The model parameters and the coefficients of determination ($R^2$), which were obtained by regression analysis, are shown in **Table 4.4.8.**

**Table 4.4.8 Parameter and Coefficient of Determination($R^2$)**

| | Independent Variable | Correlation Coefficient | | | $R^2$ |
|---|---|---|---|---|---|
| | | A | B | C | |
| Domestic passengers | -GDP of Thai<br>-International Passengers | 32.910 | -0.549 | 7,288.496 | 0.997 |

Adopting the equation model and the estimation of independent variables in future, the "dependent variables", the traffic forecasts of domestic passengers have been derived.

The traffic of domestic passengers in Thailand has been projected as shown in **Table 4.4.9 and Appendix 4.4.4** , after the same procedure of adjustments as adopted in the international passenger forecast of the previous section. Domestic passengers are estimated to increase to 25.9 million in 2010 especially with the high growth rate in the late 1990's.

**Table 4.4.9 Forecast for Domestic Air Passengers in Thailand (1991-2010)**

| | 1991 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| Number of Domestic Passengers (thousand) | 6,940 | 9,951 | 14,494 | 19,426 | 25,886 |
| Average Annual Growth Rate | | 7.5%<br>(1991-1995) | 9.9%<br>(1996-2000) | 7.6%<br>(2001-2005) | 7.4%<br>(2006-2010) |

(4) Air Passengers From/To Phuket International Airport

As shown **Figure 4.4.3 and 4.4.5,** the future air traffic at Phuket International Airport has been projected for demand of foreign passengers and demand of Thai passengers separately.

Foreign Air Passengers

**Table 4.4.10** shows foreign guest arrivals to accommodations in Phuket by region of nationality in 1990.

**Table 4.4.10 Foreign Guest Arrivals to Accommodation in Phuket by Region of Nationality, 1990**

| | Guest arrivals (thousand) | Share |
|---|---|---|
| Americas | 42.7 | 4% |
| Europe | 340.7 | 32% |
| ASEAN | 59.6 | 6% |
| Japan | 42.2 | 4% |
| Asian NIEs | 187.1 | 18% |
| Pacific | 63.2 | 6% |
| Africa & Middle East | 2.1 | 0% |
| Thai | 326.7 | 30% |
| Total | 1,064.3 | 100% |

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

It is assumed that approximately 90 % of foreign guest arrivals to accommodation establishments in Phuket will use the air transport access with the following considerations:

1) The purpose of travel for foreign arrivals to Phuket is almost (95 %) holidays and average length of stay in Phuket was 4.9 days in Phuket.
2) Alternative access from Bangkok to Phuket is bus transport, however, it takes about 12 hours by express. It seems to be too long for foreign tourists to travel by bus for twelve hours without outstanding tourism attractions en route.
3) As few attractive destinations for foreign tourists exist on the way from Bangkok to Phuket, it is not popular for foreign tourists to make an excursion tour to Phuket through the road system on the peninsula.

Consequently, the estimated traffic demands of air passenger by region at Phuket International Airport in 1990 have been obtained as shown in **Table 4.4.11.**

**Table 4.4.11 Air Passengers by Region of Nationality at Phuket International Airport, 1990**

| | Number of Air Passengers (thousand) | Share |
|---|---|---|
| Americas | 77.0 | 4% |
| Europe | 613.2 | 36% |
| ASEAN | 107.3 | 6% |
| Japan | 76.0 | 4% |
| Asian NIEs | 336.8 | 20% |
| Pacific | 113.7 | 7% |
| Africa & Middle East | 3.7 | 0% |
| Thai | 392.7 | 23% |
| Total | 1,720.4 | 100% |

Note: Transit passengers are not included.

The main purpose of travel for both foreign passengers to Thailand and to Phuket is to spend holidays. As mentioned in Chapter 2, the share of holiday purpose travelers in foreign tourists are about 90 % to the whole Thailand and 95 % to Phuket.

According to the previous study on tourism master plan for Phuket by JICA, the foreign guest arrivals in Phuket has been estimated to increase by 7 % during the period 1990-1996 and 6 % in the late 1990's. On the other hands, the Government has set forth the 7th National Plan (1992-1996) in which international tourists to Thailand have been estimated to increase by 7 % per year during the period 1992-1996 and the growth will slightly decline afterwards.

It may be assumed that the growth rate of foreign air passengers of the respective regions at Phuket International Airport will be same as the growth rate of international passengers of those regions from/to Thailand.

The future demand of foreign air passengers at Phuket International Airport by the market segments has been projected adopting the same growth rate as those of respective segments for international passenger demand from/to Thailand which was forecasted in the previous section.

Thai Air Passenger

Future Thai passengers at Phuket International Airport has been estimated using the same growth rate of country's domestic passengers in Table 4.4.9 as it is assumed that the share of Thai domestic passengers at Phuket will be constant among country's total domestic passengers.

**Table 4.4.12, 4.4.13 and Figure 4.4.6** shows the total demand of future air passengers from/to Phuket International Airport by market segment. The detailed figures are shown in **Appendix 4.4.5**.

**Table 4.4.12 Forecast for Total Air Passengers From/To Phuket International Airport (1991-2010)**

Unit: thousand

| | 1991 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| America | 79 | 113 | 154 | 193 | 238 |
| Europe | 630 | 920 | 1,346 | 1,840 | 2,413 |
| Middle East & Africa | 4 | 5 | 6 | 7 | 9 |
| ASEAN | 110 | 158 | 231 | 312 | 415 |
| Japan | 78 | 112 | 162 | 207 | 259 |
| Asian NIEs | 346 | 517 | 738 | 1,020 | 1,379 |
| Pacific | 117 | 195 | 329 | 464 | 627 |
| South Asia | 0 | 5 | 6 | 7 | 9 |
| Sub-total of Foreign Passengers | 1,364 | 2,025 | 2,972 | 4,050 | 5,349 |
| Thais | 402 | 560 | 816 | 1,093 | 1,457 |
| Grand-total | 1,766 | 2,585 | 3,788 | 5,143 | 6,806 |

Note: Transit passengers are not included.

**Table 4.4.13 Projected Average Annual Growth Rate of Total Air Passengers From/To Phuket International Airport (1991-2010)**

| | 1991-1995 | 1996-2000 | 2001-2005 | 2006-2010 |
|---|---|---|---|---|
| America | 9.3% | 6.4% | 4.7% | 4.2% |
| Europe | 9.9% | 7.9% | 6.5% | 5.6% |
| Middle East & Africa | 5.0% | 5.0% | 4.0% | 4.0% |
| ASEAN | 9.4% | 8.0% | 6.2% | 5.9% |
| Japan | 9.4% | 7.7% | 5.0% | 4.6% |
| Asian NIEs | 10.6% | 7.4% | 6.7% | 6.2% |
| Pacific | 13.6% | 11.1% | 7.1% | 6.2% |
| South Asia | | 5.0% | 4.0% | 4.0% |
| Sub-total of Foreign Passengers | 10.4% | 8.0% | 6.4% | 5.7% |
| Thais | 8.6% | 7.8% | 6.0% | 5.9% |
| Grand-total | 10.0% | 8.0% | 6.3% | 5.8% |

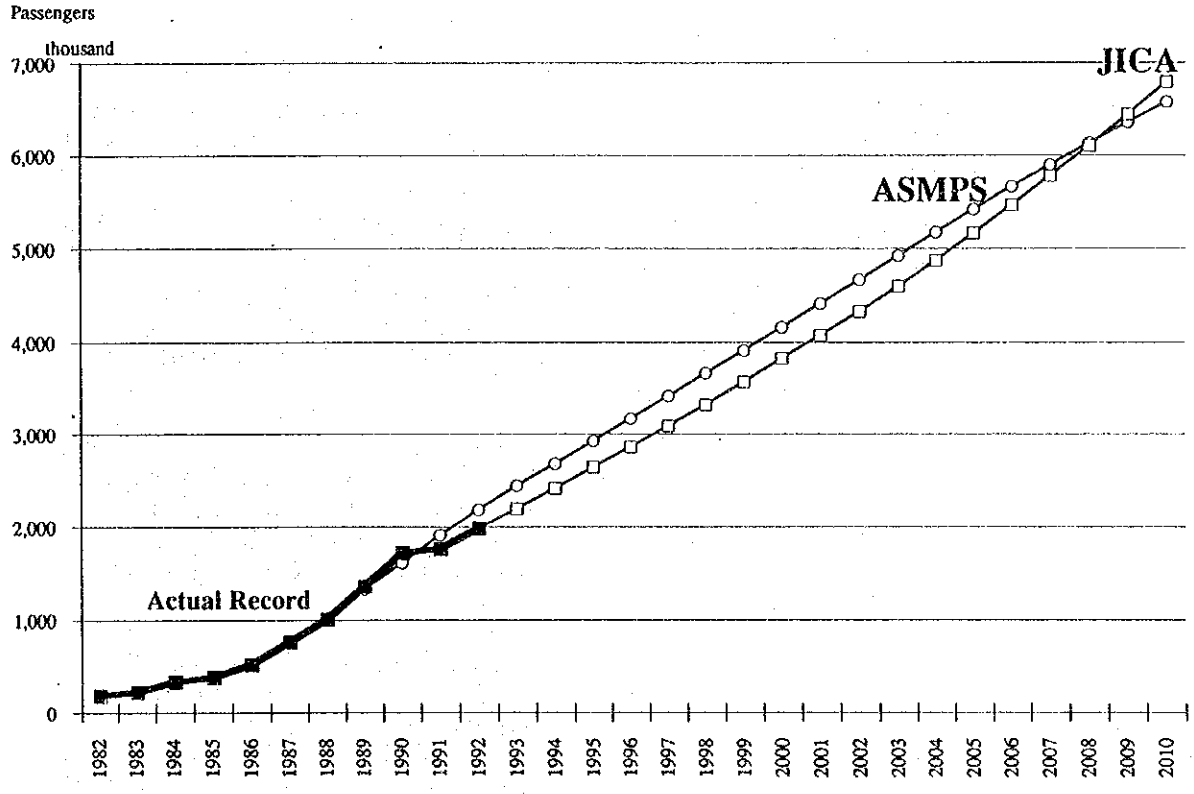



**Figure 4.4.6 Forecast for Air Passengers From/To Phuket**

As shown in **Table 4.4.12**, the total passengers from/to Phuket International Airport has been estimated to increase to 6.8 million in 2010 from 1.8 million 1991 by 3.85 times excluding transit passengers. The growth rate will reduce from 10.0 % during 1991-1995, to 8.0 %, 6.3% and 5.8 % during 1996-2000, 2001-2005 and 2006-2010 respectively. The number of transit passengers has been about 5 % of the total arrivals and departures since 1987 at Phuket International Airport and it is estimated to remain at 5 % until 2010.

Allocation of country's international passengers to Phuket International Airport depends on the policy of the Government, the policy of airlines, the capacity of airports and the propensity of international tourists.

As previously mentioned, international air passengers are/will be concentrated in Bangkok International Airport, however, the share of Phuket International Airport has increased during the last a few years, from 2.1 % in 1988 to 5.0 % in 1991. The Government of Thailand is promoting the decentralization of country's economy and expansion of infrastructure services in regional areas. Enhancing capacity of the existing international airports is one of the development guidelines for air transport promoted by the Government in the 7th National Plan. Allocation of international passengers to Phuket Airport is assumed to increase during the 1990's until the Second Bangkok International Airport will be completed.

With consideration of the above, it should be assumed that Phuket International Airport will serve at least 7 % of international passengers from/to Thailand in 2010. **Table 4.4.14** show the demand for international and domestic passengers. In the later section, the allocation of passengers by flight route will be discussed based on market segments of passengers.

**Table 4.4.14 Forecast for International and Domestic Passengers From/To Phuket International Airport (1991-2010)**

| year | International Passengers | | | | Domestic Passengers | | Total Passengers | |
|---|---|---|---|---|---|---|---|---|
| | Number (thousand) | Av.annual growth rate | Share of Int'l | Share of Phuket | Number (thousand) | Av.annual growth rate | Number (thousand) | Av.annual growth rate |
| 1991 | 555 | | 31% | 5% | 1,211 | | 1,766 | |
| 1995 | 962 | 14.7% | 37% | 6% | 1,623 | 7.5% | 2,585 | 10.0% |
| 2000 | 1,613 | 10.9% | 43% | 7% | 2,175 | 6.1% | 3,788 | 8.0% |
| 2005 | 2,155 | 6.0% | 42% | 7% | 2,988 | 6.6% | 5,143 | 6.3% |
| 2010 | 2,821 | 5.5% | 41% | 7% | 3,985 | 5.9% | 6,806 | 5.8% |

## 4.4.4 Air Freight Demand Forecast

### (1) General

The future demand for freight of Phuket International Airport has been estimated based on the process prepared in **Figure 4.4.7**. Firstly the future demand for international freights and domestic freights in whole Thailand has been estimated and then allocated to Phuket International Airport.

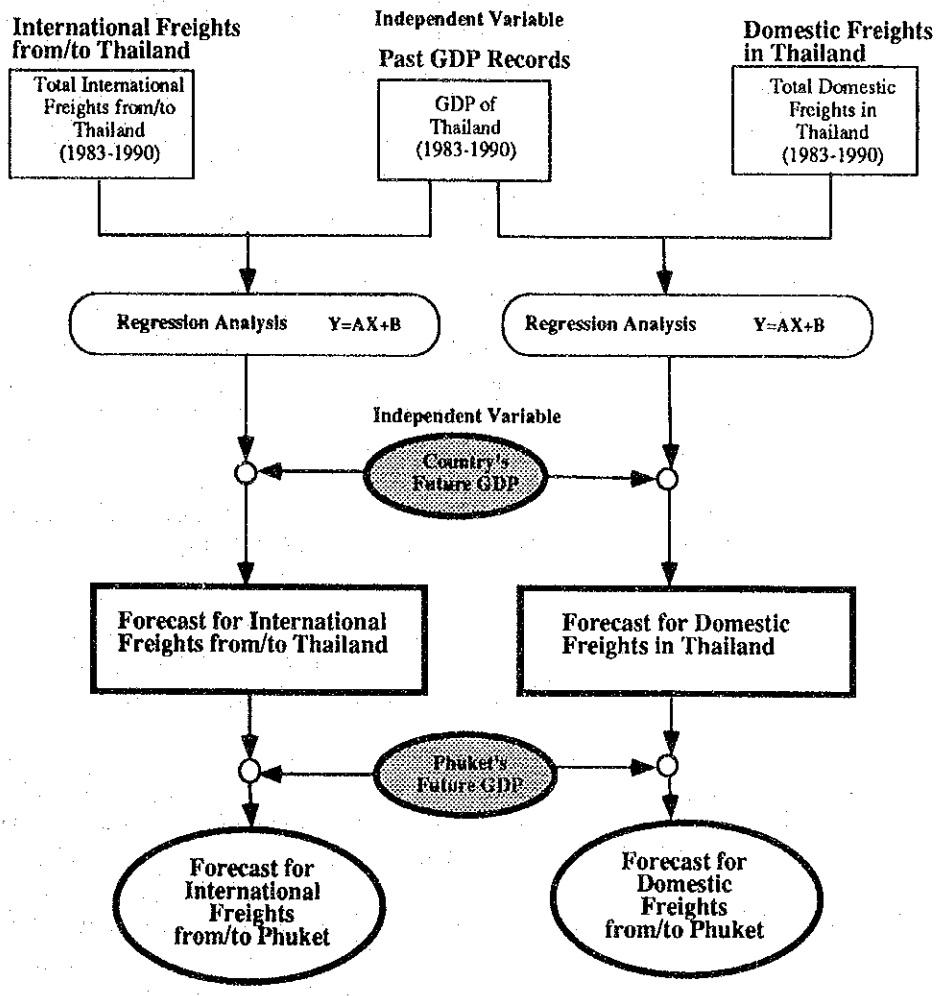



**Figure 4.4.7 Workflow of Air Freight Forecast for Phuket International Airport**

(2) International and Domestic Freights From/To Thailand

The future demand for international and domestic freights has been projected using an econometric model as follows:

1) Firstly the GDP of Thailand has been selected as an independent variables.

2) **Table 4.4.15** shows historical data of "dependent variable" (1983-1990), volume of international and domestic freights from/to Thailand.

**Table 4.4.15 International and Domestic Freights From/To Thailand (1983-1990)**

Unit:tonnes

| Year | International Freight | Domestic Freight | Total Freight |
|---|---|---|---|
| 1983 | 119,937 | 5,578 | 125,515 |
| 1984 | 147,631 | 6,639 | 154,270 |
| 1985 | 164,043 | 7,539 | 171,582 |
| 1986 | 202,193 | 10,096 | 212,289 |
| 1987 | 242,438 | 11,060 | 253,498 |
| 1988 | 292,163 | 18,533 | 310,696 |
| 1989 | 340,825 | 19,933 | 360,758 |
| 1990 | 394,775 | 25,166 | 419,941 |

Source: AAT
Note: Transit freight is not included.

3) The relationship between the dependent and the independent variables has been specified using the following linear model:

$$Y = AX + B$$

where, Y (Dependent Variable): Volume of Freight
X (Independent Variable): GDP of Thailand
A and B (Coefficient): Model Parameters

The model parameters and the coefficient of determination ($R^2$), which were obtained by regression analysis between historical records of volume of international freights and the historical GDP of Thailand, are shown in **Table 4.4.16**.

**Table 4.4.16 Parameter and Coefficient of Determination($R^2$)**

| | A | B | $R^2$ |
|---|---|---|---|
| International freight | 0.963 | -208,079.682 | 0.989 |
| Domestic freight | 0.071 | -19,939.194 | 0.982 |

4) $R^2$ shows the "goodness of fit" of the estimated relationship and T statistics also shows the significant relationships between the variables.

5) Adopting the equation model and the estimation of independent variables, the future demand for international and domestic freights in Thailand has been derived.

Future demand for international and domestic freights in Thailand has been projected as shown in **Table 4.4.17**.

**Table 4.4.17 Forecast for International and Domestic Air Freights From/To Thailand(1991-2010)**

Unit:tonnes

| | 1991 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| International Freight (tons) | 390,610 | 551,617 | 797,715 | 1,066,733 | 1,410,077 |
| Av. annual growth (%) | | 9.0% | 7.7% | 6.0% | 5.7% |
| Domestic Freight (tons) | 28,330 | 44,502 | 66,454 | 90,451 | 121,077 |
| Av. annual growth (%) | | 12.0% | 8.3% | 6.4% | 6.0% |
| Total Freight (tons) | 418,940 | 596,119 | 864,169 | 1,157,184 | 1,531,154 |
| Av. annual growth (%) | | 9.2% | 7.7% | 6.0% | 5.8% |

(3) International and Domestic Freights From/To Phuket

Based on the economic framework estimated in the previous section, the GDP of Thailand and that of Phuket Changwat are estimated as shown in **Table 4.4.18**. The share of Phuket's GPP among the country's GDP will amount to 0.76 % in 2010 from 0.61 % in 1990.

**Table 4.4.18 Estimated Future GDP and Share of Phuket**

| | GDP of Thailand (million bahts at 1990 current prices) | GPP of Phuket (million bahts at 1990 current prices) | Share of Phuket |
|---|---|---|---|
| 1990 | 2,100,000 | 12,717 | 0.61% |
| 1995 | 2,945,359 | 19,079 | 0.65% |
| 2000 | 3,941,554 | 27,224 | 0.69% |
| 2005 | 5,030,533 | 36,373 | 0.72% |
| 2010 | 6,420,377 | 48,637 | 0.76% |

The share of Phuket International Airport among the total freight is assumed to increase according as the share of its GPP will increase.

Future international and domestic freights from/to Phuket International Airport have been projected by the following formula

$$\frac{HFRTt}{TFRTt} = \frac{HFRT\ in\ 1991}{TFRT\ in\ 1991} \times \left( \frac{HGPPt}{TGGPt} \div \frac{HGPP\ in\ 1991}{TGGP\ in\ 1991} \right)$$

where, TGDPt: Thailand's GDP in t years
FGPPt: Phuket's GPP in t years
TFRTt: Volume of air freights in Thailand in t years
HFRTt: Volume of air freights in Phuket in t years

The future demand for international and domestic freights of Phuket International Airport have been prepared in **Table 4.4.19** and **Figure 4.4.8**. Detailed results are shown in **Appendix 4.4.7**. Total freight loaded and unloaded at Phuket International Airport is projected to amount to 9.6 thousand tonnes in 2000 and 19.2 thousand tonnes in 2010.

**Table 4.4.19 Forecast for International and Domestic Freights From/To Phuket(1991-2010)**

Unit:tons

| | 1991 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| International Freight (tons) | 1,026 | 1,544 | 2,370 | 3,307 | 4,615 |
| Av. annual growth (%) | | 10.8% | 9.0% | 6.9% | 6.9% |
| Domestic Freight (tons) | 2,737 | 4,581 | 7,262 | 10,314 | 14,574 |
| Av. annual growth (%) | | 13.7% | 9.7% | 7.3% | 7.2% |
| Total Freight (tons) | 3,763 | 6,125 | 9,632 | 13,621 | 19,189 |
| Av. annual growth (%) | | 13.0% | 9.5% | 7.2% | 7.1% |

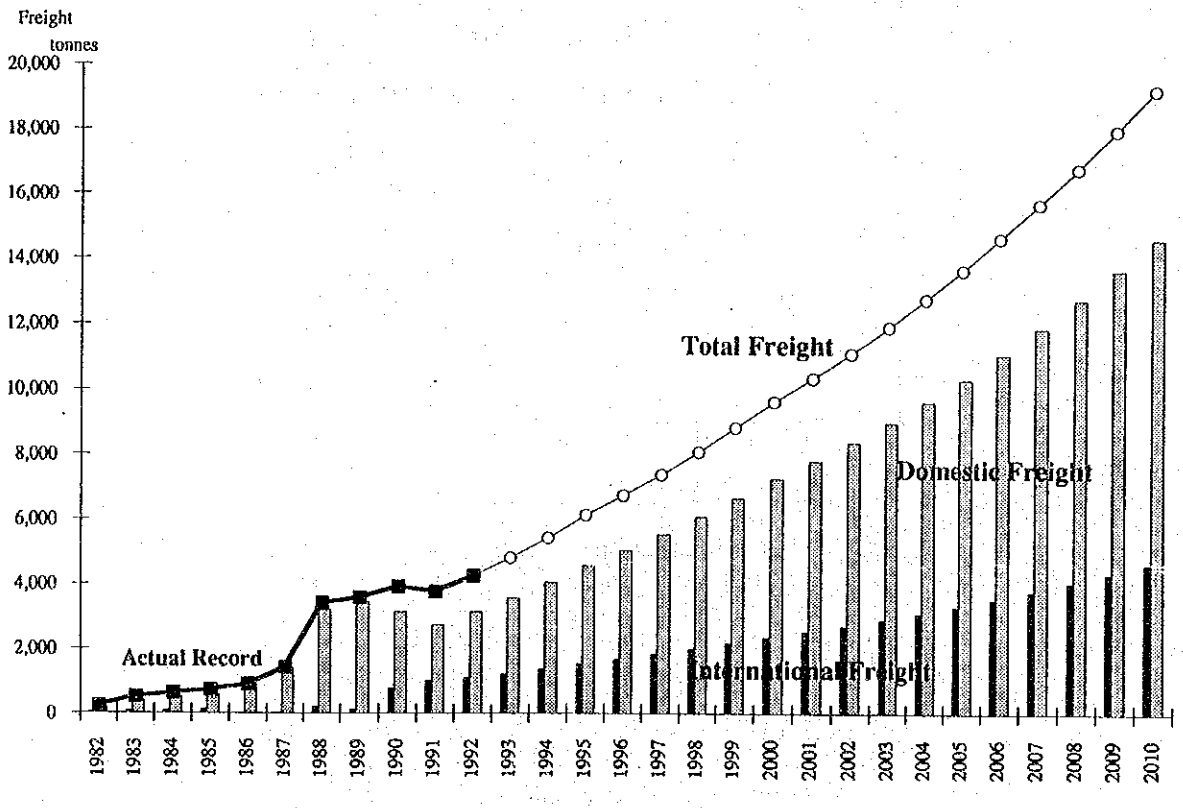



**Figure 4.4.8 Forecast for Air Freights From/To Phuket**

## 4.5 BREAKDOWN INTO DESIGN BASIS

### 4.5.1 Traffic Demand by Air Route

The traffic demand forecasted in the previous section is broken down into design basis based on the process as shown in the workflow of **Figure 4.5.1**.

The number of passengers using Phuket International Airport by nationality and air route are given in **Figure 4.5.2**. This Figure indicates that the share of passengers are Thai approximately 20 %, Europeans 35 %, Asians 30 %, and the rest are other nationalities which are Oceanians, Americans, etc. For the share of passengers by route, Thai domestic routes such as Bangkok route are approximately 70 %, other international Asians routes approximately 25 % and European routes approximately 5 %. This indicates that a greater part of the Europeans, Americans, Australians, and the rest all disembark in Thailand at Bangkok, and transit to Phuket using Thai domestic routes. The indication here is partly that Bangkok is a major tourist attraction, and partly that there are few direct flight to Phuket, and the passengers make use of Bangkok as their point of entry into Thailand.

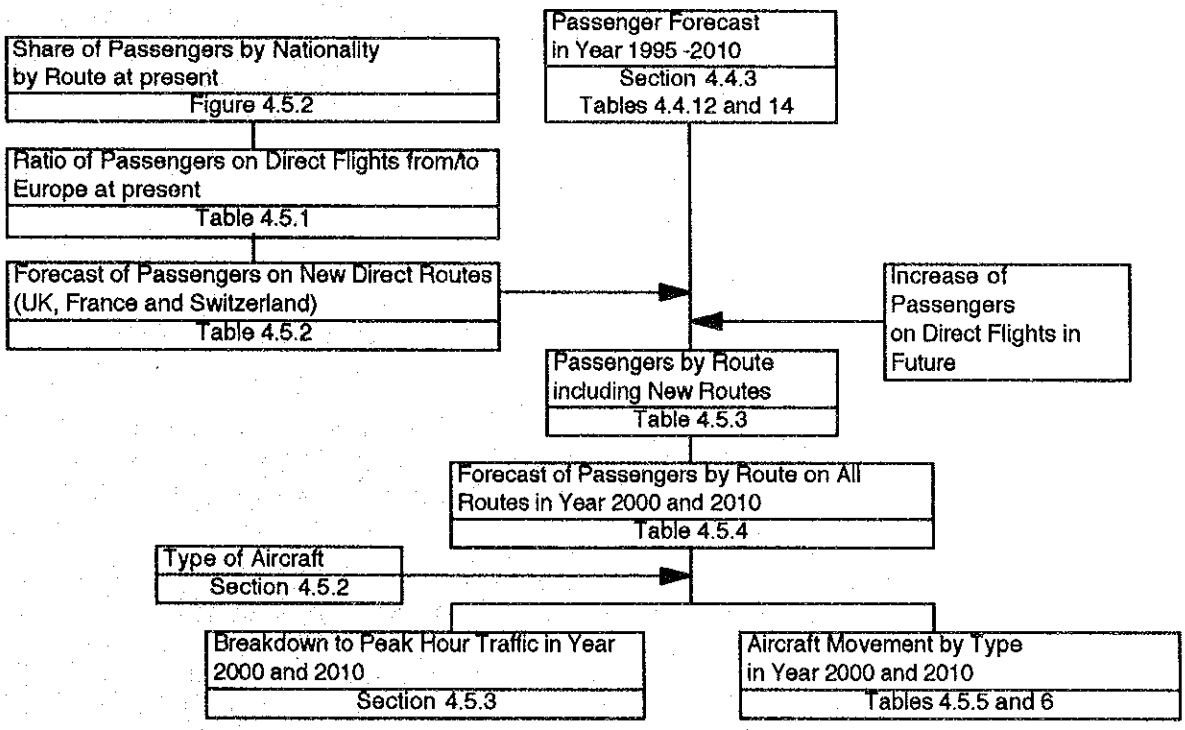



**Figure 4.5.1 Workflow of Breakdown of Traffic Demand**

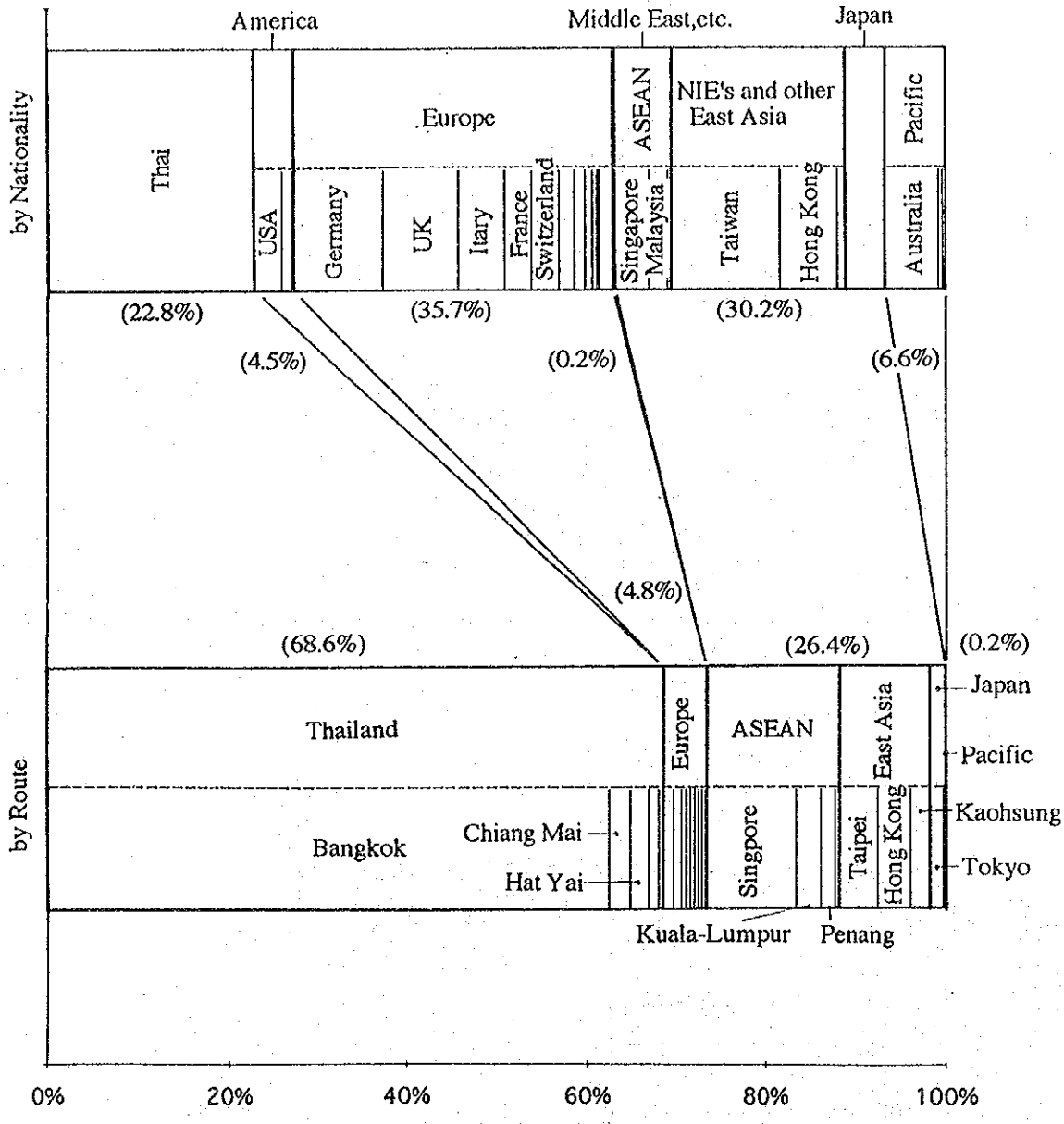



**Figure 4.5.2 Air Passengers to/from Phuket By Nationality and Route**

With the increase of passengers in the future, it is foreseen that the number of direct routes and flights to Phuket will increase. The opening of new direct routes to Phuket in the future from Europe which has the largest demand, are forecasted to develop as follows.

**Table 4.5.1** gives the share of the tourist passengers entering from Europe by nationality, and a comparison of the tourists entering Phuket by air and their nationality. This table shows that in spite of the passengers from the European countries, that the tourists are largely from England, France, Switzerland, and that their flight routes do not seem have a regular pattern. The tourists from the countries other than above three from Austria, Sweden, and a few other countries all operate direct flights to Phuket, and the total numbers of the tourists from England, France and Switzerland area sufficient to have direct flights. (There are direct flights already from England and Switzerland fixed for the 92 / 93 winter season schedule.)

**Table 4.5.1 Share of Nationality of Tourist and Air Passenger**

| Country | Guest Arrival (A) | Air Passenger (B) | (B)/(A) |
|---|---|---|---|
| Germany | 97,300 | 35,300 | 0.363 |
| Italy | 48,400 | 14,100 | 0.291 |
| Austria | 15,400 | 8,800 | 0.571 |
| Sweden | 11,600 | 8,800 | 0.759 |
| **Total** | **172,700** | **67,000** | **0.388** |

• Number of Passengers on the assumed new routes in 1991

| | | | |
|---|---|---|---|
| U.K. | 80,700 | * 0.388 = | 31,300 |
| France | 29,300 | * 0.388 = | 11,400 |
| Switzerland | 28,600 | * 0.388 = | 11,100 |

The demand of the new routes are forecasted to be as follows :

(1) The percentage of the number of tourists on the existing direct routes from Europe to Phuket is estimated at 38.8 % of the guest arrivals.

(2) The number of tourists from England, France, Switzerland (in 1991) entering on direct flights will be multiplied by this percentage to obtain their numbers.

(3) The number of passengers will be estimated for the period 2000 to 2010 (refer to Regional growth rate in **Table 4.4.12**) by multiplying the figures. The results are shown in **Table 4.5.2**.

**Table 4.5.2 Demand for London, Paris and Zurich Routes**

| Route | Tourist : | Demand for New Routes | | |
|---|---|---|---|---|
| | Present 1991 : | Present * 1991 | Forecasted 2000 | 2010 |
| London, U.K. | 80,700 | 31,300 | 66,800 | 119,800 |
| Paris, France | 29,300 | 11,400 | 24,300 | 43,600 |
| Zurich, Switzerland | 28,600 | 11,100 | 23,700 | 42,500 |

* 80,700 x 0.388 = 31,300
29,300 x 0.388 = 11,400
28,600 x 0.388 = 11,100

On the existing routes, it is felt that there will be more passengers converted to direct flights to Phuket from the route via Bangkok as the number of flights increase. It is difficult to assume the number of passengers that would be converted to direct flights, but it is felt that 50 % of the passengers from Europe would be on direct routes to

Phuket with the remaining 50 % flying into Phuket via Bangkok or other cities in the South East Asian countries such as Singapore.

The number of passengers from Europe in the year 2000 and 2010 are summarized in **Table 4.5.3.**

As a result of new direct routes opening to Phuket from Europe, 290,000 foreign passengers at Phuket International Airport will be converted from domestic flights between Bangkok and Phuket to the new direct routes in 2010. Apart from the converted traffic, it is also expected that some new traffic will be generated, however, the volume of generated traffic has not been taken into account for the demand forecast of this study, because the volume of generated traffic is uncertain and the affect on the total traffic of Phuket is estimated to be small.

From the above, the forecasted passengers by routes on the period 2000 and 2010 is expected to be as shown in Table 4.5.4.

**Table 4.5.3 Assumed Demand for Direct Routes from Europe**

| Route | 2000 | 2010 |
|---|---|---|
| Total of European Passengers | 1,346,000 | 2,413,000 |
| Bangkok | 673,000 | 1,206,500 |
| London | 87,100 | 160,200 |
| Paris | 31,700 | 58,300 |
| Zurich | 30,900 | 56,800 |
| Frankfurt | 59,000 | 108,500 |
| Munich | 39,300 | 72,300 |
| Amsterdam | 29,500 | 54,200 |
| Stockholm | 24,600 | 45,200 |
| Vienna | 24,600 | 45,200 |
| Copenhagen | 19,700 | 36,200 |
| Milan | 19,700 | 36,200 |
| Rome | 19,700 | 36,200 |

**Table 4.5.4 Annual Passengers by Route**

| Route | 1991 | 2000 | 2010 |
|---|---|---|---|
| Bangkok | 1,106,800 | 1,850,300 | 3,351,900 |
| Chiang Mai | 40,500 | 73,300 | 135,400 |
| Hat Yai | 35,400 | 63,800 | 117,700 |
| Surat Thani | 7,000 | 12,800 | 23,700 |
| Trang | 1,800 | 3,000 | 5,600 |
| Samui | 19,500 | 36,000 | 66,600 |
| **Domestic Routes** | **1,211,000** | **2,039,200** | **3,700,900** |
| Singapore | 176,800 | 507,300 | 898,100 |
| Taipei | 77,800 | 228,700 | 404,900 |
| Hong Kong | 61,900 | 182,100 | 322,700 |
| Penang | 49,600 | 143,800 | 254,700 |
| Kaohsiung | 38,900 | 114,500 | 202,900 |
| Kuala Lumpur | 30,000 | 81,100 | 143,200 |
| Tokyo | 21,200 | 61,000 | 92,600 |
| Langkawi | 7,000 | 20,500 | 36,400 |
| Fukuoka | 3,500 | 10,200 | 15,400 |
| Perth | 3,500 | 13,800 | 24,900 |
| London | – | 87,100 | 160,200 |
| Frankfurt | 21,200 | 59,000 | 108,500 |
| Munich | 14,100 | 39,300 | 72,300 |
| Paris | – | 31,700 | 58,300 |
| Zurich | – | 30,900 | 56,800 |
| Amsterdam | 10,600 | 29,500 | 54,200 |
| Stockholm | 8,800 | 24,600 | 45,200 |
| Vienna | 8,800 | 24,600 | 45,200 |
| Copenhagen | 7,100 | 19,700 | 36,200 |
| Milan | 7,100 | 19,700 | 36,200 |
| Rome | 7,100 | 19,700 | 36,200 |
| **International Route** | **555,000** | **1,748,800** | **3,105,100** |
| **Total** | **1,766,000** | **3,788,000** | **6,806,000** |

### 4.5.2 Type of Aircraft and Number of Flights

The aircrafts to be used in the future are classified as explained below based on the characteristics such as the range and seating capacity of each type.

B747 :

- Long-range route with large demand sufficient for daily operation such as a part of the Europe an routes
- Medium-range route with very large demand

B777 class (B777, A330, MD11) :

- Medium-range route with large demand
- Phuket - Bangkok route

A300 class (A300, B767, A310) :

- All routes with medium demand

B737 class (B737, B757) :

- Short-distance international and domestic routes with small demand

ATR42 class (ATR42, DHC8) :

- Local routes with limited runway length

### 4.5.3 Peak Hour Forecast

(1) Peak Month Coefficient

Peak month traffic is calculated by multiplying the annual traffic by peak month coefficient. Peak month coefficient is projected based on the past traffic data at Phuket International Airport as follows:

| | |
|---|---|
| International | 0.109 |
| Domestic | 0.0990 |

(2) Design Week Traffic

Design week traffic is calculated by multiplying the peak month traffic by the number of weeks in a month.(4.4 in average)

(3) Design Day Traffic

Design day traffic is calculated by multiplying the design week traffic by the number of days in a week.

(3) Peak Hour Traffic

Peak hour traffic is calculated by multiplying the design day traffic by peak hour coefficient. Peak hour coefficient can be expressed by the following equation which is used for planning airports in Japan since this formula is found to be applicable to the traffic characteristics at Phuket Airport.

International traffic: $a = 1.05/A+0.114$
Domestic traffic: $a = 1.51/A+0.115$ $(A<100)$
$a = 6.61/A+0.064$ $(A>100)$

A : Daily aircraft movements

(4) Summary of Air Traffic Demand

Air traffic demand at Phuket International Airport is summarized as shown in **Table 4.5.5**.

4.5.4 Number of Flights by Route

The type of aircraft to be used by route and their numbers in the years 2000 and 2010 are expected to be as shown in **Tables 4.5.6** and **4.5.7**.

## Table 4.5.5 Summary of Air Traffic Demand Forecast

| Item | | Year | | | | |
|---|---|---|---|---|---|---|
| | | Present | Future Requirement | | | |
| | | 1992 | 1995 | 2000 | 2005 | 2010 |
| 1. Annual Passengers (thousand) | | | | | | |
| - International | no. | 643 | 1,093 | 1,749 | 2,360 | 3,105 |
| - Domestic | no. | 1,272 | 1,492 | 2,039 | 2,783 | 3,701 |
| - Total | no. | 1,915 | 2,585 | 3,788 | 5,143 | 6,806 |
| 2. Annual Cargo | | | | | | |
| - International | ton | 1028 | 1544 | 2370 | 3307 | 4615 |
| - Domestic | ton | 2,096 | 4,581 | 7,262 | 10,314 | 14,574 |
| - Total | ton | 3,124 | 6,125 | 9,632 | 13,621 | 19,189 |
| 3. Annual Aircraft Movements | | a | | | | |
| - International | no. | 7,662 | 6,500 | 9,000 | 11,000 | 14,400 |
| - Domestic | no. | 9,320 | 6,100 | 8,400 | 11,400 | 15,300 |
| - Total | no. | 16,982 | 12,600 | 17,400 | 22,400 | 29,700 |
| 4. Typical Week Passengers | | | | | | |
| - International | no. | 17,700 | 26,000 | 43,300 | 56,400 | 76,900 |
| - Domestic | no. | 29,000 | 33,500 | 45,800 | 62,500 | 83,100 |
| - Total | no. | 46,700 | 59,500 | 89,100 | 118,900 | 160,000 |
| 5. Typical Week Aircraft Movements | | b | | | | |
| International | no. | 142 | 160 | 224 | 276 | 356 |
| - B-747-400 class | | – | – | 44 | 98 | 158 |
| - 777 / A-330 class | | – | 30 | 42 | 24 | 20 |
| - 767 / A-300 class | | 88 | 96 | 80 | 122 | 136 |
| - B-737 class | | 54 | 34 | 58 | 32 | 42 |
| Domestic | no. | 230 | 138 | 190 | 256 | 344 |
| - 777 / A-330 class | | – | 96 | 132 | 180 | 238 |
| - 767 / A-300 class | | 144 | 6 | 10 | 12 | 18 |
| - B-737 class | | 56 | 10 | 14 | 18 | 26 |
| - ATR-42 class | | 30 | 26 | 34 | 46 | 62 |
| Total | no. | 372 | 298 | 414 | 532 | 700 |
| 6. Peak Hour Passengers (both-way) | | b | | | | |
| - International | sq. m | 400 | 600 | 900 | 1,100 | 1,500 |
| - Domestic | sq. m | 700 | 900 | 1,100 | 1,400 | 1,700 |
| - Total | sq. m | 1,100 | 1,500 | 2,000 | 2,500 | 3,200 |
| 7. Peak Hour Aircraft Movements (both-way) | | b | | | | |
| - International | sq. m | 3 | 4 | 5 | 6 | 7 |
| - Domestic | sq. m | 5 | 4 | 5 | 6 | 7 |
| - Total | sq. m | 8 | 8 | 10 | 12 | 14 |

*Note :* a : as of 1991; including non-scheduled flights

b : calculated figure based on 1992/1993 winter schedule

**Table 4.5.6 Typical Week Traffic by Route (Year 2000)**

| | | | |
|---|---|---|---|
| Peak Month Ratio (Int'l) | 0.109 | Load Factor (Int'l) | 0.7 |
| Peak Month Ratio (Dom.) | 0.0988 | Load Factor (Dom.) | 0.7 |
| Week/Month Ratio | 1/4.4 | | |

**Target Year : 2000**

| Routing | Annual Passenger | Typical Week of Peak Month | Aircraft Type | Weekly Movement |
|---|---|---|---|---|
| Bangkok | 1,850,300 | 41,548 | B777/A330 (Dom.) | 132 |
| Chiang Mai | 73,300 | 1,646 | B767/A300 class | 10 |
| Hat Yai | 63,800 | 1,433 | B737 class | 14 |
| Surat Thani | 12,800 | 287 | ATR42 class | 8 |
| Trang | 3,000 | 67 | ATR42 class | 2 |
| Samui | 36,000 | 808 | ATR42 class | 24 |
| Dom. Routes | 2,039,200 | 45,789 | | 190 |
| Singapore | 507,300 | 12,567 | B747-class | 44 |
| Taipei | 228,700 | 5,666 | B777/A330 class | 24 |
| Hong Kong | 182,100 | 4,511 | B777/A330 class | 18 |
| Penang | 143,800 | 3,562 | B737 class | 34 |
| Kaoshung | 114,500 | 2,836 | B767/A300 class | 16 |
| Kuala Lumpur | 81,100 | 2,009 | B737 class | 20 |
| Tokyo | 61,000 | 1,511 | B767/A300 class | 8 |
| Langkawi | 20,500 | 508 | B737 class | 4 |
| Fukuoka | 10,200 | 253 | B767/A300 class | 2 |
| Perth | 13,800 | 342 | B767/A300 class | 2 |
| London | 87,100 | 2,158 | B767/A300 class | 12 |
| Frankfurt | 59,000 | 1,462 | B767/A300 class | 8 |
| Munich | 39,300 | 974 | B767/A300 class | 6 |
| Paris | 31,700 | 785 | B767/A300 class | 4 |
| Zurich | 30,900 | 765 | B767/A300 class | 4 |
| Amsterdam | 29,500 | 731 | B767/A300 class | 4 |
| Stockholm | 24,600 | 609 | B767/A300 class | 4 |
| Vienna | 24,600 | 609 | B767/A300 class | 4 |
| Copenhagen | 19,700 | 488 | B767/A300 class | 2 |
| Milan | 19,700 | 488 | B767/A300 class | 2 |
| Rome | 19,700 | 488 | B767/A300 class | 2 |
| Int'l Routes | 1,748,800 | 43,323 | | 224 |
| **Total** | **3,788,000** | **89,112** | | **414** |

| | |
|---|---|
| B747 class | : 400 |
| B777/A330 (Dom.) | : 450 |
| B777/A330 (Int'l) | : 350 |
| B767/A300 class | : 250 |
| B737 class | : 150 |
| ATR42 class | : 50 |

## Table 4.5.7 Typical Week Traffic by Route (Year 2010)

| | | | |
|---|---|---|---|
| Peak Month Ratio (Int'l) | 0.109 | Load Factor (Int'l) | 0.7 |
| Peak Month Ratio (Dom.) | 0.0988 | Load Factor (Dom.) | 0.7 |
| Week/Month Ratio | 1/4.4 | | |

**Target Year : 2010**

| Routing | Annual Passenger | Typical Week of Peak Month | Aircraft Type | Weekly Movement |
|---|---|---|---|---|
| Bangkok | 3,351,900 | 75,265 | B777/A330 (Dom.) | 238 |
| Chiang Mai | 135,400 | 3,040 | B767/A300 class | 18 |
| Hat Yai | 117,700 | 2,643 | B737 class | 26 |
| Surat Thani | 23,700 | 532 | ATR42 class | 16 |
| Trang | 5,600 | 126 | ATR42 class | 4 |
| Samui | 66,600 | 1,495 | ATR42 class | 42 |
| Dom. Routes | 3,700,900 | 83,102 | | 344 |
| Singapore | 898,100 | 22,248 | B747 class | 80 |
| Taipei | 404,900 | 10,030 | B747 class | 36 |
| Hong Kong | 322,700 | 7,994 | B747 class | 28 |
| Penang | 254,700 | 6,310 | B767/A300 class | 36 |
| Kaoshung | 202,900 | 5,026 | B777/A330 (Int'l) | 20 |
| Kuala Lumpur | 143,200 | 3,547 | B737 class | 34 |
| Tokyo | 92,600 | 2,294 | B767/A300 class | 14 |
| Langkawi | 36,400 | 902 | B737 class | 8 |
| Fukuoka | 15,400 | 382 | B767/A300 class | 2 |
| Perth | 24,900 | 617 | B767/A300 class | 4 |
| London | 160,200 | 3,969 | B747 class | 14 |
| Frankfurt | 108,500 | 2,688 | B767/A300 class | 16 |
| Munich | 72,300 | 1,791 | B767/A300 class | 10 |
| Paris | 58,300 | 1,444 | B767/A300 class | 8 |
| Zurich | 56,800 | 1,407 | B767/A300 class | 8 |
| Amsterdam | 54,200 | 1,343 | B767/A300 class | 8 |
| Stockholm | 45,200 | 1,120 | B767/A300 class | 6 |
| Vienna | 45,200 | 1,120 | B767/A300 class | 6 |
| Copenhagen | 36,200 | 897 | B767/A300 class | 6 |
| Milan | 36,200 | 897 | B767/A300 class | 6 |
| Rome | 36,200 | 897 | B767/A300 class | 6 |
| Int'l Routes | 3,105,100 | 76,922 | | 356 |
| **Total** | **6,806,000** | **160,024** | | **700** |

| | |
|---|---|
| B747 class | : 400 |
| B777/A330 (Dom.) | : 450 |
| B777/A330 (Int'l) | : 350 |
| B767/A300 class | : 250 |
| B737 class | : 150 |
| ATR42 class | : 50 |

# CHAPTER 5

# AIRPORT FACILITY REQUIREMENTS

# CHAPTER 5 AIRPORT FACILITY REQUIREMENTS

## 5.1 GENERAL

This chapter explains the airport facility requirements for Phuket International Airport based on the air traffic demand forecasts in Chapter 4. The facility requirements are estimated basically in compliance with the relevant standards and recommended practices of International Civil Aviation Organization (ICAO), those of Federal Aviation Administration (FAA) of the United States, Japan Civil Aviation Bureau (JCAB) and International Air Transport Association (IATA) are also referred to in areas where the ICAO does not cover or more practical planning is possible by using these standards. The facility requirements for Phuket International Airport are established for a period from 1995 to 2010 at five year intervals, and the results are summarized in **Table 5.1.1**.

## 5.2 RUNWAY AND RUNWAY STRIP

### 5.2.1 Runway

(1) Aerodrome Reference Code and Operational Category

The aerodrome reference code, i.e., code number and code letter will be as shown in **Table 5.2.1** in accordance with the largest aircraft anticipated to serve the airport. The operational category of the main approach runway at Phuket International Airport will be a precision instrument runway as is already practiced virtually.

**Table 5.2.1 Aerodrome Reference Code and Operational Category**

| | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| Reference Code | 4E | 4E | 4E | 4E |
| Operational Category | Precision Instrument | | | |

*Note: Aerodrome reference code*
*4D for A-300 and B-767*
*4E for B-747 , B-777 and A-330*

(2) Number of Runways

A single runway with proper exit taxiways under IFR conditions can handle 50 to 59 aircraft operations hourly according to the FAA. The above runway capacity changes depending on traffic control procedures, aircraft mix, percent arrivals and layout of exit taxiways.

Applying the local conditions and considering forecasted future hourly operation at Phuket International Airport, a single runway can cope with the traffic demand up to 2010 with appropriate measures.

## Table 5.1.1 Summary of Airport Facility Requirements

| Item | | Year | | | | |
|---|---|---|---|---|---|---|
| | | Present | Future Requirement | | | |
| | | 1993 | 1995 | 2000 | 2005 | 2010 |
| 1. ICAO Aerodrome Reference Code | | 4D | 4E | 4E | 4E | 4E |
| 2. Runway | | | | | | |
| - length | m | 3,000 | 3,000 | 3,000 | 3,500 | 3,500 |
| - Width | m | 45 | 45 | 45 | 45 | 45 |
| 3. Runway Strip | | | | | | |
| - Length | m | 3,240 | 3,120 | 3,120 | 3,620 | 3,620 |
| - Width | m | 150 | 300 | 300 | 300 | 300 |
| 4. Taxiway | | | | | | |
| - System | | 4 Exit | Parallel Full | Parallel Full | Parallel Full | Parallel Full |
| - Width | m | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 |
| 5. Apron | | | | | | |
| - B-747-400 class | no. | | 0 | 2 | 3 | 4 |
| - 777 / MD-11 class | no. | | 3 | 2 | 2 | 3 |
| - 767 / A-300 class | no. | 4 | 2 | 2 | 2 | 3 |
| - Small jet / Propeller | no. | 6 | 1 | 1 | 1 | 1 |
| 6. Passenger Terminal Building | | | | | | |
| - International | sq. m | 12,361 | 12,000 | 18,000 | 22,000 | 30,000 |
| - Domestic | sq. m | 11,494 | 9,000 | 11,000 | 14,000 | 17,000 |
| - Total | sq. m | 23,855 | 21,000 | 29,000 | 36,000 | 47,000 |
| 7. Cargo Terminal Building | | | | | | |
| - International | sq. m | | 110 | 170 | 240 | 330 |
| - Domestic | sq. m | | 330 | 520 | 740 | 1,040 |
| - Total | sq. m | 1,100 | 440 | 690 | 980 | 1,370 |
| 8. Administration/Operations Building | | | | | | |
| - AAT | sq. m | (in Pax Bldg.) | 4,500 | 4,500 | 4,500 | 4,500 |
| - Control Tower | sq. m | 1,092 | | | | |
| 9. Carpark | | | | | | |
| - Parking Slots | no. | 190 | 450 | 600 | 750 | 960 |
| - Area | sq. m | 5,700 | 15,800 | 21,000 | 26,300 | 33,600 |
| 10. Passenger Building Curb | | | | | | |
| - International | m | | 80 | 120 | 140 | 200 |
| - Domestic | m | | 120 | 140 | 180 | 220 |
| - Total Length | m | 140 | 200 | 260 | 320 | 420 |
| 11. Air Navigation Systems | | | | | | |
| - Operational Category | | Precision (ILS, NDB, VOR/DME) | Precision (ILS, NDB, VOR/DME) | Precision (MLS, NDB, VOR/DME) | Precision (MLS, NDB, VOR/DME) | Precision (MLS, NDB, VOR/DME) |
| 12. Rescue and Fire Fighting | | | | | | |
| - Level of Protection | | Category-8 | Category-8 | Category-8 | Category-8 | Category-8 |
| - Fire Station | sq. m | 984 | 450 | 450 | 450 | 450 |
| 13. Airport Utilities | | | | | | |
| - Power Supply | KVA | 50,000 | 3,100 | 4,100 | 4,900 | 6,300 |
| - Water Supply | ton/day | 300 | 260 | 340 | 410 | 520 |
| - Sewage Disposal | ton/day | 250 | 260 | 340 | 410 | 520 |
| - Solid Waste Disposal | kg/day | none | 2,200 | 2,800 | 3,300 | 4,100 |
| 14. Fuel Supply Facility | | | | | | |
| - Tank Capacity (JET A1) | KL | 538 | 1,600 | 2,200 | 3,100 | 4,000 |
| - Fuel Depot Area | sq. m | 48,000 | 10,400 | 10,400 | 10,400 | 10,400 |

(3) Runway Length and Width

From the data of the type of aircraft required by air routes, the aircraft that will require longest runway length are the Boeing B-747-400 aircraft on the Phuket - London route in the year 2010. The runway length required will be as follows :

**Table 5.2.2 Required Runway Length**

| Route | Phuket-London | |
|---|---|---|
| Type of Aircraft | Boeing B747-400 | |
| Route Distance | 5,313 NM | |
| Slope of Runway | 0.61 % (Existing) | 0.15 % (New) |
| Required Runway Length | 3,420 m | 3,260 m |

From the above information, the runway length is estimated to be 3,500 m. For a new airport, runway slope may be changed in the detailed design stage, and required length may be changed. Therefore, the runway is planned to be 3,500 m including some margin.

The required width of the runway is 45m with a 7.5m wide shoulder on each side for an aerodrome with reference code of 4E.

(4) Runway Strip

A runway strip should be extended before the threshold and beyond the end of the runway for a distance of at least 60m where the aerodrome code number is 4.

As for the width of the runway strip, ICAO stipulates as a standard that at least a 300m wide strip shall be provided for a precision runway of the code number 3 or 4, wherever practicable. This expression is toned down to a recommendation desirable in the interest of safety although the width of the runway strip for a non-precision instrument runway is the same 300m as that of the precision runway.

The FAA has a similar concept for the runway strip termed as the "primary surface". The width of the primary surface is 300m for a precision instrument runway, which is the same as the ICAO requirement. For non-precision instrument approach runways, the FAA stipulates two different widths, which are 150m and 300m for runways having visibility minimas greater than 1.2km and as low as 1.2km respectively. However, width of the strip should be 300m whenever the opposite approach runway is defined precision for approach runway.

## 5.3 OBSTACLE LIMITATION SURFACES

The requirements of ICAO obstacle limitation surfaces for non-precision and precision approach runways with the code number of 4 are illustrated in Figure 5.3.1.

The FAA stipulates "imaginary surfaces" instead of obstacle limitation surfaces, but major components are common to the two standards for precision approach runways.

For non-precision instrument approach runways the FAA allows a 2.9% slope approach surface.

The slope of the ICAO take-off climb surface is 2.0%, while planning based on the FAA standard is satisfied with a 2.9% slope which is established as a slope requirement for non-precision instrument runways.

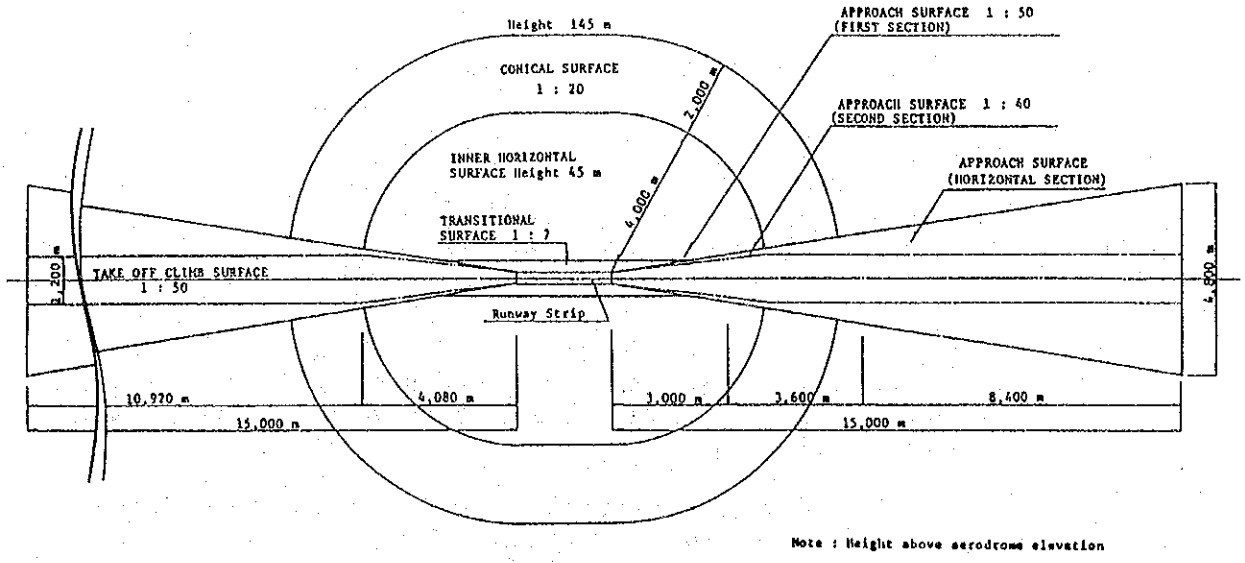



**Figure 5.3.1 Obstacle Limitation Surfaces**

## 5.4 TAXIWAY AND APRON

### 5.4.1 Taxiway

(1) Taxiway System

A complete parallel taxiway with right angle exits is economically justified where the number of instrument approaches exceeds four during the normal peak hour. Based on this criterion, Phuket International Airport should be provided with a complete parallel taxiway or equivalent taxiway system. The partial parallel taxiway sometimes provides satisfactory efficiency to aircraft operations. Whether or not the existing partial taxiway will cope with future increases of peak hour aircraft movements in terms of capacity will be examined in the evaluation of existing facilities in Chapter 6.

(2) Taxiway Width and Separation Distance

The width of the taxiway is 23m where it is intended to be used by aircrafts such as A-300 and B-747. The width of the shoulders for DC-10 and B-747 aircrafts is 7.5m and 10.5m respectively according to the ICAO and the FAA.

The separation distance between centerlines of the runway and parallel taxiway for an instrument runway is stipulated to be 176m for A-300 aircraft and 182.5m for B-747 aircraft by ICAO. The FAA provides smaller separation distance of 120 m for both A-300 and B-747 aircrafts.

The distance from the taxiway (other than aircraft stand taxilane) centerline to objects such as parked aircraft for A--300 is 40.5 m and 34.5 m by ICAO and FAA respectively. That for B-747 is 47.5 m and 48.5 m by ICAO and FAA respectively.

5.4.2 Apron

(1) Loading Stands

The number of required aircraft stands for loading/unloading of passengers is calculated using the following formula:

$$S = \sum_{i}^{n} \frac{Ti}{60} \times \frac{N i}{2} \times a + b \quad \text{..... (5.4.1)}$$

where,
- S : Number of loading stands
- Ti : Apron occupancy time of aircraft category (i) in minutes (International: 90, Domestic: 50)
- Ni : Number of movements of aircraft category (i) during peak hour
- $a$ : Allowance for special occasions (= 1.2)
- $b$ : Extra stands for special occasions

(2) Overnight Stay Stands

Phuket International Airport accommodates the overnight stay aircraft requirements of the Thai Airways and a few foreign airlines. The number of overnight stay stands is calculated using the following formula:

$$N = A \times a \quad \text{..... (5.4.2)}$$

where,
- N : Number of overnight stay stands
- A : Number of international passenger aircraft movements of the design day
- $a$ : Overnight stay ratio

The present overnight stay ratio (no. of overnight stay aircraft/no. of daily aircraft movements) is 0.06. Overnight stay aircraft can be accommodated by the loading apron and no particular overnight stay stands are required.

(3) Freighter Stands

Demand forecast shows that cargo demand will be relatively low with passenger demand at Phuket International Airport. No freighter stands are required up to year 2010.

(4) Total Number of Aircraft Stands

The total number of aircraft stands by aircraft type is estimated as shown in **Table 5.4.1**. In this estimate, all the loading stands are assumed to be co-used for overnight stay as practiced at Phuket International Airport at present.

**Table 5.4.1 Number of Aircraft Stands**

| Type of Stand | Aircraft Type | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| Loading | B-747-400 class | 0 | 2(*) | 3(*) | 4(*) |
| | 777 / MD-11 class | 3(*) | 2 | 2 | 3 |
| | 767 / A-300 class | 2 | 2 | 2 | 3 |
| | Small jet / Propeller | 1 | 1 | 1 | 1 |

*Note (*): Including one extra stand.*

(5) Size of Aircraft Stands

The sizes of the aircraft stands for each category of aircraft are shown in **Table 5.4.2**. The size of stands for jumbo jet (JJ) and wide-body jet (WB) aircraft are planned to be the same for flexible use of aircraft stands.

**Table 5.4.2 Size of Aircraft Stands**

| Category | Width of Stand* | Parking Configuration |
|---|---|---|
| B-747-400 class | 75 m | Nose-in |
| 777 / MD-11 class | 70 m | Nose-in |
| 767 / A-300 class | 60 m | Nose-in |
| Small jet / Propeller driven | 45 m | Self-maneuvering |

*Note*: Including wing tip clearance*

## 5.5 PASSENGER TERMINAL BUILDING AND OTHER BUILDINGS

### 5.5.1 Passenger Terminal Building

The floor area required for the passenger terminal building is calculated by use of the following formula:

$$RTA = UA \times PAX$$

where, RTA : Required floor area in $m^2$
UA : Unit floor area required per peak hour passengers
PAX : Number of peak hour passengers (2-ways)

The unit floor area of 20 sq.m/peak hour passenger for the international area and 10 sq.m/peak hour passenger for the domestic area are adopted for floor area estimation based on the actual planning in Japan and other countries, and the recent expansion project at Bangkok International Airport.

**Table 5.5.1 Required Floor Area of Passenger Terminal Buildings**

(Unit: $m^2$)

| Item | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| a) International | 12,000 | 18,000 | 22,000 | 30,000 |
| b) Domestic | 9,000 | 11,000 | 14,000 | 17,000 |
| c) Total | 21,000 | 29,000 | 36,000 | 47,000 |

5.5.2 Cargo Terminal Building

The floor area required for the cargo terminal building is estimated based on the annual cargo volume and unit cargo handling capacity. Based on the actual cargo handling capacity of international airports in Japan, one square meter of cargo terminal floor can handle 10 to 14 tons of annual cargo on the average. For the calculation of the floor area of the cargo terminal building at Phuket International Airport, the unit capacity of 14 ton/$m^2$ is used considering the improvement of efficiency of cargo handling by further mechanization in the future.

**Table 5.5.2 Required Floor Area of Cargo Terminal Building**

(Unit: $m^2$)

| Item | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| a) International | 110 | 170 | 240 | 330 |
| b) Domestic | 330 | 520 | 740 | 1,040 |
| c) Total | 440 | 690 | 980 | 1,370 |

5.5.3 Administration/Operations Office

The required floor area for the administrative and operational function of the AAT is estimated to be 4,500$m^2$ for Phuket International Airport in the light of the current practice of Japanese airports with comparable facilities.

A control tower for AeroThai, VFR room on the top of the tower, should be provided for air traffic control. Its location and height should be planned so that it will be free from transitional surfaces to obtain an unobstructed view of the airfield with a minimum sight angle of 35 minutes to runway thresholds from the VFR room.

## 5.6 CARPARK AND PASSENGER BUILDING CURB

### 5.6.1 Carpark

The following formula is used to calculate the required number of parking slots:

$$LOT = PAX \times PR \quad \text{---------- (5.6.1)}$$

where, LOT : Required number of parking slots
PAX : Number of peak hour passengers (2-way)
RP : Parking ratio (= 0.3 from the traffic survey at Phuket International Airport)

The required total carpark area is estimated as shown in **Table 5.6.1** by applying a unit space of 35m² for a parking slot which includes internal roads and a green zone in addition to net parking slots.

**Table 5.6.1 Required Number of Parking Slots and Carpark Area**

| Item | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| a) Number of Slots | 450 | 600 | 750 | 960 |
| b) Carpark Area ($m^2$) | 15,800 | 21,000 | 26,300 | 33,600 |

### 5.6.2 Passenger Building Curb

The following formula is used to calculate the required length of both departure and arrival curbs:

$$L = 0.095 \times PAX \times p \quad \text{---------- (5.6.2)}$$

where, L : Required curb length
PAX : Number of peak hour passengers (2-way)
p : Proportion of passenger using car/taxi : 0.7

**Table 5.6.2 Required Length of Passenger Building Curb**

(Unit : $m^2$)

| Item | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| a) International | 80 | 120 | 140 | 200 |
| b) Domestic | 120 | 140 | 180 | 220 |
| c) Total | 200 | 260 | 320 | 420 |

## 5.7 AIR NAVIGATION SYSTEMS

Air navigation system considering the following subsystems is required for Phuket International Airport to maintain safe operations and establish Precision Approach Category I service.

- Radio Navigation Aids
- Air Traffic Control System
- Aeronautical Telecommunication System
- Airfield Lighting System
- Meteorological Observation System

### 5.7.1 Radio Navigation Aids

The following provision for radio navigation facilities will be required:

- ILS or MLS
- VOR / DME
- NDB

Middle Marker and Outer Marker beacons should be provided for the ILS. In case the provision of marker beacon is impracticable, alternative DME should be provided.

According to the report of ICAO Communications / Operations Divisional Meeting on September 1985 in Montreal, the following transition plan ILS to MLS was agreed.

1) MLS will be a ICAO primary system after the year of 1998, and ILS service will be continued only on the basis of regional agreement to meet national requirements as an option.

2) MLS will be the sole ICAO standard approach and landing guidance system from 2000 onward. By the year 2000, the ILS will be withdrawn as an ICAO requirement.

However, the ICAO transition plan states that the implementation schedule will be deferred due to a delay of development of the operation program and airborne equipment.

Installation of MLS instead of ILS should be reconsidered in relation with the transition status from ILS to MLS by ICAO, and trend of the world before execution of the project.

### 5.7.2 Air Traffic Control System

Provision of air traffic control console should be provided for the Phuket approach control and aerodrome control. Provision of aerodrome terminal radar consisting of primary and secondary radar is also desirable for approach control and aerodrome control service. Radar data should be recorded automatically and kept for at least a period of fourteen days.

5.7.3 Aeronautical Telecommunication System

VHF radio having a range of more than 30 nm. coverage should be provided to enable air to ground communication.

VHF / UHF radio for surface movement control and ATIS (Automatic terminal information service) broadcast is also required.

Direct speech communication circuits should be established between the control tower and rescue and emergency authority, relevant air traffic service units, Bangkok ACC.

5.7.4 Airfield Lighting System

Airfield lighting system required for Precision Approach Category I is as follows :

- Precision approach lighting system
- PAPI or VASIS
- Runway edge light
- Runway threshold and end light
- Taxiway edge light
- Apron flood light
- Aerodrome beacon
- Illuminated wind direction indicator
- Obstacle light

5.7.5 Meteorological Observation System

Automatic meteorological observation system which collects and indicates airport meteorological conditions automatically should be provided. Required terms of observation are as follows :

- Surface wind
- Horizontal visibility
- Runway visual range
- Cloud amount, type and height of base
- Air temperature and dew point temperature
- Atmospheric pressure values (QNH / QFE)
- Rain fall

The latest observation data to be provided to relevant airport operation section or service units should also be reported to Bangkok ACC.

## 5.8 RESCUE AND FIRE FIGHTING SERVICES

The facility requirements for the rescue and fire fighting services are estimated in compliance with the ICAO recommendations. For the planning of rescue and fire fighting services, the levels of protection will be determined first. Those for B747 class aircraft are Category-9. However, these can be reduced to lower level since the number of aircraft movements of Category-9 is less than 700 in the consecutive three months. Therefore, the levels of protection required for Phuket International Airport is estimated to be Category-8. The requirements of fire fighting services for corresponding levels of protection are shown in **Table 5.8.1**.

**Table 5.8.1 Requirements of Rescue and Fire Fighting Services**

| Item | A-300 class (Category-8) | B-747 class (Category-9) |
|---|---|---|
| Principal Extinguishing Agent | Performance level B | Performance Level B |
| - Water (L) | 18,200 | 24,300 |
| - Discharge Rate (L/min) (*) | 7,200 | 9,000 |
| Complementary Agent | Dry Chemical Powder, Halon or CO2 | Dry Chemical Powder, Halon or CO2 |
| - Amount (kg) | 450 | 450 |
| Rescue and Fire Fighting Vehicles | | |
| - Minimum Number of Vehicles | 3 | 3 |
| Fire Station | | |
| - Floor Area | 450 $m^2$ | 450 $m^2$ |

*Note (*): 50% of this discharge rate should be attained by the RIV.*

The location of the fire station should be planned to achieve a response time not exceeding three minutes to the ends of runway as well as any other part of the movement area. ICAO's new recommendation effective November, 1990 states that the response time is considered to be the time when the first responding vehicle is in position to apply foam at a rate of at least 50% of the discharge rate specified in the above table.

## 5.9 AIRPORT UTILITIES

The airport utility requirements are calculated based on the unit demand shown in **Table 5.9.1**.

**Table 5.9.1 Unit Utility Demand**

| Utilities | Unit Demand | | |
|---|---|---|---|
| Electricity | Passenger Terminal Building | : | 120 $VA/m^2$ |
| | Cargo Terminal Building | : | 60 $VA/m^2$ |
| | Administration Building and others | : | 120 $VA/m^2$ |
| | Equipment | : | Calculated by Equipment |
| Water and Sewage | Passenger Terminal Building | : | 10 $L/m^2/day$ |
| | Cargo Terminal Building | : | 2 $L/m^2/day$ |
| | Administration Building and others | : | 10 $L/m^2/day$ |
| Waste | Passenger Terminal Building | : | 0.070 $kg/m^2/day$ |
| | Cargo Terminal Building | : | 0.140 $kg/m^2/day$ |
| | Administration Building and others | : | 0.140 $kg/m^2/day$ |

The demands of airport utilities anticipated at Phuket International Airport are estimated as shown in **Table 5.9.2** by multiplying the above unit demand by the required floor area of each building.

**Table 5.9.2 Airport Utility Demands**

| Item | | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|
| a) Electricity Demand | (KVA) | 3,200 | 4,100 | 4,900 | 6,300 |
| b) Water Demand | (ton/day) | 260 | 340 | 410 | 520 |
| c) Sewage | (ton/day) | 260 | 340 | 410 | 520 |
| d) Waste Disposal | (kg/day) | 2,200 | 2,800 | 3,300 | 4,100 |

5.9.1 Administrative Telephone

Microprocessor based automatic private telephone exchange (PABX) should be provided for administrative telephone service in the airport. Another telephone exchange will also be required, in terms of air traffic control which service will be provided Aerothai. Both telephone networks will be separated in view point of operation purpose, administration and air traffic control.

5.9.2 Electricity

Main primary power source from outside of the airport should be supported by a secondary power supply. Critical facilities such as air navigation facilities should be fed by an independent electrical cable, and be supported by a local secondary power supply.

## 5.10 OTHER FACILITIES AND SERVICES

5.10.1 Aviation Fuel Supply

The fuel supply requirements are calculated by multiplying the trip fuel by the number of departing flights for each route and aircraft type. The required fuel storage capacity is estimated based on the calculated fuel requirements and three days reserve policy presently practiced at Phuket International Airport. The aviation fuel storage requirements as well as required area for a fuel depot up to 2010 are as shown in **Table 5.10.1**.

**Table 5.10.1 Requirements for Aviation Fuel Storage and Fuel Depot Area**

| Item | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| a) Tank Capacity JET-A1 (KL) | 1,600 | 2,200 | 3,100 | 4,000 |
| b) Fuel Depot Area ($m^2$) | 10,400 | 10,400 | 10,400 | 10,400 |

# CHAPTER 6

# EVALUATION OF EXISTING AIRPORT

# CHAPTER 6 EVALUATION OF EXISTING AIRPORT

## 6.1 GENERAL

The starting point to prepare a long-term master plan is to evaluate the existing airport and to clarify the problems against current and future air traffic demand.

This Chapter clarifies the present conditions and problems of the existing airport and evaluation of the capacities of the existing airport facilities against the current demands.

The evaluation is based on the findings of site investigation at the airport and data and information collected through the first surveys.

**Figure 6.1.1** illustrates the summary of the evaluation which compares the capacity of existing facilities with the requirements which is described in the former chapters.

**Table 6.1.1** shows more information of evaluation based on the aspect of capacities and safe operation.

**Table 6.1.2** shows the comparison between the dimensions of existing facilities and relevant ICAO recommendations. Width of the runway strip and the separation between the runway and parallel taxiway are the major points which do not conform with ICAO recommendation for the current aerodrome reference code 4D.

**Table 6.1.3** shows the aircraft types which can be accommodated by existing facilities. This table indicates the aircraft stands of Apron C that can accommodate B-747 class aircraft in terms of size, but pavement strength is inadequate for such a large aircraft.

**Table 6.1.4** shows the capacities of existing terminal facilities and requirement by the current traffic demand. According to this comparison, major facilities of the terminal area have sufficient capacity for the current traffic demand.

**Table 6.1.5** summarizes the obstructions penetrating upon the obstruction limitation surfaces, which are detailed in Section 6.12.

## Figure 6.1.1 Summary of Evaluation for Existing Facilities

| No. | Facilities | | Year 1992 1995 2000 2005 2010 | Remarks |
|---|---|---|---|---|
| 1 | Runway | * Number | | A single runway can handle aircraft movement up to 2010. |
| | | * Length | | A 3,500m long runway will be required when B747 direct flights to Europe are operated. |
| | | * Width | | A 45m wide runway is adequate for aircraft up to B747. |
| 2 | Runway Strip | * Length | | The length of the strip should be extended when the runway is extended. |
| | | * Width | X | A 300m wide strip is recommendable in compliance with international standard. |
| 3 | Obstacle Limitation Surfaces | – Approach surface | X | The hill intruding upon the surface is an obstruction |
| | | – Transitional Surface | X | The hills both sides of the runway are obstructions. |
| 4 | Taxiway | * Separation Distance | X | The existing distance of 150 m is not sufficient for operation of A 300 class or larger aircraft. |
| 5 | Apron | * Aircraft Loading | | Parking space will become short after 2005 even though the apron expansion now under construction is completed. |
| 6 | Airfield Pavement | * Strength | | The strengthening of the existing pavement is required for operations of B777/A330 or larger class aircraft. |
| 7 | Passenger Terminal Building | – International | | Passenger terminal building should be expanded after 1995. |
| | | – Domestic | | |
| 8 | Cargo Terminal Building | | | Cargo terminal building is planned to be expanded by AAT. |
| 9 | Administration and Operation Building | – AAT Office | X | A separated administration building for AAT is ideal. |
| | | – Control Tower | X | The tower is located at unsuitable site. |
| 10 | Car Park | | X | Parking space is not enough during peak hours. |
| 11 | Passenger Building Curb | | | Passenger building curb should be expanded together with PTB expansion. |
| 12 | Air Navigation System | – Radio Navigation Aids | | Life span of NDB will end soon. |
| | | – Air Traffic Control System | | Secondary surveillance radar should be provided to the existing ASR facility. |
| | | – Aeronautical Communication System | | System is adequate and maintained well. |
| | | – Airfield Lighting System | | Approach lighting system is to be rebuild at the same time of runway extension |
| | | – Meteorological Observation System | | Power supply for the system should be enhanced (system itself has no problem). |
| 13 | Rescue and Fire Fighting | – Level of Protection | | Present level of protection of Category-8 is enough up to 2010. |
| | | – Fire Station | | The building is large enough up to 2010. |
| 14 | Airport Utilities | – Power Supply | | The capacity of emergency generator for Passenger Terminal Building is inadequate. |
| | | – Water Supply | | The capacity of deep well will be a problem. |
| | | – Sewage Disposal | | The capacity of oxidation pond is enough. |
| | | – Solid Waste Disposal | | No incinerator is available at the airport. |
| 15 | Aviation Fuel Supply | | X | Storage capacity of the fuel tanks is below requirements. |

*Note: " X indicates facility reached its capacity or is not adequate.*

## Table 6.1.1 Summary of Evaluation of Existing Airport

| Item | Description | Evaluating aspect of | |
|---|---|---|---|
| | | Capacitation | Safe Operation |
| **1. Airspace** | | | |
| 1.1 FIR | - No problem | - None | - No problem |
| 1.2 Phuket TMA | - No problem | - None | - No problem |
| 1.3 Operation Procedure | - Five instrument approach procedures are established, but angle of glide slope of ILS for RWY 27 is obliged to 3.2 degrees to ensure OAS for the final approach area because of the existence of hills.<br>- LLZ of ILS is settled offset for RWY 27 by the intersection angle of 1° 55' 54". | - No problem | - To be considered for the improvement for the compliance with ICAO recommendation. |
| **2. Runway and Runway Strip** | | | |
| 2.1 Runway | | | |
| (1) Runway usability factor | - No problem | - No problem | - No problem |
| (2) Number of runway | - No problem | - No problem | - No problem |
| (3) Length and width | - No problem | - No problem | - No problem |
| (4) Slope | - No problem | - No problem | - No problem |
| 2.2 Runway Shoulder | - No problem | - No problem | - No problem |
| 2.3 Runway Strip | | | |
| (1) Length | - Length of the existing runway strip is stipulated to be 3,240 m. in AIP. | - No problem | - No problem |
| (2) Width | - Width of the existing runway strip is 150 m. For precision approach RWY 27 it is less than 300 m recommended for a precision approach in ICAO standards. | - No problem | - To be improved for compliance with ICAO recommendation. |
| 2.4 Runway End Safety Area | - Runway end safety area are provided based on ICAO recommendation | - No problem | - No problem |
| 2.5 Clearway | - No provided | - No problem | - To be considered for provision if possible. |
| 2.6 Stopway | - 60 m. long paved stopway is provided on both ends. | - No problem | |
| **3. Obstacle Limitation Surfaces** | | | |
| 3.1 Approach Surface | | | |
| (1) RWY 27 | - A hill, 138 m. AMSL located in the second section of approach area is projected above approach surface approx. 18 m. | | - Hill, 138 m. AMSL infringes safe operation |
| (2) RWY 09 | - No problem | | - No problem |
| 3.2 Transitional Surface | - Hills project above surface C/Tower projects above the surface approx. 54 m. | | - Control tower infringes for safe operation |
| 3.3 Inner Horizontal Surface | - Hills project above surface | | - Hills projecting above surface are infringement. |

## Table 6.1.1 Summary of Evaluation of Existing Airport

(Cont.)

| Item | Description | Evaluating aspect of | |
|---|---|---|---|
| | | Capacitation | Safe Operation |
| 3.4 Take-Off Climb Surface | | | |
| (1) RWY 27 | - Hill 138 m. AMSL, located 4,400 m. from RWY 27 threshold projects above TKOF Climb surface for RWY 09. | | |
| (2) RWY 09 | - TKOF Climb surface for RWY 27 is free from obstacles. | | - Hill, 138 m. AMSL is infringed. |
| **4. Taxiway and Apron** | | | |
| 4.1 Taxiway | - New partial parallel taxiway is now under construction.<br>- Construction of complete parallel taxiway is difficult due to the compatibility with G/P antenna.<br>- Separation between RWY and TWY of new parallel taxiway does not meet ICAO recommendation.<br>- New parallel TWY is close to public road. | | - Special treatment for closed public road will be considered. |
| 4.2 Taxiway Shoulder | - Condition of shoulder meets ICAO RECOMMENDATION. | - No problem | - No problem |
| 4.3 Taxiway Strip | - No taxiway strip is defined. | - No problem | |
| 4.4 Apron | | | |
| (1) Apron Location | | | |
| Apron A & B | - Joint use on Apron A & B.<br>- Location is close to runway and between RWY and new parallel taxiway after completion of construction work. | - No problem to the current demand | - Relocation is planned |
| Apron C | - Location is in front of terminal building and is 300 meter from RWY. | - Expansion of 6 spots is planned | - No problem |
| (2) Aircraft Stands | | | |
| Apron A & B | - Totally 6 spots by DHC-8, ATR-42 and Grumman Mallard. | - No problem to the present demand | |
| Apron C | - 4 spots by B-77 simultaneously. | - No problem to the present demand | |
| **5. Airfield Pavement** | | | |
| 5.1 Runway | - Overlay works is planned to be carried out in 1993. | - No problem | - No problem |
| | - There is no problem for the current aircraft operation on the pavement structure. | - No problem | - No problem |
| 5.2 Taxiway | - No problem | - No problem | - No problem |
| 5.3 Apron A & B | | - No problem | - Parking configuration will be considered so as not to infringe on the transitional surface. |

## Table 6.1.1 Summary of Evaluation of Existing Airport

(Cont.)

| Item | Description | Evaluating aspect of | |
|---|---|---|---|
| | | Capacitation | Safe Operation |
| 5.4 Apron C | - No problem<br>- Design for space was targeted for B-747 but the pavement strength is designed for A-300. | - Strengthening shall be considered for B-747. | - No problem |
| **6. Passenger Terminal Building** | - There will be no problem on the space with the present traffic.<br>- The security screening for Pax. and baggage will be improved so as to ensure their safety.<br>- The ancillary system for PTB such as flight information system, sign board will be improved for the provision of good services.<br>- Better service level will be considered in general. | - No problem | - The improvement of security system will be considered. |
| **7. Cargo Terminal Building** | - The space is too narrow for the handling of present cargo volume. However, new CTB is now under construction. | - No problem by the operation of new CTB | - No problem |
| **8. Control Tower Building** | - Part of Apron C is out of view from VFR | - No problem | - Improvement of disturbed eyesight from VFR will be considered to Apron C. |
| **9. Fire Station Building** | - New building is scheduled to be opened | - No problem | - No problem |
| **10. Access Road, Curbside Road and Car Park** | | | |
| (1) Access Road | - No problem because there are two access roads to the airport. | - No problem | - No problem |
| (2) Curbside Road | - Curb side length for passenger terminal is short and its slope is too steep due to structural reasons. | - No problem | - The improvement will be considered for future traffic demand |
| (3) Car Park | - No problem | - No problem in consideration of future expansion area. | - No problem |
| **11. Storm Water Drainage System** | - No problem | - No problem | - No problem |
| **12. Air Navigation Systems** | | | |
| 12.1 Radio Navigation System | | | |
| - ILS/LLZ-GP | - Glide path angle is 3.2 degree due to the obstruction by RWY 27 approach surface. | | - G/P will be located to close new parallel TWY (Reliability will be problem) |
| - Middle Marker | - Location of M/M does not meet with ICAO recommendation. | | - Relocation to the adequate position will be considered. |
| - VOR/DME | - No problem | - No problem | - No problem |
| - NDB | - Life span is already exceeded | - Already exceeded | - Replacement isplanned. |

## Table 6.1.1 Summary of Evaluation of Existing Airport

(Cont.)

| Item | Description | Evaluating aspect of | |
|---|---|---|---|
| | | Capacitation | Safe Operation |
| 12.2 Aeronautical Telecommunication System | - No problem | - No problem | - No problem |
| 12.3 Airfield Lighting System | - Simple approach lighting system (SALS) on RWY 27, 300 m in length does not conform with ICAO recommendation due to the lack of 2 barrettes. | - No problem | - The replacement to ALS will be considered in compliance with ICAO recommendation. |
| 12.4 Meteorological Observation System | - Standard observation system by ICAO is followed. | - No problem | - No problem |
| **13. Rescue and Fire Fighting Service** | - Facility of Category 8 is provided | - No problem | - No problem |
| **14. Airport Utilities** | | | |
| 14.1 Power Supply System | - Major facilities are supplied from PEA line individually<br>- There are frequent power interruptions. | - Commercial power have no problem but the capacity of emergency generator for PTB is inadequate. | - High reliability of services will be considered. |
| 14.2 Water Supply System | - Deep well | - No problem | - No problem |
| 14.3 Sewerage System | - Oxidation pond | - No problem | - Will consider provision for future development |
| 14.5 Telephone | - No problem | - No problem | - No problem |
| **15. Aviation Fuel Supply** | - Apron fuel hydrant system is provided. | - No problem | - No problem |
| **16. Airport Management** | - Done by AAT | - No problem | - No problem |
| **17. Security** | | | |
| **18. Land Use Surrounding the Airport** | - West-southern part faces the National Park area, Eastern part is close to Route 402. South-east part of airport area is now developing resort area. | - There are some restrictions for the development of airport at the west and south-east side of the airport | - No problem. Noise pollution for developing resort area will not occur. |

## Table 6.1.2 Comparison of Existing Facility Characteristics with ICAO Recommendation

| Facility | ICAO Recommendation | Existing Condition | Satisfied | Not satisfied |
|---|---|---|---|---|
| Runway | | | | |
| 1. Width | 45 m | 45 m | * | |
| 2. Slope - Longitudinal | Max. 1.25% | 1.25% | * | |
| 3. Slope - Transverse | Max. 1.5% | Max. 1.5% | * | |
| 4. Shoulder Width | 7.5 m | 7.5 m | * | |
| 5. Shoulder Slope | Max. 2.5% | 2.5% | * | |
| Runway Strip | | | | |
| Length (extended length beyond runway end) | 60 m | 120 m | * | |
| Width | 300 m | 150 m | | * |
| Slope - Longitudinal | Max. 1.5% | 1.25% | * | |
| Slope - Transverse | Max. 2.5% | Max. 2.5% | * | |
| Parallel Taxiway | | | | |
| Width | 23 m | 23 m | * | |
| Slope - Longitudinal | Max. 1.5% | less than 1.5% | * | |
| Slope - Transverse | Max. 1.5% | Max. 1.5% | * | |
| Overall Width of Taxiway and Shoulders | 38 m | 44 m | * | |
| Shoulder Slope | | | | |
| High Speed Taxiway | | | | |
| Curve Radius | 550 m | 550 m | * | |
| Separation Distance between Runway and Parallel Taxiway Centerlines | 176 m | 150 m | | * |
| Aircraft Stand Taxilane (Apron C) | | | | |
| Separation Distance between Aircraft Stand Taxilane and Parking Aircraft | 36 m | 47 m | * | |

**Table 6.1.3 Existing Facilities and Aircraft Possible to be Operated**

| Facility | Aircraft Type (* : possible to be operated) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B-747 -400 | B747 -200 B | DC10 -40 | A300 -B4 | A300 -B2 | B767 -200 | B757 -200 | B-737 -200 |
| | ACN | 67 | 70 | 62 | 55 | 48 | 40 | 31 |
| Runway Length | O | O | O | * | * | * | * | * |
| | (O : depends on the flight distance) | | | | | | | |
| " Pavement (PCN 61) | | | | | * | * | * | * |
| | | | | | | | | |
| Taxiway-A,B,C Pavement (PCN 56) | | | | | * | * | * | * |
| " E,F,G,P Pavement (PCN 56) | | | | | * | * | * | * |
| " D Pavement (PCN 47) | | | | | | | * | * |
| | | | | | | | | |
| Apron-C Size of Aircraft Stand | * | * | * | * | * | * | * | * |
| Apron-B Size of Aircraft Stand | | | | | | | | * |
| Apron-A Size of Aircraft Stand | | | | | | | | * |
| | | | | | | | | |
| Apron C Pavement (PCN 56) | | | | | * | * | * | * |
| Apron B Pavement (PCN 56) | | | | | * | * | * | * |
| Apron A Pavement (PCN 47) | | | | | | | * | * |

**Table 6.1.4 Comparison of Capacity and Demand of Existing Facilities**

| Facility | Capacity | | Demand | Satf'y. | Not Satf'y. |
|---|---|---|---|---|---|
| Number of Aircraft Stands | A-300 class | 4 | 7 a | * | |
| | Small Aircraft | 6 b | | | |
| Passenger Terminal Building Floor Area | Total | 23,855 $m^2$ | 13,380 | * | |
| | International | 12,361 | 6,620 | * | |
| | Domestic | 11,494 | 6,760 | * | |
| Cargo Terminal Building Floor Area | Total | 1,100 | 450 | * | |
| Car Park | 190 lots | | 150 a | * | |

Note : a : Maximum figures observed during our traffic survey
b : Six A-300 class stands are under construction (as of August 1993) and replace with them.

**Table 6.1.5 Obstacle Limitation Surfaces (OLS) and Obstructions**

| | OLS | Obstruction | Distance (km) | Height (m) | Height of OLS (m) | Satf'y | Not Satf'y |
|---|---|---|---|---|---|---|---|
| Approach Surface | RWY 27 | Hill | 4.4 b | 138 | 120 | | * |
| | RWY 09 | (Nil) | | | | * | |
| Transitional Surface | North side | Hills | 245m a | 60 | 47 | | * |
| | South side | Hill | 360m a | 80 | 65 | | * |
| | | Control Tower | 360m a | 113 | 59 | | * |
| | | Aircraft Parking in Apron A and B | adjacent to Runway Strip | - | - | | * |
| Inner Horizontal Surface | North side | Hill | 2.3 a | 268 | 70 | | * |
| | South side | Hill | 3.8 a | 225 | 70 | | * |
| Conical | North side | (Nil) | | | | * | |
| | South side | Mountain | 4.7 southwest a | 335 | 105 | | * |
| | | Mountain | 4.2 south a | 200 | 80 | | * |
| Take-off Climb Surface | RWY 27 | (Nil) | | | | * | |
| | RWY 09 | Hill | 4.4 b | 138 | 120 | | * |

Note : a : distance from runway center line
b : distance from runway threshold

## 6.2 RUNWAY AND RUNWAY STRIP

### 6.2.1 Runway

(1) General

The existing runway system is a single runway oriented 09/27 of 3,000 m in length and 45 m in width with 7.5-m shoulders and 60-m paved overruns at both ends. The runway is paved by asphalt, except for 110 m from the runway threshold at the runway 09 end and 660 m at the runway 27 end, which are paved with concrete.

The declared runway strength in the AIP is PCN 61/F/C/X/T, which is capable of accommodating aircraft up to A300 aircraft.

(2) Runway Usability Factor

Based on the meteorological data during the last three years at the airport (wind, visibility and cloud), usability factors of the runway were examined as shown in **Table 6.2.1.**

**Table 6.2.1 Runway Usability Factor**

| Cross-wind Component | Usability Factor |
|---|---|
| Less than 13 kt | 98.72 % |
| Less than 20 kt | 98.85 % |

As shown in the table, the runway usability factor at the airport is nearly 99% in both cases of cross-wind components which sufficiently exceeds the 95% usability factor recommended by ICAO standard. It represents favorable meteorological conditions at the airport.

(3) Number of Runways

The existing single runway will face no capacity problem in terms of aircraft movements in the future.

(4) Runway Length and Width

Length and width of the existing runway are 3,000m and 45m respectively which qualify the airport as a 4D aerodrome by ICAO Annex 14 definitions. The existing 3,000m long runway is sufficient for A300 direct flight from Phuket to the Middle East. The existing runway width of 45m is adequate for all types of aircraft used for civil aviation at present.

(5) Runway Slope

The longitudinal slope of a whole of the runway, which is computed by dividing the difference between the maximum and minimum elevation by the runway length, is 0.6% based on the Topographic Survey. This slope does not exceed 1.0% recommended by ICAO standard.

At the central 1,000m portion of runway, longitudinal slope is plus 1.25%. This slope equals to the maximum slope recommended by ICAO standard.

At the eastern 1,000m portion of the runway , longitudinal slope is plus 0.8% which also equals the maximum of ICAO standard.
At the western 1,000m portion of the runway , longitudinal slopes are plus 0.258% and minus 0.097% from the threshold side (See **Figure 15.2.1**).

No serious problems for aircraft operations relating to runway slope is reported.

6.2.2 Shoulder

The shoulder is 7.5m wide and meets ICAO standard.

6.2.3 Runway Strip

(1) Length

The length of the existing runway strip is 3,240m according to the AIP .

(2) Width

The width of the existing runway strip is 150m. It is less than 300m recommended for a non-precision approach in ICAO standard.

(3) Slope

The strip is generally well graded with a slope of less than 2.5%. In the south end of the strip, new parallel and rapid exit taxiways were completed in the early 1993, and at the same time northern expansion of the strip was regraded. (See **Figure 6.2.1**)

6.2.4 Runway End Safety Area

Runway end safety area recommended by ICAO is not provided.

6.2.5 Clearway

There are no clearways on either ends.

6.2.6 Stopway

60m long paved stopways are provided on both ends.

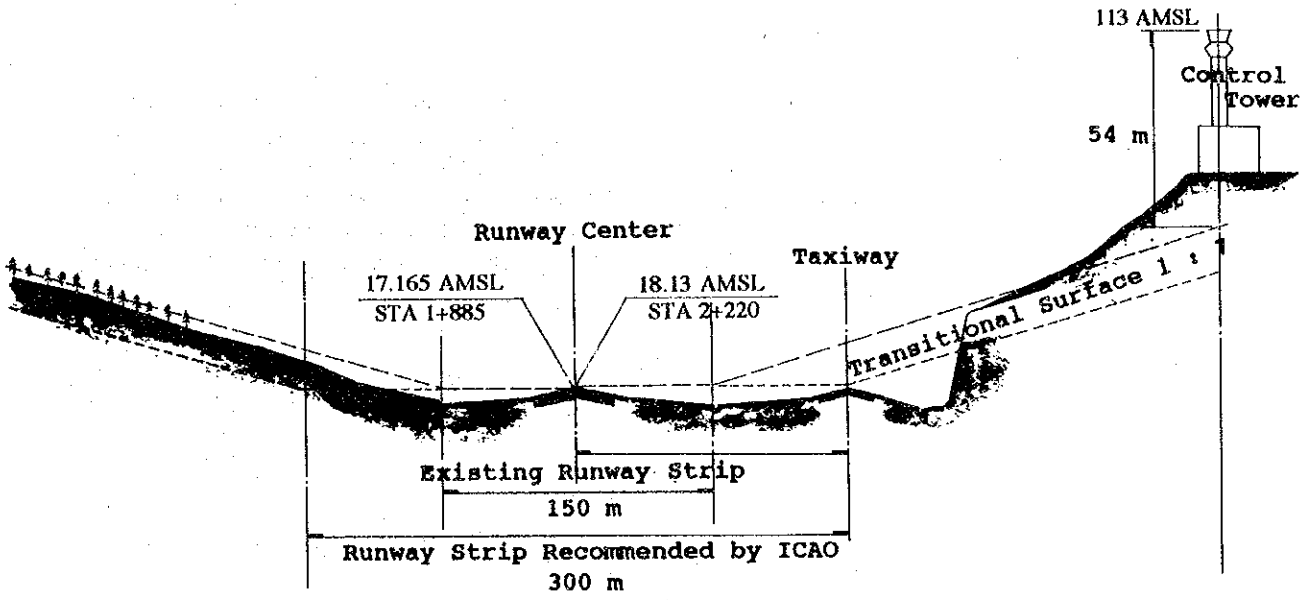



**Figure 6.2.1 Relation to Transitional Surface for Hill with Control Tower**

## 6.3 TAXIWAY AND APRON

### 6.3.1 Taxiway

A partial parallel taxiway (Taxiway P), five exit taxiways and two rapid exit taxiways are provided. At the west portion, from runway 09 end to the rapid exit taxiway (Taxiway E), the separation of runway and the parallel taxiway is 180 m. In the rest of the portion, the separation is 150 m because of existence of a hill near the taxiway. The former clears ICAO standard of 176 m for aerodrome code 4D, but the latter does not clear the code requirement. The separation of 180 m will not meet the standard if the airport is intended to be used for the large aircraft whose code letter is E ( 182.5m for code E ).

The widths of the parallel taxiway and shoulders at the west portion are 30 m and 7.0 m respectively, and 23 m and 10.5 m at the rest portion respectively .

The full length of parallel taxiway had been planned previously to this partial parallel taxiway once before, but the location of glide path antenna was incompatible with the provision of full parallel taxiway due to the condition of terrain for G/P antenna and the plan has been changed to the current one.

Taxiways C and D which are 23 and 30 m in width connect Apron A and B to the runway.

Taxiway B which is 30 m in width and 300 m length connects the current passenger terminal area to the runway. This taxiway intersects the runway at a point 200 m from runway threshold 09.

### 6.3.2 Aprons

(1) Aprons A and B

Aprons A and B are located in front of the former cargo terminal building which has been demolished already, and the two aprons have been joined into one apron. The size is approximately 400 m by 80 m. There are small aircraft stands for Grumman Mallard, ATR-42 and DHC-8 on apron A and B respectively. Since the parking positions do not have enough distance from the runway, aircraft on these aprons infringe upon the transitional surface as shown in **Figure 6.3.1.**

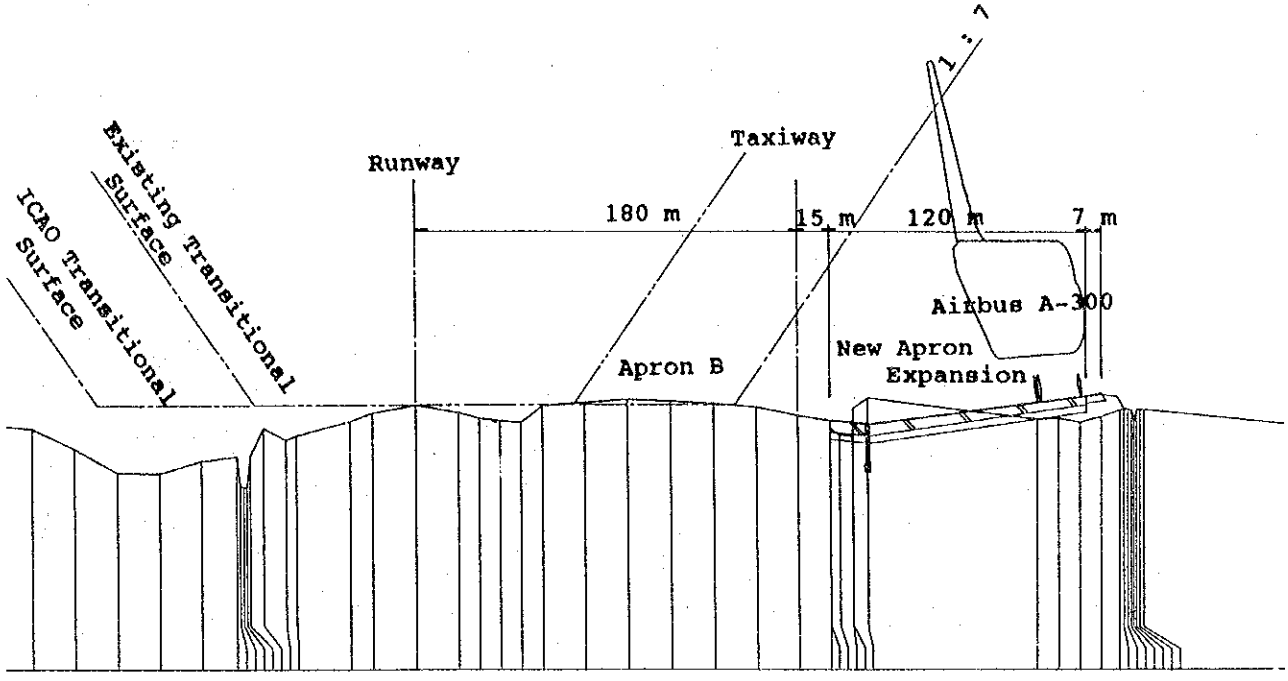



**Figure 6.3.1 Transitional Surface and Apron B**

These aircraft stands will be re-allocated due to the establishment of a new taxiway on Aprons A and B.

(2) Apron C

Apron C is located at the present terminal area. The size is 320 m wide by 150 m deep. There are four aircraft stands up to the B-747 aircraft in nose-in configuration. Size of aircraft stand is sufficient for B-747 aircraft. Distance between the runway and the nearest stand to the runway is more than 300 m without infringing upon the transitional surfaces.

(3) Planned Apron Expansion

In order to accommodate increasing traffic demand, an apron expansion is planned at the location of the former terminal area, on the opposite side to Aprons A and B of new parallel taxiway (Refer Figure 3.8.1). The plan has six parking positions for Airbus-class aircraft.

## 6.4 AIRFIELD PAVEMENT

### 6.4.1 Runway Pavement

The surface and strength of runway pavement are described in the AIP as shown in **Table 6.4.1.**

The strength is sufficient for Airbus, but was not designed for larger aircraft such as B-747. Overlay work is planned in 1993 in order to enhance the strength and to smooth irregular surface. Thickness of overlay is planned to be 8 cm with asphaltic concrete. See **Figure 6.4.1.**

**Table 6.4.1 Airfield Pavement**

| Location | Runway | | Taxiway | | | Apron | | |
|---|---|---|---|---|---|---|---|---|
| | West 110 m<br>East 610 m<br>Turning Pad | Central 1,800 m | A, B, E, F, G, P | C | D | A | B | C |
| Surface | Concrete | Asphalt | Conc. | Conc. | As. | As. | Conc. | Conc. |
| Strength (PCN) | 61 /F/C/X/T | | 56 /R/C/X/T | 56 /R/C/X/T | 47 /F/C/X/T | 47 /F/C/X/T | 56 /R/C/X/T | 56 /R/C/X/T |
| Structure (Thickness in centimetres) | | | | | | | | |
| Asphaltic Layers | - | 17 | - | - | * | * | - | - |
| Concrete Slab | 40 | - | 40~45 | 30 | | | 30 | 42 |
| Base Course | 15 | 25~32 | 30 | * | | | * | 30 |
| Subbase Course | - | 30 | - | - | | | - | - |

* : Structure Unknown

6.4.2 Taxiway and Apron Pavement

Except for the old asphalt pavement on Apron A and Taxiway D, cement concrete pavement is generally used.

Pavement for the other connecting taxiways, parallel and rapid exit taxiways are also concrete with the same PCN strength (56/R/C/X/T). The structure of these new concrete pavements are as follows:

| | | |
|---|---|---|
| Concrete Slab (non-reinforced) | : | 0.42 m |
| Crushed Aggregate | : | 0.3 m |

See also **Table 6.4.1** and **Figure 6.4.1** for reference

## 6.5 DRAINAGE

The existing airfield is located on a small flat land in an undulating area in northern part of Phuket Island. West portion of the airfield, where terminal area is located, is situated on a relatively flat terrain along Nai Yang beach. East portion is on a crotch of hills, and higher than the west.

Accordingly, storm water flows in the east to west direction. There are three drainage systems which are parallel with the runway by the open ditch in the air strip, discharging into the sea at the west end. Construction of drainage facilities was completed under the new taxiway construction work. At the terminal area, the drainage system is provided properly. So far there have been no problems reported on the existing drainage system.

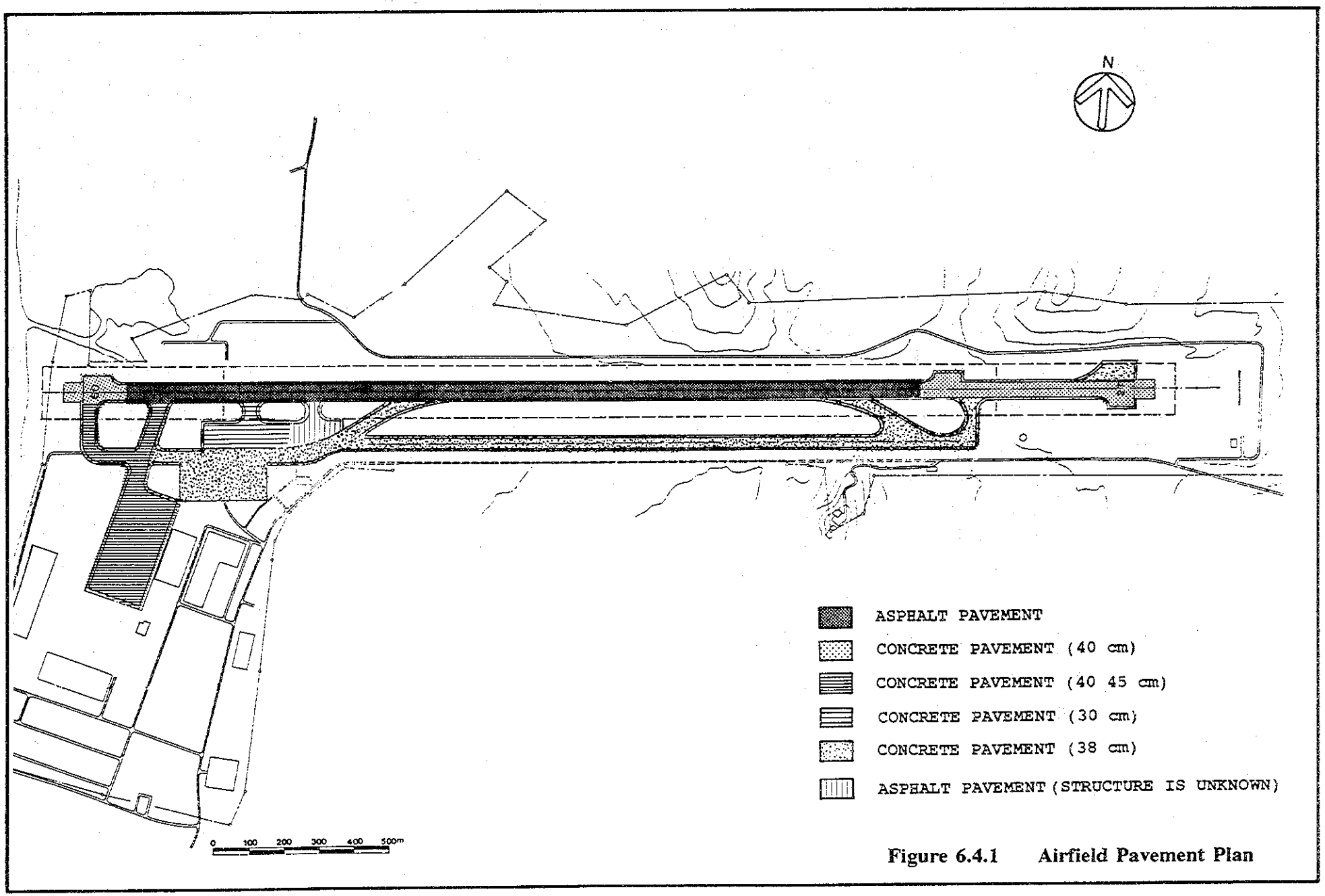



**Figure 6.4.1 Airfield Pavement Plan**

## 6.6 PASSENGER TERMINAL BUILDING

### 6.6.1 General

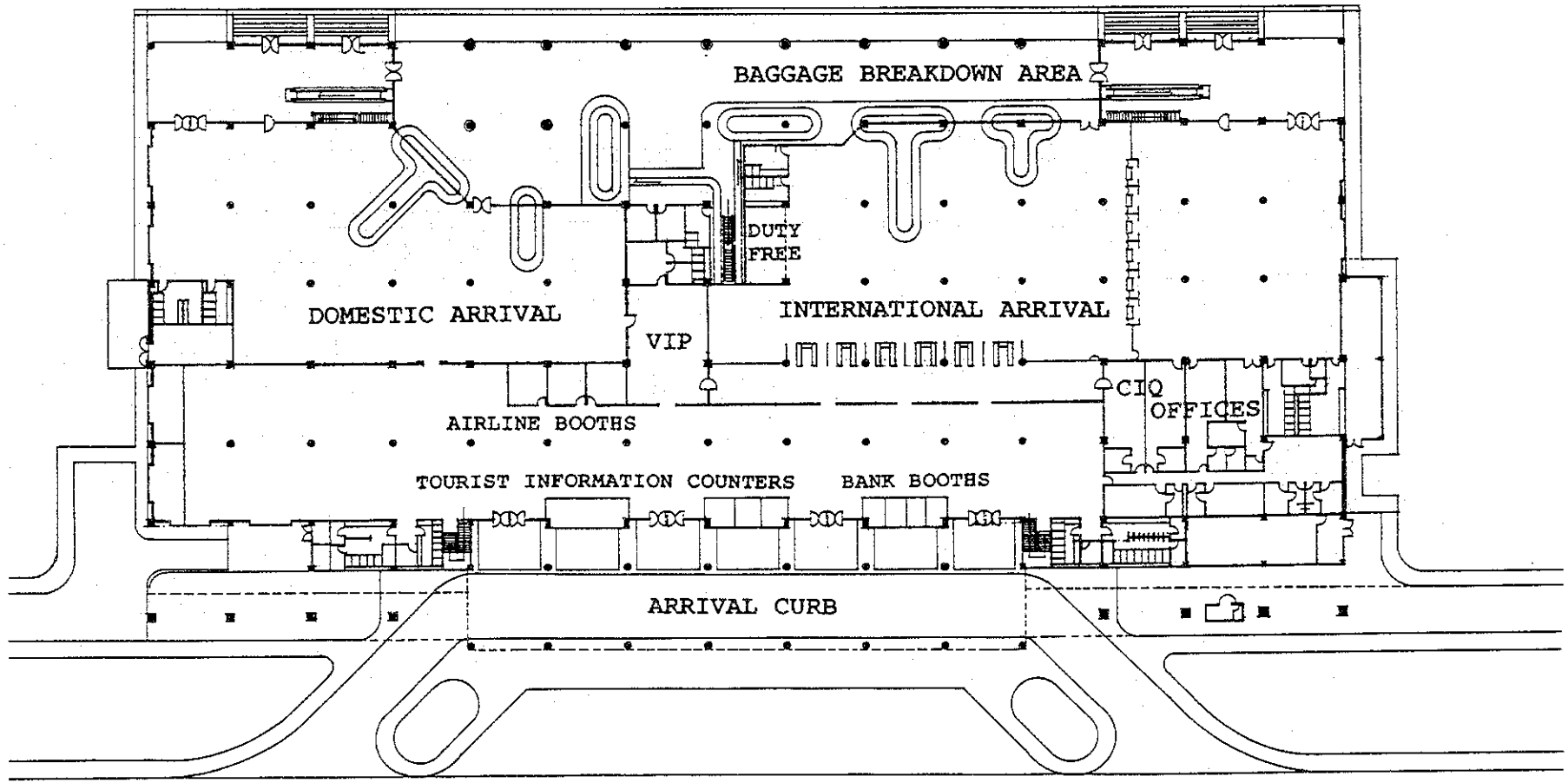
The current Passenger Terminal Building, which was opened in 1990 as the main facility of new terminal area, has two level passenger processing floors with double deck access roads at curb side.

International passenger processing areas are located at the right side looking toward the Apron of the building on both floor levels; ground level for arrival, 2nd level for departure, and for domestic, which is the same concept for domestic passenger at the left side of the building.

There are three passenger boarding bridges for Gate 1 to 3, also there are bus gate entrances at both ends of the terminal building on the ground floor for remote parking positions, which is on the right side for international and left for domestic.

Offices for airport administration and airlines and restaurants which handles both restaurant and in-flight meals are located on the third floor along the big open space above the check-in lobby of the 2nd floor. 1.5 ton lift at the south-east corner of the building is directly connected to the kitchen area.

The floor plans of the building are shown in **Figure 6.6.1 to Figure 6.6.4**.




Scale 1 : 800

**Figure 6.6.1 Passenger Terminal Building First Floor Plan**

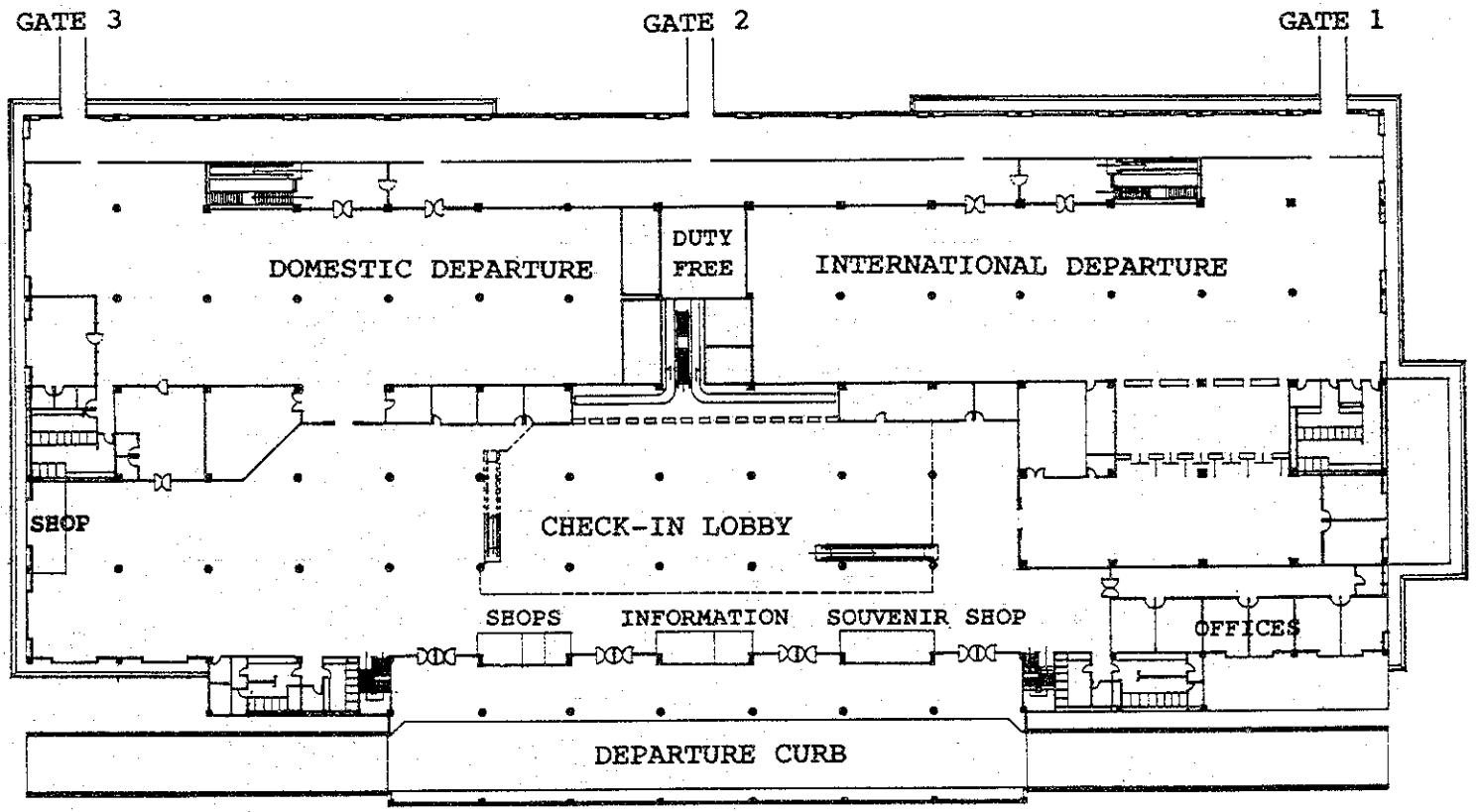



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**Figure 6.6.2 Passenger Terminal Building Second Floor Plan**

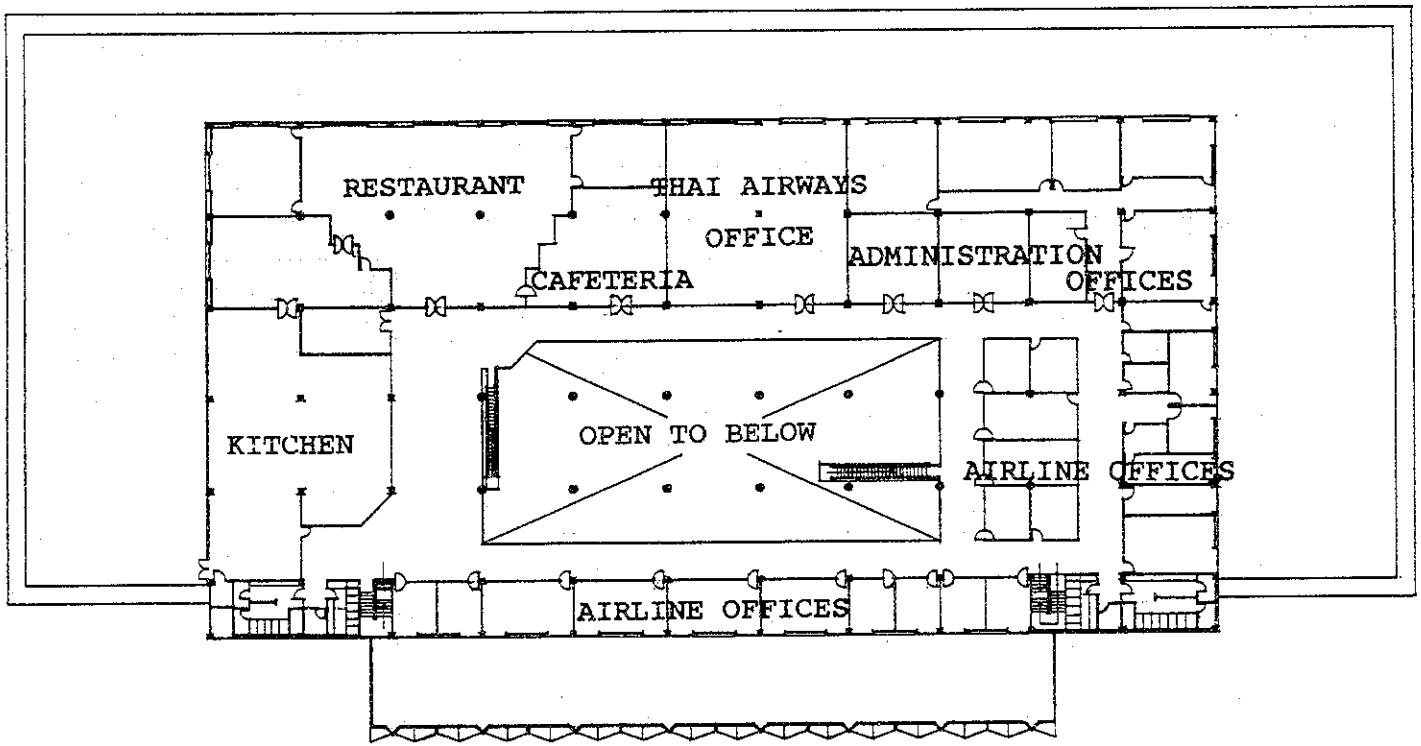


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**Figure 6.6.3 Passenger Terminal Building Third Floor Plan**

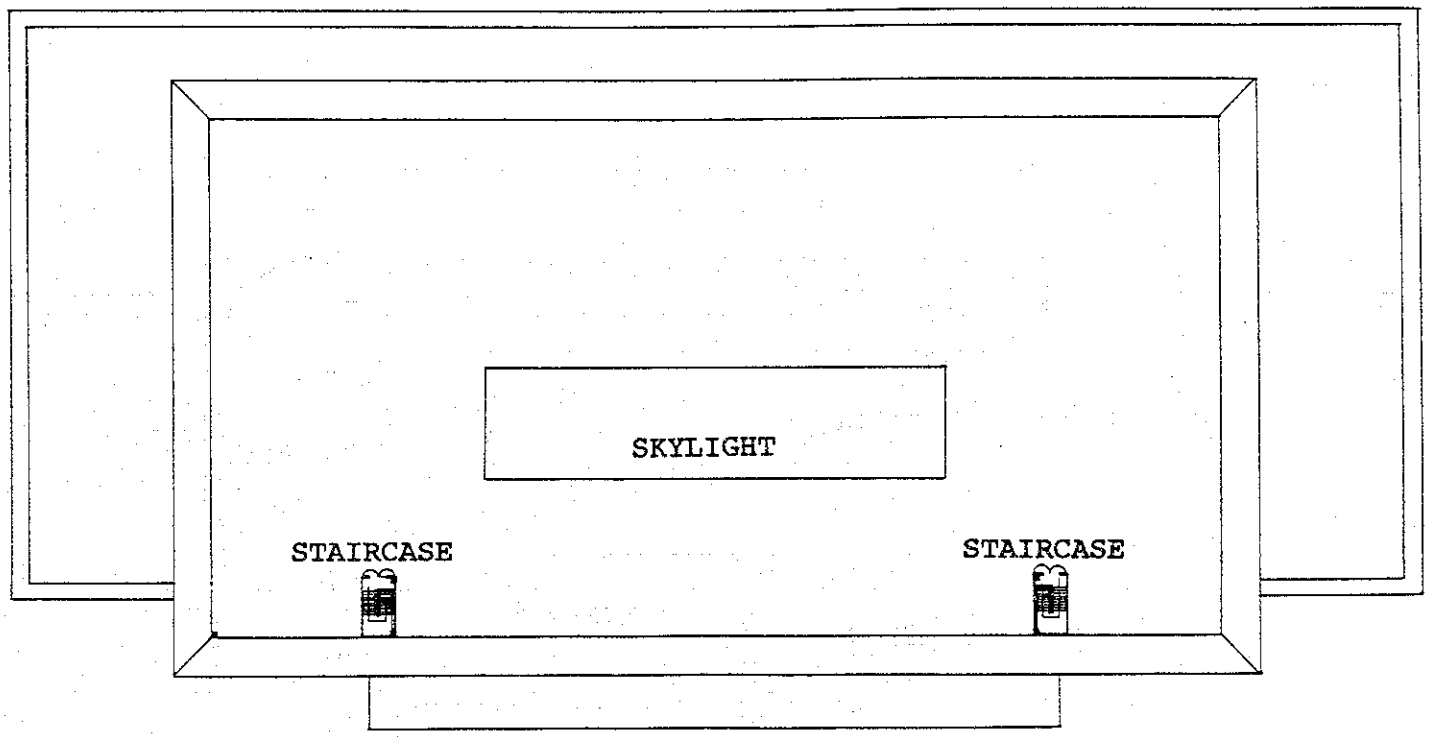


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**Figure 6.6.4 Passenger Terminal Building Roof Plan**

6.6.2 Floor Area

(1) General

At the Phuket International Airport, many international flights are of mixed flight and the parking positions are not defined for international or domestic, and some of the international flights arriving at Phuket are changed to domestic flights.

So some areas, such as corridors on the 2nd floor at the air side are fully used for international and domestic by departure or arrival of passengers. While transit passengers comes from both international and domestic flights, to/from corridor to each gate lounge crossing with the main passenger flow occasionally.

The separation of passenger between international and domestic, or arriving/departing and transit, and adequate guidance for passengers are a very important role for ground staff on the 2nd floor.

Based on this condition, the concept of "Common Use Areas" are necessary for distinction and calculation of areas at this airport as shown in **Figure 6.6.5**.

The summary of main passenger processing zones and floor areas is shown with the passenger flow in **Figure 6.6.5** in order to categorize and calculate each area in **Appendix 6.6.1**.

(2) Total Floor Area

The unit floor area of 20 sq.m/peak hour passenger for the international area and 10 sq.m/peak hour passenger for the domestic area are considered adequate to estimate the required total floor area. This can be explained by the mathematical formula as follows:

$$\text{Area} = \text{UFA} \times \text{Passenger}$$

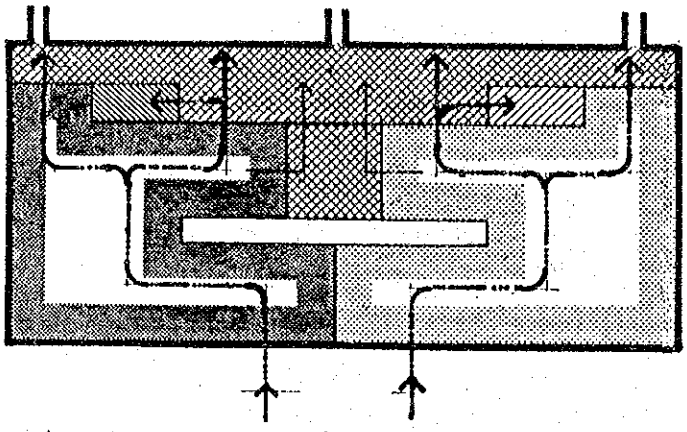
Where, Area = required total floor area in sq.m.
UFA = Unit floor area for peak hour passengers

Passenger = No. of peak hour passengers

At Phuket International Airport, the current peak hour passengers in both directions are estimated to be 331 for international flights and 676 for domestic flights as explained in **Appendix 6.6.2**. These figures were applied in the above formula and required total floor area were obtained as shown in **Table 6.6.1.**

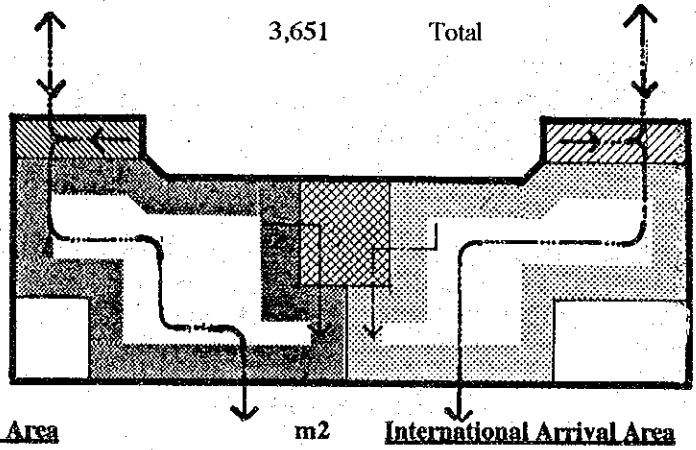
**Table 6.6.1 Comparison of Total Floor Area**

| | Required T.F.Area (sq.m) | Existing T.F.Area (sq.m) |
|---|---|---|
| International | 6,620 (100%) | 12,361 (187%) |
| Domestic | 6,760 (100%) | 11,494 (170%) |
| Total | 13,380 (100%) | 23,855 (178%) |



| Domestic Departure Area | | m2 |
|---|---|---|
| 1. Ticket Lobby | | 1,670 |
| 3. Security & Gate Lounge | | 1,410 |
| 4. V.I.P | x 1/2 | 102 |
| 5. Int.& Dom., Dept.& Arrv. Pass. | x 1/4 | 275 |
| 6. Dom., Dept.& Arrv. Pass. | x 1/2 | 194 |
| Total | | 3,651 |

| International Departure Area | | m2 |
|---|---|---|
| 1. Ticket Lobby | 1,031 | |
| 2. Security & CIQ | | 533 |
| 3. Gate Lounge | | 1,500 |
| 4. V.I.P. | x 1/2 | 102 |
| 5. Int.& Dom., Dept.& Arrv.Pass. | x 1/4 | 275 |
| 6. Int. Dept.& Arrv.Pass. | x 1/2 | 200 |
| Total | | 3,641 |



| Domestic Arrival Area | | m2 |
|---|---|---|
| 5. Int.& Dom, Dept.& Arrv.Pass. | x 1/4 | 275 |
| 6. Dom., Arrv. & Dept. Pass. | x 1/2 | 194 |
| 8. Baggage Claim | | 1,450 |
| 9. Arrival Lobby | | 1,160 |
| 10. V.I.P. (Int., Dom.) | x 1/2 | 99 |
| Total | | 3,178 |

| International Arrival Area | | m2 |
|---|---|---|
| 5. Int.& Dom., Dept.& Arrv.Pass. | x 1/4 | 275 |
| 6. Int. Arrv.& Dept.Pass. | x 1/2 | 200 |
| 7. CIQ | | 1,650 |
| 8. Baggage Claims | | 780 |
| 9. Arrival Lobby | | 700 |
| 10. V.I.P. (Int., Dom.) | x 1/2 | 99 |
| Total | | 3,704 |

**Legend**

- For International (Dept. or Arrv.)
- For International (Dept.and Arrv.)
- For Both Int. & Dom.
- For Domestic (Dept. or Arrv.)
- For Domestic (Dept.and Arrv.)

**Figure 6.6.5 Passenger Flow and Floor Area of Each Zone**

According to evaluation based on the above assumption, the existing total floor area of the building is adequate for the accommodation of the current passenger demand.

6.6.3 Passenger Handling

(1) General

International and domestic passenger flow including their baggage are shown in **Figure 6.6.6.**

The passenger processing time surveyed by the traffic survey are summarized in **Appendix 6.6.1.**

The required passenger handling capacity of each component at the passenger terminal is estimated as shown in **Appendix 6.6.2.**

(2) Passenger Handling

a) No security screening space and equipment is provided before check in of passengers. The tentative check is often carried out manually by particular airlines at the temporary counter.

The check-in passengers of domestic and international passengers are screened at the entrance of the waiting lounge.

b) For some transfer/transit passengers who arrive at the terminal by bus from the remote gate, and for transfer/transit passengers from domestic to international who go through departure CIQ at Phuket, there is no escalator from the arrival floor to the 2nd departure floor.

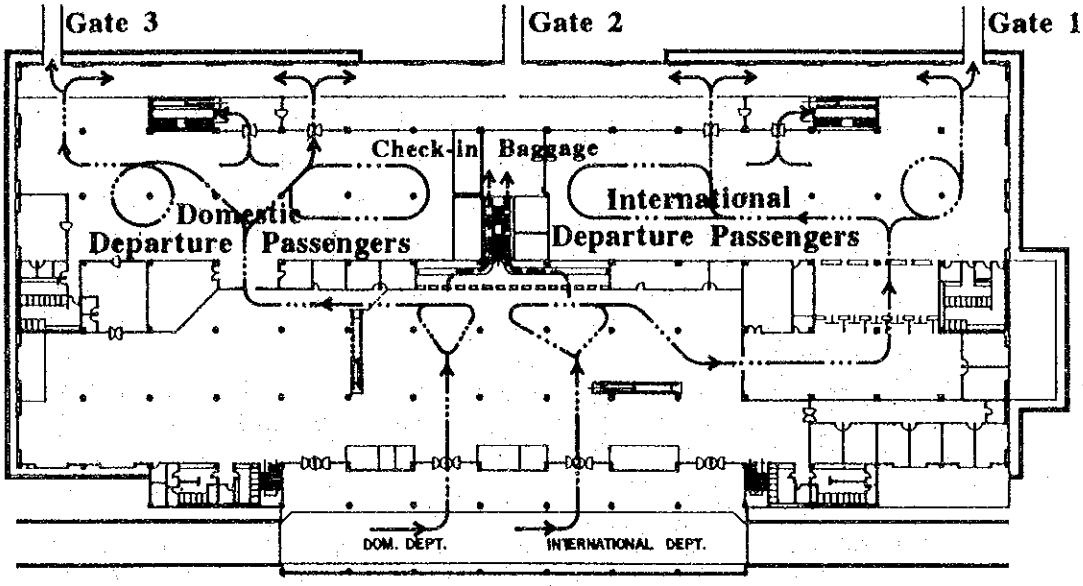
Also, adequate information which can lead these passengers to proper spaces are also lacking.

c) The occupancy ratio of concession is about 8.4% in total floor area, and the total concession area in the two floors is about 2.7% on processing floors. Compared to other airports, especially, at resort area, the ratio seems very small.

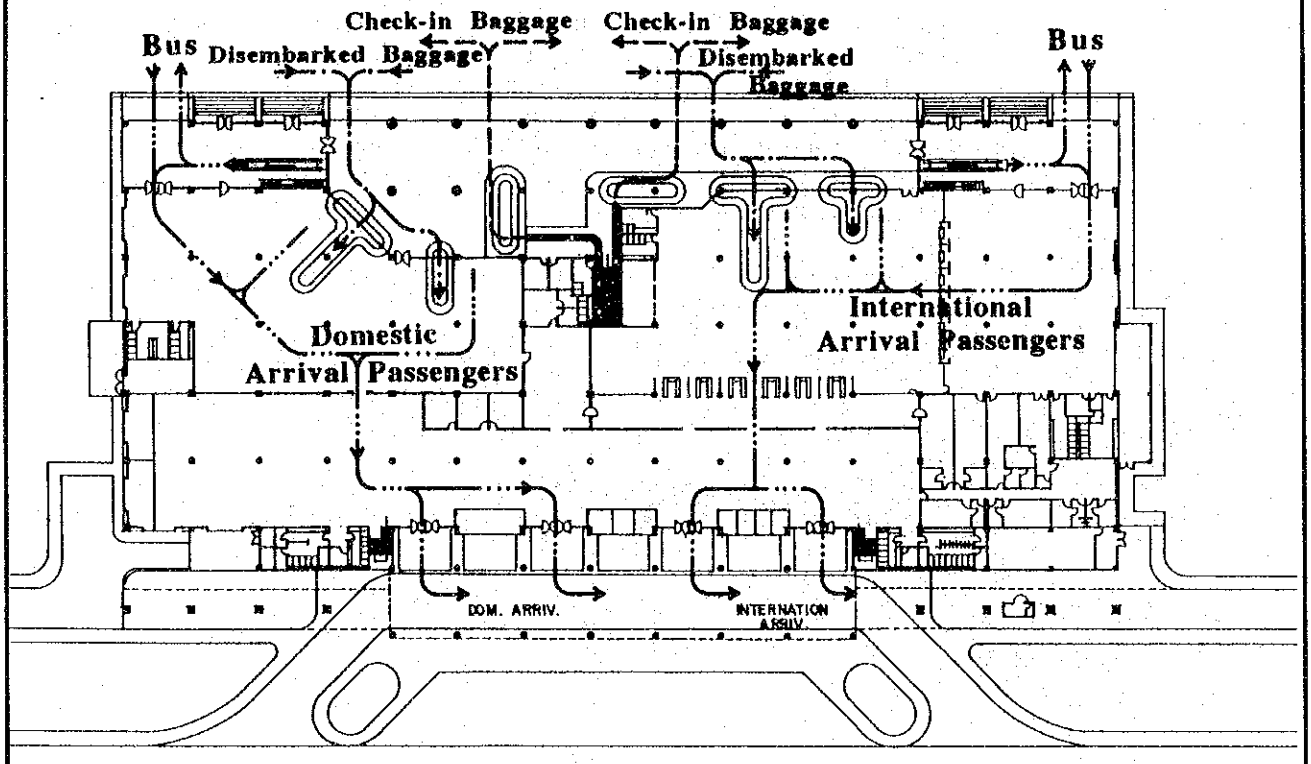
d) An elevator for handicapped persons at the airport should be considered to be provided.

e) Arrival lobby on the ground floor presents a deserted atmosphere. Special consideration on this point should be considered to provide a good impression for new comers and the repeaters.

It should also be considered to improve the condition of the gloomy passage area from baggage claim area to curb side road.




Second Floor (Departure Level)




First Floor (Arrival Level)

**Figure 6.6.6 Passenger Flow**

f) Since the check-in counters in departure area are commonly used for all airlines, the sign board on check-in counter indicates permanently domestic at left side and international at right side. But in Bangkok Airways, they use check-in counter No. 15 and 16 which are at the end of the right side of the counter in use. This is inconsistent with the location of the former sign board and it is difficult for passengers to find the proper counter to proceed to.

(3) VIP Lounges

VIP Lounges are located on the ground floor for arrival passengers and 2nd floor for departure passengers, and the toilets are used in common for international and domestic passengers.

Lounge No. 1 for departure is 100 sq.m with accommodating capacity of about 20 VIPs, No. 2 is 104 sq.m, and usually offered for executive class passengers of about 20 persons.

(4) Other Conditions

Other problems found through the first site survey are as follows:

a) The curb side roads have some problems: First, the slope is too steep as it should be a part of the road. This condition makes the flow of traffic slower unnecessarily. And secondly, the frontage of road, both in departure and arrival is shorter than the length of the terminal building.

In case of expansion of the building or extension of frontage length, it cannot be extended to match the frontage length without stopping of building usage.

b) Flight information system should be improved. Information indicated on monitor TV usually changes 3 times to show the contents, 1st picture says "Have a Good Trip" for about 10 seconds, 2nd and 3rd shows Flight Information up to 5 flights in each pictures according to the incoming flight.

It takes about 30 seconds to read the full information by gazing upwards and to follow the small letter in the picture. Sometimes it is so difficult to hear the information one needs. It is considered to be hard work especially for the old or unaccustomed persons. The full contents of information should remain continuously on the screen or information board.

c) The arrangement of seats in departure and arrival lounge are too narrow. The lounges have much space, it is better to set them farther apart from each other especially between front and back seat or row.

## 6.7 CARGO TERMINAL BUILDING

### 6.7.1 General

The existing cargo terminal building is located on the southern side of passenger terminal building, and is of a reinforced concrete structure and partial steel roof framing with two stories. The total floor area of this building is 1,100 sq.m.

The floor plan of the existing cargo terminal building is shown in **Figure 6.7.1.**

### 6.7.2 Evaluation of Total Floor Area

Required floor area of cargo terminal building can be estimated by utilizing the unit floor requirements established empirically for certain amount of annual cargo volume to be handled.

The formula established by JCAB for this purpose is as shown below:

$$A = ACV/HN \times F$$

Where:

| | | |
|---|---|---|
| A | = | Required total floor area in sq.m |
| ACV | = | Annual cargo volume tons, 4,218 ton in 1991 (excluding Transit) |
| HN | = | Handling unit tons per sq.m (14.0 ton per sq.m) |
| F | = | Factor for additional space for cargo agents and other offices (F=1.5) |

A = 4,218/14.0 x 1.5 = 451.9 = 450
A = 450 sq.m (Existing floor area 874 sq.m)

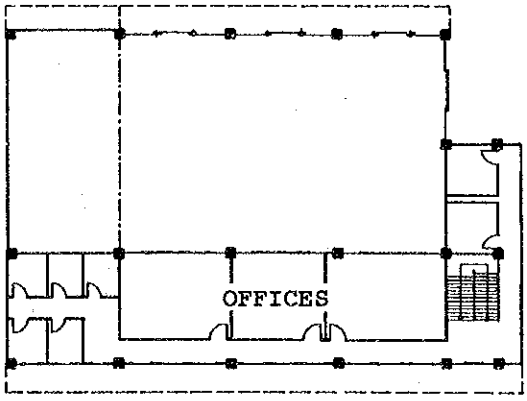
According to the evaluation result, the current space is large enough to handle the present volume of cargo.

## 6.8 CONTROL TOWER BUILDING

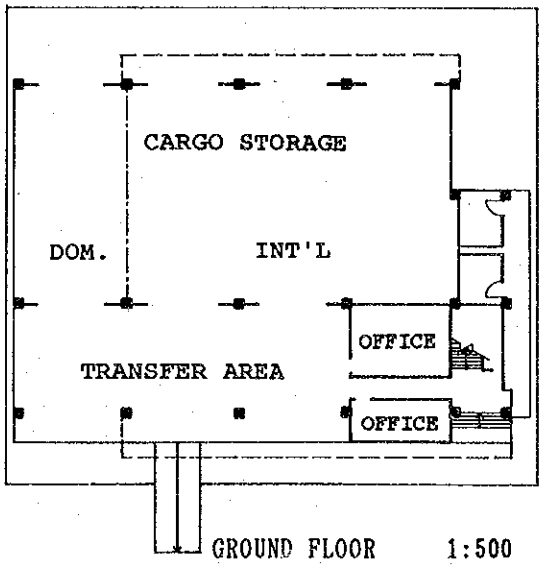
The control tower building is located on the southern side of the runway on a hill, being separated from the new terminal area.

It is of a reinforced concrete structure with nine stories and has a total area of 1,092 sq.m. The building was completed in 1991. The VFR room is constructed of a steel frame structure and its floor elevation is 109.8 m above sea level. The view of the airfield from the VFR room is unobstructed and clear, except a part of new apron (Apron C) because the apron is just behind the terminal building to the view from VFR room. The blind area and detailed information are shown in **Figure 6.8.1.**

The floor plan of the control tower building is shown in **Appendix 6.8.** The building condition is generally good by visual inspection.




2ND FLOOR 1:500




GROUND FLOOR 1:500

**Figure 6.7.1 Existing Cargo Terminal**

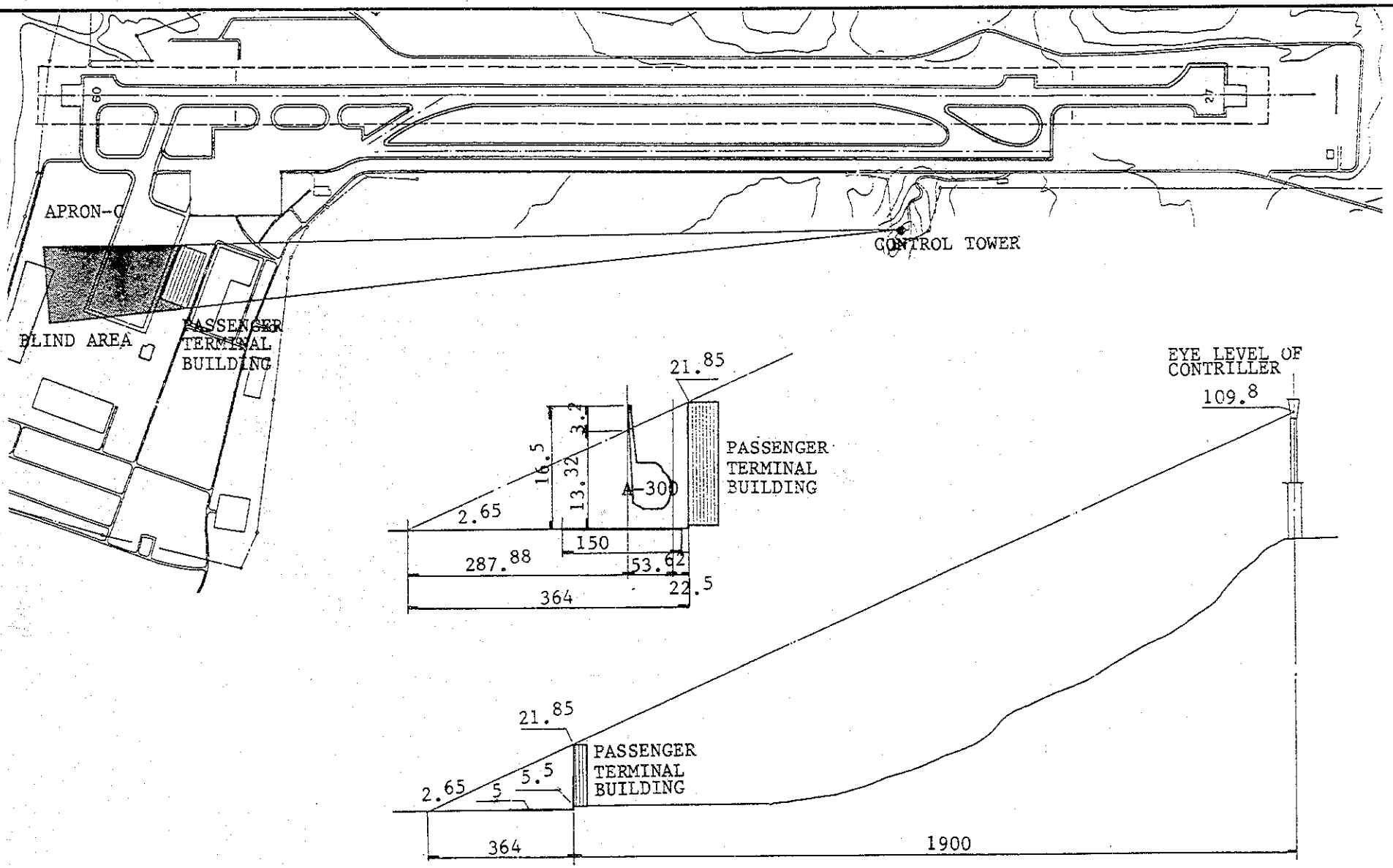



**Figure 6.8.1 Blind Area at Apron C**

## 6.9 FIRE STATION BUILDING

The new fire station building is located in front of Apron A and it is of a one story reinforced concrete structure with steel roof framing.

The building was built in 1992, and has a total floor area of 982 sq.m. with the observation room on the 4th floor, accessible by outside stairs.

The building accommodates a garage for fire engines and office, rest room, dining room and a storage. Outside the building beside new taxiway, there is an elevated water tank of about 20 ton capacity.

The floor plan of the fire station building is shown in **Appendix 6.9.**

## 6.10 ACCESS ROAD AND CAR PARKING

### 6.10.1 Access Road

The main access road to/from Phuket Town and all major resort beaches is primary Route 402. This road has a 10 m wide asphalt concrete pavement with 2 m shoulders on each side. Widening work of the road is proceeding on some sections in Phuket Island. Crossing the strait of the Island and Pang-nga, a new Sarasin Bridge has been already completed. Geometric and surface conditions are generally good.

Two secondary routes connect the airport terminal to Route 402. Route 4026 runs along air strip eastward about 3 km from the terminal to the intersection with Route 402. It was re-constructed with the parellel taxiway construction work. A part of this road has only 5 m wide carriage way due to limited space between the parallel taxiway and public property. Route 4031 which runs in the south-east direction and joins route 402 at northern point 3 km from Thalang City. This road has 6 m wide asphalt concrete pavement.

The capacity of these roads are considered adequate for the present traffic demand.

### 6.10.2 Car Parking

The existing toll car parking has 160 slots for medium cars and 30 slots for large buses. Since Phuket is a tourism resort area and many tourists use hotel courtesy bus, demand for private car parking is relatively low compared with other airports. Therefore, the number of parking slots is enough in capacity. Area for expansion is reserved at the south-east part of car parking area for future increasing demand.

## 6.11 AIRSPACE USE

### 6.11.1 Flight Information Region (FIR)

The airspace over Thailand and adjacent high seas is designated as Bangkok FIR from ground up to an unlimited altitude.

Furthermore, the airspace over the high seas south-east of Viet Nam and south of Cambodia are delegated to Thailand as Bangkok Area of Responsibility (AOR) for oceanic control services. The area of Bangkok FIR and AOR are shown in **Figure 6.11.1** and detailed dimensions are given in **Table 6.11.1.**

The area control and oceanic control services within the areas mentioned above are provided by the Aeronautical Radio of Thailand Limited (AEROTHAI) on a 24 hour basis.

### 6.11.2 Transition Altitude

A transition altitude for the civil aerodromes in Thailand is 6,000 feet, however, the airspace over the terminal control areas of Bangkok, Chiang Mai, Hat Yai, Khon Kaen, Phitsanulok, Phuket, Surat Thani, Ubon, Udon and U-tapao, 11,000 feet altitude is designated as transition altitude.

### 6.11.3 Airspace Composition at Phuket International Airport

A terminal control area and a control zone are established at Phuket International Airport as shown in **Appendix 6.11.1.**

AEROTHAI provides radar approach control and aerodrome control services using PSR/SSR for aircraft operating within the area mentioned above on a 24 hour basis.

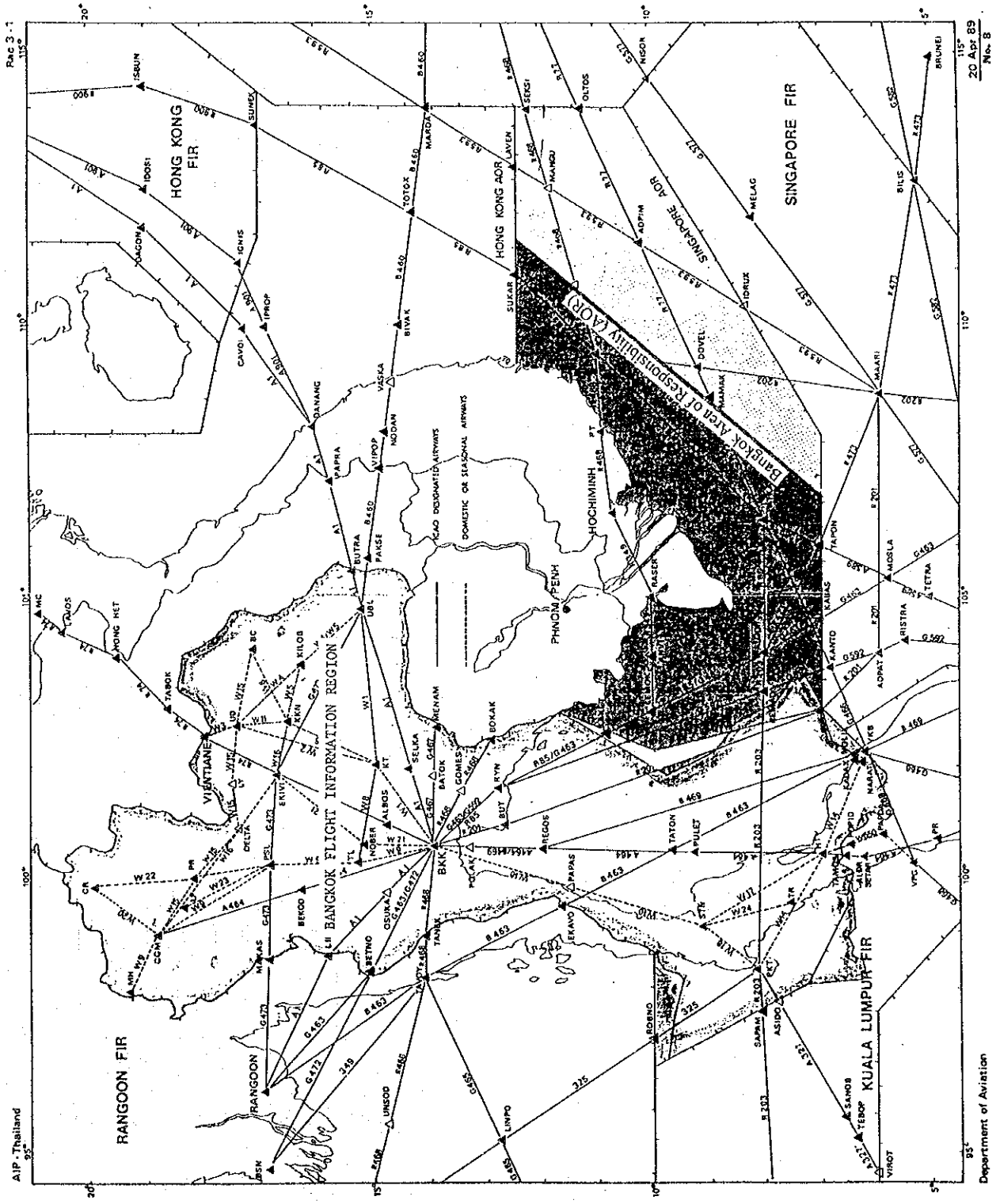



**Figure 6.11.1 Bangkok Flight Information Region and Area of Responsibility**

# Table 6.11.1 Dimension of Bangkok Flight Information and Area of Responsibility



| FLIGHT INFORMATION REGIONS AND CONTROL AREAS | | | | |
|---|---|---|---|---|
| NAME AND LATERAL LIMITS | UPPER LIMIT / LOWER LIMIT | UNIT PROVIDING SERVICE | RADIO CALL SIGN (LANGUAGES) | REMARKS |
| 1 | 2 | 3 | 4 | 5 |
| BANGKOK FLIGHT INFORMATION REGION<br><br>A point on the Thai border at 1000N, thence along the national border between Thailand and Burma/Laos/ Cambodia to the coast then to 1000N 10215E, to 0700N 10300E to 0615N 10215E, thence westward along the national border between Thailand and Malaysia to 0630N 9930E, then to 0715N 9800E, to 1000N 9630E, then eastward along 1000N to the Thai border. | UNL / GND | | | |
| BANGKOK AREA OF RESPONSIBILITY<br><br>The airspace over China Sea which Bangkok Area Control Centre provides Air Traffic Services begin at a point 1000N 10215E, thence northward along the national border of Thailand until intercept the Vietnamese territorial water front, then eastward to points 1222N 11000E, 1222N 11130E, 0700N 10700E, 0700N 10300E, then along the straight line to the starting point 1000N 10215E.<br><br>Apart from the above mentioned area, Bangkok Area Control Centre also provides Area Control Service along the Airway R468, R77, R593 and R202 in Singapore area of Responsibility which were deligated to Bangkok. | FL 460 / FL 135 | | | |
| Airways within Bangkok FIR<br><br>The latteral limits of airways commences from 5 NM either side of the center line at the facility funneling out on a 5 degrees (VOR) or 7½ degrees (NDB) tolerance to a maximum width of 10 NM either side of the center line. | | | | |
| Airways within Bangkok area of responsibility (AOR)<br><br>The width of airways within Bangkok area of responsibility (AOR) is 50 NM. | | | | |
| CONTROL AREAS<br><br>1. Alfa Control Area<br><br>The airspace within a circle of 50 NM radius centred on 135452N 1003630E excluding Bangkok Control Zone. | FL 460 / 3000 ft | ACC BANGKOK | BANGKOK CONTROL (En, Thai) | Excluding Restricted Area 9 and Danger Areas 16, 17, 18, 19, 31, 39 and 47 |





| FLIGHT INFORMATION REGIONS AND CONTROL AREAS | | | | |
|---|---|---|---|---|
| NAME AND LATERAL LIMITS | UPPER LIMIT / LOWER LIMIT | UNIT PROVIDING SERVICE | RADIO CALL SIGN (LANGUAGES) | REMARKS |
| 1 | 2 | 3 | 4 | 5 |
| VFR Flight in Alfa Control Area<br><br>In order to avoid collision between aircraft in Control Area, all VFR Aircraft before entering Alfa Control Area, must contact either BKK Approach Control or BKK Area Control Centre by reporting position. | | | | |

6.11.4 Prohibited, Danger and Restricted Areas

Many prohibited, restricted and danger areas are established within the Bangkok FIR as shown on **Figure 6.11.2.**

Danger areas VT D59 and VT D61, as shown on Figure 6.11.2, detailed dimensions are given in **Table 6.11.2**, are established on the north and east of this airport with sufficient separation between the edge of Phuket terminal control area and airways W14, 17 and 18. Accordingly, it is considered that danger areas of VT D59 and VT D61 have no effect regarding aircraft operations of this airport.

**Table 6.11.2 Dimension of Danger Areas of VT D59 and VT D61**



| PROHIBITED, RESTRICTED AND DANGER AREAS | | | |
|---|---|---|---|
| IDENTIFICATION AND NAME<br>LATERAL LIMIT | UPPER LIMIT<br>LOWER LIMIT | TYPE OF RESTRICTION/ HAZARD | REMARKS |
| 1 | 2 | 3 | 4 |
| VT D59 Surat Thani (Area 1)<br>Area bounded by lines joining successively the following points: 1058N 9906E on Thai-Myanmar border to 1058N 9934.5E 0933N 9911E then follow the arc 25 NM counter clockwise from Surat VOR/DME to 0852.3N 9849.5E 0833N 9833.5E then follow the arc 30 NM counter clockwise from Phuket VOR/DME to 0836N 9812E 0929N 9736E 0929N 9816E 0950N 9825E 0955N 9832E thence follow the boundary to the starting point. | UNL<br>GND | RTAF Flying Training | Mon-Fri 2300-1700 Contact SWALLOW Control freq 127.0 MHz or 278.4 MHz, if unable contact Surat APP freq 119.3 MHz or 284.0 MHz before entering. |
| VT D59 Surat Thani, Phuket (Area 2)<br>Beginning at 0929N 9736E 0836N 9812E then follow the arc 30 NM counter clockwise from Phuket VOR/DME to 0820N 9751.5E 0820N 9730E 0929N 9730E and 0929N 9736E. | ALT 12 000 ft<br>GND | RTAF Flying Training | Mon-Fri 2300-1700 Contact SWALLOW Control freq 127.0 MHz or 278.4 MHz, if unable contact Surat APP freq 119.3 MHz or 284.0 MHz before entering. |
| VT D61 Surat Thani<br>Area bounded by lines joining successively the following points 0845N 9929E 0816N 10004E 0816N 9847E 0828N 9842E 0845.7N 9857.2E then follow the arc 25 NM from. SURAT DVOR/DME counter clockwise to 0844.5N 9917.3E 0840.4N 9919.7E and 0845N 9929E. | ALT 7 000 ft<br>GND | RTAF Flying Training | Mon-Fri 2300-1700 Contact SWALLOW Control freq 127.0 MHz or 278.4 MHz, if unable contact Surat APP freq 119.3 MHz or 284.0 MHz before entering. |

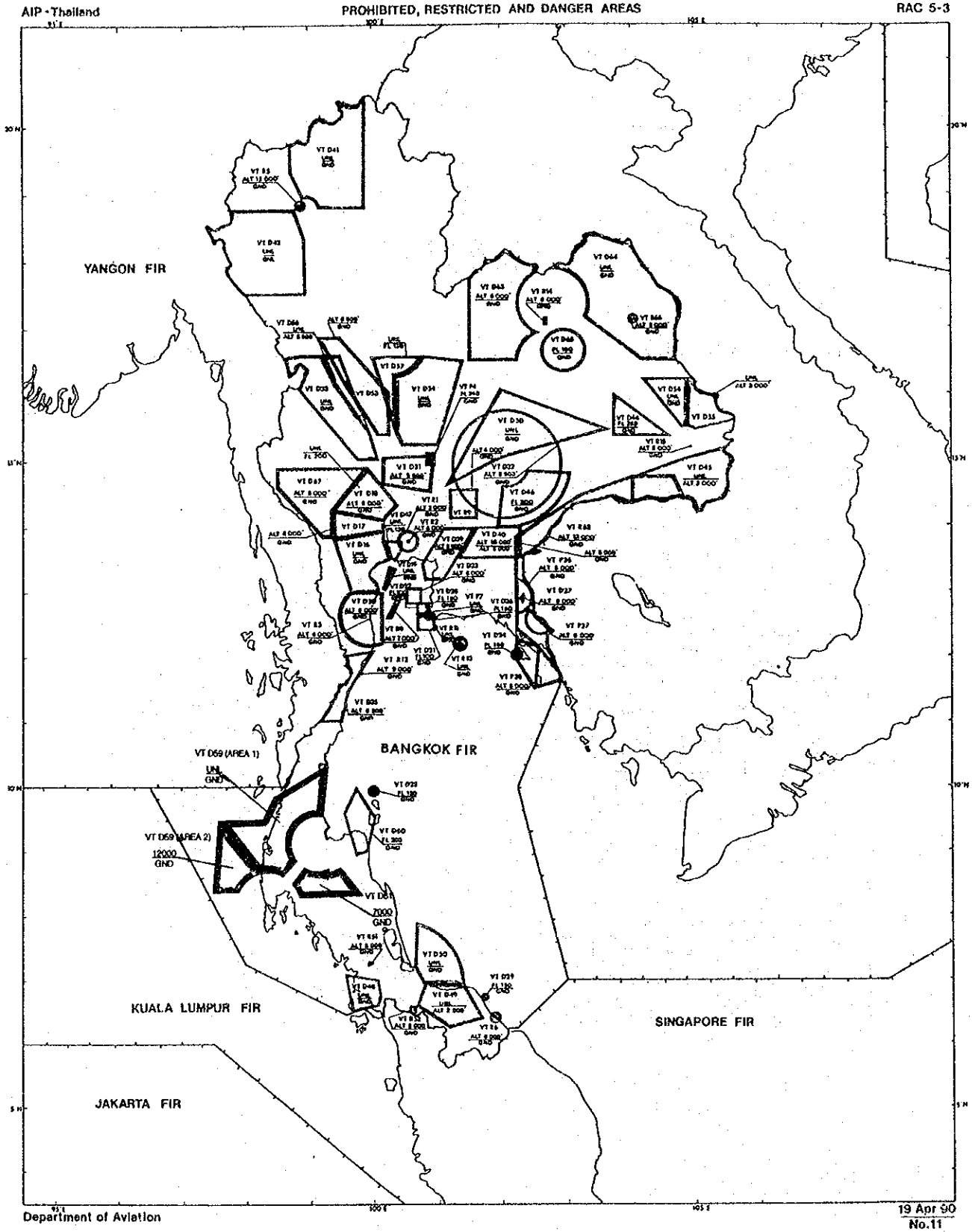



**Figure 6.11.2 Prohibited, Danger and Restricted Areas Established within Bangkok FIR**

6.11.5 Instrument Approach and Departure Procedures

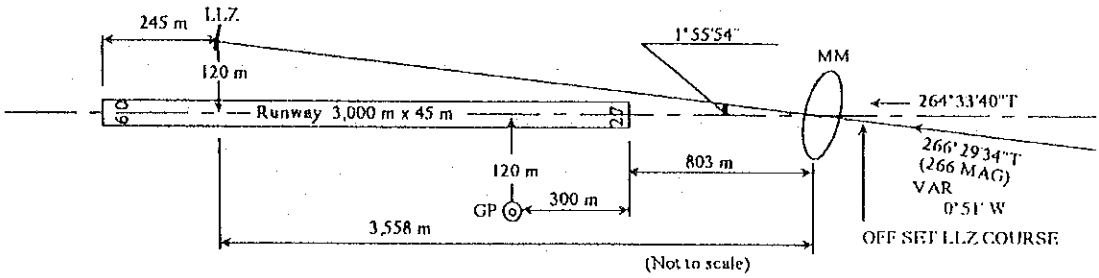
(1) Instrument Approach Procedures

At present, the following five (5) instrument approach procedures are established at Phuket International Airport (Refer **Appendix 6.11.2**).

ILS/DME RWY 27
VOR RWY 09/27
VOR/DME RWY 09
VOR/DME RWY 27
NDB RWY 27

Due to existence of a hill, 142.2 m. above mean sea level located approximately 4,575 m. east of Runway 27 threshold, angle of glide slope of ILS for Runway 27 is obliged to 3.2 degrees to ensure the Obstacle Assessment Surface (OAS) for the final approach area to Runway 27.

Furthermore, localizer facility of ILS is offset to the extended runway center line of Runway 09/27 as shown on **Figure 6.11.3** due to lack of ground space for installation of localizer facility. Accordingly, the intersection angle of localizer course line and extended runway center line is now one degree, fifty five minutes, fifty four seconds (1° 55' 54").




Note : The direction of runway described above is calculated by the middle latitude flight calculation using data of coordinates of both runway thresholds given by AEROTHAI Phuket as follows:

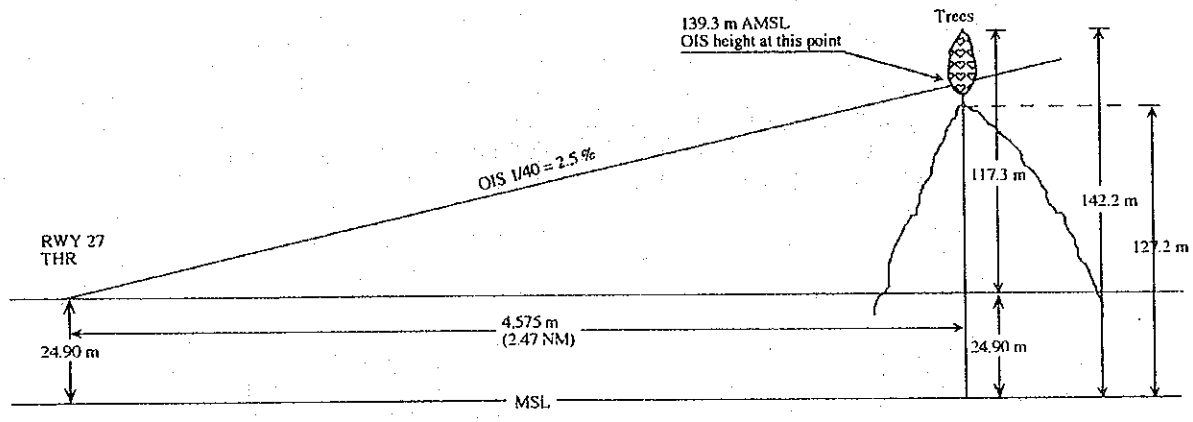
| | |
|---|---|
| RWY 09 Threshold | 08°06'35.6"N<br>98°18'22.5"E |
| RWY 27 Threshold | 08°06'44.8"N<br>98°20'00.1"E |

**Figure 6.11.3 Diagram of ILS Facility at Phuket International Airport**

(2) Standard Instrument Departure Procedures

At present, standard instrument departure procedures at this airport are not published in AIP. When taking off from Runway 09, the hill 142.2 m AMSL with trees (15 m. height of trees, should be added), located approximately 4,575 m. from Runway 27 threshold, are projected above the obstacle identification surface (OIS) of 1/40 for take-off described in PANS-OPS (Procedures for Air Navigation Services, Aircraft Operations DOC 8168-OPS/611) as shown on **Figure 6.11.4**. Thus, it is necessary to designate the climb rate so as to clear these obstacles until suitable altitude is obtained when taking off from Runway 09.

Therefore, standard instrument departure procedures including the restrictions mentioned above for Runway 09 should be issued and published.




Note : Distance between RWY 27 THR and obstacle is calculated by middle latitude flight calculation.

The coordinates of RWY 27 THR is based on AEROTHAI Phuket data, and coordinates of obstacle (hill) is read from map scaled at 1/10,000 as follows.

| | |
|---|---|
| RWY 27 THR | 08°06'44.8" N<br>98°20'00.1" E |
| Peak of the hill | 08°06'49.1" N<br>98°22'30.1" E |

* It is assumed that there are 15 m, high trees on top of the hill.
* Elevation of Runway 27 threshold is based on the result of survey works.

**Figure 6.11.4 Diagram in Relationship to OIS for RWY 27 and Obstacle at Phuket International Airport**

## 6.12 OBSTACLE LIMITATION SURFACES

### 6.12.1 Obstacle Limitation Surfaces for Approach and Take-Off Runway Described in Annex 14, Aerodromes, ICAO

The requirements of obstacle limitation surfaces for each approach type to runway with aerodrome reference code numbers are defined as shown in **Table 6.12.1** and **Figure 6.12.1**.

## Table 6.12.1 Dimension and Slopes of Obstacle Limitation Surfaces for Approach Runways

APPROACH RUNWAYS

| Surface and dimensions[a] | RUNWAY CLASSIFICATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Non-instrument | | | | Non-precision approach | | | Precision approach category I | | II or III |
| | Code number | | | | Code number | | | Code number | | Code number |
| | 1 | 2 | 3 | 4 | 1,2 | 3 | 4 | 1,2 | 3,4 | 3,4 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| CONICAL | | | | | | | | | | |
| Slope | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% |
| Height | 35 m | 55 m | 75 m | 100 m | 60 m | 75 m | 100 m | 60 m | 100 m | 100 m |
| INNER HORIZONTAL | | | | | | | | | | |
| Height | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m |
| Radius | 2 000 m | 2 500 m | 4 000 m | 4 000 m | 3 500 m | 4 000 m | 4 000 m | 3 500 m | 4 000 m | 4 000 m |
| INNER APPROACH | | | | | | | | | | |
| Width | - | - | - | - | - | - | - | 90 m | 120 m | 120 m |
| Distance from threshold | - | - | - | - | - | - | - | 60 m | 60 m | 60 m |
| Length | - | - | - | - | - | - | - | 900 m | 900 m | 900 m |
| Slope | | | | | | | | 2.5% | 2% | 2% |
| APPROACH | | | | | | | | | | |
| Length of inner edge | 60 m | 80 m | 150 m | 150 m | 150 m | 300 m | 300 m | 150 m | 300 m | 300 m |
| Distance from threshold | 30 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m |
| Divergence (each side) | 10% | 10% | 10% | 10% | 15% | 15% | 15% | 15% | 15% | 15% |
| First section | | | | | | | | | | |
| Length | 1 600 m | 2 500 m | 3 000 m | 3 000 m | 2 500 m | 3 000 m | 3 000 m | 3 000 m | 3 000 m | 3 000 m |
| Slope | 5% | 4% | 3.33% | 2.5% | 3.33% | 2% | 2% | 2.5% | 2% | 2% |
| Second section | | | | | | | | | | |
| Length | - | - | - | - | - | 3 600 m[b] | 3 600 m[b] | 12 000 m | 3 600 m[b] | 3 600 m[b] |
| Slope | - | - | - | - | - | 2.5% | 2.5% | 3% | 2.5% | 2.5% |
| Horizontal section | | | | | | | | | | |
| Length | - | - | - | - | - | 8 400 m[b] | 8 400 m[b] | - | 8 400 m[b] | 8 400 m[b] |
| Total length | - | - | - | - | - | 15 000 m | 15 000 m | 15 000 m | 15 000 m | 15 000 m |
| TRANSITIONAL | | | | | | | | | | |
| Slope | 20% | 20% | 14.3% | 14.3% | 20% | 14.3% | 14.3% | 14.3% | 14.3% | 14.3% |
| INNER TRANSITIONAL | | | | | | | | | | |
| Slope | - | - | - | - | - | - | - | 40% | 33.3% | 33.3% |
| BALKED LANDING SURFACE | | | | | | | | | | |
| Length of inner edge | - | - | - | - | - | - | - | 90 m | 120 m | 120 m |
| Distance from threshold | - | - | - | - | - | - | - | [c] | 1 800 m[d] | 1 800 m[d] |
| Divergence (each side) | - | - | - | - | - | - | - | 10% | 10% | 10% |
| Slope | - | - | - | - | - | - | - | 4% | 3.33% | 3.33% |

a. All dimensions are measured horizontally unless specified otherwise.
b. Variable length (see 4.2.9 or 4.2.17).
c. Distance to the end of strip.
d. Or end of runway whichever is less.

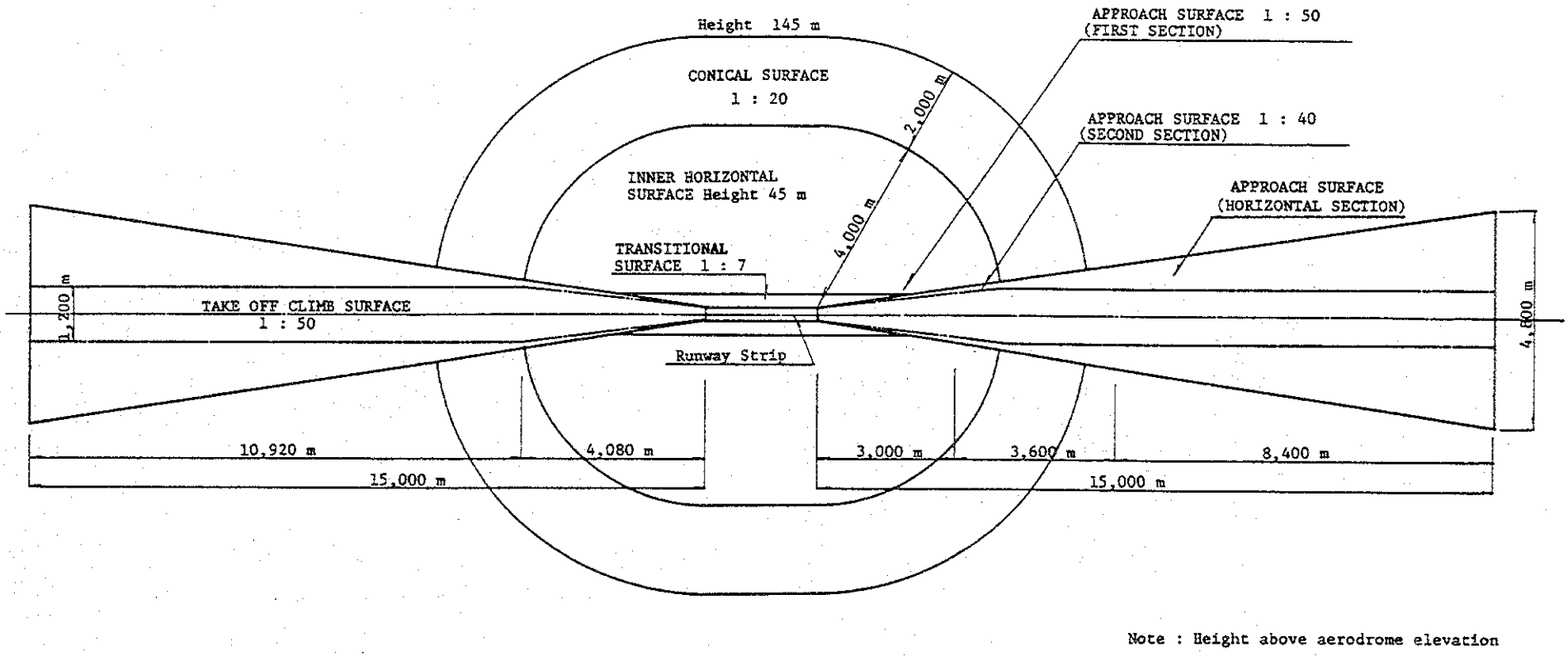



**Figure 6.12.1 Obstacle Limitation Surface for Code Number 4 of Precision and Non-Precision Approach Runway**

The requirements of obstacle limitation surfaces for take-off runways with aerodrome reference code numbers are also defined in **Table 6.12.2** and **Figure 6.12.1.**

6.12.2 Obstacle Limitation Surfaces at Phuket International Airport

The existing obstacle limitation surfaces at Phuket International Airport are established in accordance with the Annex 14, Aerodromes, ICAO as shown on **Figure 6.12.2.** The existing condition of each surface is as follows.

(1) Approach Surfaces

- Runway 09

  Since most part of approach area for Runway 09 is established on the Andaman Sea, no obstacle is projected above the approach surface of 1/50.

- Runway 27

  A hill, 142.2 m above mean sea level, located in the second section of approach area for Runway 27, is obviously projected above the approach surface as shown on **Figure 6.12.3.**

  Remainder of the approach surface for Runway 27 is considered free from obstacles.

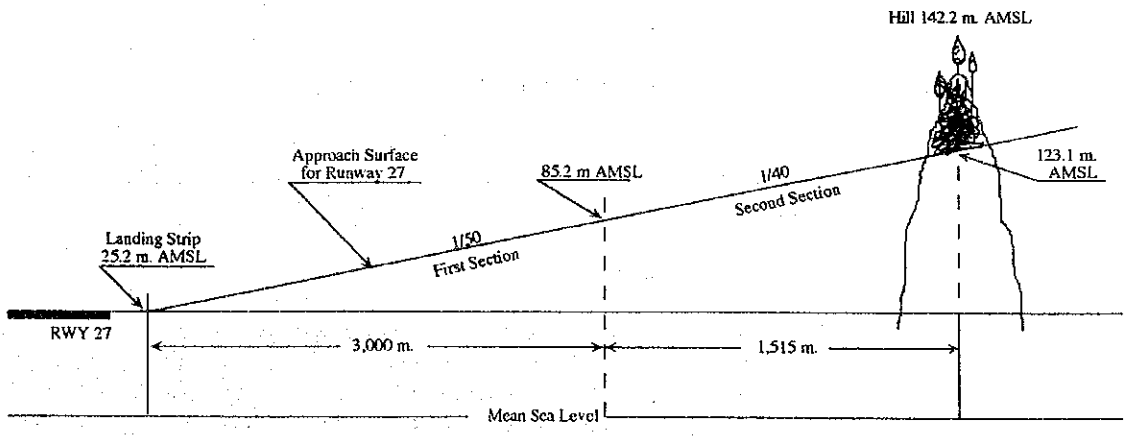



**Figure 6.12.3. Diagram in Relationship to Approach Surface for Runway 27 and 142.2 m High Hill**

(2) Inner Horizontal Surface

Hill, 253.3 m and 225 m AMSL are located on the north and south side of this airport within the inner horizontal surface as shown on **Figure 6.12.2.** These hills are projected above the inner horizontal surface approximately 180 m and 153 m respectively. Furthermore, small hills which are located in close proximity to the runway are projected above this surface. Some parts of these hills not only penetrate the transitional surface

which is established on the south side of this airport but also project above this surface.

(3) Transitional Surface

**Figure 6.12.5** shows a magnification of transitional surfaces surrounding the landing strip, hills, located on the north and south side of runway are projected above the transitional surfaces approximately 12.5 m and 21.2 m respectively. Control tower, 113 m AMSL, located on the south side hill is projected approximately 54.16 m above the surface, sometimes small aircraft are parked on Apron A and B. But these areas are not only under transitional surface but also in very close proximity to the runway. For safety of aircraft operations aircraft parking on these aprons should be avoided.

(4) Conical Surface

As shown on **Figure 6.12.2**, 335 m and 200 m AMSL class mountains, located approximately 5 km. south-west and south of this airport are projected above the conical surface which is established on the south side of this airport. Conical surface which is established on the north side of this airport is almost clear. 335 m AMSL mountain affects the decision of OCH/A (Obstacle Clearance Height/Altitude) of circling approach for approach category B or higher approach category aircraft at this airport.

(5) Take-Off Climb Surface

- Take -off Runway 27

  Take-off climb area for Runway 27 is drawn by broken lines as shown on **Figure 6.12.2.**

  The slope of take-off climb surface is 2%.

  Since much of the area of the take-off climb area for take-off Runway 27 is established on the Andaman Sea, it is considered that there are no obstacles in this area.

- Take-off Runway 09

  Take-off climb area for Runway 09 is drawn by broken lines as shown on **Figure 6.12.2.** The slope of take-off climb surface is 2%. 142.2 m AMSL hill, located approximately 4,515 m from east end of landing strip end is projected above this surface as shown on **Figure 6.12.4.**

  Attention should be given strongly to aircraft taking-off from Runway 09 over this obstacle.

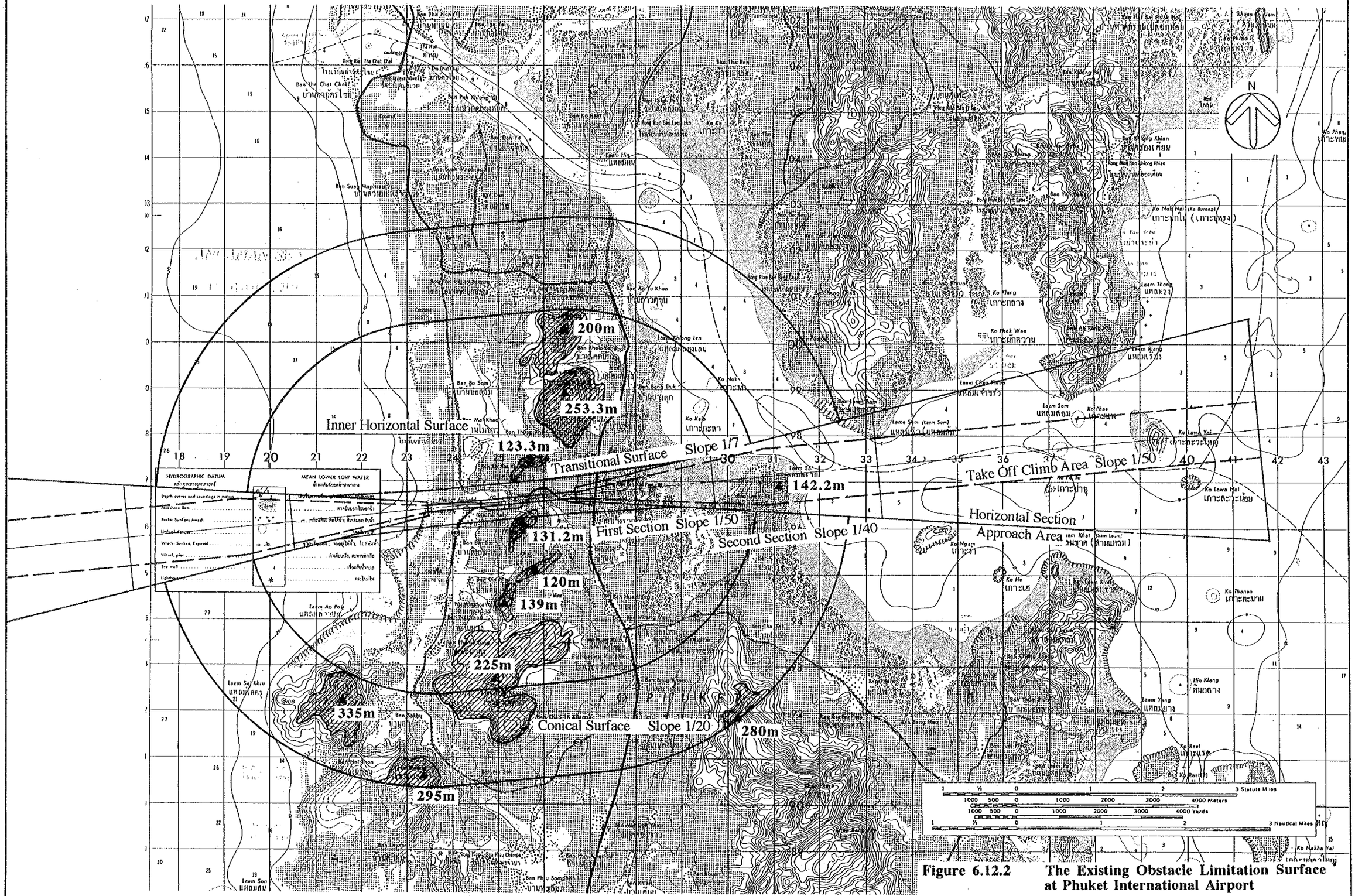



**Figure 6.12.2** **The Existing Obstacle Limitation Surface at Phuket International Airport**