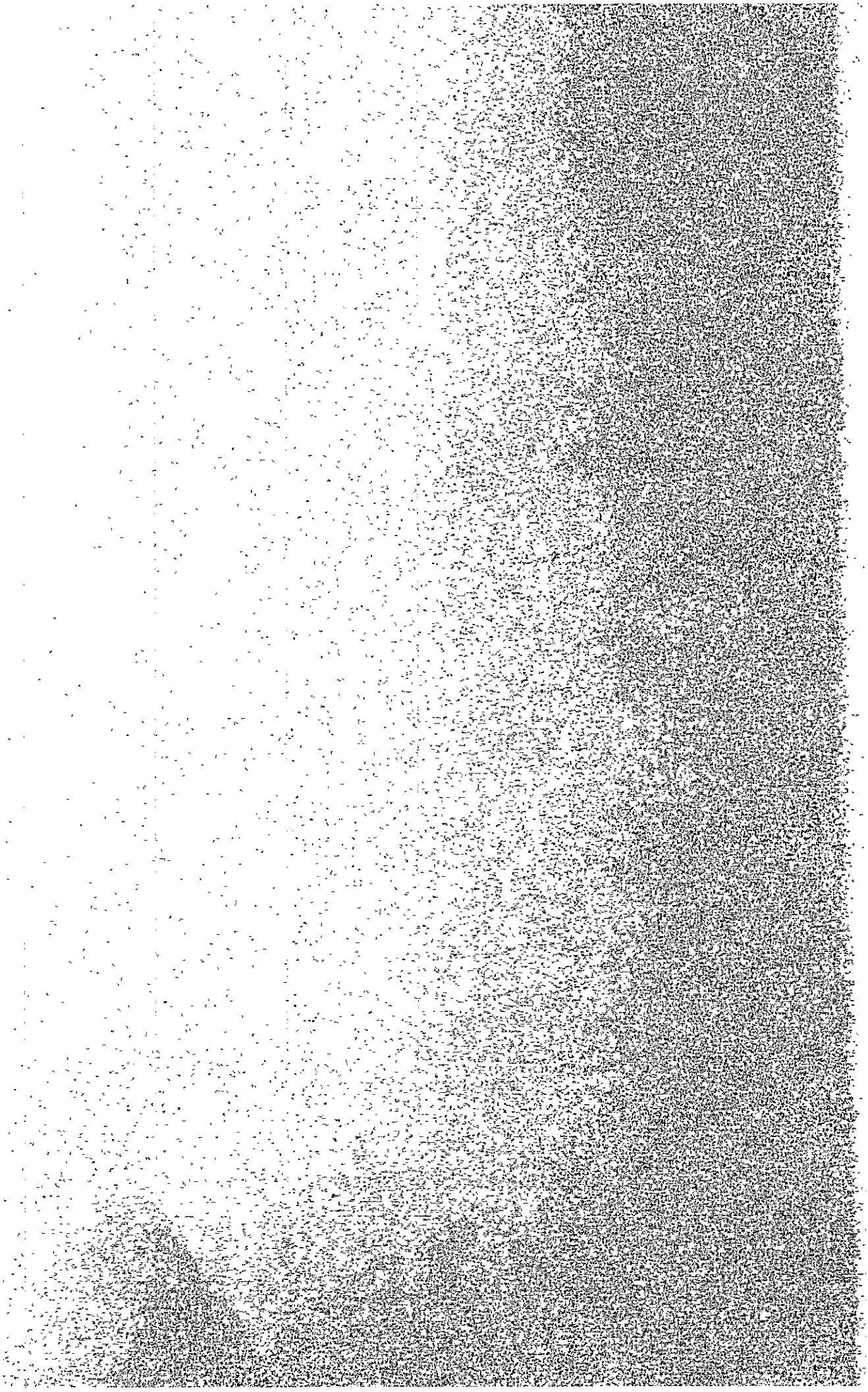
CHAPTER 2

BACKGROUND OF PROJECT



CHAPTER 2 BACKGROUND OF PROJECT

2.1 Economic Situation of Indonesia

In this section, the economic situation in Indonesia and Bali Province is reviewed.

(1) Setting

The Republic of Indonesia consists of islands straddling the equator as stated in the previous chapter.

Therefore, air routes perform a major function in promoting national communication and unity.

The country is endowed with abundant natural resources including petroleum, natural gas, coal, basic minerals including iron, tin nickel, bauxite, and copper. It also produces a wide variety of agricultural products: rice, the country's staple food, rubber, palm oil, sugar, coffee, tea, etc.

According to the most recent census conducted in 1980, the population of Indonesia was estimated to be 148 million.1/ The population growth rate between 1971 and 1980 was estimated to be 2.3 percent per annum.

The population density is 76.7 persons per square kilometer. About 62 percent of the people, however, live in Java and Madura and 19 percent in Sumatra. The population density of Java and Madura is 690 persons per square kilometer. About 40 percent of the population is under 15 years of age.

1/ Source: Statistical Pocketbook Indonesia, 1979-1980. "BIRO PUSAT STATISTIK, JAKARTA"

The size of the labor force is about 52 million, of which some 32 million people (62%) are engaged in agriculture.

(2) Production and Expenditure

The gross domestic product (GDP) of Indonesia in 1979 was 30,660 billion Rupiah. At the current exchange rate (US$ 1.00 = Rp 644), this is equivalent to about US$ 47.6 billion. On this basis, the per capita GDP is about US$ 340. The GDP of Indonesia displayed 6.7 percent growth per year on average during the period 1973 - 1979. During this period, agriculture output grew by 2.8 percent per annum, mining production by 3.9 percent, manufacturing by 12 percent, and transportation and others by 9.4 percent.

GDP 1973 - 1979

	Billion Rupiah	AAGR 1973 - 1979(%)
GDP	30,660	6.7
Agriculture		2.8
Mining		3.9
Manufacturing		12.0
Other		9.4

Private and public consumption expenditures accounted for 70.5 percent of GDP, and domestic investment for 2.6 percent, with the resource balance in surplus by 6.9 percent in 1979.

1/ See page 2-1 in the bottom.

During 1973 - 79, private expenditures grew by 7.5 percent annually, government consumption expenditures, 8.8 percent; and investment by 12.6 percent. The fast growth of investment, which was made possible by the expansion of resource availability, was one of the factors which supported the rapid economic development.

The government budget also expanded rapidly. In fact, the rapid investment growth was mainly due to the expansion of public investment which accounted for about two thirds of the domestic investment during 1975 - 79. As a result, the budgetary deficit increased from 489 billion Rupiah in 1975/76 to 1,379 billion in 1979/80, or 4-5 percent of GDP.

GOVERNMENT RECEIPTS & EXPENDITURES
(in billion of Rupiahs)

	1975/76	1976/77	1977/78	1978/79	1979/80
Revenues	2,242	2,906	2,535	4,266	6,697
Expenditures					
Current	1,333	1,630	2,149	2,744	4,062
Capital	1,398	2,055	2,159	2,556	5,014
Financing	492	784	773	1,036	1,381

Source: EPS

(3) Prices

Because of the rapid expansion of economic activities, in particular, of expenditures, the general price level in Indonesia also increased rapidly. Based on the cost of living index, the annual inflation rate in Jakarta between 1974 - 78 was 9.5 percent on an average, although this was a considerably decrease as compared with the early

1970s when the index increased over 70 percent per year (between 1969 - 74). The wholesale price index showed a significantly higher growth of 18 percent between 1974 - 79, which reflected mostly the rapid rise in petroleum price.

(4) Economic Development Plan

The government of Indonesia has directed economic development through three successive five year development plans (called REPELITA, REncana PEmbangunan LIma TAhun) since 1969/70.

The strategy of each these REPELITA is summarized as follows:

REPELITA I: (1969/70 - 1973/74)
To accomplish orderly economic growth.

REPELITA II: (1974/75 - 1979/80)
To build the nation so that all citizens living in Indonesia could enjoy equal benefits of economic political and cultural life.

REPELITA III: (1979/80 - 1983/84)
To attain the three major goals of equity, growth and national stability.

The GDP growth target of REPELITA III was initially put at 6.5 percent per annum for the five years. However, the resource constraints which were perceived at the time of plan preparation have since been significantly reduced as the price of petroleum increased sharply. It is considered, therefore, that the GDP growth should attain a 7.5 percent increase per year.

The basic instrument to support these strategies are the development of infrastructures (such as airfields), development and exchange of regional economic activities, and promotion of trade.

The development of civil air transport is recognized to play an important role in the accomplishment of the national development plan in view of Indonesian's geographical conditions and economic organization and policy.

(5) Prospects

The development prospects for the Indonesian economy remain bright, despite many foreseeable difficulties, such as the declining rate of petroleum production and exports.
Based on the abundant natural resources, and a climate suitable for agricultural production, the Indonesian economy should exhibit a basic strength during the coming decades.

Based on the last decades' achievement, the endowment of natural resources, and improved economic management, the GDP is expected to continue to grow at the rate of 7 - 8 percent per year during the next few decades.

2.2 The Transportation Sector

The transportation sector of Indonesia reflects the geographical characteristics of the country: its size and many islands. Since the economic activities and hence population have been developed with heavy concentrations in Java/Madura and Sumatra, the transportation network is also concentrated in these areas, in particular those which require heavy infrastructure investments; namely roads and railways.

2.2.1 Road

The road network is well developed in Java/Madura. In Bali island, road networks are also well developed, and about 50 percent of trunk roads are paved.

In 1979, the total length of roads in Indonesia was 128,899 km of which 57,570 kilometers (45%) were asphalt paved. Road maintenance seemed to be falling behind the rapid increase in road traffic. Only one-third of the existing roads were kept in satisfactory condition (See the following table).

ROADS CONDITIONS IN INDONESIA IN 1979

(km)

		Condition	
	Total	Good	Moderate to Poor
Sumatra	42,220	8,842	33,378
(West Sumatra)	(5,242)	(2,840)	(2,402)
Java	40,386	14,135	26,251
Bali	3,133	978	2,155
Kalimantan	9,787	1,665	8.122
Sulawesi	18,858	5,102	13,756
Other	14,515	6,220	8,295
Total	128,899	36,942	91,957

Source: EPS

2.2.2 Railway

As of 1981, only Java/Madura and Sumatra have railway transportation services. Railway traffic has been growing steadily; Passenger - kms grew by 15 percent per year between 1976 and 1980; for cargo, ton - kms by 8.5 percent.

RAILWAY TRANSPORTATION
1976 - 1981

	1976	1977	1978	1979	1980
Passenger Traffic					
Java:					
In mill passengers	18.3	19.2	23.4	34.7	39.1
In mill pass - kms	2999	3489	3050	5388	5191
Sumatra:					
In mill passengers	2.5	1.5	1.7	3.1	3.7
In mill pass - kms	310	348	407	593	639
Freight Traffic					
Java:					
In mill tonnage	2.1	2.5	3.4	2.9	2.8
In mill ton - kms	508	659	689	742	634
Sumatra:					
In mill tonnage	1.2	1.3	2.0	1.3	1.9
In mill ton - kms	193	220	304	274	336

Source: Department Perhubungan

2.3 Air Transport in Indonesia

Civil air transport plays an important role in national integration, promoting economic acitvities, regional economic balance, etc. Therefore, the development of airports are planned to be executed continuously as an important policy of the third national development plan (REPELITA III).

Concerning the air traffic demand, the passengers on international routes reached 920,000 in 1979 which is about 2.2 times the 420,000 passenger level in 1972; this is an average growth rate of 11 percent per annum. The passengers on domestic routes have increased at a high growth rate of 22 percent per annum from 1972 to 1979, and totalled about 4.8 million in 1979. The total number of air passengers in 1979 was 5.7 million and the average annual growth rate was about 20 percent during the same period.

This increasing tendency is forecast to continue steadily in future, and it is estimated in the REPELITA III that the average growth rate of air passengers will be 17-19 percent per annum.

To cope with such a sharp growth in air freight traffic and to solve the political tasks such as to dissolve the regional inbalances and to promote regional equality of economic, political and cultural benefits, the Government of Indonesia is proceeding with the development of airports.

The basic policies of the civil air transport of Indonesia are summarized as follows:

(1) To improve international airports as the gateways of Indonesia.

(2) To make it physically possible to journey from the capital of all 27 provinces to Jakarta within one day.

(3) To develop airfields in remote regions.

There are more than 300 airports in Indonesia, of which 140 are under the control of the DGAC. DGAC has classified improvement and development works for these airports into the following four categories in accordance with the importance of the airport:

(1) International airports (Category I)

DGAC's policy is to develop international airports, as the gateways of Indonesia, at Bali and Medan in addition to Jakarta, with runway lengths of 3,000 meters to accommodate B-747 class large jet aircraft. Bali International Airport is defined as the eastern gateway to Japan, Australia and the Eastern Pacific Island, whereas Medan International Airport is defined as western gateway to Malaysia and Singapore.

Jakarta, the capital city of Indonesia, has two airports, (Halim International Airport and Kemayoran Domestic Airport); however, both of these are confined and the separated airport system has proven very inefficient.

Therefore, the new Cengkareng International Airport having two runways of 3,050 and 3,660 meters is now under construction with financial assistance of France. It will become the representative International Airport of Indonesia after its completion, combining the functions of the existing two airports. The extension work (from 2,700 to 3,000 meters in length) of the Medan International Airport runway has just been completed under financial assistance of the Asian Development Bank. However, for the Bali International

Airport, there are various problems as mentioned in following Section 2.5 for which partial improvement works such as overlay of runway and extension of the terminal building have been undertaken by the airport authorities.

Nevertheless, these works are considered as only temporary expediencies for solving the problems. It can be said that BIA lags behind both the Jakarta and Medan International Airports.

(2) Trunk line airports on domestic air routes (Category II)
A total 16 of trunk line airports are planned to be installed on the main islands of Indonesia, such as Sumatera, Java, Kalimantan, Sulawesi, Irian Jaya, etc.

A runway of 2,300 meters in length to cope with the operation of DC-10 or A-300 class aircraft is planned at the trunk line airports to meet the forecast rapid growth of air traffic demand and for the operation of large jet aircraft.

Concerning large jet aircraft operations in domestic trunk lines, DC-10 are in service for the route between Medan and Jakarta, B-747 and DC-10 serve the route between Jakarta and Bali. In addition, an A-300 was just introduced for the route between Bali, Ujungpandang and Jakarta in Jan., 1982.

(3) Regional Airports
It is planned for each province that at least one airport will be developed with a runway of 1,800 meters in length which can accommodate the F-28 class aircraft operation.

If all of these regional airports could accommodate jet aircraft, citizens of all provincial capitals could go to Jakarta and return within one day.

It takes one hour and 40 minutes between Jakarta and Bali by air; therefore, the capitals of the eastern provinces are connected to Jakarta via BIA within a one-day trip.

(4) Pioneer Airports

A total 86 pioneer airports are planned at remote island areas except Java island. The remote areas in Indonesia are divided into 12 zones and these remote area will be connected by small aircraft with 12 of the trunk line airports located in each zone. For pioneer airports, a runway of 900 meters in length is planned to cope with DHC-7 class aircraft.

BIA is defined as the base airport of the 8th zone and there are air routes between BIA and 14 pioneer airports.

DGAC is developing the airports of the country in accordance with the national policies mentioned above. The roles of BIA are as an international airport, the eastern gateway of Indonesia, a major airport of domestic trunk air routes and the base airport of 8th zone for pioneer airports. However, the facilities of BIA lag behind the facilities of Jakarta and Medan International Airport.

2.4 Bali International Airport

2.4.1 Bali Island

The Bali island is a well-known tourist resort with its beautiful tropical scenery, makes a large contribution to the tourism industry of Indonesia. Bali is situated at the middle of the Indonesian archipelago at about 8° south of the equator. It extends about 140 kilometers from east to west, and 90 kilometers from south to north. Its total land area is about 5,560 square kilometers.

The volcanic mountain range across the north side of the island from east to west consists of many mountains higher than 1,000 meters. The highest is Mt. Mahameru which is 3,140 meters high and which has rich farmlands on its southern slopes.

The Bali island has a unique traditonal culture, manners and customs in addition to the fascinating volcanic and beach scenery, and these characteristics attract many visitors from all over the world. The population of Bali island is about 2.5 million. Denpasar is the capital city situated on the south side of the island.

2.4.2 History of BIA

Bali International Airport is located 13 km south of Denpasar city, at the coral isthmus connecting the Bali mainland and Nusa Penida Island. Although the BIA has a long history before World War II, its airfield (known as Tuban Airport) had a grass runway until the runway was expanded in 1947 to 1,600 meters in length and 45 meters wide with paved surfacing. In 1949, a terminal building was built, and in 1957 the airport authorities decided to upgrade the airport as an international airport. In 1969, the construction of a new runway of 2,700 meters with parallel taxiway and the new terminal building were completed, thus commencing its service as an international airport with its name changed to the Bali International Airport.

During in 1972 to 1975, studies for development of BIA have been carried out. A master plan of development was made in 1975. The construction of various airport facilities such as approach lighting, VASIS, ILS, ASR, terminal building for international passengers, etc. were executed during the period 1975 to 1979 in accordance with the Master plan.

The outline of the existing facilities of BIA are summarized in Table 2.4.1.

2.4.3 Existing Conditions of BIA

The present international air routes of BIA are as follows:

Bali	- Tokyo	Direct flight
	- Melbourne	Ditto
	- Sydney	Ditto
	- Perth	Ditto
	- Darwin	Ditto
	- Singapore	Via Jakarta
	- Hong Kong	Ditto

There are 15 domestic air routes connecting BIA with Jakarta and other domestic airports.

The volume of air traffic at BIA has increased at the high average rate of 15 percent per annum during the period 1972 to 1980 and reached a total of about one million passengers in the year 1981.

In 1980, the number of passengers of BIA totalled 870,000 (290,000 (33%) international and 580,000 (67%) domestic passengers). The volume of passengers is ranked second next to Jakarta/Halim for international airports and fourth next to Jakarta/Kemayoran, Jakarta/Halim, Surabaya for domestic airports. General layout plan of the existing airport facilities and air route network are shown in Fig. 2.4.1 and 2.4.2 respectively.

Table 2.4.1 GENERAL OUTLINE OF BALI INTERNATIONAL AIRPORT

Item	Description	Remarks
City/Aerodrome	Denpasar/BALI INTL-Ngurah Rai	
Coordinates	08.45.09S 115.10E	
Distance and direction from City	7.1 NM SSW	
Elevatron	4.33 m	
Magnetic Variation	1°	
Operation hours	23.00 ~19.00	
Aerodrome operator	D.G.A.C.	
Runway	2700m x 45m	
Stop way	100 m	
Clear way	100 m	
Runway slope		
Runway surface	Asphalt	
Runway strength	LCN 60	
Taxiway	1750m x 30m	
Apron (spot)	A: 4/DC-9 (180m x 100m) B: 2/B-747 1/DC-10 (439m x 112m) 4/DC-9	
Apron surface	Concrete	
Apron strength	LCN 60	
Passenger Terminal Bldg	Int: 6070m2 Dom: 5,800m^2 *	*Including ADM. Area (2,350m^2)
Cargo Terminal Bldg	1800m2	
Annual Passenger volume	Int: 316000 (1981) Dom: 554000 (1981)	
Annual Cargo volume	Int: 704 ton (1981) Dom: 2294 ton (1981)	
Annual Aircraft Movements	Int: 1518 (1981) Dom: 17764 (1981)	
Ground Service	Avigas 100/130 Avtur 650	
Fire Fighting	Category 7	
Lighting aids	Approach lighting:Cat1(R/W27) VASIS 3-Bar (R/W.09&27) Runway edge light Runway Threshold light Taxiway edge light	
Nav aids	C/VOR·DME D/VOR ILS · LLZ (LLZ: off-set) GP·DME ASR/SSR	

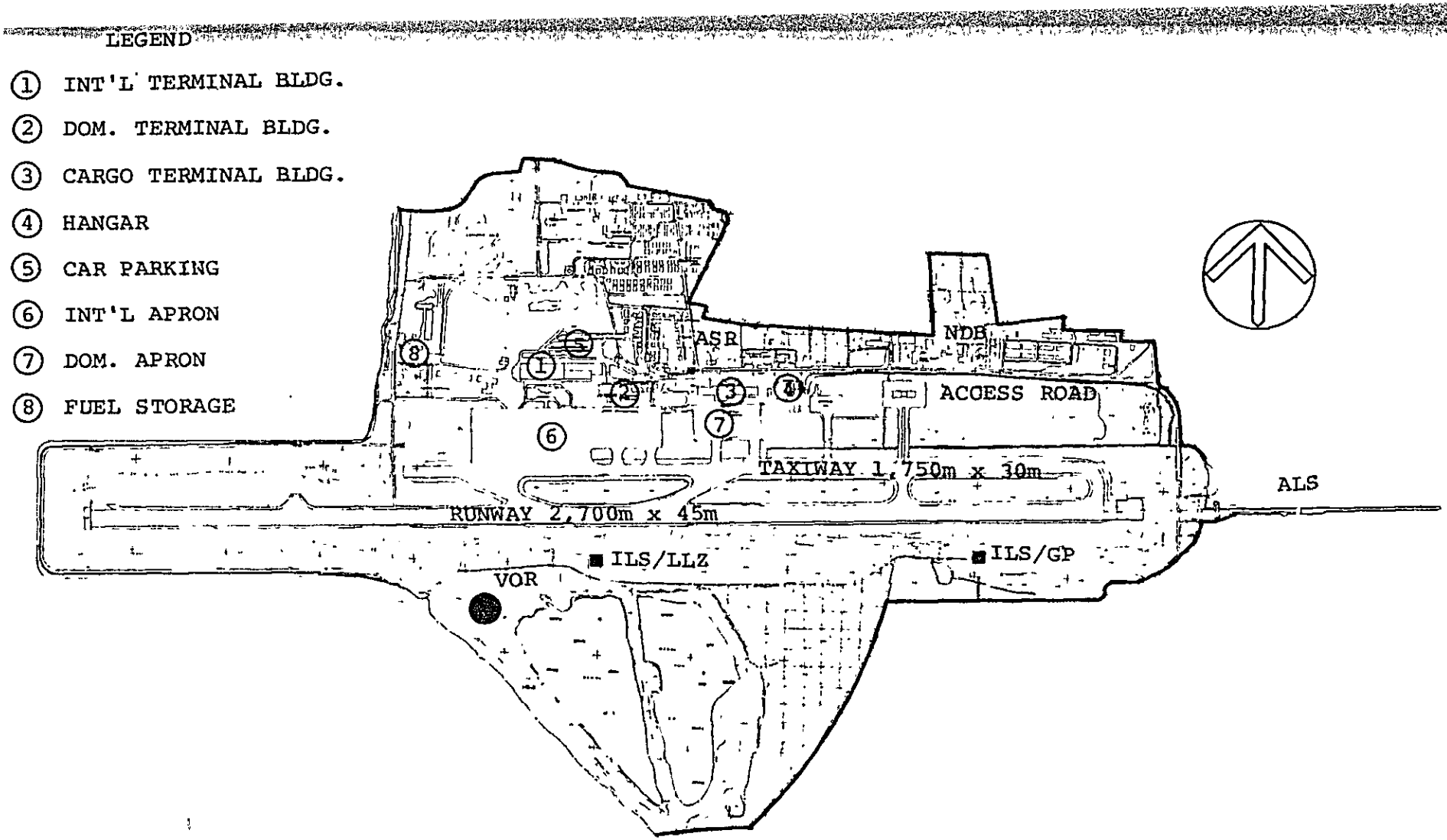
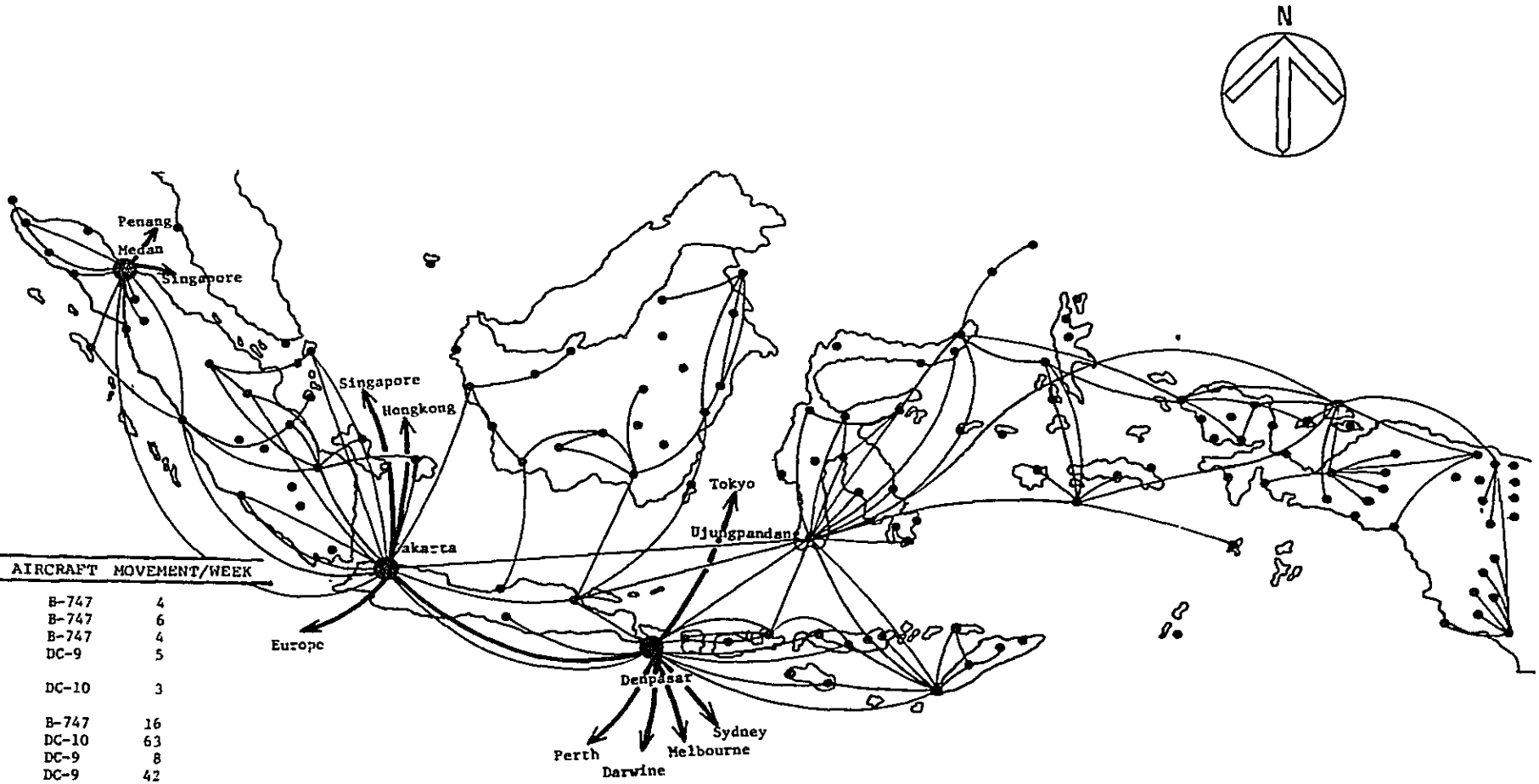


Fig. 2.4.1 General Layout Plan of Existing Airport Facilities (1981)



ROUTE		AIRCRAFT	MOVEMENT/WEEK
DPS	- MEL*	B-747	4
	SYD*	B-747	6
	PER*	B-747	4
	DRW*	DC-9	5
	NRT*	DC-10	3
	JKT	B-747	16
		DC-10	63
		DC-9	8
	JOG	DC-9	42
	UPG	F-28	26
		HS-748	7
	SUB	F-28	41
		HS-748	12
	KOE	F-28	27
	AMI	DHC-6	95
	BMU	DHC- 6	15
	DIL	F-28	1
	WGP	HS-748	1
	MOF	HS-748	4

* International Route

Fig. 2.4.2 AIR ROUTE NETWORK OF INDONESIA

2.5 Problems of BIA

In the 1975 BIA Master Plan, the target year was set at 1995 with the project life of 20 years, and DC-8 and DC-10 class were considered as the design type of aircraft.

However, jumbo jet aircraft such as B-747 which were not considered in the 1975 Master Plan have been in service internationally since 1980, and therefore, various problems related with the safe operation of jumbo aircraft have arisen such as insufficiency of runway length and runway strip width, layout of facilities, etc. in addition to facilities not complying with the ICAO standards for the safe operation of aircraft, insufficiency of terminal facility capacity, etc. Specific examples of these problems are summarized as follows:

(1) Runway

The existing runway length of 2,700 meters is not sufficient for the take-off of DC-10 from Bali to Tokyo. In addition about 25 percent weight reduction from the maximum payload is required.

(2) Runway Strip

Although the width of the runway strip is expressed as 200 meters in the AIP, it is actually about 150 meters. In both cases, it does not comply with the ICAO standard which is 300 meters.

(3) Taxiway

The distance between the center line of the runway and parallel taxiway, and between both pavement edges are 125 meters and 87.5 meters, respectively.

These values also do not comply with the ICAO standard of 180 and 150 meters which are expected to be adopted in 1983.

(4) Apron

The clearance between wing tips of parked aircraft, especially at night, is below the recommended values in the ICAO Aerodrome Design Manual, Part II.

In addition, if the ICAO standards mentioned in Para. (2) and (3) above are applied to BIA, the wide body jumbo aircraft parked on the apron would be in contravention of the obstacle limitation for transitional surfaces.

(5) International/Domestic Terminal Buildings

The most fundamental problem is that the systems and sizes of the existing terminal facilities are not appropriate for recent mass air transportation services brought about by wide body jumbo jet aircraft. In accordance with the standard requirements for the floor area of a passenger terminal building, the existing floor areas are considered to be extremely small. The floor area of the existing international passenger terminal building is 6,070 sq. meters, which is considered to be about half of the required floor area (13,300 sq.m) for the present peak-hour volume of passengers. In the domestic passenger terminal building, the existing floor area is 3,350 sq. meters versus the requirement of 6,900 sq. meters of floor area.

Deficiencies in the passenger and baggage handling system of BIA are now causing a serious slowdown in the level of services to passengers. When there are three flights of DC-10 and B-747 in the peak-hour of international air traffic, severe congestion occurs due to the insufficient floor area and the inadequate

number of check-in counters even though the check-in work is executed two hours before departure time. In the domestic passenger terminal building, check-in counters are also insufficient and the baggage handling system is not considered to be capable of coping with the large amount of baggage of the wide-body jumbo aircraft, especially in terms of the size of make-up and break-down area.

Presently, expansion works of the international and domestic terminal buildings are under construction by the airport authorities as a temporary expediency for solving the above-mentioned problems; however, it is considered that the new capacities will accommodate the future traffic demand only for the short-term (with in 2-3 years) based on the results of air traffic demand projection.

(6) Cargo Terminal Building

The present building which is utilized as a cargo terminal building was constructed 30 years ago as the passenger terminal building. It is now in superannuated condition. Cargo handling is performed manually. The capacity of existing cargo building has now reached its ultimate limit due to the dense use of building space.

Without the construction of a new cargo building to permit the containerization of air cargo, there is no possibility for the existing superannuated cargo terminal building to be able to cope with increasing cargo volumes.

(7) Air Navigation System

Due to geographical limitations, the existing localizer is located on the off-set of the runway at an abnormal location contrary to the

requirement that it must be located on the prolonged center line of the runway. Hence, the missed approach point is ambiguous for an aircraft approaching under ILS (Instrument Landing System).

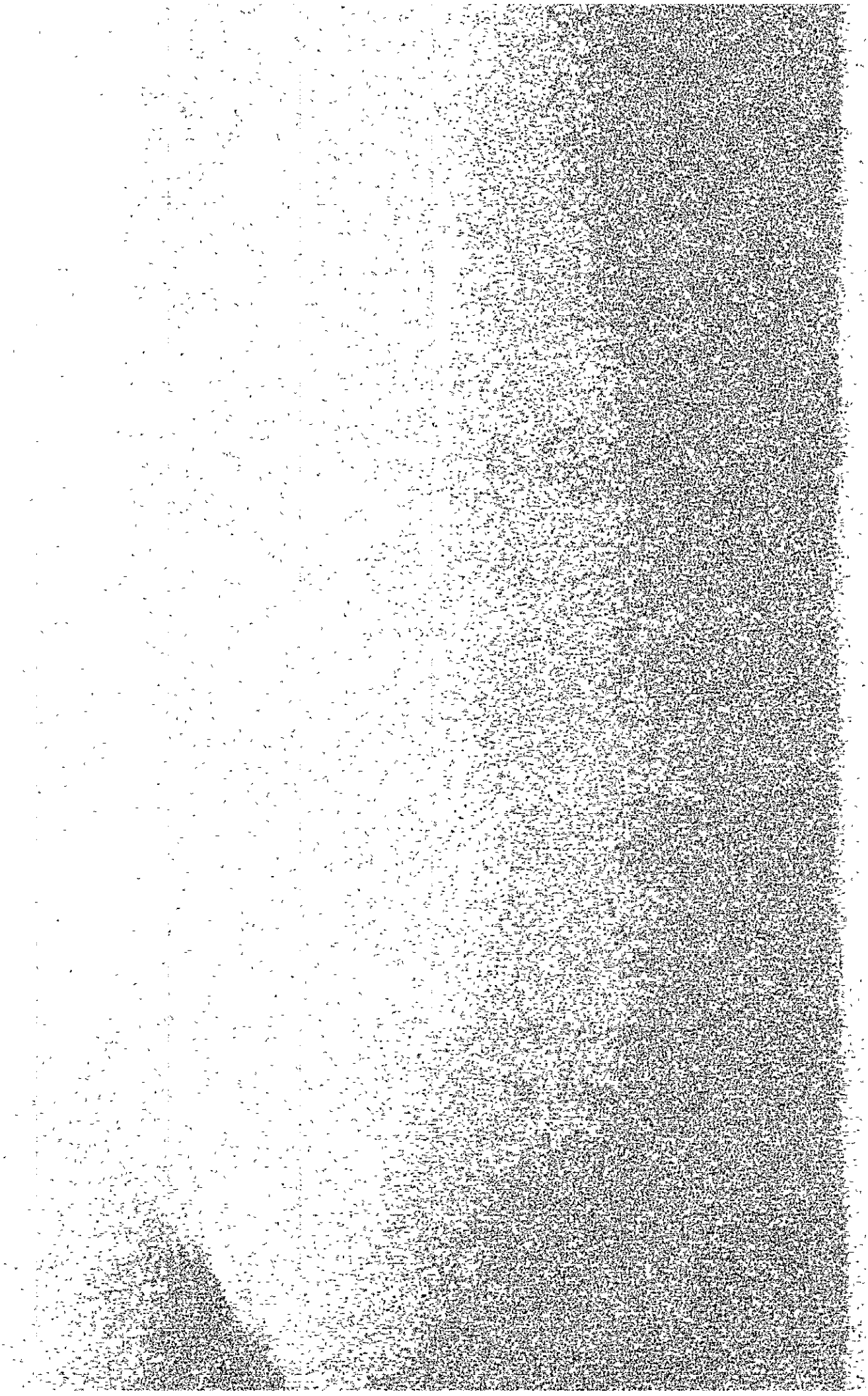
In addition to the above, the main approach direction based on the wind analysis is considered as west side of BIA, contrary to the existing usage of east direction as main approach.

2.6 Necessity of Development Planning of BIA

Although there is a 1975 Master Plan, the existing conditions of air traffic in BIA show remarkable gaps against the forecast values for the volume of passengers, type of aircraft to be introduced, etc. Therefore, it is indispensable to establish a long term development plan based on the long-term trends of air traffic demand for solving the present problems and for execution of development works required to serve future air traffic demand.

CHAPTER 3

AIR TRANSPORT DEMAND FORECAST



CHAPTER 3 AIR TRANSPORT DEMAND FORECAST

3.1 Outline of Air Tranaport Demand Forecast

To establish and estimate the requirements and design conditions for airport planning, the forecast of air transportation demand is very important.

The demand forecast for air transportation not only establishes the design conditions for the runway, taxiway, apron, terminal buildings and airport facilities, but also determines the economical and financial relevance required for investment in the airport plan.

In the detailed airport planning, the basic values will be determined by the demand forecast. In addition to the definition of design scale and requirements with it, more detailed requirements for the airport facility can be established.

The demand forecast plays a fundamental role in the financial balance which must be used to evaluate and define the airport operations and in the economical analysis required to evaluate the feasibility of the project.

The demand forecast for air transportation is based on long-range considerations during the planning stage for the airport. It also confirms the contribution toward national development anticipated from the airport and allows for prediction of the operations of the airport without any difficulty related to increasing demand and long-term usage.

With regard to the demand, the forecast for the airport will be different based on the selected system of facilities, and also on trip generating factors.

Therefore, in the following study, the forecast is averaged between passenger and cargo volume, international & domestic routes and On/Off boarding conditions for through and transit passengers.

The study was based on the following procedure:

- Adjustment of the demand data values.
- Selection of demand model based on parameters which must be measured related to the contents of demand to reproduce the demand values accurately.
- Assumption of the future values for the explanatory factors.
- Forecast of the future values for 1990, 2000 and 2010 based on established formulas with an explanatory factor.
- Projection of the forecast values for the years between target year, peak day, peak hour, and the values required for estimating the facility requirements and for the analysis of economical and financial returns.

3.2 Actual Movement of Demand

The actual movement of air transportation demand for passengers and cargo at Bali International Airport is based on the statistical data issued by Indonesian Government for the years 1972 - 80.

The actual movement for passengers, transit passengers, and cargo volume for domestic and international routes are shown in Tables 3.2.1, 3.2.2 and 3.2.3. Data for the tables and the figures shown in page 3-4, 5 and 6 were derived from BIA records in Dec. 1981.
The changes which have occurred in aircraft operations relevant to BIA during the statistical period were brought out the change by the commencement or cessation of direct flights by foreign airlines.

The actual movement values, consequently are distorted slightly under the influence of above mentioned changes.

Only Qantas Airways has a direct flight to the Bali International Airport. The other four foreign airlines (PA, TG, LX and SQ) must stop at Jakarta/Halim International Airport.

Therefore, foreign passenger must exit in Jakarta, and then change planes to come to Bali as domestic passengers by Garuda Indonesian Airlines's mixed flight.

Due to the operation of direct flight by the foreign airline, the passenger volume by International and Domestic flight are changing constantly.

Therefore, it is necessary to forecast conditions in the future based on the smoothing of current data.

The adjustment process for the data is as follows:

(1) Data is based on the assumption that direct flights are operated by a foreign airline for the whole year since 1972.

    This data is adopted as the base data with regard to clearly projecting the classes international and domestic demand.

Table 3.2.1 DOM. & INT'L PAX. VOLUMES, 1972-80

(unit: x1,000 Person)

	DOM. PAX.	INT'L PAX.	TOTAL
1972	80	137	217
1973	214	92	296
1974	228	111	339
1975	151	255	406
1976	264	275	539
1977	466	123	589
1978	555	123	678
1979	599	140	739
1980	556	262	818

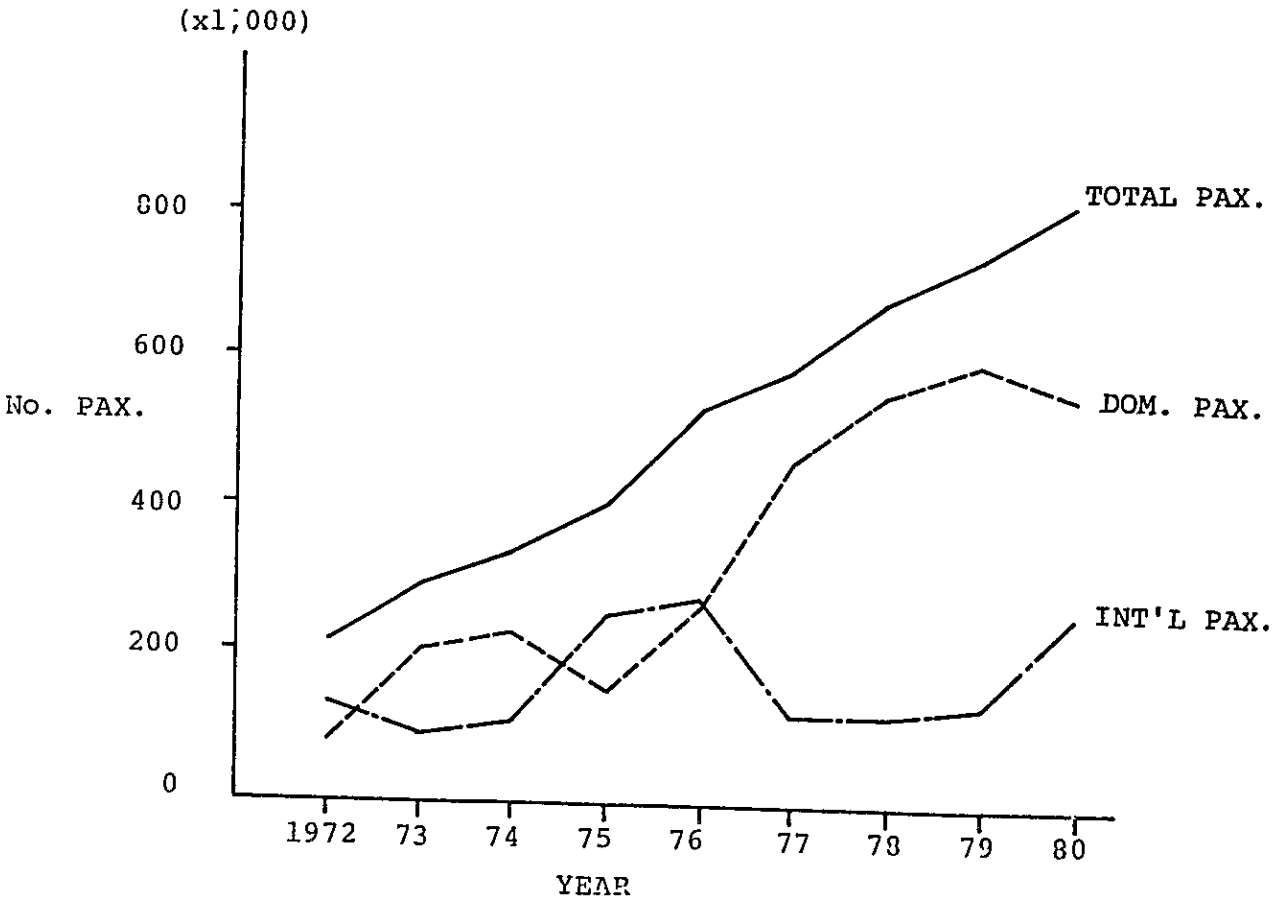


Fig. 3.2.1 DOM. & INT'L VOLUMES, 1972-80

Table 3.2.2 DOM. & INT'L TRANSIT PAX. VOLUMES, 1972-80

(unit: xl,000 Person)

	DOM. PAX	INT'L PAX	TOTAL
1972	22.0	13,1	35.1
1973	12.9	12,3	25.2
1974	9.2	10.0	19.2
1975	11.4	816	20.0
1976	16.0	16.0	36.0
1977	31.1	14.3	45.4
1978	34.8	15.7	50.5
1979	38.7	15.8	54.5
1980	23.8	28.2	52.0

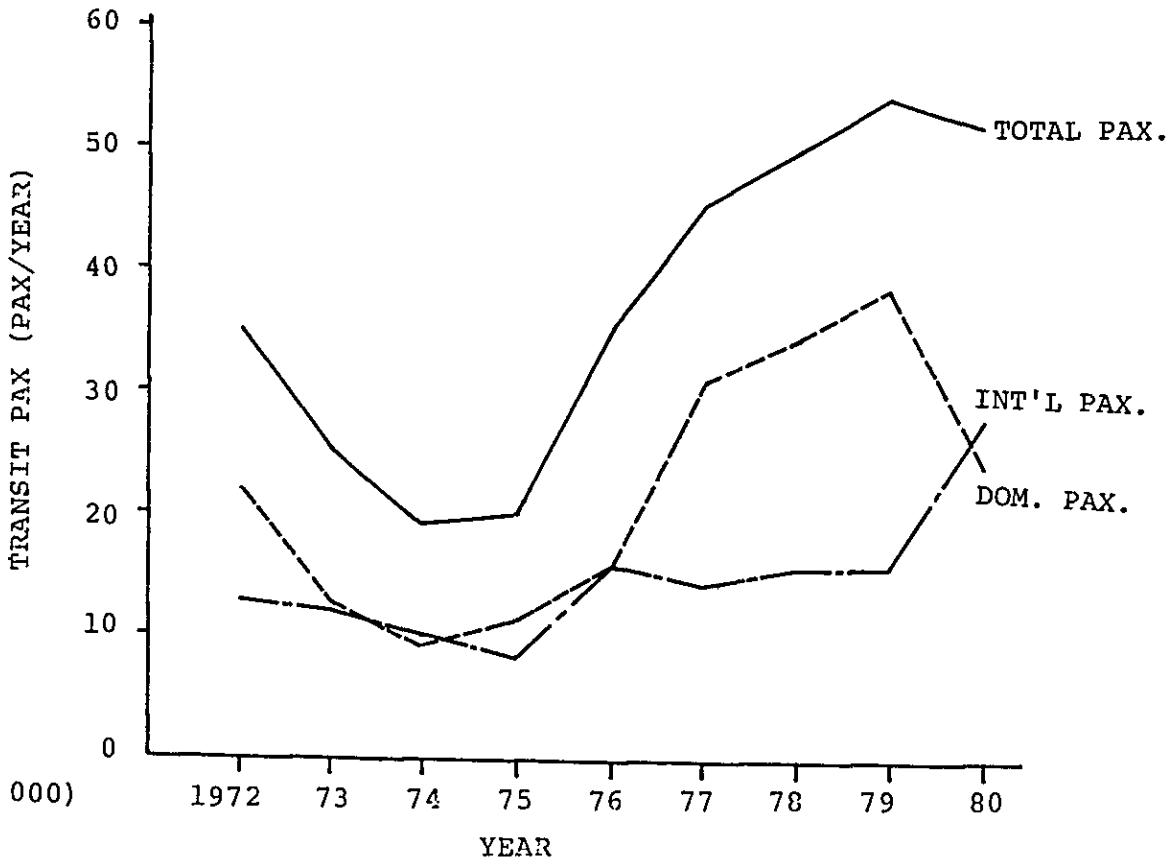


Fig. 3.2.2 TRANSIT PAX. VOLUMES, 1972-80

Table 3.2.3 DOM. & INT'L AIR CARGO VOLUMES, 1972-80

(unit: Ton)

	DOM. CARGO	INT'l CARGO	TOTAL
1972	158	146	304
1973	475	281	756
1974	594	245	839
1975	522	886	1.408
1976	1.069	794	1.862
1977	1.630	156	1.786
1978	1.642	309	1.951
1979	1.939	306	2.245
1980	2.294	704	2.998

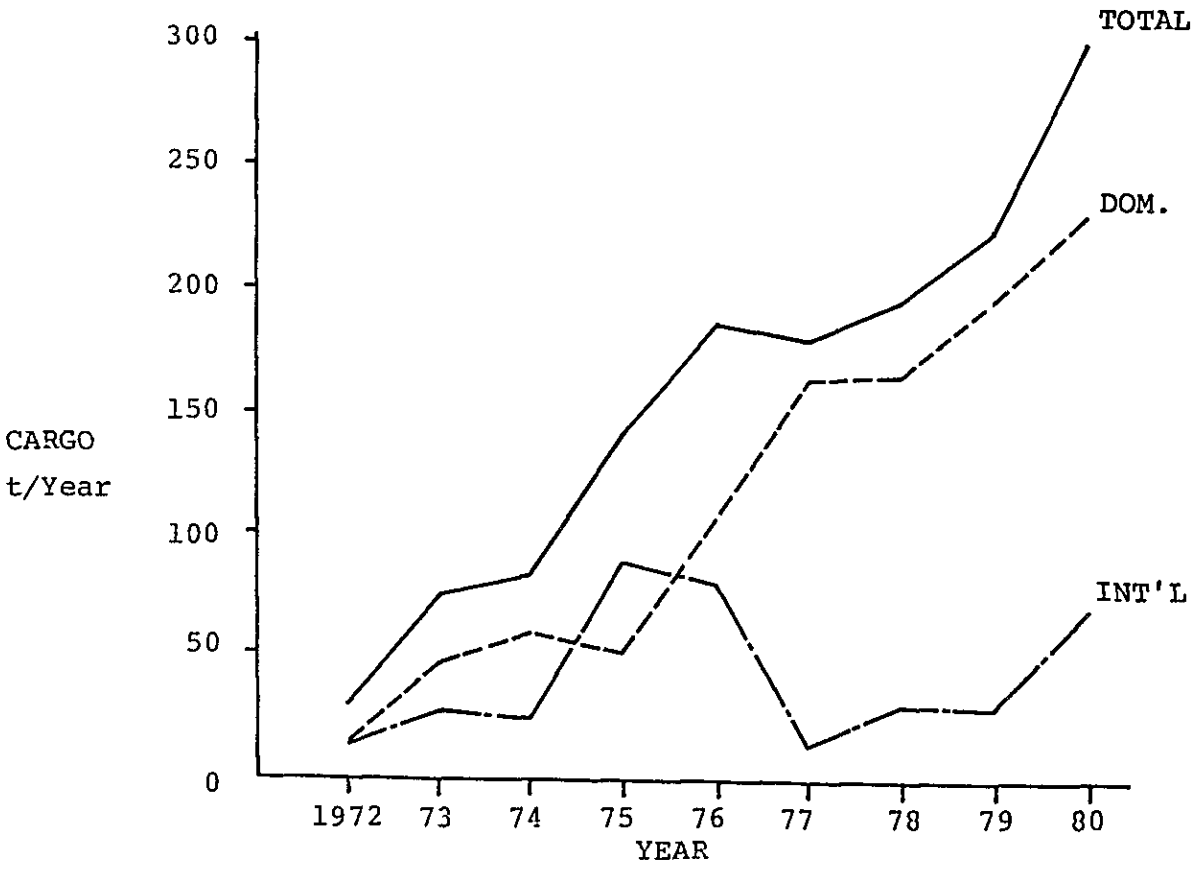


Fig. 3.2.3 AIR CARGO VOLUMES, 1972-80

(2) The growth rate of international and domestic passenger's demand at BIA is the same as for all Indonesia.

(3) The actual movement of demand for international and domestic passengers at BIA from 1972 to 1980 has been calculated by multiplying the growth rate of the demand for international and domestic passengers at BIA by the growth rate of the demand for all of Indonesia.

(4) The actual movement was adjusted a small amount by assuming the percentage of international and domestic passengers with respect to the total arrival and departure passenger volume on an annual basis.

The adjusted actual movement for arrival and departure passengers are shown in Table 3.2.4.
The adequency of the adjusted data was checked by the following procedure.

(1) Most of the passengers being accommodated by international flights were foreigners and 60% of the foreigners who arrived or departed at BIA came by exclusive international flights.

(2) The foreigners who come directly are recognized either as exclusive international flight passengers or mixed flight passengers. According to the statistics for visitors to Bali issued by the Indonesian Government, the past data for visitors coming directly to Bali is about 60% of the adjusted past number of arrival passengers by international flights (half the number arrival/departure passengers) being at BIA.

Table 3.2.4 DOM & INT'L PAX. VOLUMES

"as an adjusted table"

(x1,000)

	DOM. PAX (INDONESIAN PAX)	INT'L PAX (FOREIGNER PAX)	TOTAL
1972	80	137	217
1973	108	188	296
1974	127	212	339
1975	149	257	406
1976	177	362	539
1977	215	374	589
1978	253	425	678
1979	293	446	739
1980	340	478	818

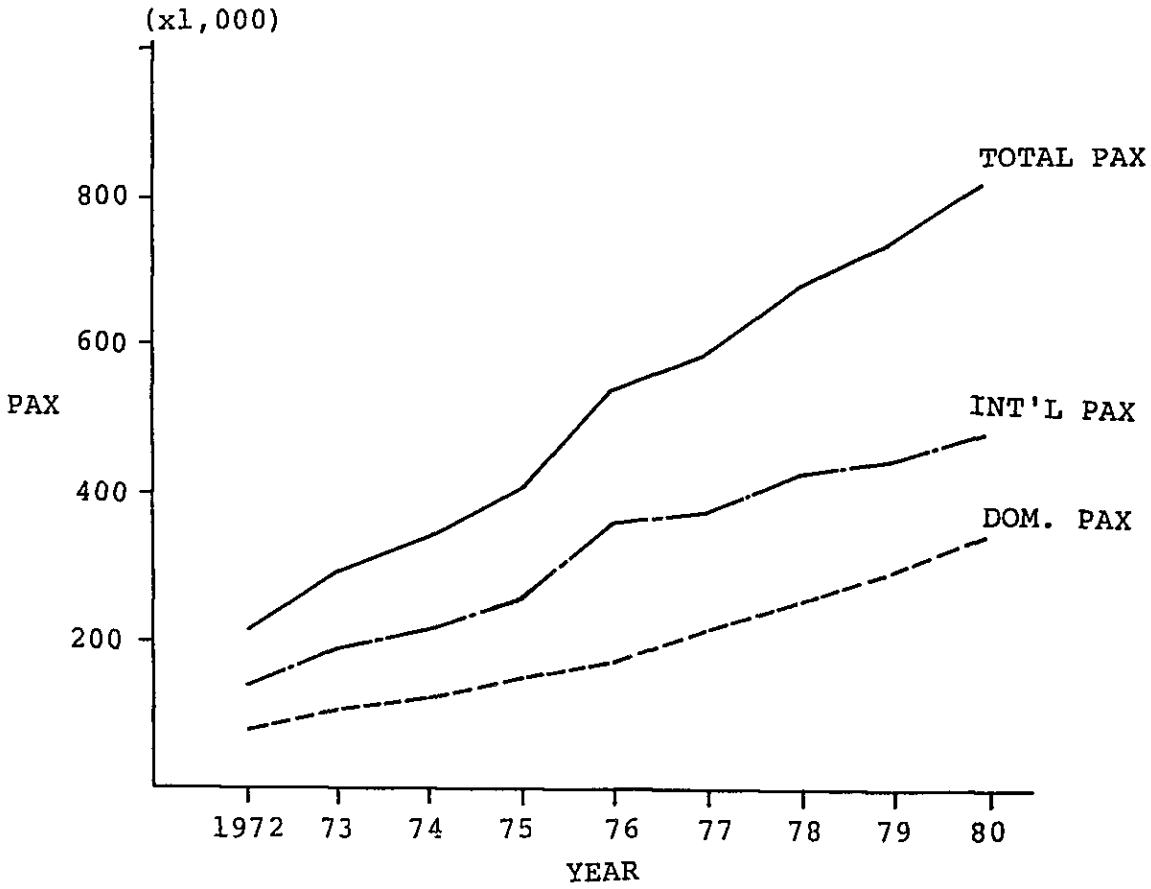


Fig. 3.2.4 DOM. & INT'L PAX. VOLUMES

(3) The above mentioned ratio has remained stable without any difference from 1972 to 1980.

3.3 Demand Forecast for Domestic Passengers and Cargo

The method for forecasting domestic passengers and cargo demand is as follows:

(1) It can be assumed that the domestic air traffic of a country is correlated to its level of its economic activity. This assumption is verified in Figs.3.3.1 and 3.3.2, in which the relationship between air traffic demand and per capita Gross National Product (GNP) are shown for 8 countries (India, Indonesia, Philippines, Korea, Malaysia, Brazil, Japan and USA) which have different levels and stages of economic development. Accordingly, the correlations shown in Table 3.3.1 obtained from Figs.3.3.1 and 3.3.2 are considered to forecast the demand levels for domestic air passengers and cargo.

Table 3.3.1 Correlation between Domestic Air Traffic Demand and GNP

Traffic	Correlation equation	Correlation Coefficient
Passengers	ln P/N = -4.1102 + 1.2094 ln GNP/N	$r^2 = 0.9603$
Cargo	ln C/N = -2.6808 + 1.3488 ln GNP/N	$r^2 = 0.8969$

Note: P/N : Air passengers per 1,000 population (Number)

C/N : Cargo volume per 1,000 population (Ton)

GNP/N: Per capita GNP (US$)

(2) In the projections for air traffic demand, the future GNP values must be established. For this purpose, high, medium and low values of projected GNP together with the growth

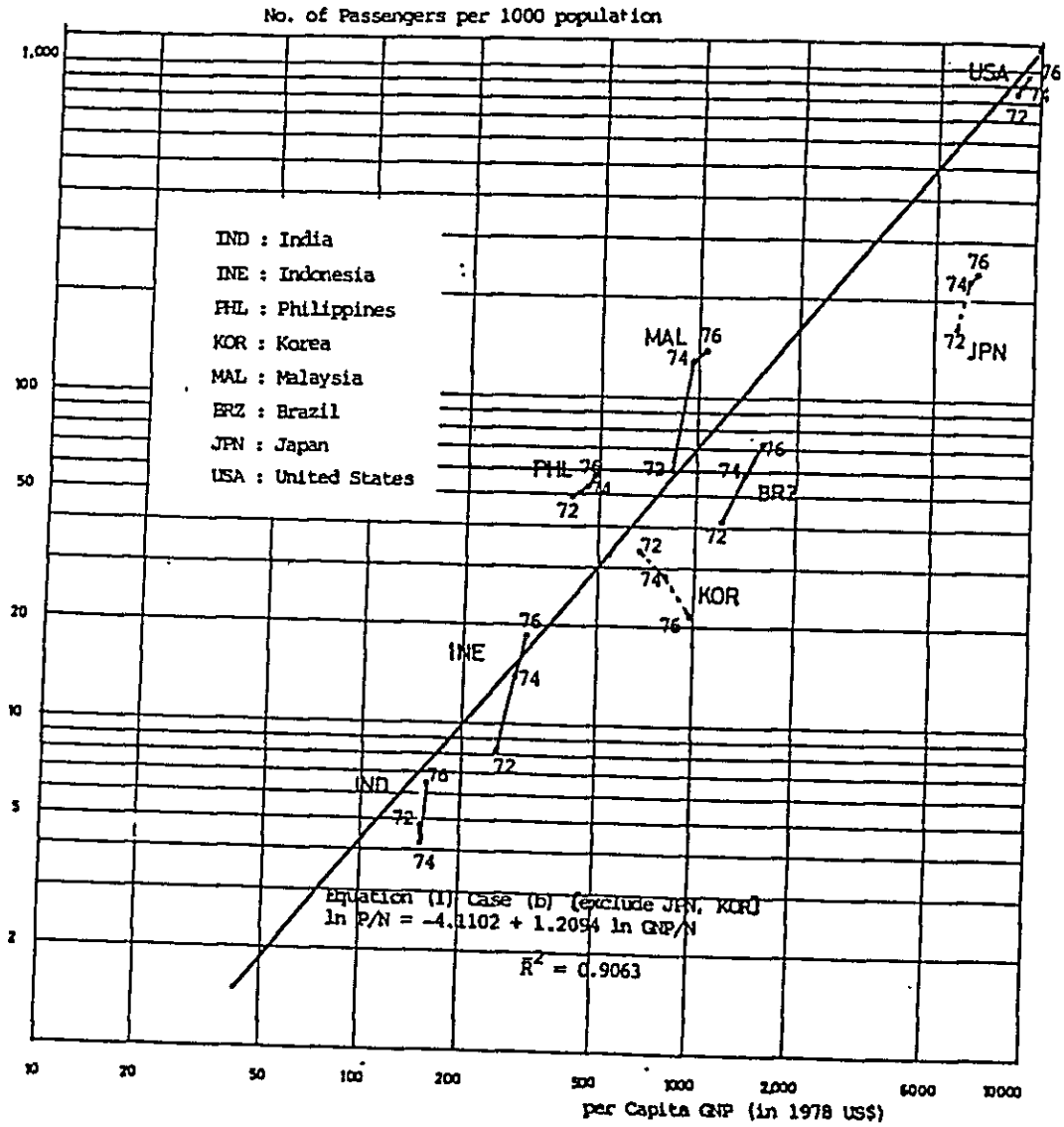


Fig. 3.3.1 DOMESTIC PASSENGER TRAFFIC
(1972, 74, 76)

Source: 1.No of Passenger
"Airline Traffic - Volume 2"(ICAO)
1971-
2.Per Capita GNP
"International Financial Statistic"
(IMF) 1980

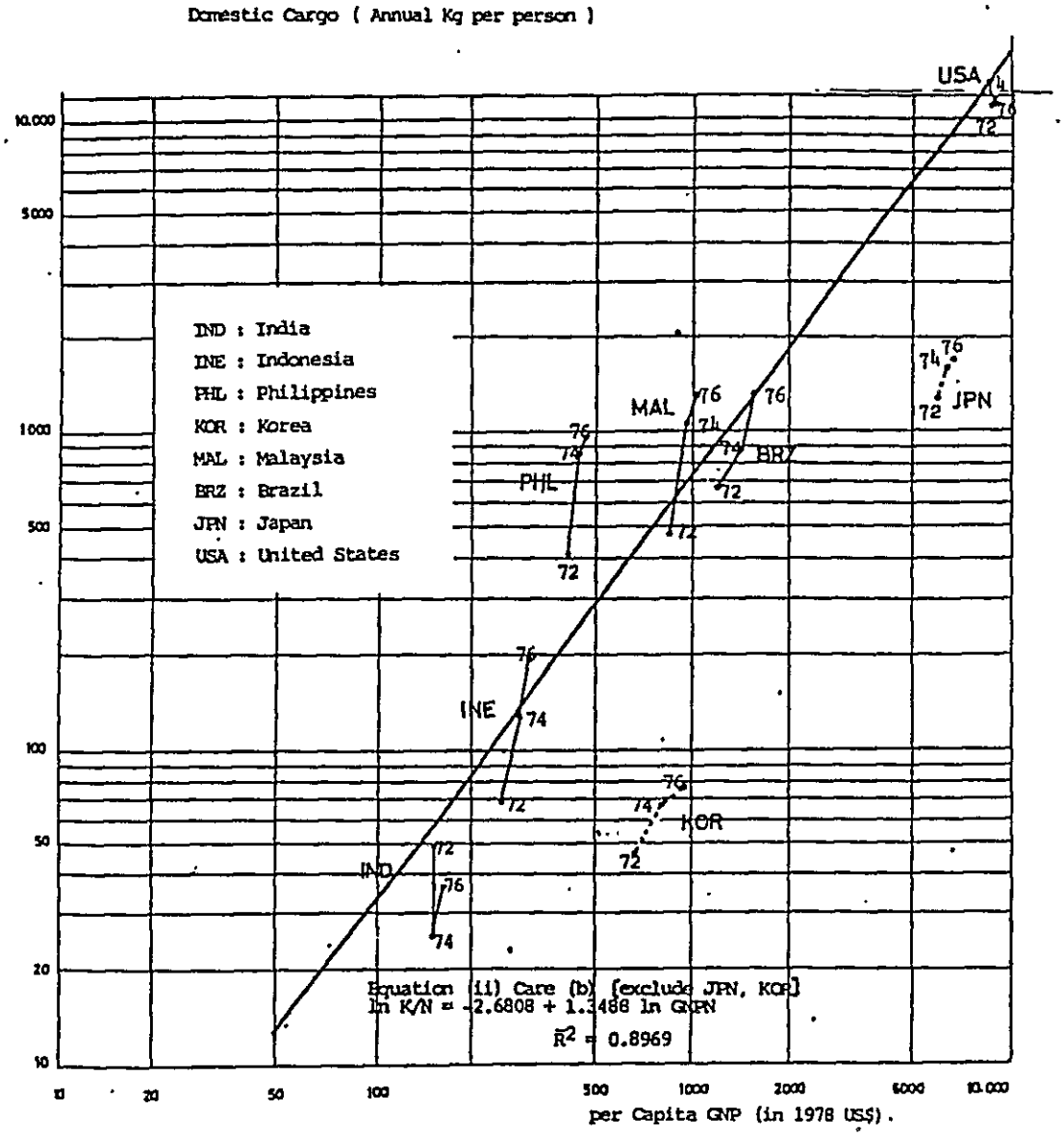


Fig. 3.3.2 DOMESTIC CARGO TRAFFIC
(1972,74,76)

Source: 1. No of Cargo
"Airline Traffic - Volume 2" (ICAO)

2. Per Capita GNP
"International Financial Ststistic"
(IMF) 1980

rate in Indonesia are forecast as shown in Table 3.3.2.

Table 3.3.2 Projected GNP Values and Growth Rate

GNP / Capita	Year			
	1980	— 1990	— 2000	— 2010
High	171,100	(5.6) 296,400	(5.6) 511,200	(5.2) 1,005,600
Medium		(5.2) 284,000	(5.5) 485,000	(5.2) 805,200
Low		(5.0) 278,700	(5.0) 453,000	(5.0) 740,000

Note : (1) Unit: Rupiah
(2) Values in parentheses indicate forecast growth rate (%)

Applying the above forecast GNP values to the equations given in Table 3.3.2, air traffic demand for the future are forecast and from these values growth rates for future air traffic demands can be estimated as shown in Table 3.3.3 .

Table 3.3.3 Forecast Growth Rate for Domestic Air Traffic Demand in Indonesia

Traffic	GNP	1980 - 1990	1990 - 2000	2000 - 2010
Passenger	High	13.1	7.8	7.4
	Medium	11.2	8.8	6.9
	Low	8.9	8.5	7.5
Cargo	High	12.1	8.7	7.7
	Medium	10.3	8.8	8.3
	Low	7.3	9.6	7.7

(3) Based on the above growth rates for air traffic demand in Indonesia, the growth rate of air traffic demand for BIA in future are conservatively forecast as tabulated below based on past records for the growth rate of BIA (1972 - 1980) and an evaluation of the regional characteristics of Bali Island which are described below.

The projected growth rate for domestic passengers of BIA shown in Table 3.3.4 are based on the results of studies of factors such as total number of projected values of international passengers (which is mentioned in a later section), the above preliminary projected values for domestic passengers, the regional characteristics of Bali and its hinterland, and the maximum available capacities for hotel accommodation as a specific factor.

With regard to the growth rate for domestic cargo of BIA, it is forecast based on the past records of Indnesian cargo growth rate as shown in Table 3.3.4.

Table 3.3.4 Projected Growth Rates for Domestic Passengers and Cargo of BIA

Unit: Percent

year / Traffic	1980 - 1990	1990 - 2000	2000 - 2010
Passengers	13.0	7.5	5.0
Cargo	12.0	10.0	9.0

3.4 Demand Forecast for International Passenger and Cargo

3.4.1 International Passenger Traffic

The method for forecasting international passengers demand is as follows:

(1) The past data concerning the international passengers of BIA show that about 85% are from 8 countries: Japan, USA, France, Italy, W. Germany, England, Australia and New Zealand. It has been shown that there is a close correlation between the number of international passengers of BIA from above 8 countries during the period of 1972 - 1980 and the average per capita incomes of these 8 countries during the same period.
Therefore, it is considered that the future international passenger demand for BIA can be forecast based on the above relationship.

(2) Although the forecast of per capita incomes of these 8 countries is difficult on the estimation, trend analysis results in a close correlation to the average per capita income of 8 countries during the period of 1972 - 1978.
This tendency is assumed to continue in the future, and accordingly, the forecast the future average per capita income of 8 countries is adopted as the basis for forecasting international passenger demand. The correlations between per capita income and for international passengers are shown in Table 3.4.1.

Table 3.4.1 Correlation between Per Capita Income and International Passengers Demand

	Correlation Equation	Correlation Coefficient
Average per capita income of 8 countries	Nt = -6287.7 + 829.22 In T	r = 0.9902
International passengers of BIA	In P = 5,8961 + 2,0276 In Nt	r^2 = 0.9339

where; Nt: Average per capita income at the year t (1000 US$)

T : Year

P : International air passengers of BIA in the year t (1000 passengers)

(3) International demand calculated from the correlation shown in Table 3.4.1 above is considered to be modified in connection with the present condition of BIA to improve the accuracy of the forecast.
To improve the accuracy a coefficient is obtained from the actual average per capita income of 8 countries to the correlation equations in Table 3.4.2 and the actual number of international passengers of BIA. Thus, the modified growth rates of international passengers of BIA are forecast as shown in Table 3.4.2 .

Table 3.4.2 Forecast Growth Rates of International Passengers of BIA

	1980	1990	2000	2010
Average per capita income of 8 countries (US$)	6,790	10,970 (4.9)	15,120 (3.3)	19,260 (2.4)
Growth Rate (%)		10.2	6.7	5.0

Note : Figure in ( ) are Growth Rates (%) of average per capita income of 8 Countries

3.4.2 International Air Cargo Traffic

The method for forecasting international air cargo traffic demand is as follows:

(1) As one might expect, there is a close correlation between the per capita tourist purchase of foreign currencies at the Bank Indonesia Denpasar branch office and the volume of international air cargo at BIA. Therefore, the forecast for international air cargo traffic demand is made from this precisely determined relationship.

(2) Concerning the trend of per capita expenditure of foreign currencies in Bali island, past data forms a regression line with a high degree of correlation. Therefore, the correlation equations shown in Table 3.4.3 are considered to forecast the future international air cargo traffic of BIA.

Table 3.4.3 Correlation between Foreign Currency Purchase and International Cargo Traffic of BIA

	Correlation Equations	Correlation Coefficient
Per capita tourist purchase of foreign currencies at Bali Island	Pt = -603,282.9 + 29,517.4 In T	r = 0.8867
International air cargo traffic	Ct = -678,968 + 4,006.6 Pt	r = 0.9992

where; Pt: Per capita tourist purchase of foreign currencies in Bali Island in year t (US$)

Ct: Volume of international air cargo at BIA in year t (1000 t)

T : Year

(3) The same modification was made as described in Section 3.4.1 above, and the future growth rates of international air cargo traffic of BIA was calculated by the same method are summarized in Table 3.4.4. Consequently, international air cargo volumes for the year from 1985 to 2010 are forecast as shown in Table 3.4.6.

Table 3.4.4 Forecast Growth Rates of International Air Cargo Traffic of BIA

	1980	1990	2000	2010
Per capita tourist purchase of foreign currencies at Bali Island	346	722	1,121	1,518
Growth Rate (%)		7.6	4.5	3.0
Modified Growth Rate (%)		12.1	5.6	3.5

Table 3.4.5 DEMAND FORECAST OF DOM. & INT'L PAX.

(X1,000)

	DOM. PAX.	INT'L PAX.	TOTAL
1980	530	288	818
1985	960	490	1,450
1990	1,660	760	2,420
1995	2,380	1,080	3,460
2000	3,360	1,460	4,820
2005	4,290	1,890	6,180
2010	5,470	2,400	7,870

Not include transit (pax.)

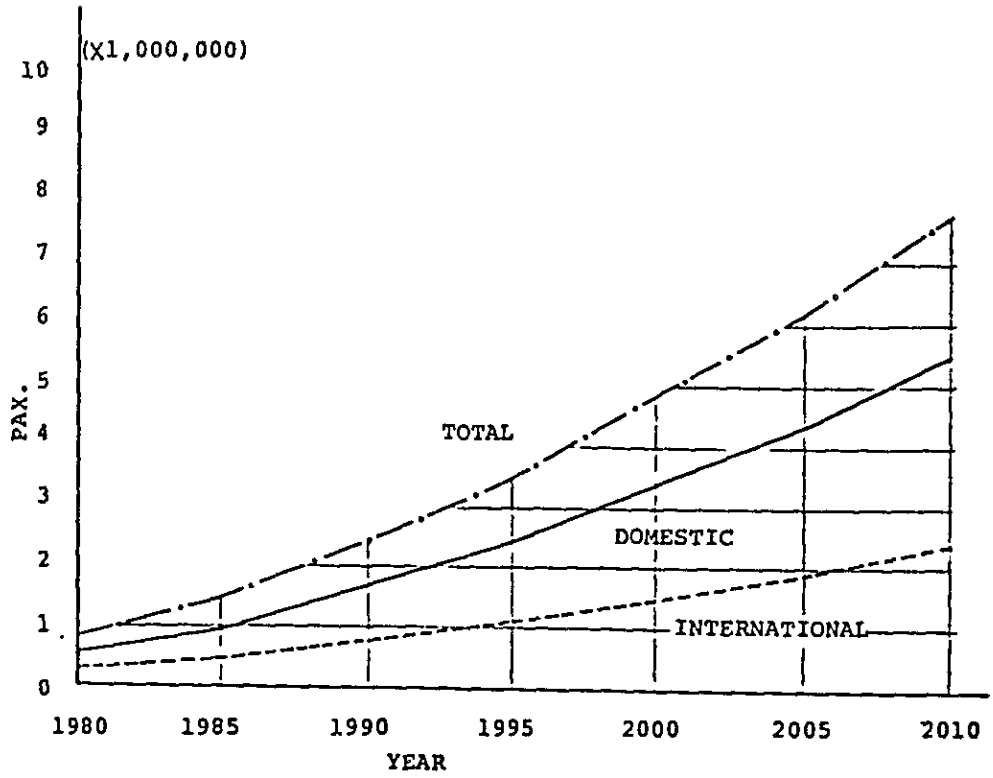


Fig. 3.4.1 DEMAND FORECAST OF DOM. & INT'L PAX.

Table 3.4.6 DEMAND FORECAST OF DOM. & INT'L CARGO

(Unit:Kg.)

Year	Dom.Cargo	Int'l Cargo	Total Cargo
1980	2,294,000	704,000	2,998,000
1985	4,043,000	1,412,000	5,455,000
1990	7,125,000	2,214,000	9,339,000
1995	11,475,000	3,015,000	14,490,000
2000	18,480,000	3,812,000	22,292,000
2005	28,430,000	4,606,000	33,036,000
2010	43,740,000	5,403,000	49,143,000

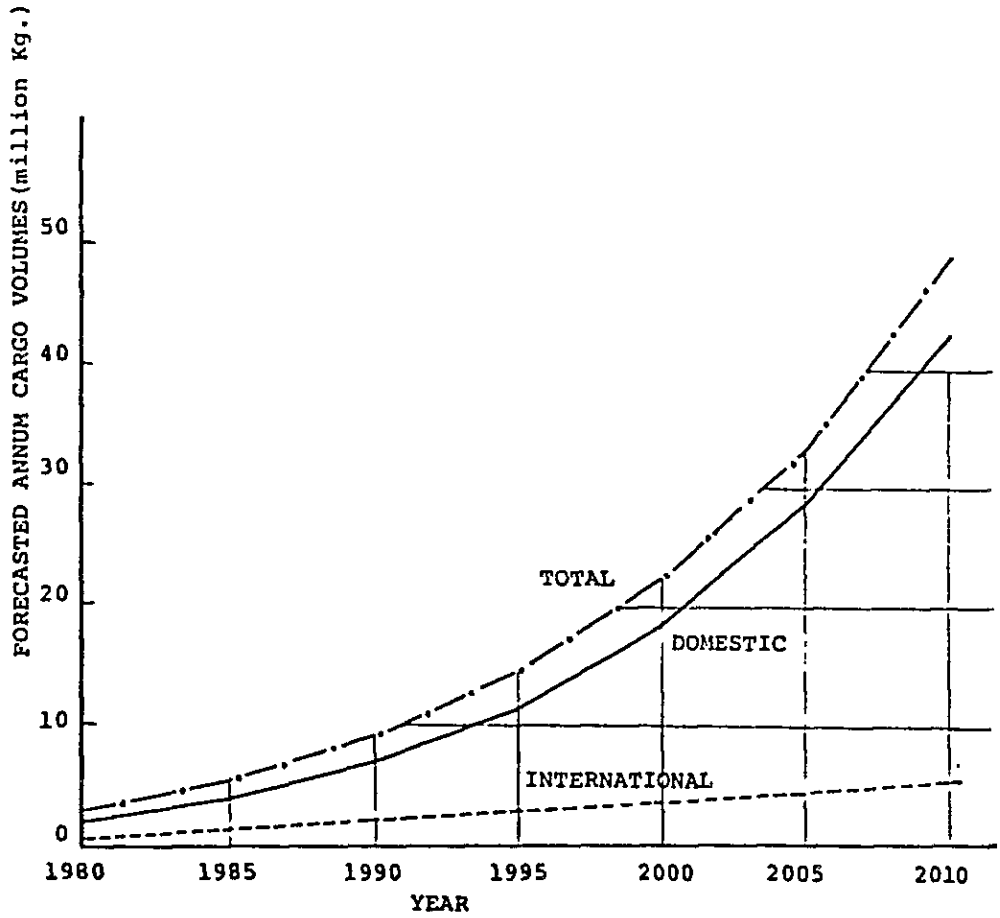


Fig. 3.4.2 DEMAND FORECAST OF DOM. & INT'L CARGO

3.5 Demand Forecast for International / Domestic Transit Passengers

3.5.1 Domestic Transit Passengers

(1) Domestic transit passenger flow at BIA occurs on the air routes between the trunk airline route and local air route to the eastern provinces of Indonesia such as Nusa Tenggara, Barat, Timur, Southern Sulawesi, Naluk, Irian, etc.

(2) In order to determine the relationship among populations of the eastern provinces and the volumes of domestic transit passengers of BIA, the population statistics of the eastern provinces and past domestic transit passengers data were studied. The results show a close correlation which is expressed in the following equation:

$$Pt = 0.02715\ P_E - 322.80 \quad (\gamma = 0.9363)$$

Where, Pt: Domestic transit passenger in year t (1000 passengers)

P_E: Total population of eastern provinces in year t (1000 population)

Based on above correlation equation and the modification by the same method mentioned in Section 3.4.1, the forecast growth rates for future domestic transit passenger of BIA are calculated as shown in Table 3.5.1 .

Table 3.5.1 Forecast Growth Rates for Domestic Transit Passengers of BIA

	1980	1990	2000	2010
Total population of eastern provinces (1000)	13,693	17,528	22,436	28,720
Domestic transit passengers (1000)	38.7	152	288	465
Growth Rate (%)		2.5	2.5	2.5
Modified Rate (%)		13.2	6.6	5.0

3.5.2 International Transit Passengers

To determine the international transit passenger demand of BIA, the traffic volume of international transit passengers and the number of international flights of BIA during the period of 1972 - 1980 were studied. The number of international transit passengers per international flight show a constant tendency except in the year 1980 due to the introduction of wide-body jet aircraft.

Table 3.5.2 below lists the past data on international transit passengers and flights of BIA.

Table 3.5.2 International Transit Passenger Volumes (1973 - 1980)

Year	International transit passengers	International flights	Transit passengers per flight
1973	12,286	2,342	5.2
1974	10,006	2,390	4.2
1975	8,613	5,856	1.5
1976	15,979	5,122	3.1
1977	14,294	2,060	6.9
1978	15,742	1,950	8.1
1979	15,750	1,846	8.5
1980	28,152	1,518	18.5

The active utilization of wide-body jet aircraft on international air routes is likely to continue in the future. Based on this consideration, the unit number of transit passengers per international flight was adopted as 20.

The forecast for the international transit passenger demand is summarized in Table 3.5.3 which was calculated by multiplying the above unit ratio and international flight forecast of BIA presented in Section 3.7.2.

Table 3.5.3 Forecast of International Transit Passenger Demand of BIA

	1980	1990	2000	2010
Forecast No. of International Flights		2,170	4,200	7,400
No. of International Transit Passengers	28,200	43,000	85,000	150,000
Growth Rate (%)		4.3	7.0	5.8

Table 3.5.4 DOM. & INT'L TRANSIT PAX'S DEMAND FORECAST

(X1,000)

	DOM. PAX..	INT'L PAX.	TOTAL
1980	23.8	28.2	52.0
1985	96.0	30.0	126.0
1990	152.0	43.0	195.0
1995	214.0	60.0	274.0
2000	288.0	85.0	373.0
2005	372.0	115.0	487.0
2010	465.0	150.0	615.0

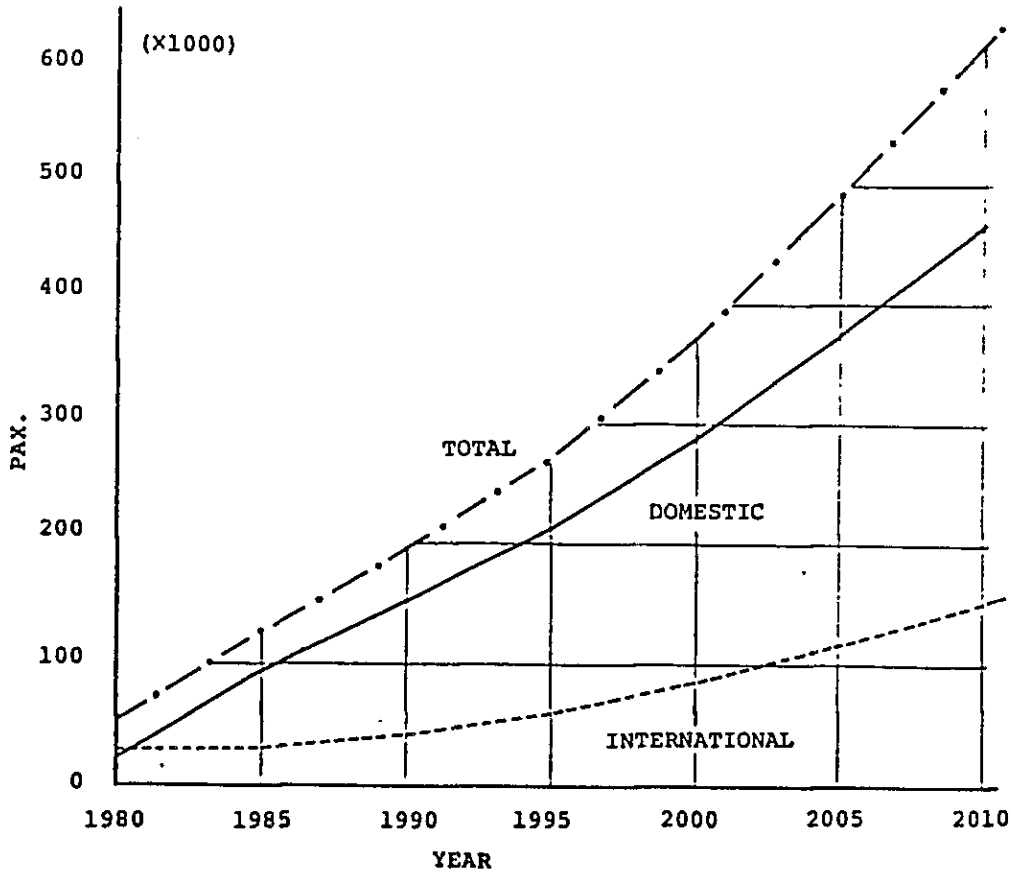


Fig. 3.5.1 DOM. & INT'L TRANSIT PAX'S DEMAND FORECAST

3.6 Verification of Passenger Forecast Demand

To verify the appropriateness of the forecast values for passengers in the year 2010, the forecast value was compared with the capacity of hotel accommodations of Bali Island. The present number of hotel and inn rooms are 4,560. Considering this existing condition, the capacity of hotels under construction and in planning, and the indicators of future hotel construction such as land zoning and the development plans for infra-structures for these lands, etc., the number of new rooms added by the year 2010 is expected to be as follows:

	Additional Rooms by 2010
Hotels	About 8,500 rooms
Inns	About 6,000 rooms

Based on the above consideration, the total number of rooms in the year 2010 will be 19,060 (=4,560 + 8,500 + 6,000). Assuming that the average stay per person was 3 days and the number of guests per room in the peak season was 1.8, then the maximum annual capacity of hotel accommodation of Bali Island in the year 2010 is estimated as follows:

	Rooms		Guests/ room		Days		Days/ Guest room	
N =	19,060	x	1.8	x	365	÷	3	= 4,174,000 Guests

Since the forecast number of arriving and departing passengers in the year 2010 is 7,870,000, the number of passengers staying in Bali Island will be half this volume or 3,935,000 guests. This value is within the estimated maximum capacity of hotel accommodations (4,174,000 guests). Accordingly the forecast passenger demand is verified to be a reasonable one.

Table 3.6. 1 . TABLE OF PAX'S DEMAND FORECAST

(Unit: x1000 PERSONS)

YEAR	DOMESTIC			INTERNATIONAL			TOTAL		GROUND TOTAL
	PAX	TRAN-SIT	1 SUB TOTAL	PAX	TRAN-SIT	2 SUB TOTAL	PAX	TRAN-SIT	1 + 2
1985	626	96	722	824	30	854	1.450	126	1.576
1990	1.150	152	1.302	1.270	43	1.313	2.420	195	2.615
1995	1.660	214	1.874	1.800	60	1.860	3.460	274	3.734
2000	2.380	288	2.668	2.400	85	2.485	4.780	373	5.153
2005	3.030	372	3.402	3.150	115	3.265	6.180	487	6.667
2010	3.870	465	4.335	4.000	150	4.150	7.870	615	8.485

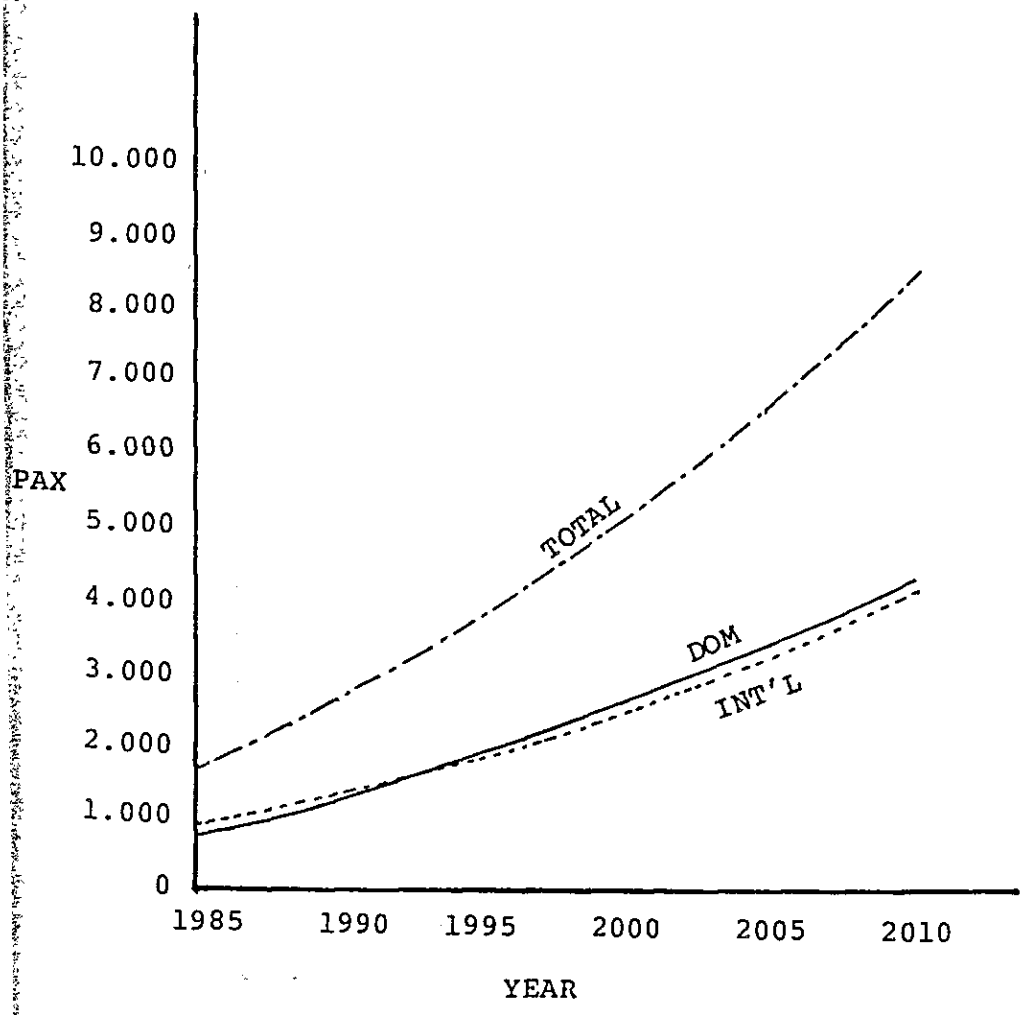


Fig. 3.6.1 NUMBER OF PAX'S DEMAND FORECAST

3.7 Breakdown of Air Traffic Volume

3.7.1 Assumptions

For the computation of the scale of facilities at the airport, the ICAO and FAA recommendations are followed and the demand at a peak hour on the average day of a peak month are used as basic project values.

The computation process is based on the flow indicated in Fig. 3.7.1. In the following, the calculation of coefficients, etc., required for the computation are discussed.

(1) Composition of Routes

(a) International Routes

The international flight services of Bali International Airport consist of four routes to and from Australia (Sydney, Melbourne, Darwin and Perth), a route to and from Tokyo and two routes to and from Hong Kong and Singapore via Jakarta (some of flights are mixed). In conjunction with a rise in the number of passengers on international flights, the number of routes will presumably increase but there is no clear evidence at present to qualify this possibility. For this reason, it is hypothesized here that the composition of international routes will remain the same in the future as at present.

Moreover, judging from annual passenger forecast, the routes of Sydney and Melbourne are expected to be the same present routes as the triangle of DPS-SYD-MEL or DPS-MEL-SYD until the year 2000.

(b) Domestic Routes

At present, GIA and MNA have scheduled flight services to Bali International Airport. There also are about 20 airports which might be linked to Bali. Some of

the airports are situated on the same island, and some are pioneer air routes with an exceedingly small transport volume. For this reason, future routes to the east of Bali are predicted here on the condition that one airport would represent one island.

Table 3.7.1 Anticipated Routes

Island	Airport	Representative Airport	City
-	Halim	Halim	JAKARTA (JKT)
-	JOGYA	Jogya	JOGYA (JOG)
-	Juanda	Juanda	SURABAYA (SUB)
LOMBOK	Rembiga	Rembiga	AMPENAN (AMI)
SUMBAWA	Sumbawa BIMA	Sumbawa	SLMBAWA (SWQ)
SUMBA	Wingapu Tambolaka	Wingapu	WINGAPU (WGP)
FLORES	Ruteng Ende Maumere	Maumere	MAUMERE (MOF)
TIMOR	Kupang Dili	Kupang	KUPANG (KOE)
SULAWESI	Ujung Pandang	Ujung Pandang	UJUNG PANDAN (UPG)
	Other		

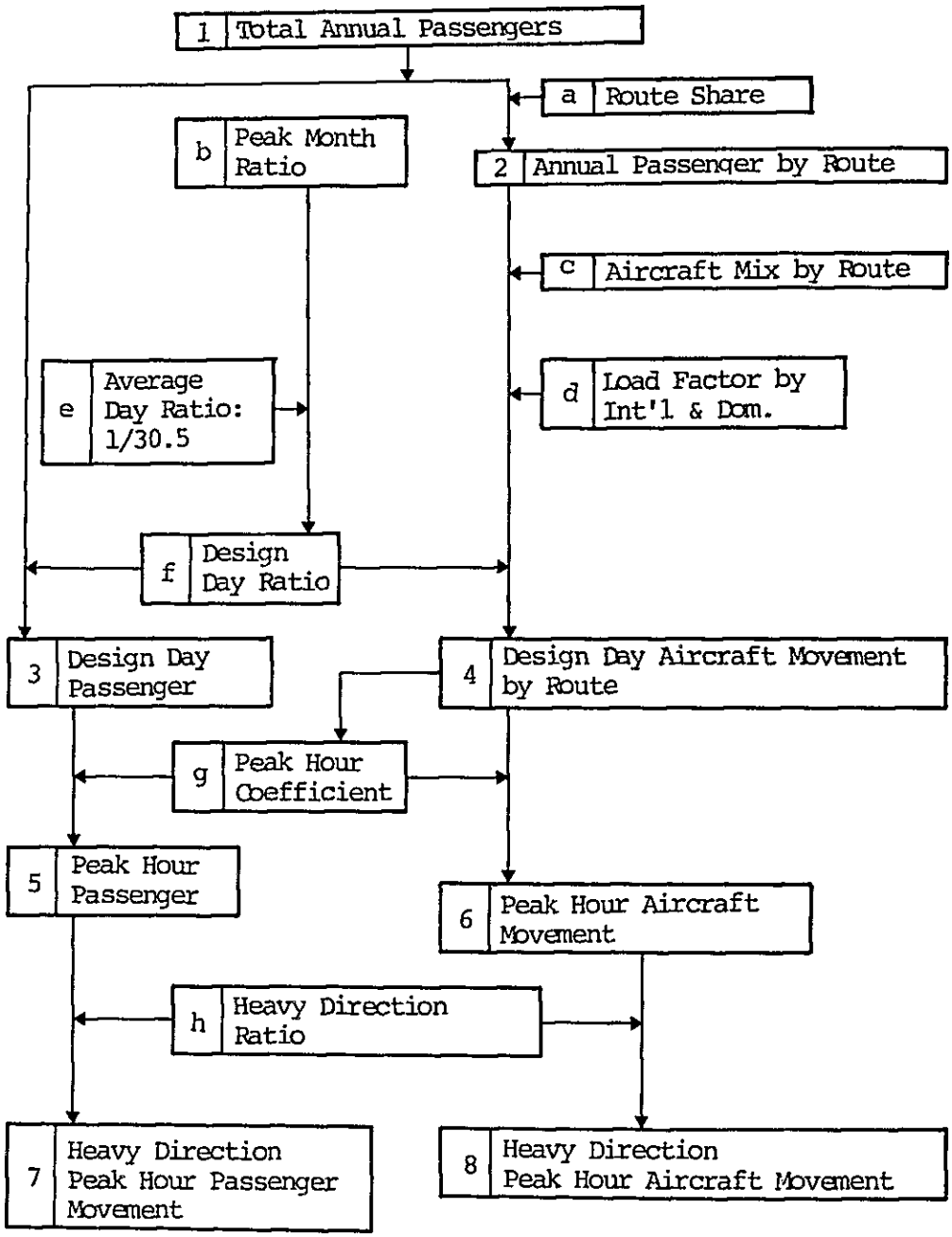


Fig. 3.7.1 FLOW CHART BREAKING DOWN AIR TRAFFIC VOLUME

Note: Design basis is peak hour traffic of an average day of the peak month.

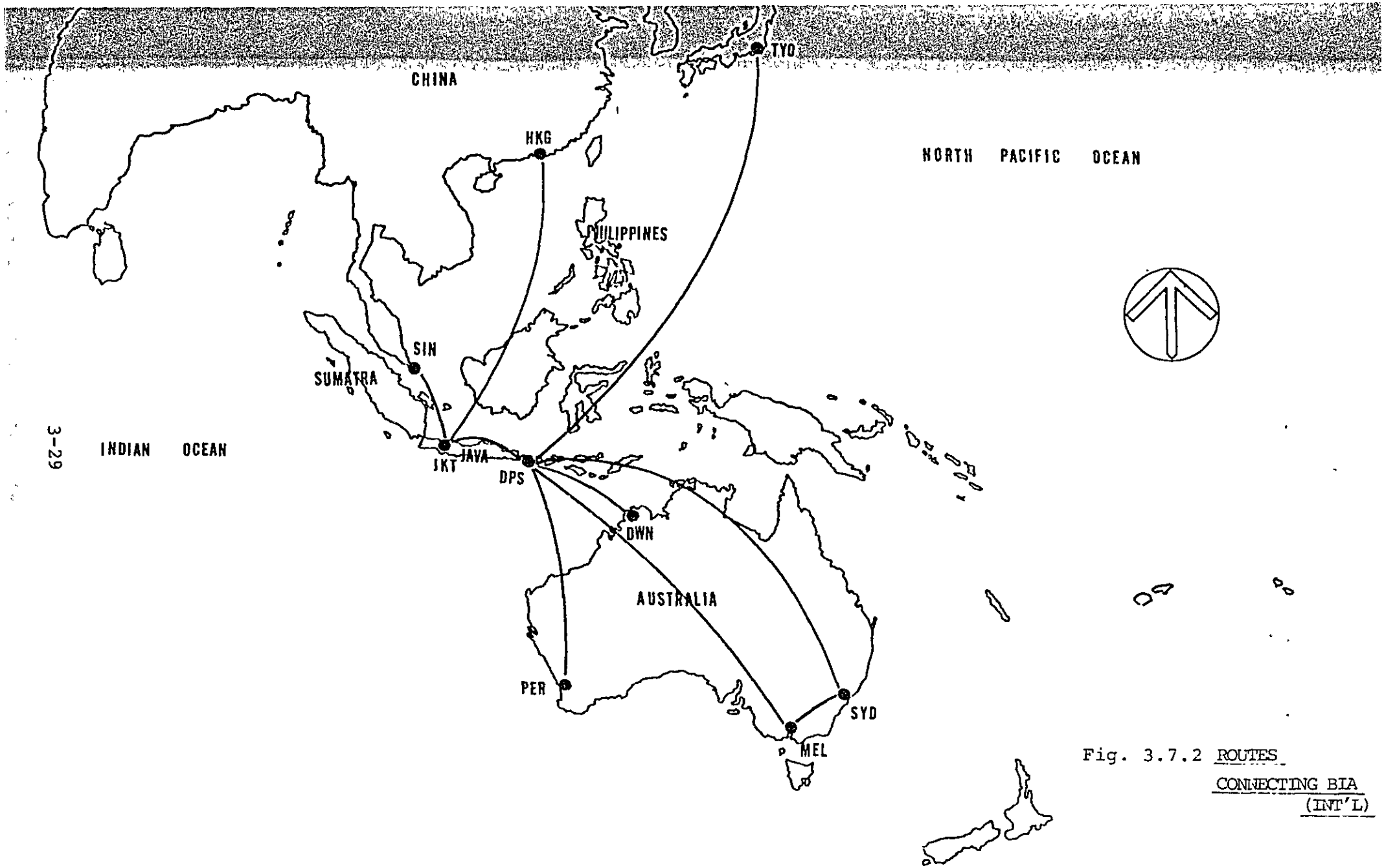


Fig. 3.7.2 ROUTES CONNECTING BIA (INT'L)

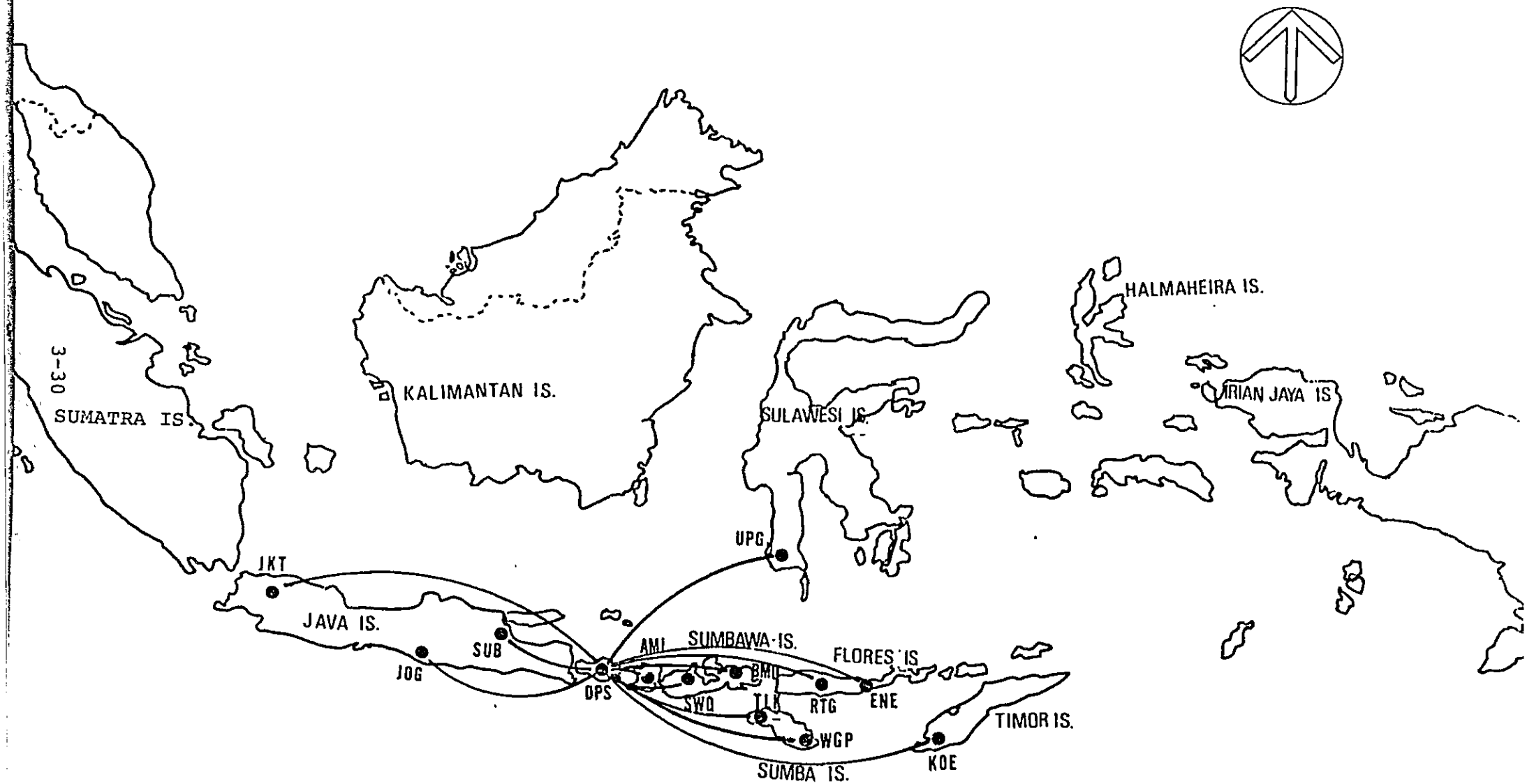
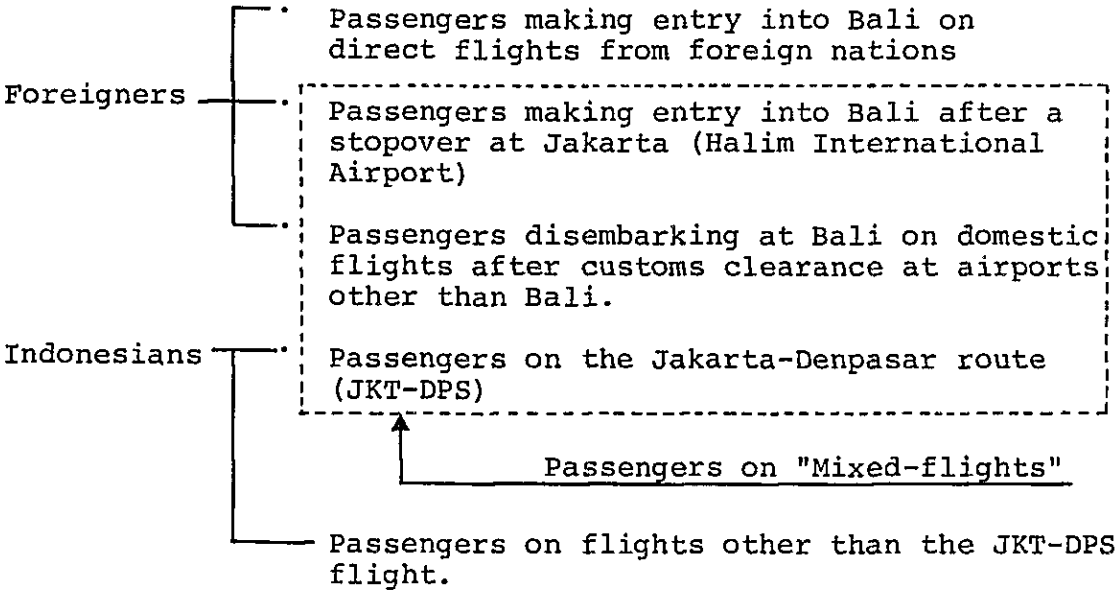


Fig. 3.7.3 AIR ROUTE CONNECTING BIA (DOM.)

(2) Demand by Routes

Passengers embarking and disembarking at Bali International Airport may be classified by route, port of entry and nationality as follows:



As indicated above, the composition of passengers on the routes to and from Bali is complicated and it is difficult to distinguish them with clarity.

The main cause of the above mentioned classification is that Qantas is the only international airline operating to Bali International Airport, and international passengers other than from Japan and Australia are carried between Jakarta Denpasar together with domestic passenger by the same flight. This is called a "Mixed Flight" in this Report.

The route traffic demand forecast is calculated on assumption that mixed flights will be continued for the time being.

Given this limitation, passengers are distinguished, as indicated in Fig. 3.7.4 for the computation of the demand of routes on the basis of statistics of Bali's tourism and fluctuations in the number of foreign tourists by nation.
The share of each route is shown in Tables 3.7.2 and 3.7.3. The process in which the demand by route is computed is elaborated in the APPENDIX 3.7.1 - 3.7.7, and the results are shown in the Table 3.7.4.

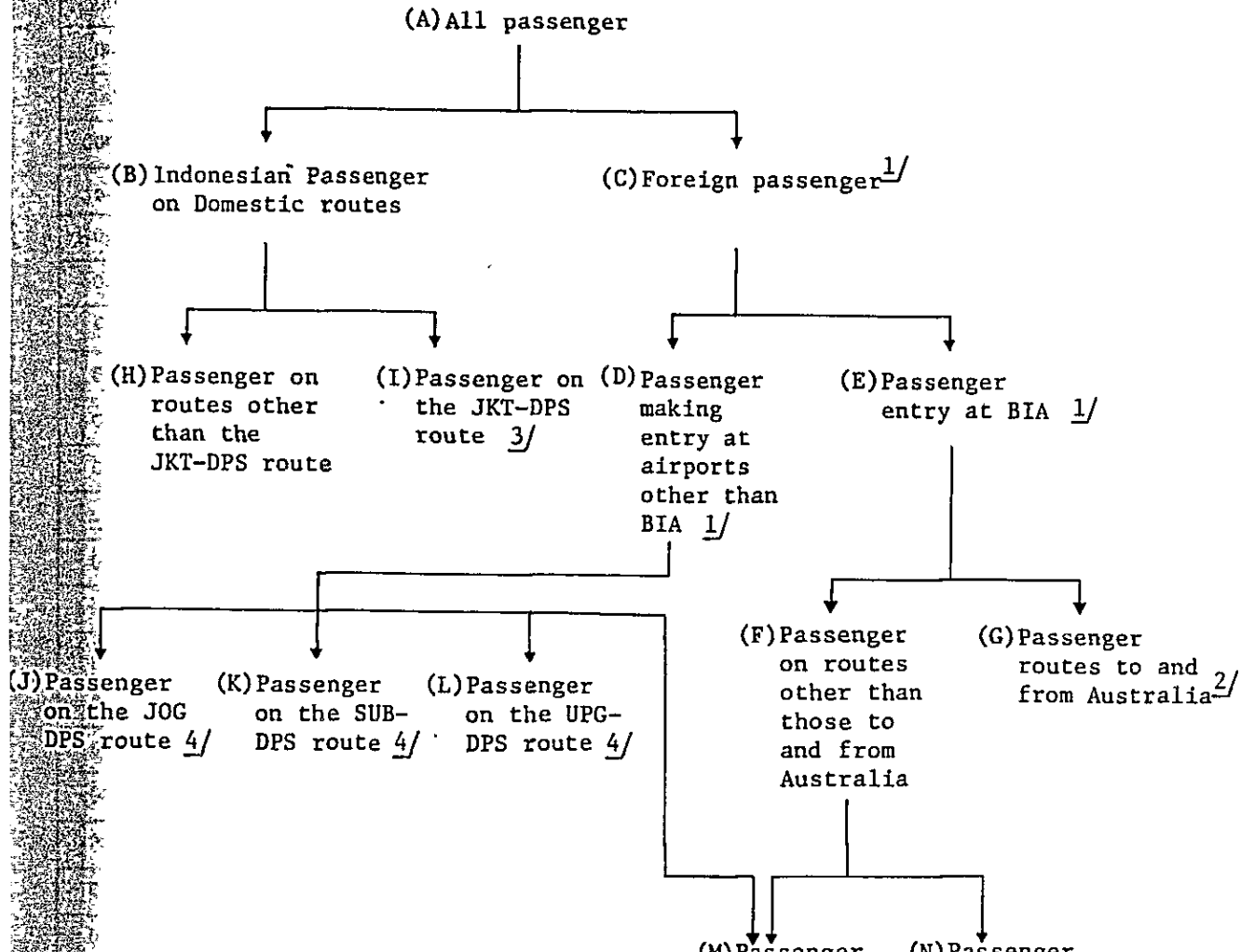
Table 3.7.2 SHARE OF INDONESIAN PASSENGERS BY ROUTE

Route - DPS	Share
JKT	33.5%
JOG	11
SUB	15
AMI	18.5
SWQ	3
WGP	1.5
MOF	0.5
KOE	10
UPG	5
OTHER	2
TOTAL	100%

Table 3.7.3 SHARE OF ROUTE TO AND FROM AUSTRALIA BY ROUTE

Route - DPS	Share
SYD (Sydney)	48.9%
DRW (Darwin)	4
PER (Perth)	24
MEL (Melbourne)	23.5
TOTAL	100%

Fig. 3.7.4 COMPOSITION OF BIA'S PASSENGER



1/ (C) = (D) + (E)
100% 40% 60%

2/ Rate of (G) to (C)

1985 - 2010
(about 34%) (about 50%)

3/ Passenger on Mixed JKT-DRS flights

4/ (JOG-DPS):(SUB-DPS):(UPG-DPS) = 1:0.5:0.5

5/ Rate of (N) to (E) about 10 - 11 %

Table 3.7.4 DEMAND FORECAST OF PAX. ON DOM. & INT'L ROUTES

ROUTE \ YEAR			1985	1990	1995	2000	2005	2010
INT'L	JKT		(167,000)	(219,000)	(254,000)	(294,000)	(278,000)	(230,000)
	SYD		139,000	237,000	369,000	530,000	732,000	991,000
	DRW		12,000	20,000	32,000	46,000	64,000	86,000
	PER		69,000	116,000	182,000	260,000	359,000	488,000
	MEL		67,000	113,000	177,000	254,000	351,000	475,000
	TYO		56,000	88,000	126,000	171,000	221,000	280,000
	TOTAL		343,000	574,000	886,000	1,261,000	1,727,000	2,320,000
DOM	JKT	A	167,000	219,000	254,000	294,000	278,000	230,000
		B	160,000	250,000	360,000	490,000	630,000	800,000
		C	250,000	436,000	625,000	900,000	1,147,000	1,446,000
		SUB TOTAL	577,000	905,000	1,239,000	1,684,000	2,055,000	2,476,000
	JOG	B	80,000	125,000	180,000	245,000	315,000	400,000
		C	84,000	146,000	209,000	301,000	383,000	483,000
		SUB TOTAL	164,000	271,000	389,000	546,000	698,000	883,000
	SUB	B	40,000	63,000	90,000	122,000	158,000	200,000
		C	114,000	198,000	283,000	409,000	521,000	655,000
		SUB TOTAL	154,000	261,000	373,000	531,000	679,000	855,000
	AMI		136,000	238,000	341,000	492,000	626,000	790,000
	UPG	B	40,000	62,000	90,000	123,000	157,000	200,000
		C	38,000	67,000	95,000	137,000	175,000	220,000
		SUB TOTAL	78,000	129,000	185,000	260,000	332,000	420,000
	KOE		77,000	133,000	192,000	277,000	352,000	445,000
	SWQ		20,000	35,000	50,000	73,000	92,000	117,000
	WGP		12,000	20,000	29,000	42,000	55,000	69,000
	MOF		2,000	6,000	8,000	11,000	13,000	17,000
	Other		13,000	23,000	32,000	46,000	58,000	73,000
	TOTAL		1,233,000	2,021,000	2,838,000	3,692,000	4,960,000	6,145,000
T O T A L			1,576,000	2,595,000	3,724,000	5,223,000	6,687,000	8,465,000

Note: A; Foreign Passengers coming by mixed flight and making entry at BIA.

B; Foreign Passengers making entry at airports other than BIA, and coming by domestic or mixed flight.

C; Indonesian Passenger

Figures in ( ) are excluded from TOTAL.

Mixed-flight between JKT-DPS is included in "DOM".

(3) Assigned Aircraft by Route

(a) Classification of Aircraft

The aircraft which are expected to be assigned to Bali in the future are classified in Table 3.7.5 on the basis of:

i) The sizes and numbers of seats of aircraft which are possessed by Indonesian airlines and foreign airlines which have opened flight services to Bali.

ii) FAA's projected value and Civil Aviation Bureau of Japan design value.

Incidentally, particular attention is drawn to the following points for the classification.

i) It is hypothesized that Indonesia airlines present aircraft characteristics will remain unchanged in the next 10 years as indicated in Table 3.7.6 .

ii) The number of seats in each airplane is based on the actual figure.

iii) According to data of airlines, it is expected that aircraft will undergo the following changes in the near future.

- In future, the number of wide-bodied aircraft and F-28-4000s and other small jets will increase. The DC-9's 30 Series will be replaced by the 80 Series.
- Large and medium propeller aircraft will be decomissioned in conjunction with the development of each airport.
- There will arise the necessity of adopting 150-seat size aircraft which comes between new medium jets and prevailing small jets.

Table 3.7.5 CLASSIFICATION OF AIRCRAFT IN THIS SURVEY (No.1)

Aircraft	INT'L/DOM	Project Year	No. of Seats	Description
Jumbo (J)	INT'L	1985 - 2010	432	The average value of 425 seats for B-747 on GIA's international route and QF's 439
	DOM	1985 - 2010	485	In actuality, passengers on international routes are mixed with those on domestic routes, so that the average number of seats of the all-economy plane (544 seats) and the plane with a mixture of first-class and economy seats (425 seats) is adopted.
Wide-Bodied (WB)	INT'L	1985 - 1995	270	The same as the number of GIA's DC-10-30's seats
		2000 - 2010	350	The number of seats are increased by engine power up
	DOM	1985 - 1990	283	The average number of seats of GIA's A300 (284 seats in a mixture of first-class and economy-class or 302 seats in an all-economy class) /1
		1995	305	The number of seats practically the same as GIA's DC-10 or A300 with economy-class seats only
		2000 - 2010	350	The number of seats are increased by engine power up
New Medium Jet (NMJ)	INT'L DOM	1985 - 2010	230	B-767 or DC-9-80 is expected
Medium Jet (MJ)	INT'L DOM	1985 - 1990	105	DC-9-30 is expected
		1995 - 2010	150	The number of seats are increased by engine power up

/1 for DC-10: 270 seats in a mixture of first-class and economy-class

CLASSIFICATION OF AIRCRAFT IN THIS SURVEY (No.2)

Aircraft	INT'L/DOM	Project Year	No. of Seats	Description
Small Jet (SJ)	DOM	1985 - 2010	65 - 85	F-28-1000 or 4000 is assumed
Large propeller (LP)	DOM	1985 - 2010	135	VC-9 class is assumed
Small propeller (SP)	DOM	1985 - 2010	60	HS-748, VC-8 or F-27 is assumed
STOL	DOM	1985 - 2010	20	DHC-6 or CN-235 class is assumed

Table 3.7.6 AIRCRAFT CLASSIFICATIONS FOR DOMESTIC FLIGHTS CURRENTLY USED

<table>
<tr><th colspan="4">CLASSIFICATION BY</th></tr>
<tr><th>Present fleet of Indonesia</th><th>Previous Studies* for Indonesian Domestic Airports</th><th>Japanese C.A.B. Design basis for 1990</th><th>F.A.A.</th></tr>
<tr><td rowspan="2">Jumbo : B747
(425 - 544)
↑ ↑
18F/ All
407Y economy</td><td></td><td rowspan="2">Jumbo: B747
(525)</td><td>Special B747
(421 - 500)</td></tr>
<tr><td>B747 Type
(350)</td><td>B-747
(341 - 420)</td></tr>
<tr><td rowspan="2">LTJ (Wide Body):
DC10, A300,
(308) (302)
All economy
or
24F/246Y 8F/266Y
(270) (284)</td><td>Wide Body:
DC10, A300B
(250)</td><td rowspan="2">Airbus:
DC10, L1011
(370)</td><td>Special DC10/
(281 - 340)</td></tr>
<tr><td rowspan="2">Small Wide Body:
A310, B767
(180)</td><td rowspan="3">Medium Jet:
B767, DC9-80
(230)</td><td>DC-10, L1011,
A300
(211 - 280)</td></tr>
<tr><td rowspan="2">LTP1 : VC9
(133)</td><td rowspan="2">Medium Capacity:
DC-9
(102)</td><td>DC-861, NSA
(161 - 210)</td></tr>
<tr><td rowspan="2">MTJ: DC-9-30
(102)</td><td rowspan="2">Small Jet:
DC-9 (165)</td><td>DC8, B707,
B727, DC9-50
(111 - 160)</td></tr>
<tr><td rowspan="2">LTP2 : L188 (93)</td><td rowspan="3">Low Capacity:
F28, F27
(65)</td><td>B737, B727-
100, DC9-30
(81 - 110)</td></tr>
<tr><td rowspan="2">STJ F-28
(65 - 85)</td><td rowspan="2">Propeller:
YS11
(64)</td><td rowspan="2">DC-9-10,
BAC111
(61 - 80)</td></tr>
<tr><td rowspan="2">MTP : VC8, F27
(44 - 68)</td><td rowspan="2">Light Aircraft:
DHC-6,
BN 2 A (30)</td></tr>
<tr><td rowspan="2">STP: Cassa 212
DHC-6, DC-3
(10 - 30)</td><td rowspan="2">STOL:
DHC - 6
(19)</td><td>CV580, YS-11,
M404, F227
(40 - 60)</td></tr>
<tr><td></td></tr>
</table>

* Selected seven domestic airports study.

- MNA is scheduled to decommission HS748, VC-8s and VC-9s within the next five years and increase F-27s and CN-235s.

(b) Forecast of Aircraft likely to be assigned to Bali International Airport by route.

The forecast of aircraft in the future by route is shown in Table 3.7.7 . This composition is worked out with due consideration paid to the aforementioned classification of aircraft and the following matters.

i) International Routes

The existing international routes at BIA and the aircraft used are as follows:

DPS - JKT	DC - 10	(GIA)
	B - 747	(GIA , QF)
DPS - SYD	DC - 9	(GIA)
DPS - MEL	B - 747	(GIA, QF)
DPS - PER	B - 747	(GIA)
	B - 747	(QF)
DPS - DRW	DC - 9	(GIA)
DPS - TYO (NRT)	DC - 10	(GIA)

GIA's DPS-JKT future route flights with a mixture of international and domestic passengers.

As indicated above, all are long-range international routes other than the DPS-DRW route. According to the airlines' policy, aircraft of the DC-10 and larger capacity classes are assigned without relation to the route demand. As this tendency is expected to remain as it is aircraft based on large jet operations are taken into account.

ii) Domestic routes

The domestic routes and commissioned aircraft at BIA at present are as follows:

DPS - JKT	DC - 10	(GIA)
	B - 747	(GIA)
	DC - 9	(GIA)
DPS - JOG	DC - 9	(GIA)
DPS - UPG	A - 300	(GIA)
	F - 28	(GIA)
	HS - 748	(MNA)
DPS - SUB	F - 28	(GIA)
	HS - 748	(MNA)
DPS - KOE	F - 28	(GIA)
DPS - DIL	F - 28	(GIA)
DPS - MOF	HS - 748	(MNA)
DPS - AMI	DHC - 6	(MNA)
DPS - BMU	DHC - 6	(MNA)

According to Repelita III, principal development programs for other airports with routes to and from Bali are as follows:

SUB -- Assignment of DC-10s will be made possible.

UPG -- Ditto

MOF -- Assignment of F-28s will be made possible.

With the aforementioned present situation in mind and with the following matters take into account, the aircraft for domestic routes are assumed as shown in Table 3.7.7. Detailed information is mentioned in the APPENDIX 3.7.8.

i. Of the domestic routes centering on Bali International Airport, GIA

Table 3.7.7 AIRCRAFT MIX PROJECTION BY ROUTE (1) (1985-1990)

Year	Route DPS-		Annual Pax	Aircraft Expected in Services
1985	INT'L	MEL/SYD	206,000	J
		DRW	12,000	MJ
		PER	69,000	J
		TYO	56,000	WB
		TOTAL	343,000	
	DOM	JKT	577,000	J:20, WB:80
		JOG	164,000	MJ
		SUB	154,000	MJ
		AMI	136,000	SP:50, STOL:50
		UPG	78,000	NMJ
		KOE	77,000	SJ
		SWQ	20,000	STOL
		WPG	12,000	STOL
		MOF	2,000	STOL
		Other	13,000	STOL
		TOTAL	1,233,000	
	TOTAL		1,576,000	
1990	INT'L	MEL/SYD	350,000	J
		DRW	20,000	MJ
		PER	116,000	J
		TYO	88,000	WB
		TOTAL	574,000	
	DOM	JKT	905,000	J:50, W:50
		JOG	271,000	MJ
		SUB	261,000	WB:70, MJ:30
		AMI	238,000	SJ
		UPG	129,000	WB:50, SJ:50
		KOE	133,000	MJ
		SWQ	35,000	SP
		WPG	20,000	STOL
		MOF	6,000	STOL
		Other	23,000	STOL
		TOTAL	2,02J,000	
	TOTAL		2,595,000	

AIRCRAFT MIX PROJECTION BY ROUTE (2) (1995-2000)

Year	Route DPS-		Annual Pax	Aircraft Expected in Services
1995	INT'L	MEL/SYD	546,000	J
		DRW	32,000	MJ
		PER	182,000	J
		TYO	126,000	J
		TOTAL	886,000	
	DOM	JKT	1,239,000	J:60, WB:40
		JOG	389,000	NMJ:40, MJ:60
		SUB	373,000	WB
		AMI	341,000	MJ:40, SJ:60
		UPG	185,000	WB:50, MJ:50
		KOE	192,000	MJ
		SWQ	50,000	SJ
		WPG	29,000	SP:50, STOL:50
		MOF	8,000	STOL
		Other	32,000	STOL
		TOTAL	2,838,000	
	TOTAL		3,724,000	
2000	INT'L	MEL/SYD	530,000	J
		DRW	46,000	MJ
		PER	260,000	J
		MEL	254,000	J
		TYO	171,000	J
		TOTAL	1,261,000	
	DOM	JKT	1,684,000	J
		JOG	546,000	WB:70, NMJ:30
		SUB	531,000	WB:70, NMJ:30
		AMI	492,000	MJ
		UPG	260,000	WB
		KOE	277,000	MJ
		SWQ	73,000	SJ
		WPG	42,000	SP
		MOF	11,000	STOL
		Other	46,000	SP:30, STOL:70
		TOTAL	3,962,000	
	TOTAL		5,223,000	

AIRCRAFT MIX PROJECTION BY ROUTE (3) (2005-2010)

Year	Route DPS-		Annual Pax	Aircraft Expected in Services
2005	INT'L	SYD	732,000	J
		DRW	64,000	MJ
		PER	359,000	J
		MEL	351,000	J
		TYO	221,000	J
		TOTAL	1,727,000	
	DOM	JKT	2,055,000	J
		JOG	698,000	WB
		SUB	679,000	WB
		AMI	626,000	NMJ
		UPG	332,000	WB:60, MJ:40
		KOE	352,000	NMJ:70, MJ:30
		SWQ	92,000	MJ
		WPG	55,000	SJ
		MOF	13,000	STOL
		Other	58,000	SP:20, STOL:80
		TOTAL	4,960,000	
	TOTAL		6,688,000	
2010	INT'L	SYD	991,000	J
		DRW	86,000	NMJ
		PER	488,000	J
		MEL	475,000	J
		TYO	280,000	J
		TOTAL	2,320,000	
	DOM	JKT	2,476,000	J
		JOG	883,000	WB
		SUB	855,000	WB
		AMI	790,000	NMJ
		UPG	420,000	WB
		KOE	445,000	NMJ:80, MJ:20
		SWQ	117,000	MJ
		WPG	69,000	SJ
		MOF	17,000	STOL
		Other	73,000	SP:40, STOL:60
		TOTAL	6,145,000	
	TOTAL		8,465,000	

operates trunk routes and routes to which jets may be assigned, whereas other local routes are operated by MNA with STOLs and small propeller-driven planes.

ii. The routes operated by MNA take on the character of a GIA feeder route (called the Pioneer Air System). If there is a rise in demand and the development of airports is in stages, these routes may be used by GIA with large aircraft.

iii. As new medium wide-bodied aircraft for assignment to domestic routes, GIA adopted A300s and used them to the JKT-SUB, JKT-JPG, UPG-DPS and other routes from January, 1982.

iv. Demand forecast for domestic new route is classified in "others". At BIA, new domestic route will be expected to open mainly as a pioneer air route and the demand that will be generated from such new route is considered rather small. It will not affect technical and/or operational required facilities accordingly.

(4) Coefficients in Peak Month and on Peak Day

Monthly fluctuations in the number of BIA passengers in 1972 - 1980 are shown in APPENDIX 3.7.1-4. As it is discernible from these figures, August may be described as the year's peak month both for domestic and international routes. In some years, August did not turn out to be the peak month because routes or airlines schedules were changed or because the method

of processing passenger statistics was changed.

The peak-month coefficient in the past ranged from 17.2% to 10.1% for domestic routes and from 18.4% to 10.1% for international routes. However, as the peak-month coefficient only for August was 11.3% and 11.5%, respectively, the project values are set in Table 3.7.8 while incorporating a drop in the peak ratio in the future. The peak-day coefficient is set at 1/31 of the peak-month coefficient.

Table 3.7.8 PEAK-MONTH AND PEAK-DAY COEFFICIENTS

Classification	Project Year	Peak-Month Coefficient	Peak-Day Coefficient
DOM, PAX	1985, 1990	10.3%	0.003323
	1995, 2000	10.0%	0.003226
	2005, 2010	9.5%	0.003065
INT'L, PAX	1985, 1990	11.0%	0.003548
	1995, 2000	10.5%	0.003387
	2005, 2010	10.0%	0.003226

(5) Coefficient at Peak Hour

In regard to the peak-hour coefficients of domestic routes, the relations among the rate of concentration at the peak hour according to the schedules of other Indonesian airports (frequency of operations at the peak hour ÷ frequency of operations a day), BIA's actual data in 1981 and the characteristics at the peak hour in Japan are indicated in Fig. 3.7.5. As it is assumed that the characteristics of the BIA domestic lines are close to the borderline shown in Fig. 3.7.5 , the borderline values are adopted. As regards international routes, the future tendency is projected in Fig.3.7.5 on the basis of the actual values.

(6) Average Load Factor

BIA's average load factor (actual value) in the month of August 1981 stood at 53.3% for domestic routes and 51.5% for international routes. As it is expected that the load factor will rise in conjunction with a rise in demand in the future and as the profitability, etc., of airlines are taken into consideration, the average load factor in the peak month is set at 65 - 70%.

(7) Heavy Direction Ratio During Peak Hour

The rate of deviation of departures and arrivals at the peak hour is set at 0.55 on the basis of a survey conducted in the month of August 1981.

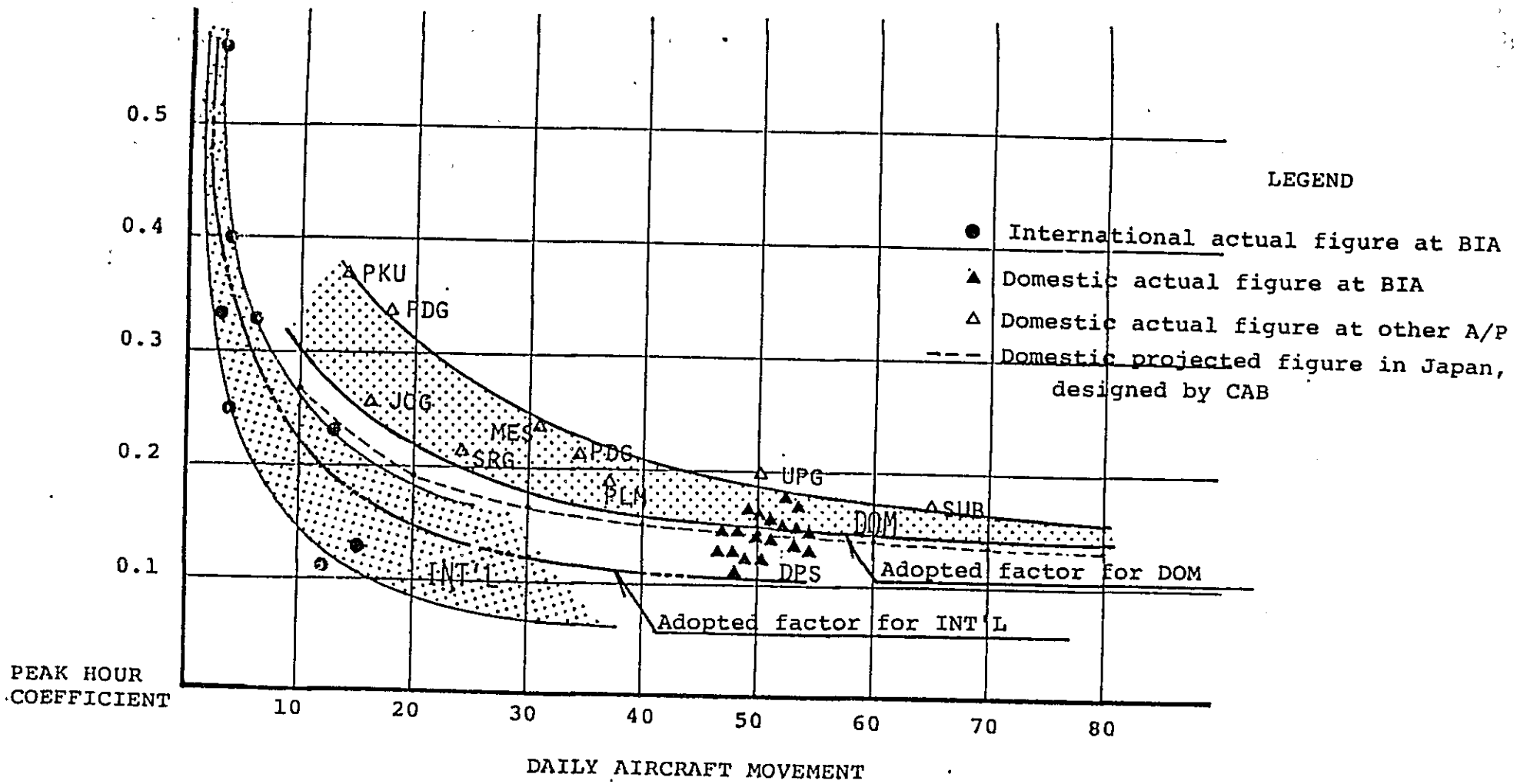


Fig. 3.7.5 PEAK HOUR COEFFICIENT

3.7.2 Breakdown of Air Traffic Volume

The Table 3.7.9 shows the air traffic demand breakdown under the before-mentioned assumptions.

Table 3.7.9 SUMMARY OF AIR TRAFFIC DEMANDS

YEAR	ITEM	PASSENGER			CARGO (Ton)	AIRCRAFT MOVEMENT						
		DOM	INT'L	TOTAL		J	WB	NMJ	MJ/SJ	SP	STOL	TOTAL
1985	Annual	1,233,000	343,000	1,576,000	5,500	2,293	3,573		7,184	1,805	7,222	22,077
	Peak Month	127,000	37,700	164,000	570	248	372		744	248	744	2,356
	Design Day	4,100	1,220	5,320	18	8.0	12.0		24.0	8.0	24.0	76.0
	Peak Hour	570	270	840		1.6	1.8		3.5	1.1	3.4	11.4
	Heavy Direction Peak Hour	320	150	470		0.9	1.0		1.9	0.6	1.9	6.3
1990	Annual	2,021,000	574,000	2,595,000	9,300	3,497	4,175		12,000	1,204	4,213	25,089
	Peak Month	208,200	63,100	271,300	960	372	434		1,240	124	434	2,604
	Design Day	6,720	2,040	8,760	31	12.0	14.0		40.0	4.0	14.0	84.0
	Peak Hour	940	450	1,390		2.2	2.1		5.8	0.6	2.0	12.7
	Heavy Direction Peak Hour	520	250	770		1.2	1.2		3.2	0.3	1.1	7.0
1995	Annual	2,838,000	886,000	3,724,000	14,500	5,432	3,608	1,240	11,130	620	3,720	25,750
	Peak Month	283,000	93,000	376,800	1,450	558	372	124	1,116	62	372	2,604
	Design Day	9,160	3,000	12,160	47	18.0	12.0	4.0	36.0	2.0	12.0	84.0
	Peak Hour	1,280	600	1,880		3.1	1.7	0.6	5.2	0.6	2.0	13.2
	Heavy Direction Peak Hour	700	330	1,030		1.7	0.9	0.3	2.9	0.3	1.1	7.2
2000	Annual	3,962,000	1,261,000	5,223,000	22,300	9,684	4,960	1,240	9,890	1860	3,100	30,734
	Peak Month	396,200	132,400	528,600	2,230	992	496	124	992	186	310	3,100
	Design Day	12,780	4,270	17,050	72	32.0	16.0	4.0	32.0	6.0	10.0	100.0
	Peak Hour	1,660	640	2,300		4.5	2.1	0.5	4.2	0.8	1.3	13.4
	Heavy Direction Peak Hour	910	350	1,260		2.5	1.1	0.3	2.3	0.4	0.7	7.3
2005	Annual	4,960,000	1,727,000	6,687,000	33,000	12,725	7,830	5,873	4,535	653	3,915	35,531
	Peak Month	471,000	172,700	643,900	3,140	1,240	744	558	434	62	372	3,410
	Design Day	15,200	5,570	20,770	101	40.0	24.0	18.0	14.0	2.0	12.0	110.0
	Peak Hour	1,980	780	2,760		5.4	3.1	2.3	1.6	0.3	1.6	14.3
	Heavy Direction Peak Hour	1,090	430	1,520		3.0	1.7	1.3	0.9	0.1	0.9	7.9
2010	Annual	6,145,000	2,320,000	8,465,000	49,100	16,510	9,788	8,450	3,263	1,305	3,263	42,579
	Peak Month	583,800	232,000	815,800	4,660	1,612	930	806	310	124	310	4,092
	Design Day	18,800	7,480	26,280	150	52.0	30.0	26.0	10.0	4.0	10.0	132.0
	Peak Hour	2,450	970	3,420		7.8	3.9	3.4	1.3	0.5	1.3	18.2
	Heavy Direction Peak Hour	1,350	540	1,890		3.7	2.1	1.9	0.7	0.3	0.7	9.4

Note:Mixed-fliht between JKT-DPS is included in"DOM".