

2.2.4 INFRASTRUCTURE DEVELOPMENT

1. TRANSPORT MODAL SPLIT OF PHUKET TOURISTS

1.1 REVIEW OF EXISTING SURVEYS

There are two surveys where a pattern of transportation modal split for tourists to Phuket was studied. Both were conducted by TAT in 1985 and 1986 as shown in Table 2-18. Since the basis of estimation is different from each other, a consistency of the outcomes is missing and great differences appeared on the weights of bus transport as well as on the total numbers of tourists.

Another sampling interview survey entitled "Survey on Tourists to Phuket, Feb-March, 1985" was conducted also by TAT which pursues Phuket tourists' attributes and opinions on accommodations. However, transportation modal structure of tourists was based only on Thai tourists.

After words, there is no reliable data/information available for identifying the present pattern of transport modal split of Phuket tourists.

1.2 PROVISIONAL ESTIMATE OF TRANSPORT MODAL SPLIT

The following assumptions are made for the said estimate:

- 1) A relationship between numbers of tourist passengers (NTP) and accommodation guests (NAG) is assumed. For foreign tourists, $NAG = 0.95 NTP$ and for Thai tourists, $NAG = 0.8 NTP$.
- 2) Number of passengers by air is derived from the actual data accounted at the Phuket International Airport by the DOA.
- 3) Number of passengers by fixed route bus is assumed based on the data of services recorded at the Phuket bus terminal by the LTD (refer to Bus Transport).
- 4) Number of passengers by group tour (by non-scheduled chartered bus) is difficult to assume. The existing two surveys presented that tour group passengers were 128,290 in 1985 and 105,015 in 1986. It is only way to say that the number will fall into a range between 10 % to 20 % of the total tourists. Therefore, it is bravely assumed, 20 percent of foreign tourists, and 10 percent of Thai tourists.
- 5) Number of passengers by ship is derived from the data reported by the Phuket Immigration Office.

The outcomes are as shown in Table 2-19. It is noted that the share of the passengers by air accounts for almost half, 47.4% in 1986 and 48.1% in 1987. The percentage of passengers by bus including fixed routed bus and tour group (non-scheduled chartered bus) accounts for 36.2% in 1986 and 36.9% in 1987. Those of passengers by private car came up from about 14% in 1986 to 18.4% in 1987. Passengers by ship were a minority group, just 1.4 or 1.5% of the total.

Looking into a future pattern, it is seemed that such a present characteristic will not drastically change, although the share of Thai passengers by air is anticipated to become gradually larger along with an increase in the level of their income. However, another constraint would be there, say, a certain limit of increase in the flight capacity (this is discussed in "Air Transport" in depth). The percentage of passengers by land transportation will retain the present level, since it is expected that the land transport system will be more diversified, i.e., a more comfortable service system would be realized on the fixed route bus system, and non-scheduled luxury coaches for both tour groups and individuals will be more facilitated, including a new service system jointing with railway and coach which caters for a number of railway passengers of the Orient Express Asia and the southern line from the Surat Thani Railway Station to Phuket.

TABLE 2-18 TRANSPORT MODES OF PHUKET TOURISTS, ESTIMATES IN EXISTING SURVEYS

	Survey A 1985	Survey B, 1986		
		Foreigners	Thai	Total
Total	761,809 (100.0)	263,717 (100.0)	367,283 (100.0)	631,000 (100.0)
By Air	188,635 (24.8)	87,049 (33.0)	48,284 (13.1)	135,333 (21.4)
By Bus	387,766 (50.9)	91,788 (34.8)	148,329 (40.4)	240,117 (38.1)
By Tour Group	128,293 (16.8)	49,490 (18.8)	55,525 (15.1)	105,015 (16.6)
By Private Car	27,755 (3.6)	35,390 (13.4)	107,441 (29.3)	142,831 (22.6)
By Ship	4,750 (0.6)	-	-	-
Others	24,600 (3.2)	-	7,704 (2.1)	7,704 (1.2)

Notes: Survey A: Tourism Situation in Phuket, 1985, TAT
Survey B: Report for Domestic Tourism Survey, 1987, TAT

As a provisional estimate, based on the above considerations, a pattern of transport modal split of tourist passengers to Phuket in future is assumed as below.

Percentage of Share	
By Air	50%
By Bus(Fixed Route)	20%
By Non-scheduled Bus	15%
By Private Car	14%
By Ship	1%

The structure of transport modal split of Phuket tourists shown above is applied for studying transport facilities requirements and carrying capacity.

TABLE 2-19 ESTIMATE OF TOURISM PASSENGERS (FOREIGN AND THAI) TO PHUKET BY TRANSPORT MODES, 1986 AND 1987

	Unit: thousand, (%)	
	1986	1987
Accommodation Guest 1/	477	696
Tourist Passengers	546 (100.0)	795 (100.0)
By Air	259 (47.4)	382 (48.1)
By Fixed Route Bus	122 (22.3)	147 (18.5)
By Non-Scheduled Bus	81 (14.8)	127 (16.0)
By Private Car	76 (13.9)	128 (16.1)
By Ship	8 (1.5)	11 (1.4)

Notes: 1/ derived from the TAT statistics

2. AIR TRANSPORT

2.1 PRESENT CONDITIONS AT PHUKET INTERNATIONAL AIRPORT

1) AIRPORT FACILITIES (AS OF AUG., 1988)

The Phuket International Airport (PIA) is located at the west coast in the northern district of Phuket Island, and has a runway set on the east-west direction. PIA plays an important role of international airport. PIA has a runway 3,000 meter long due to the completion of runway extension project which has been commenced in 1987. The terminal facilities consist of an apron which can accommodate five aircraft for parking simultaneously. The existing terminal has a passenger handling capacity of 850 passengers per peak-hour. The car parking space is for 120 vehicles.

2) AIR PASSENGERS

The annual numbers of passengers at PIA during the last decade are noted that the numbers of passengers particularly in the last two years drastically increased with 35 to 45 % growth rates. International passengers coming back and forth directly from foreign countries 1987, increased 1.7 times of that in 1986. This was affected by the new operation of air flights to/from Hong Kong by Thai Airways International and Dragon Air.

The number of passengers carried by charter flights also increased drastically in 1987. One of the reasons is that new charter flights to/from West Germany and Austria has been operated once a week since November 1987 by Condor Air and Lauda Air respectively.

3) OUTLINE OF ON-GOING PROJECTS

At present, the following projects are going on at PIA.

- Construction of new terminal facilities including apron (2 spots for B747), car parking, and roads which is due to be completed in September, 1988;
- Construction of a new terminal building with a passenger handling capacity of 2,050 for international and 1,683 for domestic passengers during peak-hours which is to be completed in March, 1989;
- Installation of a PSR/SSR radar and ILS facilities, and construction of a new control tower.

2.2 EVALUATION OF ON-GOING PROJECT

1) INCREASE IN TRANSPORT CAPACITY

The project of the runway extension to 3,000 meter in length will accommodate large-scale aircraft (B747) and contribute to an increase in the transport capacity. Direct flights of B747 type of large-scale aircraft from Japan will be possible.

As for the terminal facilities, by completion of the on-going projects of the new apron and the terminal building and facilities will be able to handle 4.5 to 4.8 million passengers per year (refer to Technical Notes 1 and 2).

2) UPGRADING OF SAFETY FOR AIRCRAFT OPERATION

By installation of the PSR/SSR radar, control operators will be able to monitor a position of aircraft exactly, and guide it adequately with a separation of arriving and departing aircraft. On the other hand, the installation of the ILS facilities will enable pilots to trace an adequate approach course.

As mentioned above, the on-going projects for the installation of the PSR/SSR radar and the ILS facilities will bring an upgrading of safety for aircraft operation at a great rate.

2.3 PROBLEMS AFTER COMPLETION OF ON-GOING PROJECT

1) PARALLEL TAXIWAY

Although the runway has been developed to be an international class, the runway capacity is still limited at a low level, due to no existence of a parallel taxiway. Even if carriers make an effort to increase their transport capacities so as to meet the anticipated demands, the runway capacity is thought to be around 1.5 million passengers per year at maximum, compared with the new terminal with a 4.5 million passenger capacity. Taking into account a balance between the terminal and the runway in terms of capacity, a parallel taxiway should be developed as early as possible.

2) RUNWAY STRIP

In order for PIA to become a first class international airport to play a significant role of a national gateway, it is required that the airport facilities may meet the international standards in terms of both physical features and quality. Based on this recognition, the runway strip should be widened from the existing of 150 meter to 300 meter in width. A precision runway with ILS facilities requires this standard.

3) LOCALIZATION ANTENNA

The localizer antenna which is one of the ILS facilities is to be installed without an exact direction of the runway center-line, because of avoidance of an obstacle (Laem Sai Hill) which is located about 4.5 km far from the east end of runway exactly on the direction of the runway center-line. Such an offset localizer system cannot provide an auto-pilot operation which could regularly be provided by an onset system. Thus, from a safe operation point of view, the onset system is assessed to be much better. However, since the offset localizer system has almost the same efficiency as the onset system in terms of function, the further development of such a landing aids system should be considered in response the guidelines provided by the International Civil Aviation Organization (ICAO).

2.4 RECOMMENDATIONS ON FURTHER DEVELOPMENT FOR PIA

1) RUNWAY STRIP AND PARALLEL TAXIWAY DEVELOPMENT

In order to upgrading the safety level of aircraft operation and increase the airport capacity, a project for widening the runway strip is strongly recommended from the present width of 150 meter to a ICAO standard width of 300 meter.

A project to be more urgently undertaken is the development of a parallel taxiway. From an efficiency of construction point of view, however, it is recommended that both projects are carried out at the same time.

A proposal of the above further development is as shown in Fig. 2.1. The costs for these two projects are estimated to be about 151 million baht at 1988 price, including the costs for demolishing and rebuilding the existing terminal which are needed to widen the runway strip.

2) NAVIGATIONAL AIDS FOR FOR LANDING AIRCRAFT

The runway will be upgraded to an precision runway due to installation of the ILS facilities such as the localizer antenna and glide path antenna. However, since the ILS facility is recognized as a temporary system, it is recommend to install a regular landing system in future.

At present, there are tow systems for a precision landing system: the ILS and MLS. ICAO has a schedule that the latter is to be replaced by the former in the coming decade, as shown in Table 2.4. According to this program, only the MLS will become an authorized system in 2000.

Considering such a circumstance, it is recommended that the forthcoming offset localizer antenna will be utilized in ten years, and be replaced by the MLS between 1998 and 2000. In order to install the MLS, it is required to clear the obstacle surface limit completely for the onset system (refer to Technical Note 3).

3) EXPANSION OF TERMINAL FACILITIES

The forthcoming terminal facilities will have a passenger handling capacity of about 4.5 million passengers per year. This capacity will be able to meet the demands in 2001, but beyond the year 2001, the terminal will be needed to be expanded.

2.5 RECOMMENDATIONS ON FEEDER AIR TRANSPORT SYSTEM

The Krabi Airport with a runway 1200 meter long and 12 meter wide has been close in operation since 1987, although the Bangkok Airways had operated flights three times a week. The major reasons were a shortage in demands for passengers to/from Bangkok, and an inadequacy of the airport facilities.

Meanwhile, in order to facilitate the development of local economy, especially tourism sector, it would be necessary to develop a rapid transportation. For this purpose, utilization of the Krabi Airport, which can be re-opened with a little amount of additional investment, is thought to be an efficient measure. The Krabi Airport was initially constructed by the Krabi provincial government, and have been transferred to the national government, DOA. Because of this, a future function of the Krabi Airport may be considered from a view-point of the national air transport network system in Thailand.

The Krabi Airport is located at the center of Southern Thailand, and the positioning of this airport is thought to be one of the airports with feeder services by small aircraft to/from major centers in Southern Region such as Phuket, Surat Thani, and Hat Yai. Out of these, air transport services to/from Phuket will be most promising in terms of feasibility, taking into account much potential in tourism development in Greater Phuket.

Based on the above recognition, the Krabi Airport is recommended to be improved so as to be one of feeder airports with emphasis on upgrading the safety level. The following projects are proposed:

- widening of runway from 12 meter to 30 meter, including improvement of the existing runway;
- widening of runway strip to 150 meter; and
- improvement of the access road and the terminal.

2.6 AIR EXCURSION ROUTES DEVELOPMENT BY HELICOPTER

Provision of air excursion routes may increase the attractiveness for the Greater Phuket tourism. A helicopter is assessed to be better rather than small-scale aircraft, because any possible air excursion route in Greater Phuket would be with a short length not more than 200 km.

A model of air excursion routes by helicopter is proposed as shown in Fig.2-6. A major heliport is proposed to be located at the Phuket Town (Sapanhin area), and several satellite heliports be located in major transport nodes such as the Phuket International Airport, the Krabi Airport, Similan Island and Phi Phi Island and the new development zone.

The facilities of the main heliport are designed with the number of helicopters to be introduced. The design criteria are as shown in Table 2-20. A model is proposed as illustrated on Fig. 2-7.

TABLE 2-20 DIMENSIONS OF SELECTED HELICOPTERS

Maker	Model	Poter Diameter (m)	Length Over-All (m)	Height (m)	No. of Seats Passengers
Bell	212/UH-IN	14.63	17.46	3.93	14
	412	14.02	17.07	4.32	14
Sikorsky	S-76	13.41	16.00	4.41	12

FIG. 2-5 AIR EXCURSION ROUTES (TENTATIVELY PROPOSED)

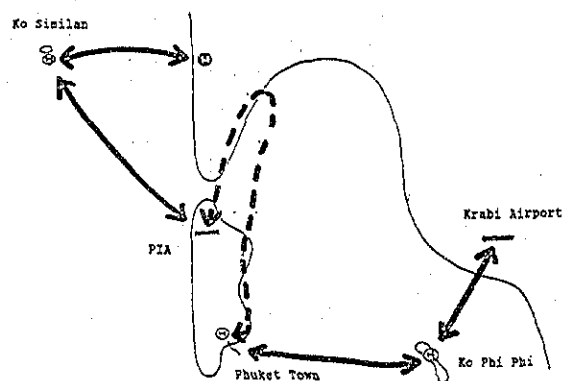
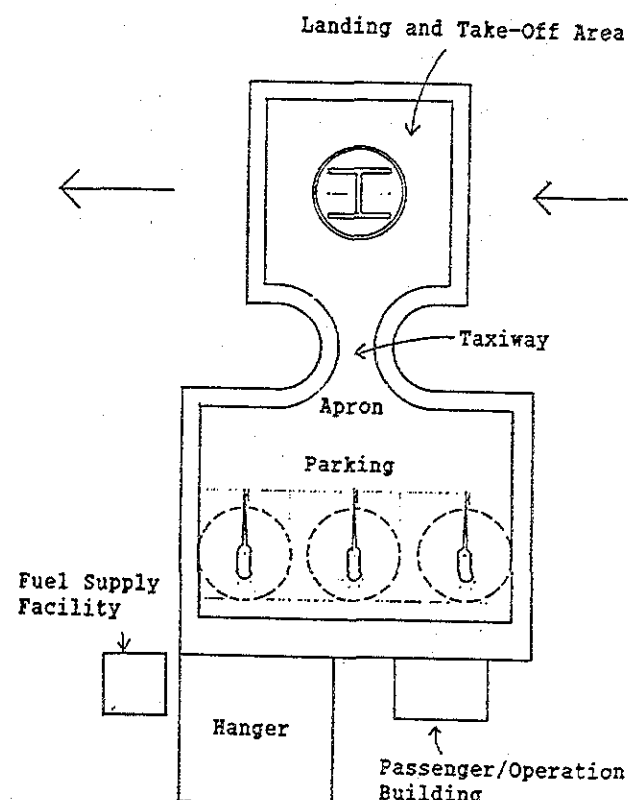


FIG. 2-6 A LAYOUT MODEL OF MAIN HELIPORT



2.7 TECHNICAL NOTES:

1) APRON CAPACITY ESTIMATE

The number of aircraft parking at the apron is given by the following formula:

$$G = C \times T/U,$$

where G : number of aircraft parking spot;
 C : design value of arrivals and departures of aircraft per hour;
 T : gate-occupancy time (hours);
 U : gate utilization factor.

By using this formula, the number of passengers to be handled during peak-hours is calculated as follows:

Aircraft Type	(1) No. of Spots	(2) U	(3) T	(4) G	(5) No. of Seat	(6) (4)x(5)	(7) (6)x2 x 0.7
B747	3	0.5	1.00	1.50	378	567	
A300	1	0.5	0.75	0.67	223	149	
B737	2	0.5	0.50	2.00	115	230	
Short	1	0.5	0.50	1.00	36	36	
						982	1,375

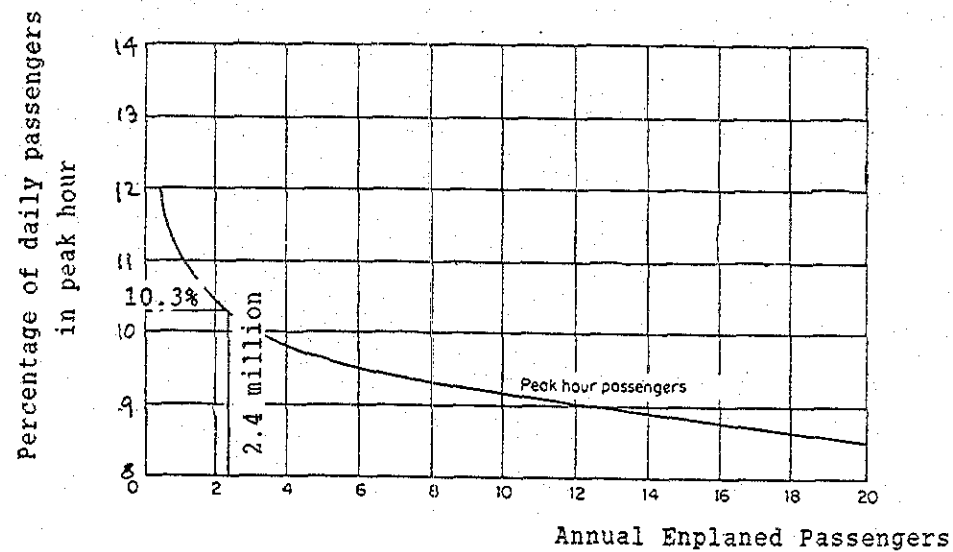
The outcome calculated above is converted into a number of the annual passengers by using a percentage of daily passengers in peak hour as shown in Fig. 2-8, and as follows:

$$1,375 \text{ (passengers/hour)} \times 365 \text{ (days)} / 0.103 \\ = 4,850,000 \text{ passengers per year.}$$

2) TERMINAL BUILDING

The Federal Aviation Administration had indicated that a gross terminal area space requirement is planned to be between 0.08 and 0.12 sq.ft per annual passenger. Based on this unit, the capacity of terminal building is calculated to be about 4.5 million annual passengers for the area of new terminal building, 24,180 m².

FIG. 2-7 RELATION BETWEEN PEAK-HOUR PASSENGERS AND ANNUAL ENPLANED PASSENGERS



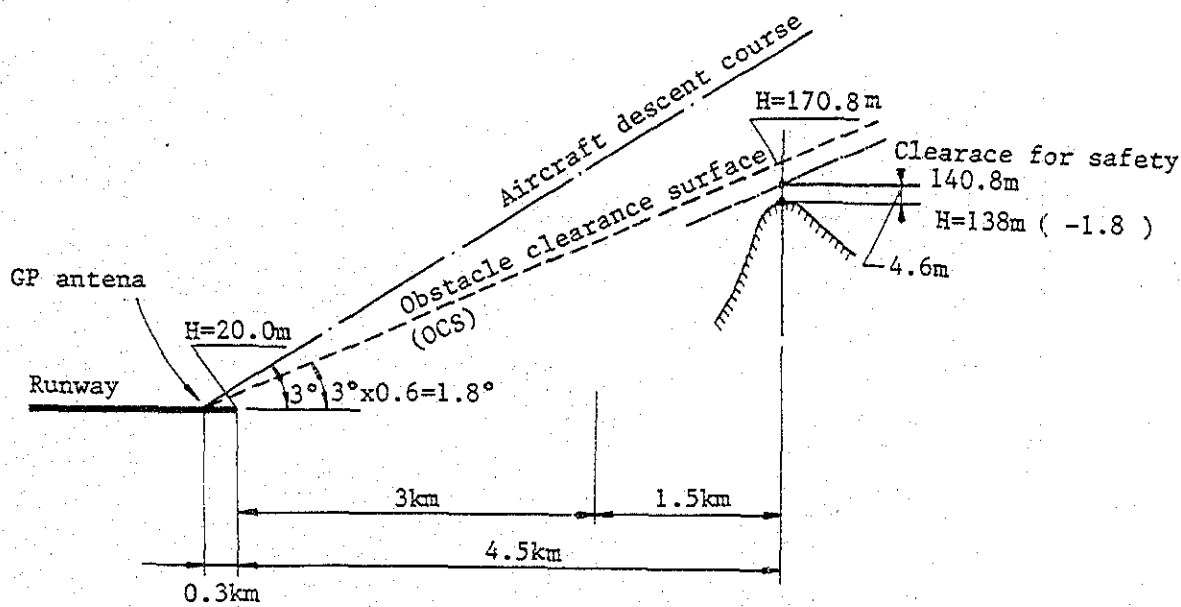
3) OBSTACLE CLEARANCE SURFACE

Fig. 2-9 shows a relation between the required obstacle clearance surface (OCS) and the hill (Laem Sai) located on the axis of the runway and 4.5 km far from the end of the runway in the eastern side. At the top of the hill, a limited height of the clearance is required to be a 140.8 meter height. This figure comes up, based on the following: a descent angle of aircraft is basically 2.5 degree, but recently descent angle of aircraft has generally become 3.0 degree. Considering a safety of the clearance, the OCS has to be a 170.8 meter height, with a 1.8% (3% x 0.6) degree surface. Given 30.0 meter to a safety allowance in addition to the OCS, the limited height can be obtained by subtracting 30 meter from 170.8 meter.

Afterwards, the clearance between the hill 138 meter high and the limited height of 140.8 meter is about 4.5 meter, taking into account a declination due to a curvature of the earth (about 1.8 meter). Although the Laem Sai hill doesn't become the obstacle on a calculation, this ensured clearance of about 4.5 m is very critical, thereby requiring some measures on land use at the top of the hill. Tall trees should not be planted at least.

Meanwhile, an effectiveness of the localizer beam is related close to the Obstacle Limitation Surface (OCS). For the Phuket International Airport, because of the above condition, the offset localizer system has been adopted for the landing system. However, in order to install an onset localizer system such as MLS, the OCS should be ensured.

FIG. 2-8 RELATION BASED ON THE ANGLE OF DESCENT OF AIRCRAFT



4) ESTIMATE OF CARRYING CAPACITY BASED ON FLEET POSSESSION

a. Current Fleet Possession of Thai Airways International (TG)

for domestic			for international		
4	: shorts 330	30 seats	11	: A300-B4	233 seats
2	: shorts 360	36 "	1	: A300-C4 combi	120 "
3	: B737-200	115 "	6	: A300-600	47 "
4	: A310-200	265 "	3	: DC-10 ER	245 "
			6	: B747-200	378 "
			2	: B747-300	405 "

b. Future Plan for Procurement of Aircraft

A procurement plan of aircraft for domestic services has not been approved by the government yet, however, that for international services has already been approved. The aircraft of MD 11 will be introduced first within three years, and after then, they will be introduced one by one successively. In any case, the future plan indicated above will be realized until around 1996.

for domestic		for international	
2	: B737-200/300 (lease)	1	: A300-6 (Aug. 1988)
4	: commuter 50 seats class	4	: MD 11 (288 seats)
2or3	: 150 seats class	2	: B747-400 (405 seats)

c. Growth of Transport Capacity

A growth of transport capacity is estimated by multiplying the factor of seat to the number of flight times, as follows:

- For domestic flight, at present,

	aircraft	seats	hours/year
Shorts 330	4 x	30	x 1400
shorts 360	2 x	36	x 1400
B737-200	3 x	115	x 3000
A310-200	2 x	265	x (2200)

Total: 2,470,000 seat x hr,

while in future, additionally,

	aircraft	seats	hours/year
B737-200/300	2 x	115	x 2500
150 seats class	3 x	150	x 2500
50 seats class	4 x	50	x 1400

Total: 1,980,000 seat x hr,

Grand total in future : 4,450,000 seat x hr.

From the above calculations, the domestic transport capacity in around 1996 will be 1.8 times as large as that at present.

- For international flight, at present,

	aircraft	seats	hours/year
A300-B4	11 x	223	x 2250
A300-C4	1 x	120	x 2200
A300-600	6 x	247	x 2930
DC-10 ER	3 x	245	x 4350
B747-200	6 x	378	x 4570
B747-300	x x	405	x 4350

Total: 27,200,000 seat x hr,

while, in future, additionally,

	aircraft	seats	hours/year
A300-600	1 x	247	x 2930
MD 11	4 x	288	x 4350
B747-400	2 x	405	x 4350

Total: 9,300,000 seat x hr,

Grand total in future : 36,500,000 seat x hr.

A international transport capacity in around 1996 will be 1.35 times as large as that at present.

d. Estimate on Carrying Capacity at the Phuket Airport

An assumption is made the an increase of transport capacity at PIA until around 1996 will be distributed in proportion to the present seat supplies. Based on this, the carrying capacity at PIA is estimated as follows:

A. Carrying capacity for domestic: at present,

	aircraft	seats	flights/week
Phuket - Bangkok,	A310	: 265	x 42
	A300	: 223	x 6
	B737	: 115	x 18
PKT - Hat Yai,	B737	: 115	x 14
	Shorts 360	: 36	x 14
PKT - Surat Thani,	Shorts 330	: 30	x 14
PKT - Trang,	Shorts 360	: 36	x 14

Total: 17,576 seats/week = 914,000 seats/year.

then, for future domestic services,

914,000 seats/year x 1.8 = 1,645,000 seats/year

In addition to the above figure, the carrying capacity will be increased in accordance with a TG plan that it will operate B747, which is for international use, for the Phuket service lines during the period of high season. Taking into account this plan, an additional carrying capacity is calculated under an assumption that the B747 will be operated turn around flight twice a day in four months as follows:

370 seats x 4 flights x 120 days = 180,000 seats.

Consequently, the total carrying capacity for domestic passengers at PIA is anticipated to be around 1,825,000 passengers in 1996.

B. Carrying capacity for international services, at present

	seats	flights/week		seats/year
Phuket-Hong Kong (KA)	115	x 6	=	690
-Hong Kong (TG)	223	x 3	=	669
-Kuala Lumpur	115	x 8	=	920
-Penang	115	x 4	=	460
-Singapore	223	x 8	=	1,784
Total:				4,523

4,523 seats/week = 235,000 seats/year,

while in future,

235,000 seats/year x 1.35 = 320,000 seats/year.

C. Carrying capacity for charter flights

According to the record, at present (1988), a number of charter flights were operated:

- from West German : 4 flights/week by DC10/L1011;
- from Austria : 2 flights/week by B737.

The number of seats from these Europe countries is estimated:

$$8 \times 245 + 4 \times 115 = 2,420 \text{ seat/week}$$
$$= 63,000 \text{ seats/NOV.-APR.}$$

The charter flights from Singapore (in 1987) were:

	seats	flights		seats/year
A310 :	240	x 16	=	3,840
B737 :	115	x 2	=	230
B757 :	186	x 20	=	3,720
A300 :	250	x 6	=	1,500

Total : 9,290 seats/year

Hence, the total number is estimated: 72,000 seats/year.

The future carrying capacity is calculated under an assumption that the number of seats will increase at a 8% growth rate by 1996 as follows:

$$72,000 \times 1.08^9 = 145,000 \text{ seats/year}$$

D. Total carrying capacity in 1996

As a result, a total of about 2.29 million seats will be available in 1996 as follows:

Domestic	: 1,825,000	seats/year
International	: 320,000	
Charter	: 145,000	
Total	: 2,290,000	seats/year

Assumed that cabin factors for domestic and international/charter flights are 70% and 60% respectively, the future carrying capacity of the Phuket International Airport is estimated to be about 1.56 million seats per year by the following calculation:

$$1,825,000 \times 0.7 + (320,000 + 145,000) \times 0.6 = 1,560,000 \text{ seats/year}$$

3. LAND TRANSPORT

3.1 BUS TRANSPORT

1) CLASSIFICATION

Fixed Route Buses administered by the LTD are classified into 4 categories and 3 standards as follows:

- Category I : Urban-Operating only within large cities such as Bangkok and Chiang Mai;
- Category II : Inter-City with Bangkok at one end of the routes;
- Category III : Inter-City between cities other than Bangkok;
- Category IV : Inter-District within the boundary of a Changwat.

- Standard 1 : Air conditioned bus with toilet;
- Standard 2 : Air conditioned bus;
- Standard 3 : Bus with fan only.

Non-Fixed Route Buses (with yellow license plate with prefix "30") are being operated for chartered buses or tourist coaches. A large oversupply of air-conditioned coaches existed in the late 1970s and early 1980s and this led to extensive illegal competition of these vehicles with legal fixed route services. However, due to a drastic increase in tourists with the advent of "Visit Thailand Year in 1987", the vehicle over-supply was being absorbed at present. Out of the total coaches registered in this category, 70 percent serve in Bangkok and its suburbs, and 31 percent are coaches with standard 1 or 2 (air-conditioned) which cater mainly for foreign tourists.

2) INTER-CITY BUS SERVICES TO PHUKET

The distance between Bangkok and Phuket is about 890 km and the duration is more and less 14 hours. Individual passengers from Bangkok to Phuket usually use buses of category II with standard 1 or 2 (air-conditioned) or with standard 3, running through Chumphon, Ranong, and Takuapa on the national highway No.4. There is a slightly seasonal fluctuation in the service frequency: the category II-1 bus (air-Conditioned) had 351 services per month in the highest season (April), compared with 238 services in the lowest season (June) in 1986.

Passengers from other provinces to Phuket use buses of category III, which links with major cities in the southern region such as Phang Nga, Krabi, Surat Thani, Hat Yai, Trang and so on.

Non-fixed route buses with standard 1 or 2 mainly for tour groups are privately run from Bangkok and major cities such as Hat Yai and Surat Thani.

Major bus services are summarized in Table 2-21.

3) TOURIST BUS PASSENGERS TO PHUKET

The data of numbers of tourists passengers transported by fixed route bus to Phuket is not available, but a rough number of passengers can be estimated to be about 122,000 persons in 1986, of which about 75,000 persons or 61.5% were from Bangkok and 47,000 or 38.5%, from other provinces, based on the following formula.

$$P_i = S_i \times C_i \times L_{Fi} \times TR_i$$

- where P_i : Tourist passengers by bus of Category i ;
- S_i : Number of services of Category i ;
- C_i : Average Passenger Capacity of Category i ;
- L_{Fi} : Load Factor of Category i ;
- TR_i : Tourist Ratio of Category i .

According to the terminal statistics of the LTD, number of services to Phuket by category (S_i) in 1986 were:

- Category II-1 : 3,341;
- Category II-3 : 2,692; and
- Category III : 15,967.

Other factors are assumed as below:

i	C_i 1/	L_{Fi} (%) 1/	TR_i (%) 2/
II-1	46	50	70
II-3	66	60	20
III	49	30	20

Source: 1/ LTD/Pak-Poy & Kneebome Pty Ltd (Feb., 1988):
Study of Inter-City and Rural Bus Transport
2/ assumed in this study

Hence, Numbers of tourists passengers to Phuket by bus (1986) are computed as:

From Bangkok (II-1: air-conditioned bus)	: 54,000
(II-3: non air-conditioned bus)	: 21,000
sub-total	: (75,000)
From Other Provinces (III)	: 47,000

Total	: 122,000

4) IMPROVEMENT ON INTER-CITY BUS TRANSPORT FOR TOURISM

Fixed route buses catered for 122,000 tourists coming to Phuket in 1986 as estimated above. This stands for 22% of the total tourist passengers, 546,000. Thus, the bus transportation has played a significant role in the whole transport system. Along with an increase in accommodation capacity in Phuket, the carrying capacity of bus transport will also be needed to expand to be almost twice as much as that at present toward the year 2001.

In line with this, there are three critical issues to be tackled with in terms of improvement of the bus transport system, referring to basic requirements of tourists: safety; time-conservation and comfort.

- a. Safety: Bus road accidents often take place mainly because of drivers' careless mistake. The LTD study shows that on an average, the accident rate per 100 million vehicle-km of heavy bus accounts for 233, compared with that of car/taxi, 88 (refer to Table 2-22). This means that the bus transport is thought to be three times as dangerous as car/taxi transport. A long haul with 890 km or 14 hours drive is more likely to be susceptible to road accidents. Bus should be a reliably safe transportation, which is one of the basic requirements for tourism.

For this, two action programs should be taken as soon as possible:

- b. An insurance system should be more thoughtfully facilitated besides the existing deposit system. A compulsory third party insurance, which is being considered by the government, should be implemented.
- c. A Safe Operation System should be explored and implemented by the LTD in terms of drivers' working hours and education and bus construction/modification specification.
- d. Time-Conservation: Highway improvement is associated with this improvement of bus operation. As argued in section of "Highway Development", if an East-West link highway with a high standard connecting between Surat Thani and Phuket be developed, the travel hours from Bangkok will reduced by 2 hours.

By completion of this, it is expected that a considerable number of railway passengers of the forthcoming "Orient Express Asia" or the southern line may easily be invited into Phuket, transferring to coaches at the Surat Thani Station.

- e. Comfort: Tourists always pursue a more comfortable travel. It is recommended that even for the fixed route buses, more luxurious coaches are legally catered for the public.

5) BUS SERVICES IN PHUKET ISLAND

Small vehicles such as pick-ups and trucks with seven and more seats (yellow license plate with prefix "20") serve as the public transportation within the Phuket Island. 8 service routes from the Phuket Town to major beaches/villages are normally being operated every 20 to 30 minutes, as shown in Fig 2-10. There is no service route linking beaches with each other so far because of lacking of roads.

Fares vary from place to place, depending on the distance. The standard fare rate is regulated at 0.23 Baht per km.

TABLE 2-21 FIXED ROUTE BUS SERVICES FOR INTER-CITY NETWORK

	Distance (km)	Category -Standard	Fare (Baht)	Duration (hrs)	No. of Services	
					to	from
1. Bangkok-Phuket	891	II-1	299	14	8-10	8-10
		II-3	165	15	8-10	8-10
2. Bangkok-Phang Nga	815	II-1	274	13	1-2	1-2
		II-3	161	14	2-3	2-3
3. Bangkok-Krabi	867	II-1	290	13.5	1-2	1-2
		II-3	161	14.5	3-4	3-4
4. Phuket-Phang Nga	87	III-3	22	2	5	5
5. Phuket-Krabi	176	III-3	38	4	3	3
6. Phuket-Surat Thani	287	III-3	61	6	8	8
7. Phuket-Hat Yai	466	III-1,2	154	8	2	2
		III-3	91	8	4	4
8. Phuket-Trang	312	III-3	62	6	8	8
9. Phuket-Nakhon Si Thammarat	336	III-3	75	8	6	6

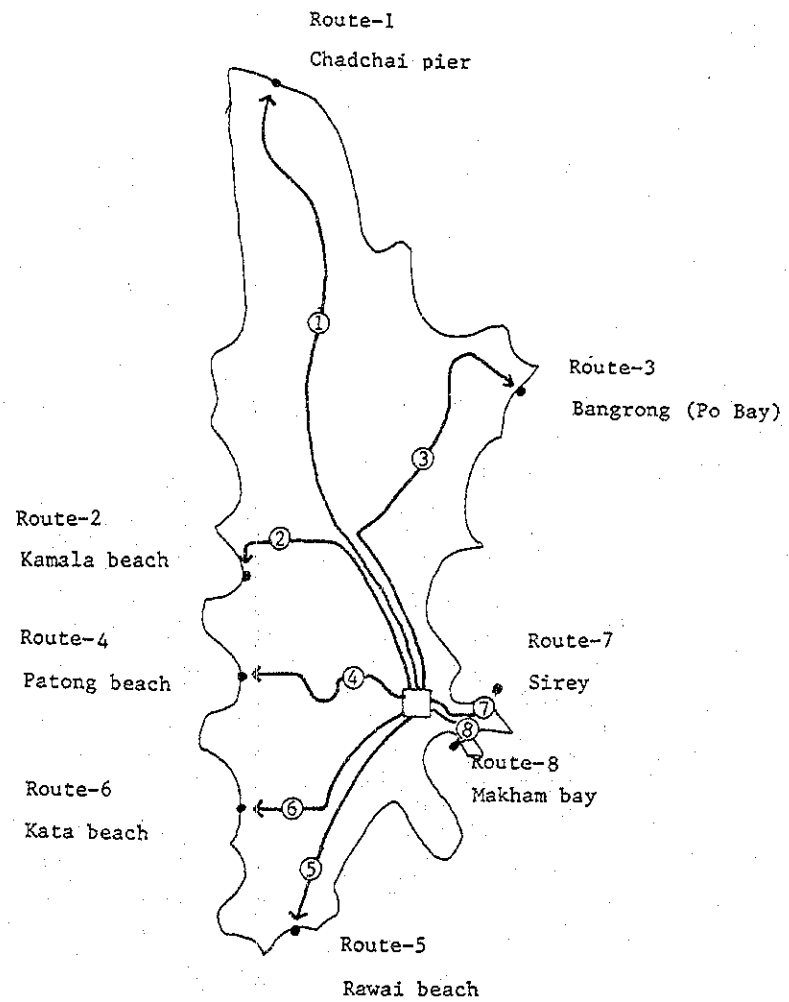
Source: LTD

TABLE 2-22 PROVISIONAL ESTIMATE OF CURRENT ROAD VEHICLE ACCIDENT RATES

Vehicle Type	Accident Rate per 100 million vehicle-km
Car/Taxi	88
Truck	175
Heavy Bus	233
Light Bus	140
Motorcycle	500
Average 175	

Source: LTD/ Pak-Poy & Kneebome Pty Ltd (Feb., 1988): Study of Inter-City And Rural Bus Transport

FIG. 2-9 BUS ROUTES IN PHUKET PROVINCE



6) GENERAL INFORMATION:

- 8 routes in the island;
- No. of Buses : about 254 vehicles;
- Services: every 20 - 30 minutes for all routes.

