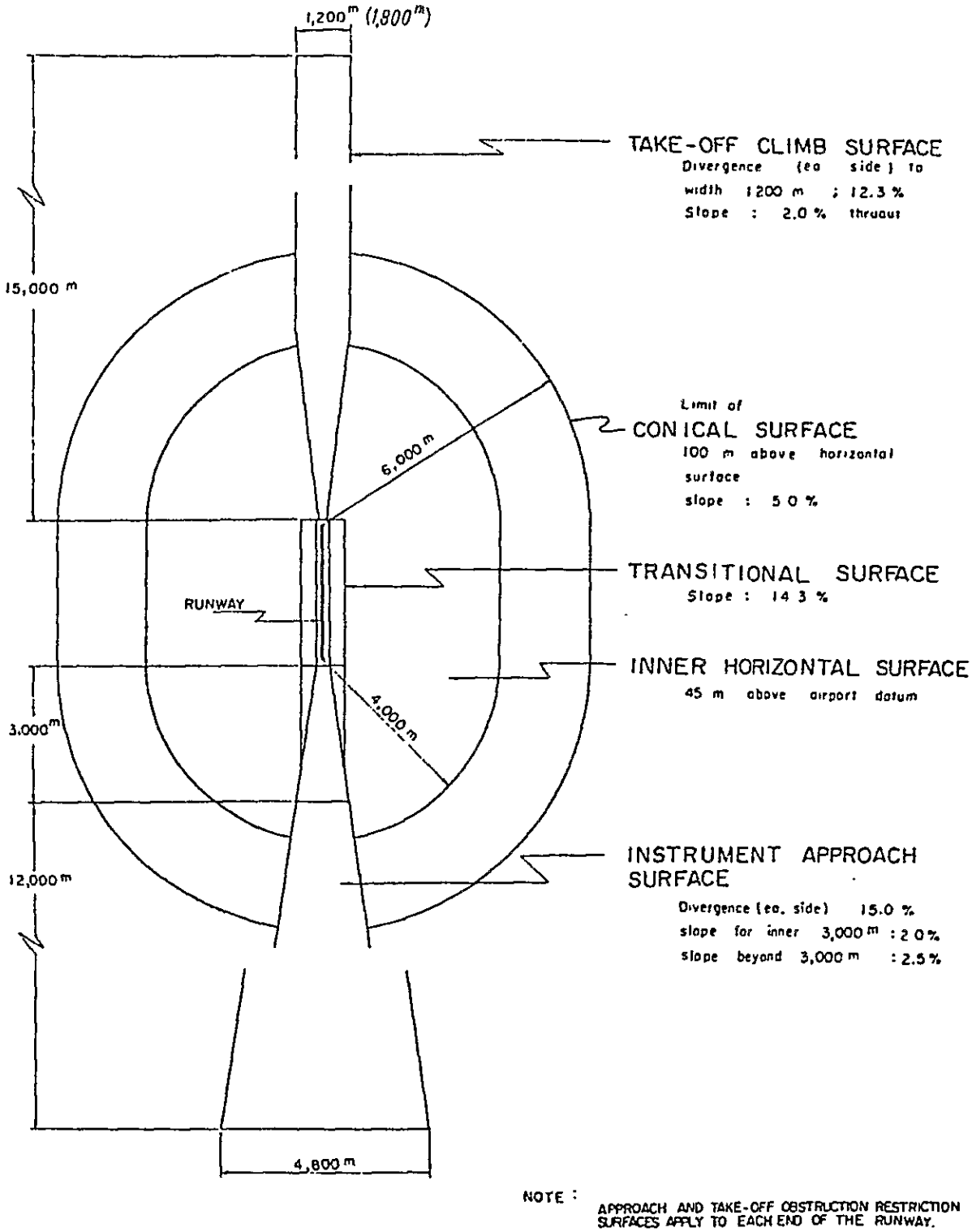



Fig.3-3 I.C.A.O. OBSTACLE LIMITATION SURFACES

### 3.1.4 Airport accessibility criteria

Screening of sites in terms of accessibility is based on the criteria of 60 Km road distance and 60 minutes travel time from downtown Tegucigalpa.

## 3.2 Evaluation of Sites

Evaluation of the 18 potential sites is made on the basis of the foregoing screening criteria, and the results are summarized in Table 3-1. Back-up data and analytical drawings of the screening are shown in Appendices 3A, 3B, 3C and 3D.

Some of the decisive defects of the sites found unsuitable for the new airport construction are as follows:

a. TONCONTIN (the existing airport site): Whichever direction the runway may be oriented, the mountains around the site project either into the obstacle limitation surfaces or the obstacle clearance surface for ILS final approach (Appendix 3C). Possible alternatives of runway orientation reduce the wind coverage under the maximum cross-wind components of 10 KTS to less than 90%, seriously affecting the operation of small aircraft (Appendix 3B). The present surrounding land use is incompatible with the future expansion possibilities of the airport (Appendix 3C).

b. VALLE DE TALANGA-A, VALLE DE ILAMAPA-A, and -B: Whichever the orientation of the runway may be, the mountains around the site interfere with the air space required.

c. SOROGUARA, EL HATILLO, LA JOYA, LAS SABANAS and CERRO QUEMADO: Each of these sites suffers from impracticability of earthwork, and the airspace, furthermore, is obstructed by the surrounding mountains.

c. VALLE DE AMARATECA-A, and -B and VALLE DE ZAMORANO: The necessary airspace cannot be secured, and the existing land use is incompatible with the airport.

d. LAGUNA EL PEDREGAL-A: The obstacle clearance surface for ILS final approach is projected into by the mountains existing on the south of the site.

e. CERRO DE HULE-A, and -B: The weather conditions are not satisfactory (Appendix 3B). Furthermore, the National Road Route No. 1 passes through the site.

f. COMAYAGUA: The access road distance from downtown Tegucigalpa is around 90 Km, which is considered too long for an airport to serve the national capital.

## 3.3 Alternative Sites

As a result of the overall comparative evaluation of the 18 potential sites, following two sites are selected for detailed site selection study hereinafter presented.

(1) VALLE DE TALANGA-B (hereinafter simply called TALANGA)

(2) LAGUNA EL PEDREGAL-B (hereinafter simply called PEDREGAL)

Table 3-1 SUMMARY OF SITE PRELIMINARY EVALUATION FACTORS

| EVALUATION CRITERIA / POTENTIAL SITES | | LOCATION | ACCESSIBILITY | RUNWAY | | TERRAIN CONDITIONS | | | | OBSTACLES | | METEOROLOGICAL CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | From Tegucigalpa | Road Diatance And Travel Time From Tegucigalpa | Orientation | Elevation | Topographical Conditions | Maximum Elevation Range | Geological Conditions | Present Conditions Of Land Use | Obstacle Limitation Surfaces Projected into by Mountains | Objects Projecting into Obstacle Clearance Surface for ILS Final Approach | |
| VALLE DE TALANGA | A | 42km to NNE | 60km 60 minutes | N04W | 760m | Flat | 10m or less | Alluvium | Cultivated fields | Approach surface (N,S) Horizontal surface (E) Conical surface (E,SW) | 1100m high mountain 11km to south 1100m high mountain 10km to north | Under observation |
| | B | | | N73W | 750m | Flat | 10m or less | | Wild land & Stock farms | Horizontal surface (S) Conical surface (S) | | |
| VALLE DE ILAMAPA | A | 25km to N | 35km 40 minutes | N20E | 910m | Hilly | 50m to 60m | Gravel Terrace | Wild land | Approach surface (N,S) ▲ | | No data available |
| | B | | | N55E | 950m | Hilly | 40m to 60m | | Wild land | Approach surface (N,S) ▲ | | |
| VALLE DE AMARATECA | A | 20km to NE | 30km 35mminutes | N45W | 950m | Hilly | 10m to 70m | Alluvial sandy loam | Center of Special Industrial & Recreation ▲ | Approach surface(NW,SE) ▲ | | No data available |
| | B | | | N00 | 1070m | Hilly | 50m to 120m ▲ | | | Approach surface (N,S) ▲ | | |
| SOROGUARA | | 15km to NE | 25km | N45E | 1360m | Mountainous | 120m to 180m ▲ | Andesite, Volcanic rock | Forests, Wild land | Approach surface (SW) ▲ | | No data available |
| EL HATILLO | | 6km to NE | 10km 15 minutes | N90E | 1450m | Mountainous | 180m to 230m ▲ | Tuff | | Approach surface (E) ▲ | | No data available |
| LAGUNA EL PEDREGAL | A | 8km to W | 16km 30 minutes | N28E | 1500m | Isolated mountain partially with flat area | 110m to 130m ▲ | Andesite | Stock farms | Horizontal surface (E,W) | 1776m high mountain 8km to south ▲ | Wind coverage; 99 % |
| | B | | | N12E | 1500m | | 110m to 130m ▲ | | | | | |
| TONCONTIN | | 4km to S | 7km 15 minutes | N20E | 1000m | Tableland | 0m to 80m | Hard clay, Tuff | Existing airport | Approach surface (N,S) ▲ Horizontal surface (E,W) Conical surface (N,S,E,W) | ILS is not applicable ▲ | Wind coverage; 99% |
| LA JOYA | | 7km to S | 15km | N45W | 1150m | Mountainous | 80m to 170m ▲ | Tuff | Forests, Wild land | Approach surface (SE,NW) ▲ Horizontal surface (N,W) | | Prevailing wind; N |
| LAS SABANAS | | 17km to SW | | N35W | 1550m | Mountainous | 70m to 190m ▲ | Tuff, Andesite | Forests, Wild land | Approach surface (N) ▲ Horizontal surface(N,S,E,W) | | No data available |
| CERRO QUEMADO | | 13km to S | 18km 30 minutes | N20E | 1300m | Mountainous | 100m to 200m ▲ | Andesite | Forests | Approach surface (S) ▲ Horizontal surface(E,W,S) | | Prevailing wind; N |
| VALLE DE ZAMORANO | | 26km to SE | 37km 45 minutes | N00 | 750m | Flat | 40m or less | | Farms, Technical Institute of Agriculture ▲ | Approach surface (S) ▲ Horizontal surface (E,W) | | No data available |
| CERRO DE HULE | A | 18km to S | 27km 40 minutes | N45E | 1540m | Tableland | 30m to 80m | Andesite | Cultivated fields, Wild land, Residential area, | Horizontal surface (W) | | Low Ceil./Visibility Strong north wind Wind coverage 90% |
| | B | | | N00 | 1500m | Tableland | 30m to 80m | | | Horizontal surface (E,W) | | Low Ceil./Visibility Strong north wind Wind coverage 99% |
| COMAYAGUA | | 58km to NE | 90km 90 minutes | N17W | 620m | Flat | 10m or less | Alluvial terrace | Wild land, Military airport | Horizontal surface (E) | | No data available |

▲ indicates the impracticability of the site in terms of the particular evaluation criterion.

# CHAPTER 4. AIR TRAFFIC FORECAST

# CHAPTER 4 AIR TRAFFIC FORECAST

Forecast is made of the passenger and cargo transport demand of the Republic of Honduras, as well as of the Toncontín Airport and the two alternative sites of PEDREGAL and TALANGA.

## 4.1 Methodology and Premises of Forecast

### 4.1.1 Outline of methodology

Air transport demand both of the entire Honduras and of the Tegucigalpa area is considered to have a close relationship with the level of economic activities of the country as stated in Chapter 2. As the country develops economically, the social, economic and cultural interchange with foreign countries become increasingly more active, causing increasing number of foreigners visiting the country and Hondurans going abroad, and hence resulting in increased international air passenger traffic. Similarly, as the level of individual income and of economic activities of the country rises, so does the time value of Hondurans, domestic inter-city passenger traffic, and the share of air transport within the domestic transport system by virtue of its great time saving effect in preference to road transport, which is the alternative means of transport available within the domestic transport system of Honduras. Along with the economic growth of the country, increase in imports of consumer goods resulting from improved consumption standards, and of capital goods necessary for the industrialization of the country, as well as in exports of manufactured Honduran products, altogether results in greater utilization of air transport for commodities that can bear higher freight charges. By the same token, share of air transport within the domestic cargo transport system is also expected to increase.

Gross domestic product of Honduras is regarded as the most suitable economic index of the levels of economic activities of the country, and for this reason, it is used as an independent variable in regression models of air traffic forecasting in this study.

Air traffic forecast of Tegucigalpa area is made in relation to the total national air transport demand of Honduras. As a first step, forecast is made of the normal traffic of the total Honduran air transport, which is the traffic to be expected when there are no capacity limits at all airports of the country. Then, using that as the control total, forecast is made of the normal traffic projected for the Toncontín airport.

Air traffic demand of PEDREGAL and TALANGA sites is considered to be affected significantly by the differences in access conditions from those of Toncontín airport, and is, therefore, forecast by means of a gravity model into which such differences are built in. Sequence of the forecasting procedures is shown in Fig. 4-1.

### 4.1.2 Premises of forecast

Premises of forecast are established as follows based on the results of analyses made in Chapter 2.

(1) Period of forecast

Forecast is made for a period of 25 years starting from 1980 through the ultimate design year of 2005 established for the purpose of this feasibility study.

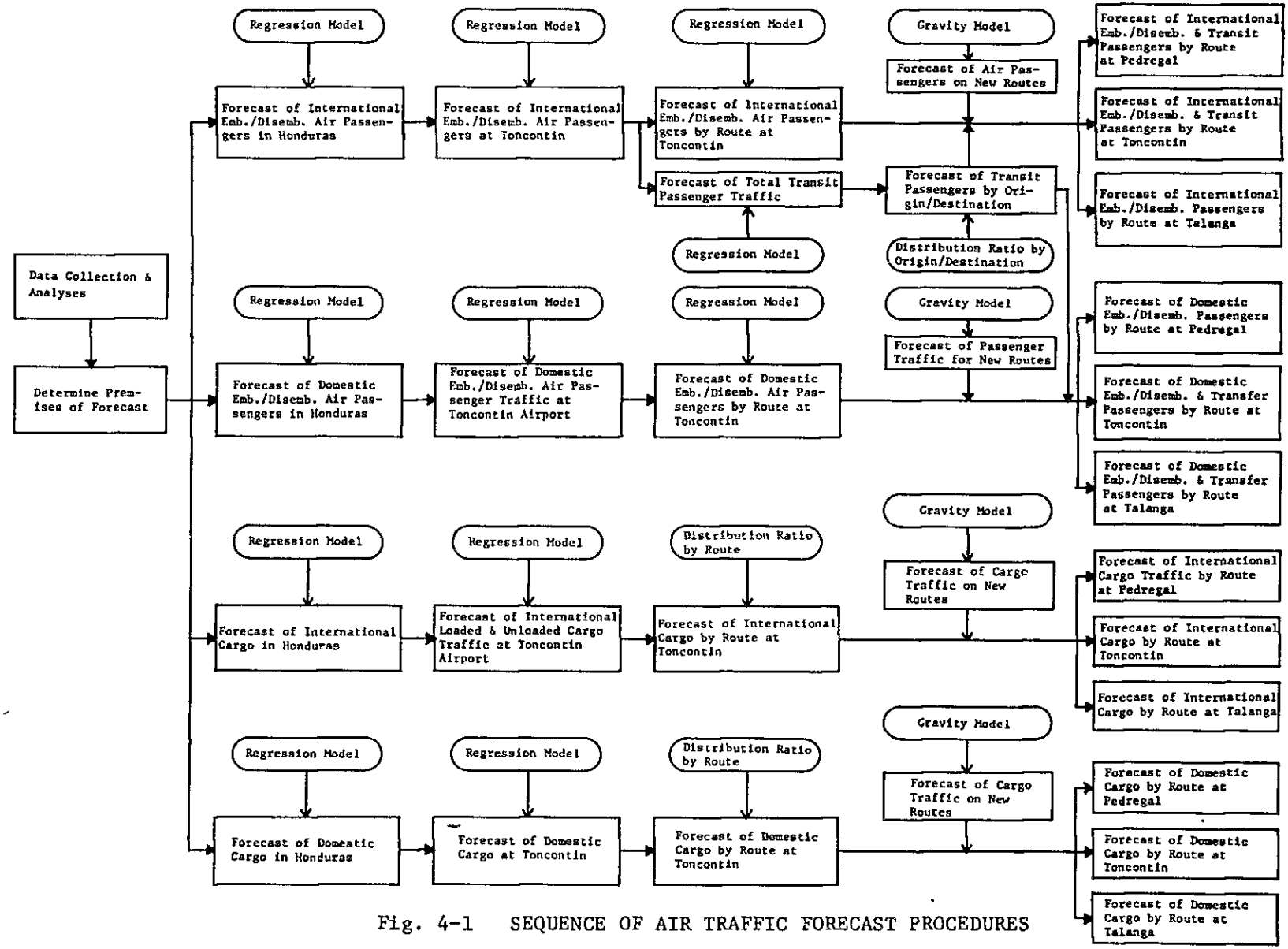



Fig. 4-1 SEQUENCE OF AIR TRAFFIC FORECAST PROCEDURES

(2) Air route network

a. International air routes

The existing international air route network serving Tegucigalpa is assumed to remain unchanged. In addition, two new air routes are assumed to be established, namely one between Tegucigalpa and Houston presently contemplated by TAN and SAHSA, and another between Tegucigalpa and San Salvador which is likely to be operated when the diplomatic relations between Honduras and El Salvador are normalized. The origins/destinations of international air routes to be considered in the forecast are as follows:

Existing routes

| | | |
|---|---|---|
| Tegucigalpa [TGU] | - Miami | [MIA] |
| " | - Mexico | [MEX] |
| " | - Panama | [PTY] |
| " | - San Andres | [ADZ] |
| " | - San José | [SJO] |
| " | - Managua | [MGA] |
| " | - Guatemala | [GUA] |
| " | - Belize | [BZE] |
| " | - New Orleans | [MSY] |

New routes

| | | |
|---|---|---|
| Tegucigalpa | - Houston | [IAH] |
| " | - San Salvador | [SAL] |

b. Domestic air routes

The existing domestic air routes serving Tegucigalpa are assumed to remain unchanged. Due to the insufficiency of data made available,

however, the origins/destinations of the domestic routes to be considered in the forecast are limited to the following:

| | | |
|---|---|---|
| Tegucigalpa [TGU] | - San Pedro Sula | [SAP] |
| " | - La Ceiba | [LCE] |
| " | - Loatán (Including Utila and Guanaja) | [ROA] |
| " | - Trujillo (Including Tocoa) | [TJI] |
| " | - Olanchito (Including Coyoles) | [OAN] |
| " | - Puerto Lempira (Including Ahuas and Brus Laguna) | [PLP] |

(3) Population

Population of Honduras is estimated by the Bureau of Statistics and Census of Honduras to be 4,373 thousand in 1985 with an average annual growth rate of 3.5% during the 9-year period between 1976 and 1985, and this growth rate is used in the present study for that period. A slightly lower annual growth rate of 3.0% is assumed for the ensuing 9-year period of 1986 - 1995, and a lower still rate of 2.5% for the last 9-year period of 1996 - 2005, these lower rates being assumed on the perspective of a relatively slower growth tendency in the future. The estimates of the population of the country obtained on the above premises are shown in Table 4-1.

As to the population of Tegucigalpa, the estimate made in the Metropolitan Development Plan is adopted in this study for the 20-year period of 1980 - 2000, and for the remaining 5 years of the forecast period, estimate is made by extrapolation using the average annual growth rate derived from the annual estimates given in the said Plan (Table 4-1).

(4) Gross domestic product

The National Development Plan of Honduras (1974 - 1978) envisages a 6.0% annual growth rate of GDP in real terms. The actual growth rate of GDP during the 1974 - 1977 period, however, averaged 5% per year. The World Bank estimate shows the rate of 5.0% for the 4-year period of 1978 - 1982, while the Inter-American Development Bank gives a figure of 4.92% for the 13-year period of 1977 - 1990. Taking all these into account, the annual growth rate in real terms of GDP is assumed to be 5.0% for the 13-year period of 1977 - 1990, and 4.0% for the rest of the forecast period in expectation of a duller growth tendency. The estimates of GDP based on these assumptions are shown in Table 4-1.

(5) Gross domestic product per capita

The estimates of per capita GDP based on the results of Sub-sections (3) and (4) above are shown in Table 4-1.

Table 4-1 PREMISES OF FORECASTING

| Year | Population | | Gross Domestic Product (Millions of Constant 1966 Lempiras) | Per Capita GDP (Constant 1966 Lempiras) |
|---|---|---|---|---|
| | Honduras ('000) | Tegucigalpa ('000) | | |
| 1980 | 3,691 *1 | 400 | 1,978 | 536 |
| 1985 | 4,373 *1 | 500 | 2,524 | 577 |
| 1990 | 5,070 | 650 | 3,221 | 635 |
| 1995 | 5,877 | 800 | 3,919 | 667 |
| 2000 | 6,649 | 1,100 | 4,768 | 717 |
| 2005 | 7,523 | 1,400 *2 | 5,801 | 771 |

Note: *1 Estimated by Dirección General Estadistica y Censos.

*2 Based on average annual growth rate of 5.2% from the year 2000.

## 4.2 International Air Passenger Traffic Forecast

### 4.2.1 International embarking and disembarking passengers of Honduras

As a result of regression analyses of international passengers in Honduras and of the GDP or the per capita GDP, the regression model as per Formula 1 (Appendix 4A) is found to have a higher reliability than any other alternatives used in the analysis, with the correlation coefficient of 0.989 and the Durbin-Watson ratio of 2.272 (n = 18). Based on the assumption that the model structure remains unchanged throughout the period of forecast, the international embarking and disembarking passenger traffic of Honduras is forecast by the said regression model, with the results as shown in Fig. 4-2. It should be noted, however, that the forecast is made only of the normal traffic and does not include the generated traffic to be expected on new routes.

### 4.2.2 International embarking and disembarking passengers at Toncontín airport

Through similar process as employed in the case of national total demand as explained above, the regression model as per Formula 2 (Appendix 4A) is found to have the highest reliability, and is likewise used for forecasting the international embarking and disembarking passenger traffic at Toncontín airport. The results shown in Fig. 4-2, however, are again of the normal traffic alone.

### 4.2.3 International embarking, disembarking and transit passenger traffic by route and by site

Forecast is made of the international embarking, disembarking and transit passenger traffic by route for each airport site by the following procedures, with the results

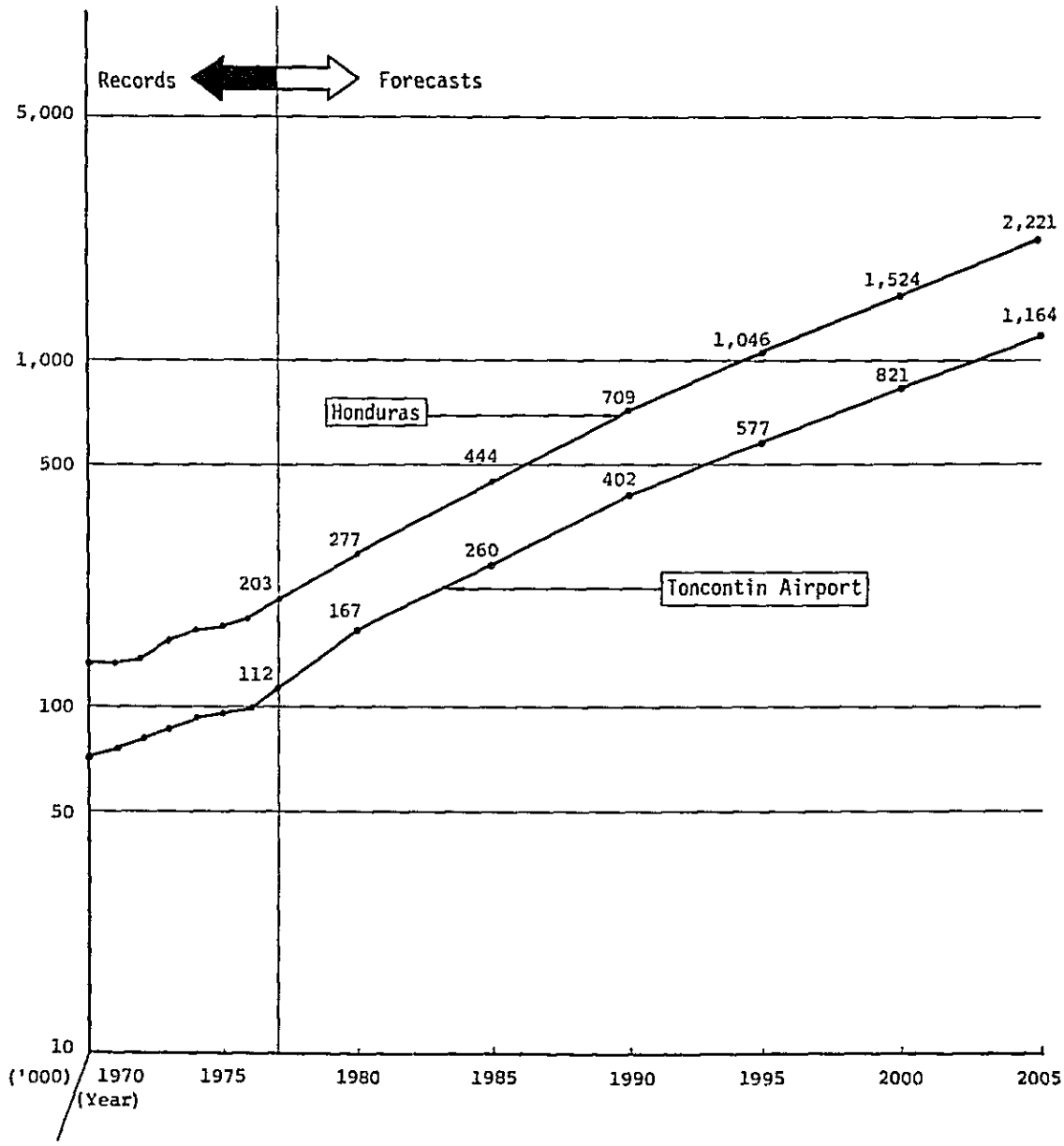



Fig. 4-2 FORECASTS OF INTERNATIONAL EMBARKING & DISEMBARKING AIR PASSENGERS OF NORMAL TRAFFIC

as shown in Tables 4-2, 4-3 and 4-4 for Toncontín airport, PEDREGAL site and TALANGA site respectively.

(1) Embarking and disembarking passenger traffic by existing route

Assuming that the passenger traffic on the existing routes are not affected by the differences in access conditions between one another of the airport sites, the demand by route of the normal traffic is calculated by distributing the results obtained in Sub-section 4.2.2 above to each route with the regression models as per Formulae 3 through 11 (Appendix 4A), and the results by route thus obtained are adjusted so that the sum of the distributed traffic of all routes may be equal to the original figure.

(2) Embarking and disembarking passenger traffic by new route

The passenger traffic generated by the establishment of the two new routes of Tegucigalpa-Houston and Tegucigalpa-San Salvador is forecast by the gravity model as per Formula 12 (Appendix 4A) into which are incorporated the difference of access conditions of each site.

(3) Transit passenger traffic

Transit passenger traffic is assumed to be identical at all sites. The total transit passengers calculated by the regression model as per Formula 13 (Appendix 4A) are distributed to each route according to the shares by origin/destination of the 1977 records (Appendix Table 2A-26).

Table 4-2 FORECASTS OF INTERNATIONAL EMBARKING, DISEMBARKING AND TRANSIT PASSENGER TRAFFIC BY ROUTE AT TONCONTIN AIRPORT

(In thousand persons)

| Route | | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| TGU-MIA | Emb. & Disemb. | 34 | 58 | 94 | 139 | 201 | 289 |
| | Transit | 14 | 22 | 35 | 52 | 74 | 106 |
| | Total | 48 | 80 | 129 | 191 | 275 | 395 |
| TGU-MEX | Emb. & Disemb. | 14 | 21 | 31 | 43 | 59 | 83 |
| | Transit | 1 | 2 | 2 | 4 | 5 | 8 |
| | Total | 15 | 23 | 33 | 47 | 64 | 91 |
| TGU-PTY | Emb. & Disemb. | 22 | 41 | 69 | 104 | 153 | 222 |
| | Transit | 1 | 1 | 2 | 4 | 5 | 8 |
| | Total | 23 | 42 | 71 | 108 | 158 | 230 |
| TGU-ADZ | Emb. & Disemb. | 9 | 14 | 24 | 35 | 51 | 74 |
| | Transit | 3 | 6 | 9 | 14 | 19 | 28 |
| | Total | 12 | 20 | 33 | 49 | 70 | 102 |
| TGU-SJO | Emb. & Disemb. | 19 | 25 | 35 | 48 | 65 | 89 |
| | Transit | 18 | 29 | 47 | 67 | 98 | 139 |
| | Total | 37 | 54 | 82 | 115 | 163 | 228 |
| TGU-MGA | Emb. & Disemb. | 13 | 17 | 22 | 28 | 38 | 50 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 24 | 35 | 50 | 70 | 97 | 135 |
| TGU-GUA | Emb. & Disemb. | 30 | 38 | 49 | 63 | 83 | 110 |
| | Transit | 5 | 8 | 13 | 19 | 27 | 40 |
| | Total | 35 | 46 | 62 | 82 | 110 | 150 |
| TGU-BZE | Emb. & Disemb. | 2 | 2 | 3 | 4 | 5 | 7 |
| | Transit | 2 | 2 | 4 | 6 | 8 | 12 |
| | Total | 4 | 4 | 7 | 10 | 13 | 19 |
| TGU-MSY | Emb. & Disemb. | 24 | 44 | 75 | 113 | 166 | 240 |
| | Transit | 14 | 22 | 35 | 52 | 74 | 106 |
| | Total | 38 | 66 | 110 | 165 | 240 | 346 |
| TGU-IAH | Emb. & Disemb. | 27 | 36 | 47 | 63 | 84 | 113 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 38 | 54 | 75 | 105 | 143 | 198 |
| TGU-SAL | Emb. & Disemb. | 19 | 29 | 42 | 61 | 89 | 131 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 30 | 47 | 70 | 103 | 148 | 216 |
| TOTAL | Emb. & Disemb. | 213 | 325 | 491 | 701 | 994 | 1,408 |
| | Transit | 91 | 146 | 231 | 344 | 487 | 702 |
| | Total | 304 | 471 | 722 | 1,045 | 1,481 | 2,110 |

Table 4-3 FORECASTS OF INTERNATIONAL EMBARKING, DISEMBARKING AND TRANSIT PASSENGER TRAFFIC BY ROUTE AT PEDREGAL SITE

(In thousand persons)

| Route | | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| TGU-MIA | Emb. & Disemb. | 34 | 58 | 94 | 139 | 201 | 289 |
| | Transit | 14 | 22 | 35 | 52 | 74 | 106 |
| | Total | 48 | 80 | 129 | 191 | 275 | 395 |
| TGU-MEX | Emb. & Disemb. | 14 | 21 | 31 | 43 | 59 | 83 |
| | Transit | 1 | 2 | 2 | 4 | 5 | 8 |
| | Total | 15 | 23 | 33 | 47 | 64 | 91 |
| TGU-PTY | Emb. & Disemb. | 22 | 41 | 69 | 104 | 153 | 222 |
| | Transit | 1 | 1 | 2 | 4 | 5 | 8 |
| | Total | 23 | 42 | 71 | 108 | 158 | 230 |
| TGU-ADZ | Emb. & Disemb. | 9 | 14 | 24 | 35 | 51 | 74 |
| | Transit | 3 | 6 | 9 | 14 | 19 | 28 |
| | Total | 12 | 20 | 33 | 49 | 70 | 102 |
| TGU-SJO | Emb. & Disemb. | 19 | 25 | 35 | 48 | 65 | 89 |
| | Transit | 18 | 29 | 47 | 67 | 98 | 139 |
| | Total | 37 | 54 | 82 | 115 | 163 | 228 |
| TGU-MGA | Emb. & Disemb. | 13 | 17 | 22 | 28 | 38 | 50 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 24 | 35 | 50 | 70 | 97 | 135 |
| TGU-GUA | Emb. & Disemb. | 30 | 38 | 49 | 63 | 83 | 110 |
| | Transit | 5 | 8 | 13 | 19 | 27 | 40 |
| | Total | 35 | 46 | 62 | 82 | 110 | 150 |
| TGU-BZE | Emb. & Disemb. | 2 | 2 | 3 | 4 | 5 | 7 |
| | Transit | 2 | 2 | 4 | 6 | 8 | 12 |
| | Total | 4 | 4 | 7 | 10 | 13 | 19 |
| TGU-MSY | Emb. & Disemb. | 24 | 44 | 75 | 113 | 166 | 240 |
| | Transit | 14 | 22 | 35 | 52 | 74 | 106 |
| | Total | 38 | 66 | 110 | 165 | 240 | 346 |
| TGU-IAH | Emb. & Disemb. | 31 | 41 | 54 | 72 | 96 | 128 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 42 | 59 | 82 | 114 | 155 | 213 |
| TGU-SAL | Emb. & Disemb. | 16 | 24 | 35 | 51 | 75 | 110 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 27 | 42 | 63 | 93 | 134 | 195 |
| TOTAL | Emb. & Disemb. | 214 | 325 | 491 | 700 | 992 | 1,402 |
| | Transit | 91 | 146 | 231 | 344 | 487 | 702 |
| | Total | 305 | 471 | 722 | 1,044 | 1,479 | 2,104 |

Table 4-4 FORECASTS OF INTERNATIONAL EMBARKING, DISEMBARKING AND TRANSIT PASSENGER TRAFFIC BY ROUTE AT TALANGA SITE

(In thousand persons)

| Route | | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| TGU-MIA | Emb. & Disemb. | 34 | 58 | 94 | 139 | 201 | 289 |
| | Transit | 14 | 22 | 35 | 52 | 74 | 106 |
| | Total | 48 | 80 | 129 | 191 | 275 | 395 |
| TGU-MEX | Emb. & Disemb. | 14 | 21 | 31 | 43 | 59 | 83 |
| | Transit | 1 | 2 | 2 | 4 | 5 | 8 |
| | Total | 15 | 23 | 33 | 47 | 64 | 91 |
| TGU-PTY | Emb. & Disemb. | 22 | 41 | 69 | 104 | 153 | 222 |
| | Transit | 1 | 1 | 2 | 4 | 5 | 8 |
| | Total | 23 | 42 | 71 | 108 | 158 | 230 |
| TGU-ADZ | Emb. & Disemb. | 9 | 14 | 24 | 35 | 51 | 74 |
| | Transit | 3 | 6 | 9 | 14 | 19 | 28 |
| | Total | 12 | 20 | 33 | 49 | 70 | 102 |
| TGU-SJO | Emb. & Disemb. | 19 | 25 | 35 | 48 | 65 | 89 |
| | Transit | 18 | 29 | 47 | 67 | 98 | 139 |
| | Total | 37 | 54 | 82 | 115 | 163 | 228 |
| TGU-MGA | Emb. & Disemb. | 13 | 17 | 22 | 28 | 38 | 50 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 24 | 35 | 50 | 70 | 97 | 135 |
| TGU-GUA | Emb. & Disemb. | 30 | 38 | 49 | 63 | 83 | 110 |
| | Transit | 5 | 8 | 13 | 19 | 27 | 40 |
| | Total | 35 | 46 | 62 | 82 | 110 | 150 |
| TGU-BZE | Emb. & Disemb. | 2 | 2 | 3 | 4 | 5 | 7 |
| | Transit | 2 | 2 | 4 | 6 | 8 | 12 |
| | Total | 4 | 4 | 7 | 10 | 13 | 19 |
| TGU-MSY | Emb. & Disemb. | 24 | 44 | 75 | 113 | 166 | 240 |
| | Transit | 14 | 22 | 35 | 52 | 74 | 106 |
| | Total | 38 | 66 | 110 | 165 | 240 | 346 |
| TGU-IAH | Emb. & Disemb. | 27 | 35 | 47 | 63 | 84 | 112 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 38 | 53 | 75 | 105 | 143 | 197 |
| TGU-SAL | Emb. & Disemb. | 12 | 17 | 25 | 37 | 55 | 80 |
| | Transit | 11 | 18 | 28 | 42 | 59 | 85 |
| | Total | 23 | 35 | 53 | 79 | 114 | 165 |
| TOTAL | Emb. | 206 | 312 | 474 | 677 | 960 | 1,356 |
| | Transit | 91 | 146 | 231 | 344 | 487 | 702 |
| | Total | 297 | 458 | 705 | 1,021 | 1,447 | 2,058 |

The transit passengers on new routes are estimated by using the shares of the comparable existing routes, namely that of New Orleans for Houston, and Managua for San Salvador.

The origin/destination table as per Appendix Table 2A-26, however, includes the traffic of passengers transferring at Tegucigalpa from international to domestic route or vice versa, for example Managua - Tegucigalpa - San Pedro Sula or La Ceiba - Tegucigalpa - San José, etc., such category of passengers being called in the present study as "transfer passengers" to be distinguished from transit passengers. Whatever the origin/destination outside of Honduras of such combination routes may be, the domestic portion of such routes are invariably limited to the two routes of Tegucigalpa-San Pedro Sula and Tegucigalpa-La Ceiba, and the traffic of "transfer passengers" on these domestic portions of air routes is counted as the domestic transfer passenger traffic in Subsection 4.4.3 hereunder.

## 4.3 Domestic Air Passenger Traffic Forecast

### 4.3.1 Domestic embarking and disembarking passenger traffic in Honduras

The regression model as per Formula 14 (Appendix 4A) found to be the most reliable through a similar process as employed in the cases of international passenger forecast, is used in forecasting the normal traffic of the domestic embarking and disembarking passengers at all airports of Honduras, with the results as shown in Fig. 4-3. In this model air-road travel time ratio is used as one of the independent variables because it is best thought to explain the declining tendency

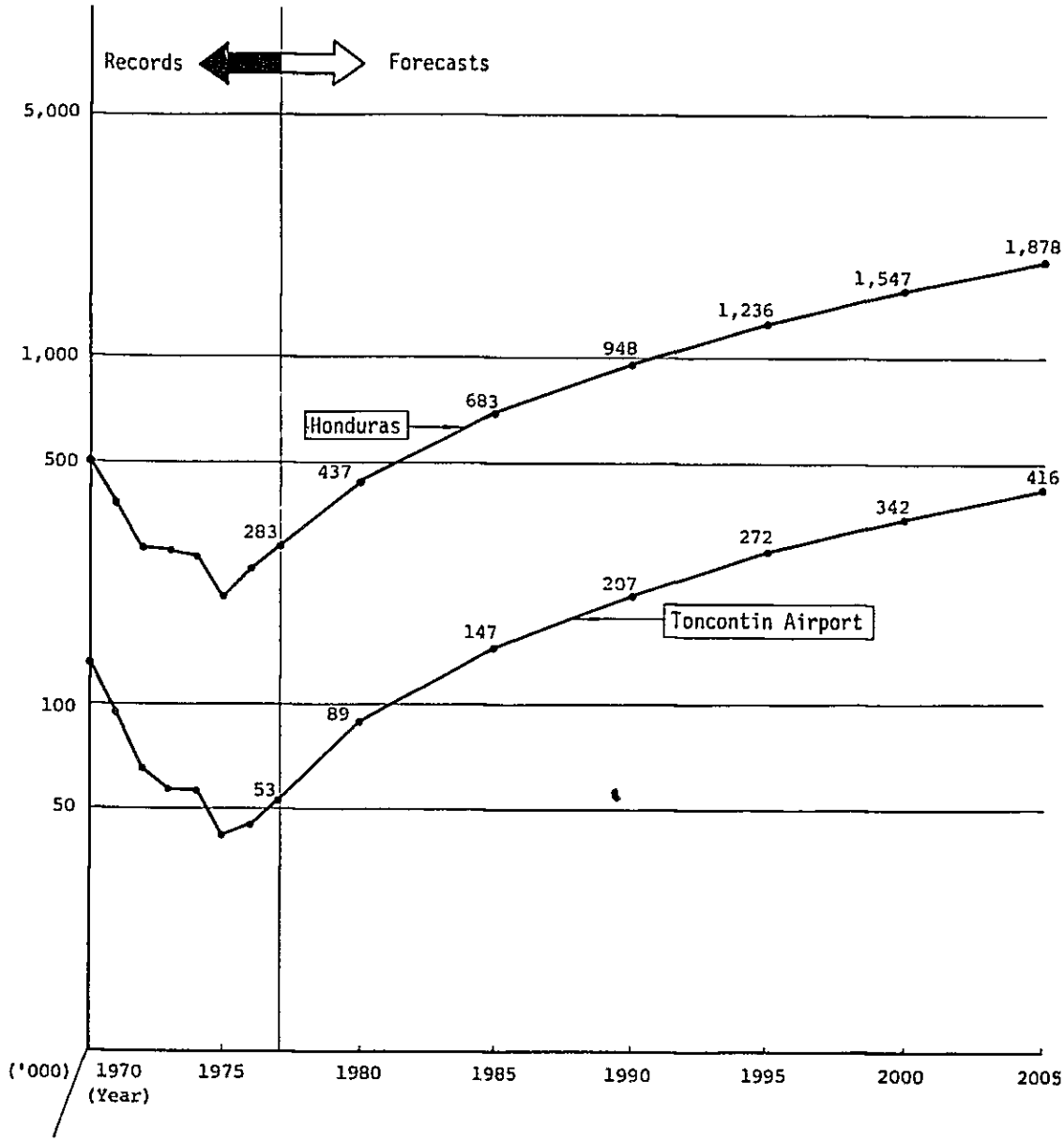



Fig. 4-3 FORECASTS OF DOMESTIC EMBARKING & DISEMBARKING AIR PASSENGERS OF NORMAL TRAFFIC

of the domestic air passenger traffic witnessed since 1970. The ratio used is that of the route between Tegucigalpa and San Pedro Sula.

### 4.3.2 Domestic embarking and disembarking passenger traffic at Toncontín airport

Using the regression model of the highest reliability as per Formula 15 (Appendix 4A), forecast of the normal traffic of the domestic embarking and disembarking passengers at Toncontín airport is calculated as shown in Fig. 4-3.

### 4.3.3 Domestic embarking, disembarking and transit passenger traffic by route and by site

Forecast is made of the domestic embarking, disembarking and transit passenger traffic by route for the existing Toncontín airport, PEDREGAL site, and TALANGA site, in the following procedures, with the results as shown in Tables 4-6, 4-7 and 4-8 respectively.

(1) Embarking and disembarking passenger traffic by route

The domestic passenger traffic either at PEDREGAL site or at TALANGA site is expected to be relatively small as compared with that of the existing Toncotín airport because of the difference in access conditions.

By distributing the results obtained in Subsection 4.3.2 hereinabove to each route with the respective regression model as per Formulae 16 through 21 (Appendix 4A), the passenger traffic by route at Toncontín airport is calculated, and then reduced to the demand levels projected for PEDREGAL site and TALANGA site by using the reduction co-

efficients obtained by the gravity model as per Formula 22 (Appendix 4A) as shown in Table 4-5.

In addition to the above, forecast is made of the passenger traffic between Tegucigalpa and Copán by using the above gravity model (Formula 22), strictly for reference purposes only, based on an assumption that a modern airport is developed at Copán which is one of the most promising resources of tourism of Honduras.

(2) "Transfer Passenger" traffic by route

As mentioned in Paragraph 4.2.3 - (3) above, the "transfer passenger" traffic to and from international routes expected on the two routes of between Tegucigalpa and San Pedro Sula and between Tegucigalpa and La Ceiba is included in the traffic of domestic passengers as shown in Table 4-6.

Table 4-5 RATES OF REDUCTION OF DOMESTIC PASSENGER TRAFFIC DEMAND BY ROUTE AT PEDREGAL AND TALANGA SITES AS COMPARED WITH DEMAND AT TONCONTIN AIRPORT

| Route | Toncontin Airport | Pedregal Site | Talanga Site |
|---|---|---|---|
| TGU - SAP | 1.000 | 0.927 | 0.817 |
| - LCE | 1.000 | 0.935 | 0.834 |
| - ROA | 1.000 | 0.970 | 0.918 |
| - TJI | 1.000 | 0.965 | 0.904 |
| - OAL | 1.000 | 0.935 | 0.835 |
| - PLP | 1.000 | 0.962 | 0.898 |

Table 4-6 FORECASTS OF DOMESTIC EMBARKING, DISEMBARKING AND TRANSFER PASSENGER TRAFFIC BY ROUTE AT TONCONTIN AIRPORT

(In thousand persons)

| Route | | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| TGU-SAP | Emb. & Disemb. | 34 | 49 | 64 | 80 | 97 | 115 |
| | Transfer | 18 | 29 | 47 | 68 | 98 | 140 |
| | Total | 52 | 78 | 111 | 148 | 195 | 255 |
| TGU-LCE | Emb. & Disemb. | 29 | 53 | 76 | 101 | 131 | 160 |
| | Transfer | 1 | 2 | 4 | 5 | 7 | 11 |
| | Total | 30 | 55 | 80 | 106 | 138 | 171 |
| TGU-ROA | Emb. & Disemb. | 7 | 13 | 19 | 26 | 33 | 41 |
| TGU-TJI | Emb. & Disemb. | 5 | 7 | 11 | 14 | 17 | 21 |
| TGU-OAN | Emb. & Disemb. | 9 | 18 | 27 | 37 | 48 | 59 |
| TGU-PLP | Emb. & Disemb. | 5 | 7 | 10 | 14 | 16 | 20 |
| TOTAL | Emb. & Disemb. | 89 | 147 | 207 | 272 | 342 | 416 |
| | Transfer | 19 | 31 | 51 | 73 | 105 | 151 |
| | Total | 108 | 178 | 258 | 345 | 447 | 567 |
| TGU-COPAN *1 | | 1.7 | 2.1 | 2.7 | 3.4 | 4.4 | 5.6 |

*1 Forecast for reference purpose only

Table 4-7 FORECASTS OF DOMESTIC EMBARKING, DISEMBARKING AND TRANSFER PASSENGER TRAFFIC BY ROUTE AT PEDREGAL SITE

(In thousand persons)

| Route | | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| TGU-SAP | Emb. & Disemb. | 32 | 45 | 59 | 74 | 90 | 107 |
| | Transfer | 18 | 29 | 47 | 68 | 98 | 140 |
| | Total | 50 | 74 | 106 | 142 | 188 | 247 |
| TGU-LCE | Emb. & Disemb. | 27 | 50 | 71 | 94 | 122 | 150 |
| | Transfer | 1 | 2 | 4 | 5 | 7 | 11 |
| | Total | 28 | 52 | 75 | 99 | 129 | 161 |
| TGU-ROA | Emb. & Disemb. | 7 | 13 | 18 | 25 | 32 | 40 |
| TGU-TJI | Emb. & Disemb. | 5 | 7 | 11 | 14 | 16 | 20 |
| TGU-OAN | Emb. & Disemb. | 8 | 17 | 25 | 35 | 45 | 55 |
| TGU-PLP | Emb. & Disemb. | 5 | 7 | 10 | 13 | 15 | 19 |
| TOTAL | Emb. & Disemb. | 84 | 139 | 194 | 255 | 320 | 391 |
| | Transfer | 19 | 31 | 51 | 73 | 105 | 151 |
| | Total | 103 | 170 | 245 | 328 | 425 | 542 |
| TGU-COPAN *1 | | 1.5 | 2.0 | 2.5 | 3.2 | 4.1 | 5.2 |

*1 Forecast for reference purpose only

Table 4-8 FORECASTS OF DOMESTIC EMBARKING, DISEMBARKING AND TRANSFER PASSENGER TRAFFIC BY ROUTE AT TALANGA SITE

(In thousand persons)

| Route | | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| TGU-SAP | Emb. & Disemb. | 28 | 40 | 52 | 65 | 79 | 94 |
| | Transfer | 18 | 29 | 47 | 68 | 98 | 140 |
| | Total | 46 | 69 | 99 | 133 | 177 | 234 |
| TGU-LCE | Emb. & Disemb. | 24 | 44 | 63 | 84 | 109 | 133 |
| | Transfer | 1 | 2 | 4 | 5 | 7 | 11 |
| | Total | 25 | 46 | 67 | 89 | 116 | 144 |
| TGU-ROA | Emb. & Disemb. | 6 | 12 | 17 | 24 | 30 | 38 |
| TGU-TJI | Emb. & Disemb. | 5 | 6 | 10 | 13 | 15 | 19 |
| TGU-OAN | Emb. & Disemb. | 8 | 15 | 23 | 31 | 40 | 49 |
| TGU-PLP | Emb. & Disemb. | 5 | 6 | 9 | 13 | 14 | 18 |
| TOTAL | Emb. & Disemb. | 76 | 123 | 174 | 230 | 287 | 351 |
| | Transfer | 19 | 31 | 51 | 73 | 105 | 151 |
| | Total | 95 | 154 | 225 | 303 | 392 | 502 |
| TGU-COPAN *1 | | 1.4 | 1.8 | 2.3 | 2.9 | 3.7 | 4.8 |

*1 Forecast for reference purpose only

## 4.4 International Air Cargo Traffic Forecast

In all forecasting procedures of cargo traffic in this Section, regression analysis is made between the gross domestic product of Honduras and the transport demand of the cargo of different categories. As a result of the regression analysis, an optimum regression model showing the high enough correlation coefficient and Durbin-Watson ratio is selected for use in the respective forecast.

### 4.4.1 International loaded and unloaded cargo traffic of Honduras

Forecast of the normal traffic of the international loaded and unloaded cargo of Honduras is obtained by the regression model as per Formula 23 (Appendix 4A), and the result is shown in Fig. 4-4.

### 4.4.2 International loaded and unloaded cargo traffic at Toncontín airport

The normal traffic of the international loaded and unloaded cargo at Toncontín airport is forecast by the regression model as per Formula 24 (Appendix 4A) with the result shown in Fig. 4-4.

### 4.4.3 International loaded and unloaded cargo traffic by route and by site

Forecast is made of the international loaded and unloaded cargo traffic by route for each site by the following procedures, with the results as shown in Tables 4-10, 4-11 and 4-12 for Toncontín airport, PEDREGAL site and TALANGA site respectively.

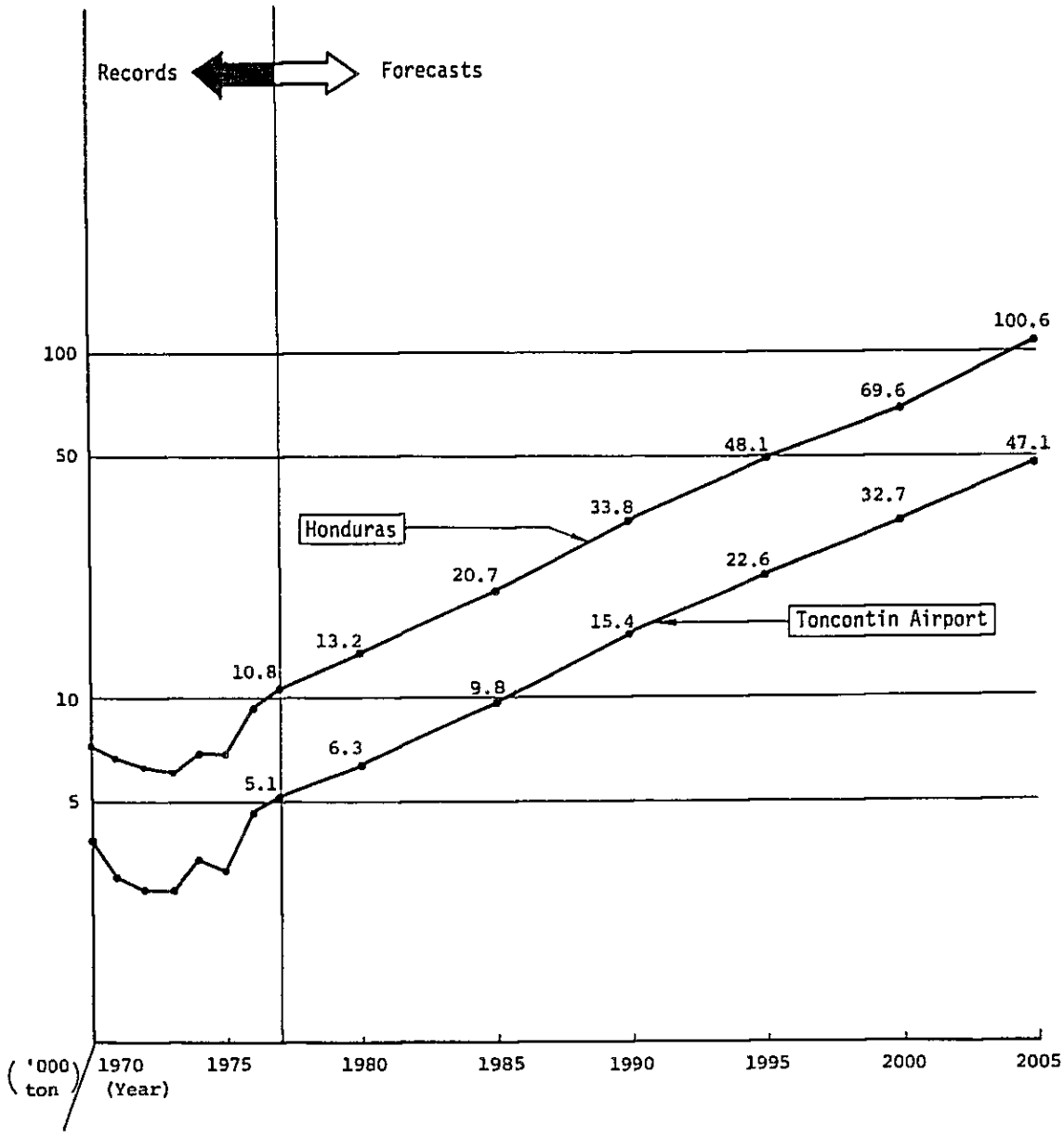



Fig. 4-4 FORECASTS OF INTERNATIONAL LOADED & UNLOADED AIR CARGO OF NORMAL TRAFFIC

(1) Cargo traffic on existing routes

Based on an assumption that the share of cargo traffic by route remains unchanged throughout the forecast period, and further that the demand by site is not affected by the differences in access conditions, the forecast of the international cargo traffic by route is calculated by distributing the results obtained in Subsection 4.4.2 to each route according to the shares by route obtained by averaging the records of the past 3 years between 1974 and 1976 (Table 4-9).

(2) Cargo traffic on new routes

Forecast is made of the cargo traffic on the new routes between Tegucigalpa and Houston, and between Tegucigalpa and San Salvador by the gravity model as per Formula 25 (Appendix 4A) into which are incorporated the access conditions of the sites.

Table 4-9 DISTRIBUTION RATIO BY ROUTE OF INTERNATIONAL LOADED & UNLOADED CARGO AT TONCONTIN AIRPORT

( % )

| Route | Ratio |
|---|---|
| TGU - MIA | 48.6 |
| - MEX | 6.4 |
| - PTY | 17.3 |
| - ADZ | 0.6 |
| - SJO | 4.5 |
| - MGA | 1.4 |
| - GUA | 14.1 |
| - BZE | 0.4 |
| - MSY | 6.7 |
| Total | 100.0 |

Table 4-10 FORECASTS OF INTERNATIONAL LOADED & UNLOADED CARGO TRAFFIC BY ROUTE AT TONCONTIN AIRPORT

(In tons)

| Route | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| TGU-MIA | 3,060 | 4,760 | 7,480 | 10,980 | 15,890 | 22,890 |
| -MEX | 400 | 630 | 990 | 1,450 | 2,090 | 3,010 |
| -PTY | 1,090 | 1,690 | 2,670 | 3,910 | 5,660 | 8,150 |
| -ADZ | 40 | 60 | 90 | 130 | 200 | 280 |
| -SJO | 280 | 440 | 690 | 1,020 | 1,470 | 2,120 |
| -MGA | 90 | 140 | 220 | 320 | 460 | 660 |
| -GUA | 890 | 1,380 | 2,170 | 3,190 | 4,610 | 6,640 |
| -BZE | 30 | 40 | 60 | 90 | 130 | 190 |
| -MSY | 420 | 660 | 1,030 | 1,510 | 2,190 | 3,160 |
| -IAH | 1,600 | 2,400 | 3,600 | 5,500 | 8,100 | 12,200 |
| -SAL | 200 | 250 | 400 | 600 | 900 | 1,200 |
| Total | 8,100 | 12,450 | 19,400 | 28,700 | 41,700 | 60,500 |

Table 4-11 FORECASTS OF INTERNATIONAL LOADED & UNLOADED CARGO TRAFFIC BY ROUTE AT PEDREGAL SITE

(In tons)

| Route | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| TGU-MIA | 3,060 | 4,760 | 7,480 | 10,980 | 15,890 | 22,890 |
| -MEX | 400 | 630 | 990 | 1,450 | 2,090 | 3,010 |
| -PTY | 1,090 | 1,690 | 2,670 | 3,910 | 5,660 | 8,150 |
| -ADZ | 40 | 60 | 90 | 130 | 200 | 280 |
| -SJO | 280 | 440 | 690 | 1,020 | 1,470 | 2,120 |
| -MGA | 90 | 140 | 220 | 320 | 460 | 660 |
| -GUA | 890 | 1,380 | 2,170 | 3,190 | 4,610 | 6,640 |
| -BZE | 30 | 40 | 60 | 90 | 130 | 190 |
| -MSY | 420 | 660 | 1,030 | 1,510 | 2,190 | 3,160 |
| -IAH | 1,900 | 2,800 | 4,200 | 6,400 | 9,500 | 14,200 |
| -SAL | 150 | 200 | 300 | 500 | 700 | 1,000 |
| Total | 8,350 | 12,800 | 19,900 | 29,500 | 42,900 | 62,300 |

Table 4-12 FORECASTS OF INTERNATIONAL LOADED & UNLOADED CARGO TRAFFIC BY ROUTE AT TALANGA SITE

(In tons)

| Route | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| TGU-MIA | 3,060 | 4,760 | 7,480 | 10,980 | 15,980 | 22,890 |
| -MEX | 400 | 630 | 990 | 1,450 | 2,090 | 3,010 |
| -PTY | 1,090 | 1,690 | 2,670 | 3,910 | 5,660 | 8,150 |
| -ADZ | 40 | 60 | 90 | 130 | 200 | 280 |
| -SJO | 280 | 440 | 690 | 1,020 | 1,470 | 2,120 |
| -MGA | 90 | 140 | 220 | 320 | 460 | 660 |
| -GUA | 890 | 1,380 | 2,170 | 3,190 | 4,610 | 6,640 |
| -BZE | 30 | 40 | 60 | 90 | 130 | 190 |
| -MSY | 420 | 660 | 1,030 | 1,510 | 2,190 | 3,160 |
| -IAH | 1,600 | 2,400 | 3,600 | 5,400 | 8,000 | 12,000 |
| -SAL | 100 | 150 | 250 | 350 | 500 | 700 |
| Total | 8,000 | 12,350 | 19,250 | 28,350 | 41,290 | 59,800 |

## 4.5 Domestic Air Cargo Traffic Forecast

### 4.5.1 Domestic loaded and unloaded cargo traffic of Honduras

Forecast is made of the normal traffic of the domestic loaded and unloaded cargo at all airports of Honduras by the regression model as per Formula 26 (Appendix 4A), and the result is shown in Fig. 4-5.

### 4.5.2 Domestic loaded and unloaded cargo traffic at Toncontín airport

Forecast is made of the normal traffic of the domestic loaded and unloaded cargo at Toncontín airport by the regression model as per Formula 27 (Appendix 4A), with the results as shown in Fig. 4-5.

### 4.5.3 Domestic loaded and unloaded cargo traffic by route and by site

The domestic cargo traffic at PEDREGAL and TALANGA sites is expected to be less than that of Toncontín airport because of the relatively unfavorable access conditions. By distributing the results of Subsection 4.5.2 to each route according to the 3-year average shares by route based on the 1974 - 1976 records (Table 4-13), the cargo traffic at Toncontín airport by route is calculated, and is thereafter reduced to the demand levels expected at PEDREGAL site and TALANGA site by applying the same reduction coefficients as shown in Table 4-5 in Subsection 4.3.3. The results of the demand forecast by route for Toncontín airport, PEDREGAL site and TALANGA site are shown in Tables 4-14, 4-15 and 4-16 respectively.

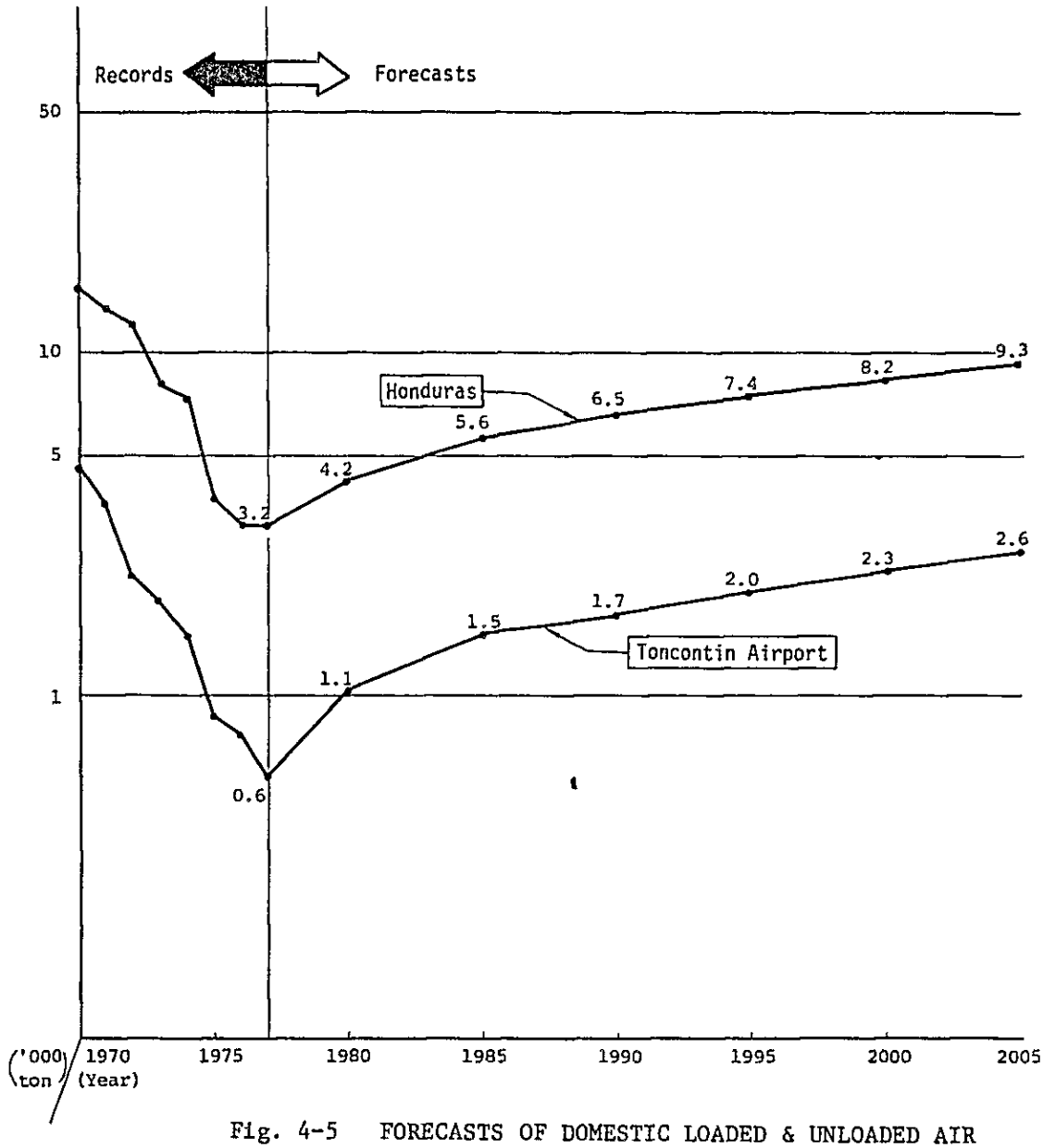



Fig. 4-5 FORECASTS OF DOMESTIC LOADED & UNLOADED AIR CARGO OF NORMAL TRAFFIC

Table 4-13 DISTRIBUTION RATIO BY ROUTE OF DOMESTIC LOADED & UNLOADED CARGO AT TONCONTIN AIRPORT

( % )

| Route | Ratio |
|---|---|
| TGU - SAP | 24.1 |
| - LCE | 24.8 |
| - ROA | 10.2 |
| - TJI | 8.1 |
| - OAN | 17.7 |
| - PLP | 15.1 |
| Total | 100.0 |

Table 4-14 FORECASTS OF DOMESTIC LOADED & UNLOADED CARGO TRAFFIC BY ROUTE AT TONCONTIN AIRPORT

(In tons)

| Route | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| TGU - SAP | 270 | 360 | 410 | 480 | 550 | 630 |
| - LCE | 270 | 370 | 420 | 510 | 570 | 650 |
| - ROA | 110 | 150 | 170 | 200 | 230 | 270 |
| - TJI | 90 | 120 | 140 | 160 | 190 | 210 |
| - OAN | 190 | 270 | 300 | 350 | 410 | 460 |
| - PLP | 170 | 230 | 260 | 300 | 350 | 390 |
| Total | 1,100 | 1,500 | 1,700 | 2,000 | 2,300 | 2,600 |

Table 4-15 FORECASTS OF DOMESTIC LOADED & UNLOADED CARGO TRAFFIC BY ROUTE AT PEDREGAL SITE

(In tons)

| Route | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| TGU - SAP | 250 | 330 | 380 | 440 | 510 | 580 |
| - LCE | 250 | 350 | 390 | 480 | 530 | 610 |
| - ROA | 110 | 150 | 160 | 190 | 220 | 260 |
| - TJI | 90 | 120 | 140 | 150 | 180 | 200 |
| - OAN | 180 | 250 | 280 | 330 | 380 | 430 |
| - PLP | 160 | 220 | 250 | 290 | 340 | 380 |
| Total | 1,040 | 1,420 | 1,600 | 1,880 | 2,160 | 2,460 |

Table 4-16 FORECASTS OF DOMESTIC LOADED & UNLOADED CARGO TRAFFIC BY ROUTE AT TALANGA SITE

(In tons)

| Route | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| TGU - SAP | 280 | 290 | 330 | 390 | 450 | 510 |
| - LCE | 230 | 310 | 350 | 430 | 480 | 540 |
| - ROA | 100 | 140 | 160 | 180 | 210 | 250 |
| - TJI | 80 | 110 | 130 | 140 | 170 | 190 |
| - OAN | 160 | 230 | 250 | 290 | 340 | 380 |
| - PLP | 150 | 210 | 230 | 270 | 310 | 350 |
| Total | 940 | 1,290 | 1,450 | 1,700 | 1,960 | 2,220 |

SUPPLEMENTS

## 1. Forecast of Number of Small Aircraft Registered at Toncontín Airport

The number of small aircraft registered at Toncontín airport is forecast by the regression model as per Formula 28 (Appendix 4A), and the result is shown in Table 4-17. The historical data is shown in Appendix Table 2A-31.

Table 4-17 FORECAST OF NUMBER OF SMALL AIRCRAFT REGISTERED AT TONCONTIN AIRPORT

| Year | Number |
|---|---|
| 1980 | 135 |
| 1985 | 195 |
| 1990 | 272 |
| 1995 | 249 |
| 2000 | 442 |
| 2005 | 556 |

## 2. Forecast of Number of Airport Employees at New Sites

Based on the records of the number of employees at Toncontín airport as of March 1978 as shown in Appendix Table 2A-32, the number of employees per "traffic unit" of 1,000 passengers or 100 tons of cargo is calculated to be 1.6 persons. Taking into account the expected improvement in labor productivity in the future, the number of employees per traffic unit is assumed to decrease to 1.0 person in 2005, and the results of forecast made on this basis are shown in Table 4-18.

Table 4-18 FORECAST OF NUMBER OF AIRPORT EMPLOYEES AT NEW SITES

| Year | Number of Employees Per One Traffic Unit* | Pedregal Site | | Talanga Site | |
|---|---|---|---|---|---|
| | | Total Traffic Units | Number of Employees | Total Traffic Units | Number of Employees |
| 1980 | 1.5 | 502 | 750 | 481 | 720 |
| 1985 | 1.4 | 783 | 1,100 | 748 | 1,050 |
| 1990 | 1.3 | 1,182 | 1,540 | 1,137 | 1,480 |
| 1995 | 1.2 | 1,686 | 2,020 | 1,625 | 1,950 |
| 2000 | 1.1 | 2,355 | 2,590 | 2,272 | 2,500 |
| 2005 | 1.0 | 3,294 | 3,290 | 3,180 | 3,180 |

* One traffic unit comprises 1,000 passengers or 100 tons of cargo

# CHAPTER 5. AIRPORT FACILITY REQUIREMENTS

# CHAPTER 5 AIRPORT FACILITY REQUIREMENTS

Based on the planning criteria established for the purpose of this study in conformity with the ICAO standards and/or the FAA regulations, the facility requirements at the two possible sites to meet the air traffic forecast for the year 2005 are analyzed in the sequence as shown in the flowchart given in Fig. 5-1. The outline of this analysis is presented in the following.

## 5.1 Airfield Facilities

### 5.1.1 Runway strip

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

### 5.1.2 Runway

Length of runway for the two alternative sites is determined based on the assumed operating conditions of aircraft with the maximum stage length of the projected air route network shown in Figs. 5-2(a) and (b).

The basic figures used in calculating the runway length are as follows:

a. Desired payload is to be equal to the full passenger load, i.e., two hundred pounds per seat multiplied by the total number of seats available.

b. Maximum stage length is assumed at 1,250 statute miles, which is that of between Tegucigalpa and Houston, Texas in U.S.A.

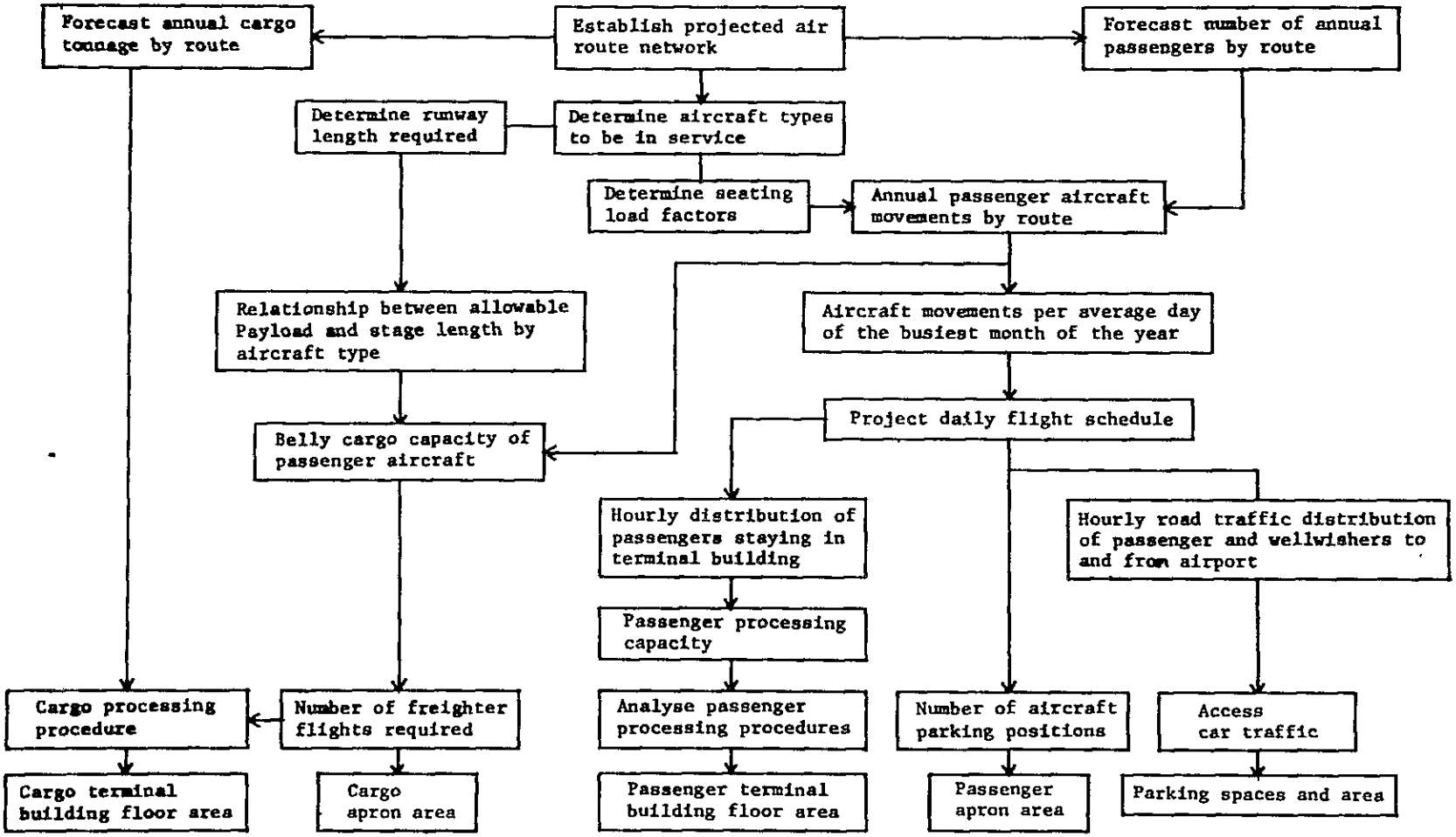
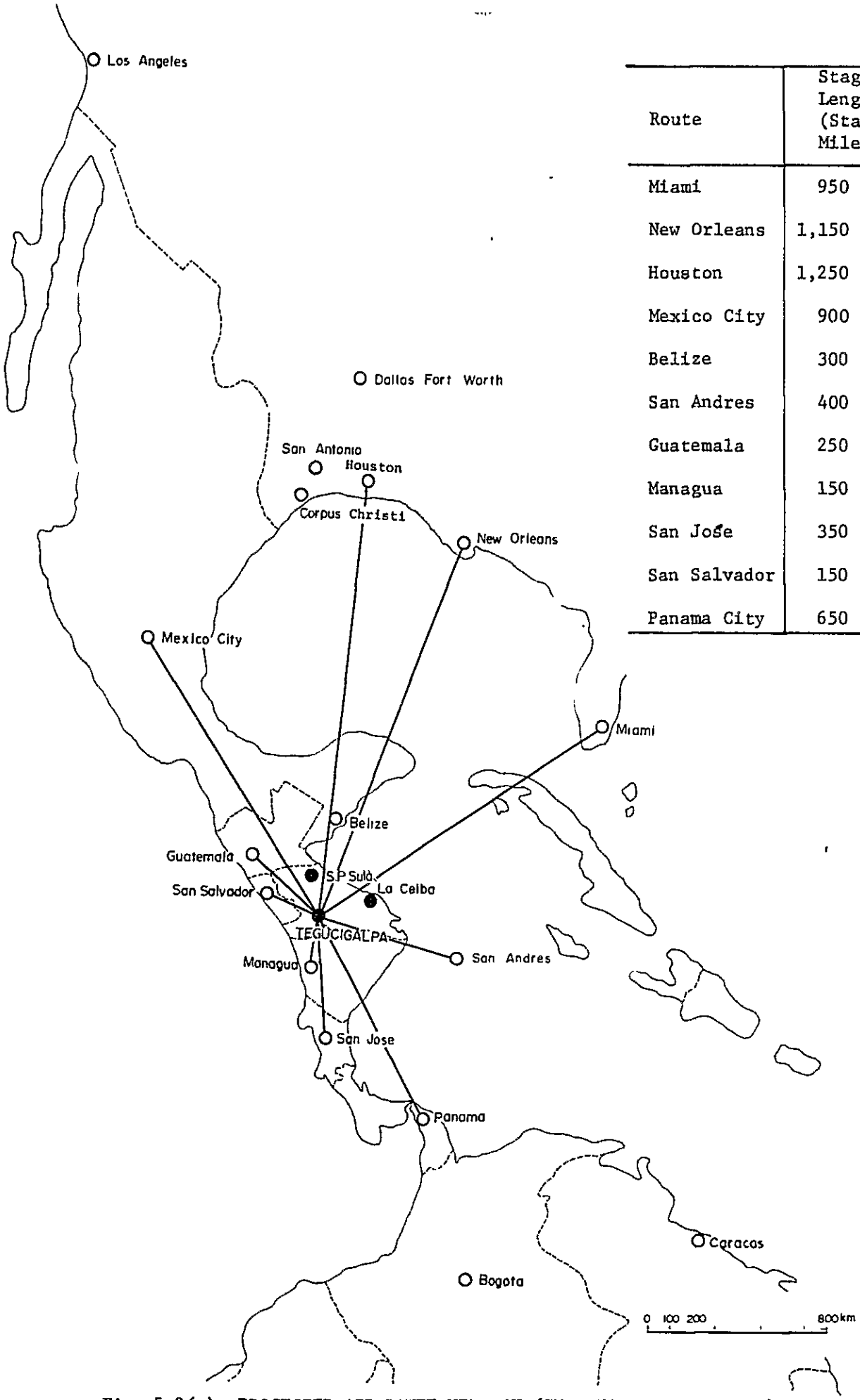



Fig.5-1 SEQUENCE OF FACILITY REQUIREMENTS ANALYSIS




| Route | Stage Length (Statute Miles) |
|---|---|
| Miami | 950 |
| New Orleans | 1,150 |
| Houston | 1,250 |
| Mexico City | 900 |
| Belize | 300 |
| San Andres | 400 |
| Guatemala | 250 |
| Managua | 150 |
| San Jose | 350 |
| San Salvador | 150 |
| Panama City | 650 |

Fig. 5-2(a) PROJECTED AIR ROUTE NETWORK (INTERNATIONAL SERVICE)

| Route | Stage Length (Statute Miles) |
|---|---|
| S.P. Sula | 150 |
| La Ceiba | 150 |
| Olanchito | 150 |
| P. Lempira | 250 |

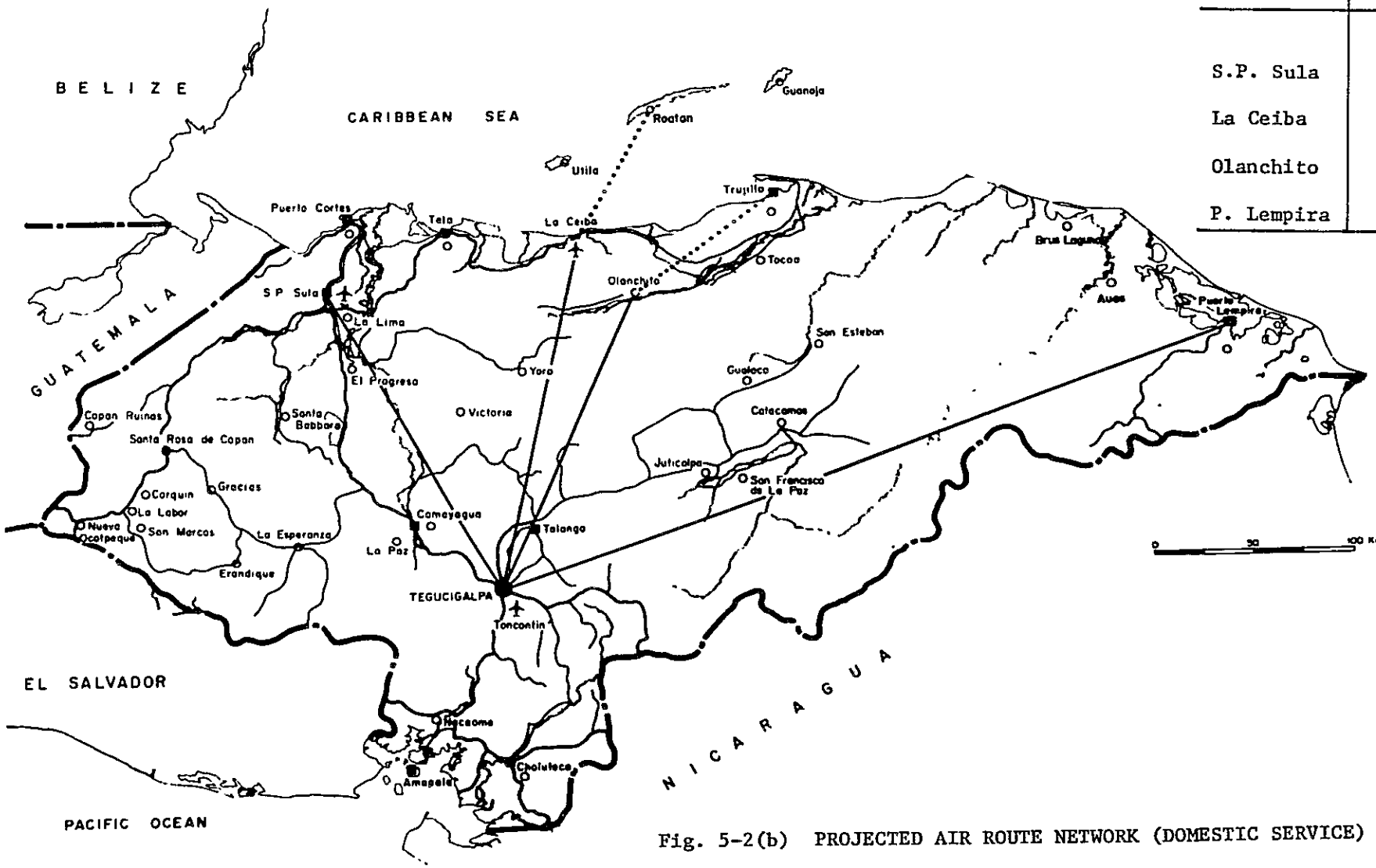



Fig. 5-2(b) PROJECTED AIR ROUTE NETWORK (DOMESTIC SERVICE)

c. Alternate airport for the proposed new airport is given to be Ramon Villeda Morales (San Pedro Sula), and for Houston International Airport there are 4 alternate airports of Corpus Christi, Dallas/Fort Worth, New Orleans, and San Antonio.

d. Reserve fuel is calculated for 1.25 hours of extra flight.

e. Effective runway gradient is assumed to be 0.5%, which, however, shall be corrected in accordance with the grading plan to be made in the later stage of this study.

f. Normal maximum temperature at PEDREGAL site is 24.7°C, and 31.0°C at TALANGA site.

g. Airport elevation at PEDREGAL site is estimated to be 1,500 m above sea level, and 800 m at TALANGA site.

Based on the results of the above analysis, the following lengths of runway are recommended.

PEDREGAL site : 2,770 m
TALANGA site : 2,650 m

The relationship between the projected stage lengths and the maximum permissible payload of each aircraft type on the above calculated runway lengths is analysed as illustrated in Appendix 5A.

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

### 5.1.3 Taxiway

A parallel taxiway connected with the runway by exit taxiways shall be provided along the full length of the runway. The width of all taxiways shall be 23 m.

### 5.1.4 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 following three categories coded A, B, and C for the purpose of this study.

Table 5-1 AIRCRAFT CATEGORIES

| Air Route | | Aircraft |
|---|---|---|
| International Services | TGU-MIA<br>TGU-MSY<br>TGU-IAH<br>TGU-MEX<br>TGU-PTY | A type ---- 200 seater jet |
| | Others | B type ---- 120 seater jet |
| Domestic Services | TGU-SAP<br>TGU-LCE | B type ---- 120 seater jet |
| | Others | C type ---- 40 seater non-jet |

(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 Tables 5-2(a) and (b).

(4) Busiest month passenger peaking coefficient

The busiest month peaking coefficient for international passengers and domestic passengers is assumed to be 1.2 and 1.1 respectively.

(5) Busiest day passenger aircraft movements

The passenger aircraft movements by route are calculated as tabulated in Tables 5-2(a) and (b).

(6) Daily flight schedule

The following basic conditions are taken into account in establishing the possible flight schedules as shown in Appendix 5B.

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

b. The number of aircraft to serve the projected air route network shall be minimized so as to ensure the airlines' payability.

Table 5-2 (a) PROJECTED AIRCRAFT MOVEMENTS BY ROUTE AT PEDREGAL IN THE YEAR 2005

| Route | Number of Passenger (1,000) | Aircraft Movements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 200-Seater Jet | | | 120-Seater Jet | | | 40-Seater Non-Jet | | |
| | | Annual | Monthly | Daily | Annual | Monthly | Daily | Annual | Monthly | Daily |
| TGU - MIA | 395 | 3,292 | 330 | 11 | | | | | | |
| " - IAH | 213 | 1,775 | 178 | 6 | | | | | | |
| " - MSY | 346 | 2,883 | 289 | 10 | | | | | | |
| " - MEX | 91 | 759 | 76 | 3 | | | | | | |
| " - PTY | 230 | 1,917 | 192 | 7 | | | | | | |
| " - BZE | 19 | | | | 246 | 27 | 1 | | | |
| " - GUA | 150 | | | | 2,084 | 209 | 7 | | | |
| " - SAL | 195 | | | | 2,709 | 271 | 10 | | | |
| " - MGA | 135 | | | | 1,875 | 188 | 7 | | | |
| " - SJO | 228 | | | | 3,167 | 317 | 11 | | | |
| " -AADZ | 102 | | | | 1,417 | 142 | 5 | | | |
| Sub Total | 2,104 | 10,626 | 1,065 | 37 | 11,516 | 1,154 | 41 | | | |
| TGU - SAP | 247 | | | | 2,941 | 270 | 9 | | | |
| " - LCE | 201 | | | | 2,393 | 220 | 8 | | | |
| " - OAN | 75 | | | | | | | 2,679 | 246 | 9 |
| " - PLP | 19 | | | | | | | 679 | 63 | 3 |
| Sub Total | 542 | | | | 5,334 | 490 | 17 | 3,358 | 309 | 12 |
| Total | 2,646 | 10,626 | 1,065 | 37 | 16,850 | 1,644 | 58 | 3,358 | 309 | 12 |

Table 5-2 (b) PROJECTED AIRCRAFT MOVEMENTS BY ROUTE AT TALANGA IN THE YEAR 2005

| Air Route | Number of Passengers (1,000) | Aircraft Movements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 200-Seater Jet | | | 120-Seater Jet | | | 40-Seater Non-Jet | | |
| | | Annual | Monthly | Daily | Annual | Monthly | Daily | Annual | Monthly | Daily |
| TGU - MIA | 395 | 3,292 | 330 | 11 | | | | | | |
| " - IAH | 197 | 1,642 | 165 | 6 | | | | | | |
| " - MSY | 346 | 2,884 | 289 | 10 | | | | | | |
| " - MEX | 91 | 759 | 76 | 3 | | | | | | |
| " - PTY | 230 | 1,917 | 192 | 7 | | | | | | |
| " - BZE | 19 | | | | 264 | 27 | 1 | | | |
| " - GUA | 150 | | | | 2,084 | 209 | 7 | | | |
| " - SAL | 165 | | | | 2,292 | 230 | 8 | | | |
| " - MGA | 135 | | | | 1,875 | 188 | 7 | | | |
| " - SJO | 228 | | | | 3,167 | 317 | 11 | | | |
| " - ADZ | 102 | | | | 1,417 | 142 | 5 | | | |
| Sub Total | 2,058 | 10,494 | 1,052 | 37 | 11,099 | 1,113 | 39 | | | |
| TGU - SAP | 234 | | | | 2,786 | 256 | 9 | | | |
| " - LCE | 182 | | | | 2,167 | 199 | 7 | | | |
| " - OAN | 68 | | | | | | | 2,429 | 223 | 8 |
| " - PLP | 18 | | | | | | | 643 | 59 | 2 |
| Sub Total | 502 | | | | 4,953 | 455 | 16 | 3,072 | 282 | 10 |
| Total | 2,560 | 10,494 | 1,052 | 37 | 16,052 | 1,568 | 55 | 3,072 | 282 | 10 |

c. Aircraft parking time is assumed to be as follows according to the characteristics and past performances of each aircraft type.

Table 5-3 AIRCRAFT PARKING TIME

| Aircraft Category* | Through Flights | Turn Around Flights |
|---|---|---|
| A type | 45 minutes | 90 minutes |
| B " | 30 " | 45 " |
| C " | 30 " | 30 " |

* For definitions see Table 5-1

(7) Number of passenger aircraft parking positions

Based on the hourly requirements of aircraft parkings positions obtainable from the projected flight schedules as per Tables 5-2(a) and (b), it is considered necessary to provide the new airport with the following number of aircraft parking positions.

Table 5-4 NUMBER OF PASSENGER AIRCRAFT PARKING POSITIONS

| Aircraft Category* | International Flights | Domestic Flights | Reserve | Total |
|---|---|---|---|---|
| A type | 4 | 0 | 1 | 5 |
| B type | 4 | 2 | 1 | 7 |
| C type | 0 | 2 | 0 | 2 |
| Total | 8 | 4 | 2 | 14 |

* For definitions see Table 5-1

### 5.1.5 Cargo loading apron

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

Although the analysis of projected total belly cargo capacity has shown that the entire cargo volume projected for the year 2005 can be transported in belly, international cargo traffic is assumed to be distributed 50/50 between belly and freighter for the purpose of the facility requirements analysis, in view of the expected future trend for greater increase in freighter traffic than in belly cargo traffic in international service, while for domestic service the entire tonnage projected is assumed to be transported in belly.

(2) Busiest month cargo tonnage peaking coefficient

The busiest month coefficient for international cargo and domestic cargo is assumed to be 1.5 and 1.3 respectively.

(3) Freighter load factor

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

(4) Parking time

The average parking time of freighters is assumed to be 120 minutes in accordance with the aircraft characteristics and past performances.

(5) Projected cargo tonnage and freighter movements

The cargo tonnage and freighter movements are estimated as shown in Tables 5-5(a) and (b).

Table 5-5(a) PROJECTED INTERNATIONAL FREIGHTER CARGO TONNAGE AND FLIGHT MOVEMENTS IN THE YEAR 2005

(PEDREGALE SITE)

| Traffic | Aircraft Category | Outbound | | | Inbound | | |
|---|---|---|---|---|---|---|---|
| | | Annual | Monthly | Daily | Annual | Monthly | Daily |
| Cargo Tonnage (t) | B-707 Class | 4,224 | 530 | 17.8 | 21,491 | 2,688 | 89.8 |
| | DC-9 Class | 1,277 | 162 | 5.6 | 4,170 | 524 | 17.7 |
| | Total | 5,501 | 692 | 23.4 | 25,661 | 3,212 | 107.5 |
| Flight Movements | B-707 Class | 263 | 35 | 2 | 1,292 | 165 | 6 |
| | DC-9 Class | 162 | 24 | 1 | 522 | 68 | 3 |
| | Total | 425 | 59 | 3 | 1,814 | 233 | 9 |

Table 5-5(b) PROJECTED INTERNATIONAL FREIGHTER CARGO TONNAGE AND FLIGHT MOVEMENTS IN THE YEAR 2005

(TALANGA SITE)

| Traffic | Aircraft Category | Outbound | | | Inbound | | |
|---|---|---|---|---|---|---|---|
| | | Annual | Monthly | Daily | Annual | Monthly | Daily |
| Cargo Tonnage (t) | B-707 Class | 3,997 | 502 | 16.9 | 20,612 | 2,579 | 86.2 |
| | DC-9 Class | 1,155 | 147 | 5.1 | 4,142 | 521 | 17.6 |
| | Total | 5,152 | 649 | 22.0 | 24,754 | 3,100 | 103.8 |
| Flight Movements | B-707 Class | 202 | 28 | 1 | 1,014 | 129 | 5 |
| | DC-9 Class | 125 | 17 | 1 | 440 | 58 | 2 |
| | Total | 327 | 45 | 2 | 1,454 | 187 | 7 |