CHAPTER 15 AIRSPACE USE

15.1 General

This chapter describes airspace use and the utilization of the airport.

Since the new airport site has been selected adequately there are no constraints in establishing aircraft operation procedures. This makes it possible to conduct the optimum aircraft operations with minimum requirements for the precision approach category-I.

The airport utilization by aircraft is expected to be more than 99% including wind, visibility and ceiling factors. This assumes that efficient and safe aircraft operations can be expected at the new airport.

15.2 Airspace

This section discusses the results of the obstruction and aircraft operations studies, and indicates the most suitable procedures for the new airport.

15.2.1 Basic Assumptions and Conditions

Basic assumptions and conditions used for the Study are tabulated in Table 15.2.1

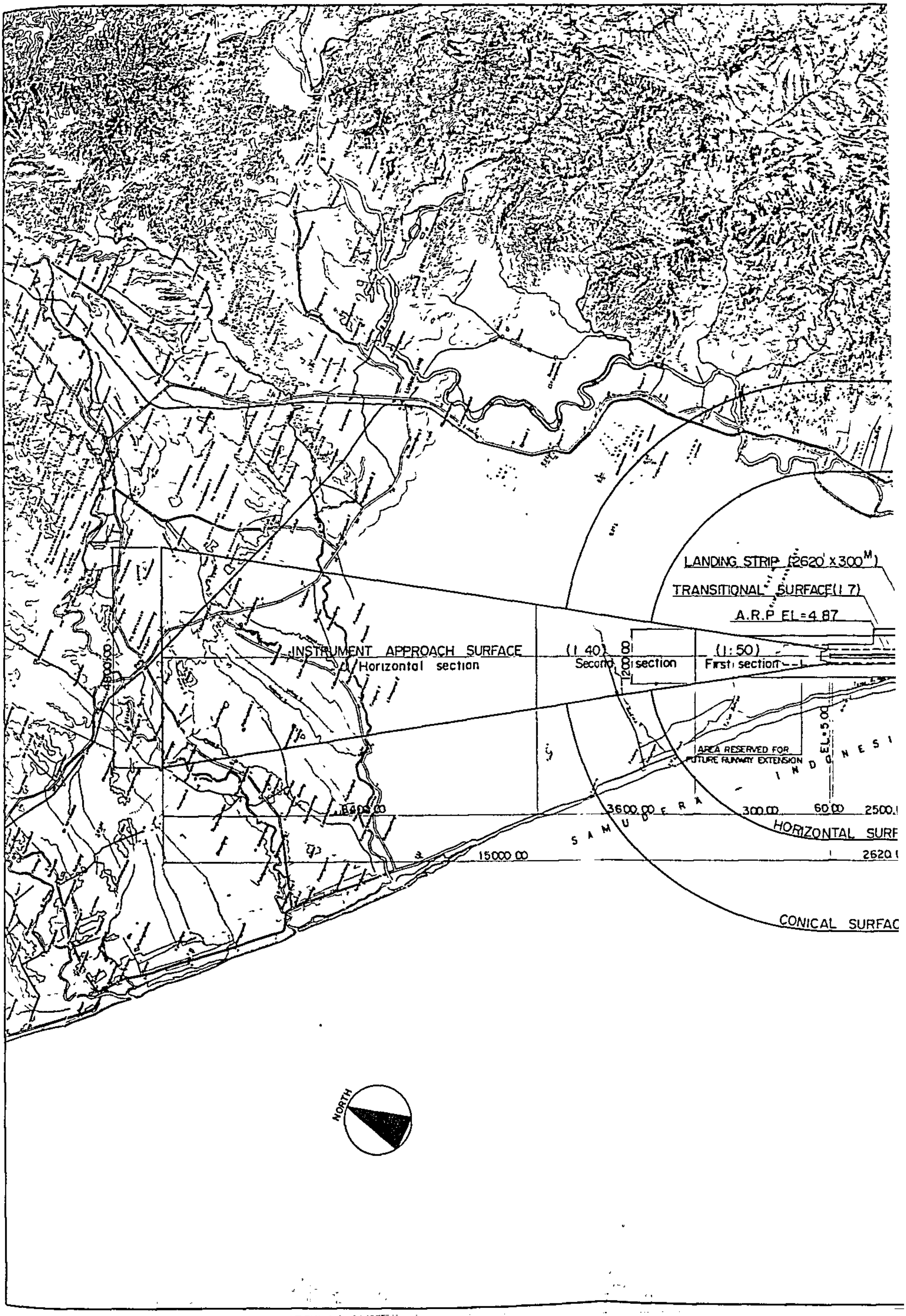
TABLE 15.2.1 BASIC ASSUMPTIONS

Item	Dimension
Runway Location (ARP)	S 00° 47' 26" E 100° 17' 05"
Runway Orientation	T-North 24.0 deg. West (Runway 34/Runway 16)
Magnetic Variation	0 degree
Runway Elevation	
ARP	4.87 m above Mean Sea Level
RWY 34 TDZ	4.76 m "
RWY 16 TDZ	5.00 m "
RWY 34 Threshold	4.50 m "
RWY 16 Threshold	5.00 m "
Runway Length	2,500 meters
Runway Utilization Ratio	RWY 34 84% RWY 16 16%
Navaids	ILS, VOR/DME,NDB, Locator

15.2.2 Obstacle Limitation Surfaces

There will be no obstructions which affect the obstacle limitation surfaces, as shown in Figure 15.2.1.

It is, however, necessary to remove the coconut trees which are located within the approach surfaces area and near the transitional surfaces. The area which should be cleared for the obstacle limitation surfaces is shown in Figure 15.2.2.



LANDING STRIP (2620 x 300M)
TRANSITIONAL SURFACE(1 7)
A.R.P EL=4 87
INSTRUMENT APPROACH SURFACE
(1 40)
(1:50)
Horizontal section
Second section
First section
AREA RESERVED FOR FUTURE RUNWAY EXTENSION
4800.00
1200
EL=5.00
8400.00
3600.00
300.00
60.00
15000.00
SAMUDERA INDONESIA
HORIZONTAL SURF
CONICAL SURFAC
NORTH

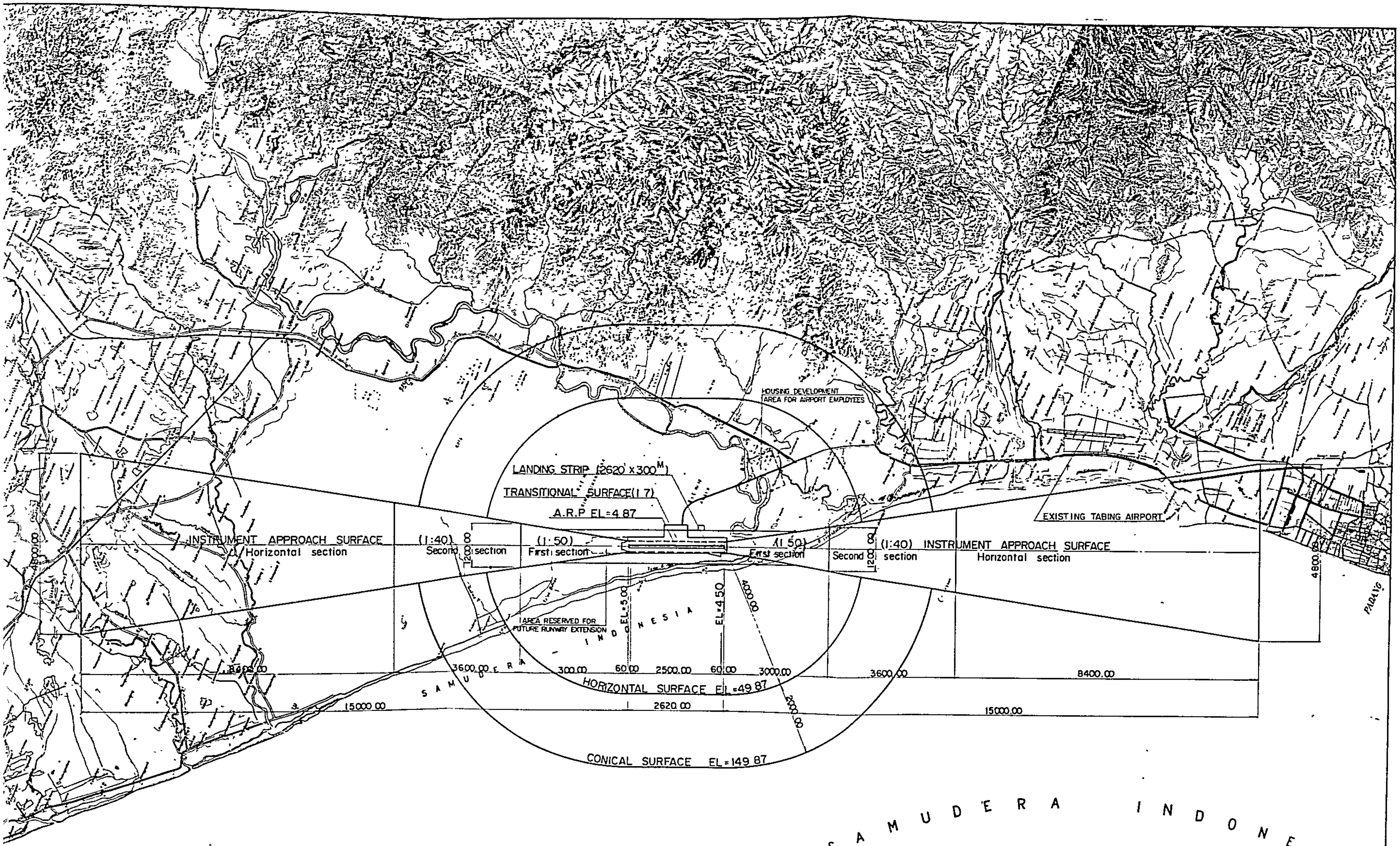


Figure 15.2.1 OBSTACLE LIMITATION SURFACES

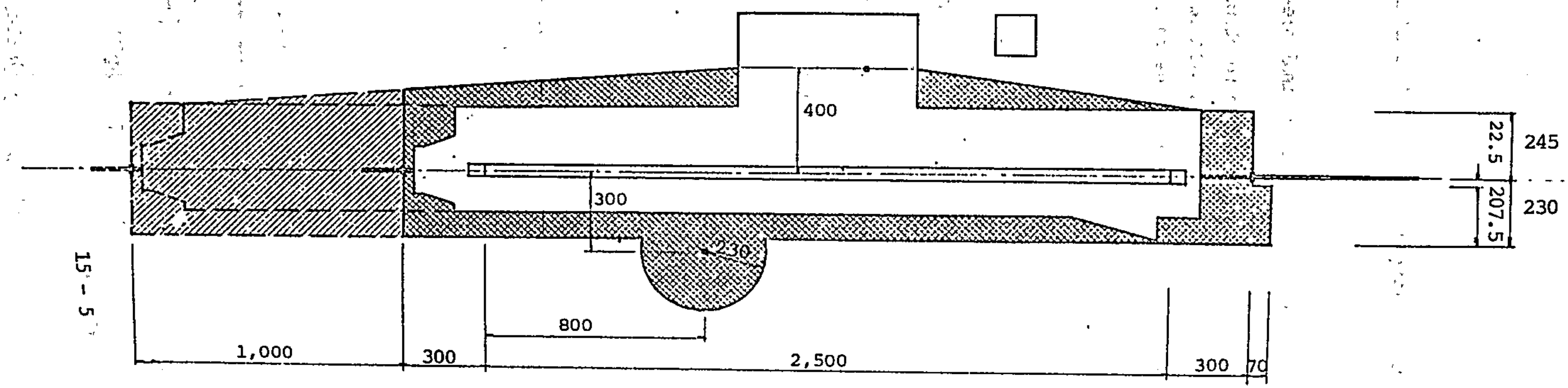


Figure 15.2.2 OBSTACLE CLEARANCE ZONE

LEGEND

The area necessary for present operations

Area reserved for future runway extension

(Unit in meters)

15.2.3 Approach and Departure Procedures

Terminal Area Chart

Figure 15.2.3 shows one of the most feasible terminal area chart.

It is possible to comply with the existing air route structure without much modification. Only a slight modification will be needed for the magnetic bearings and the air route distances due to the relocation of the airport.

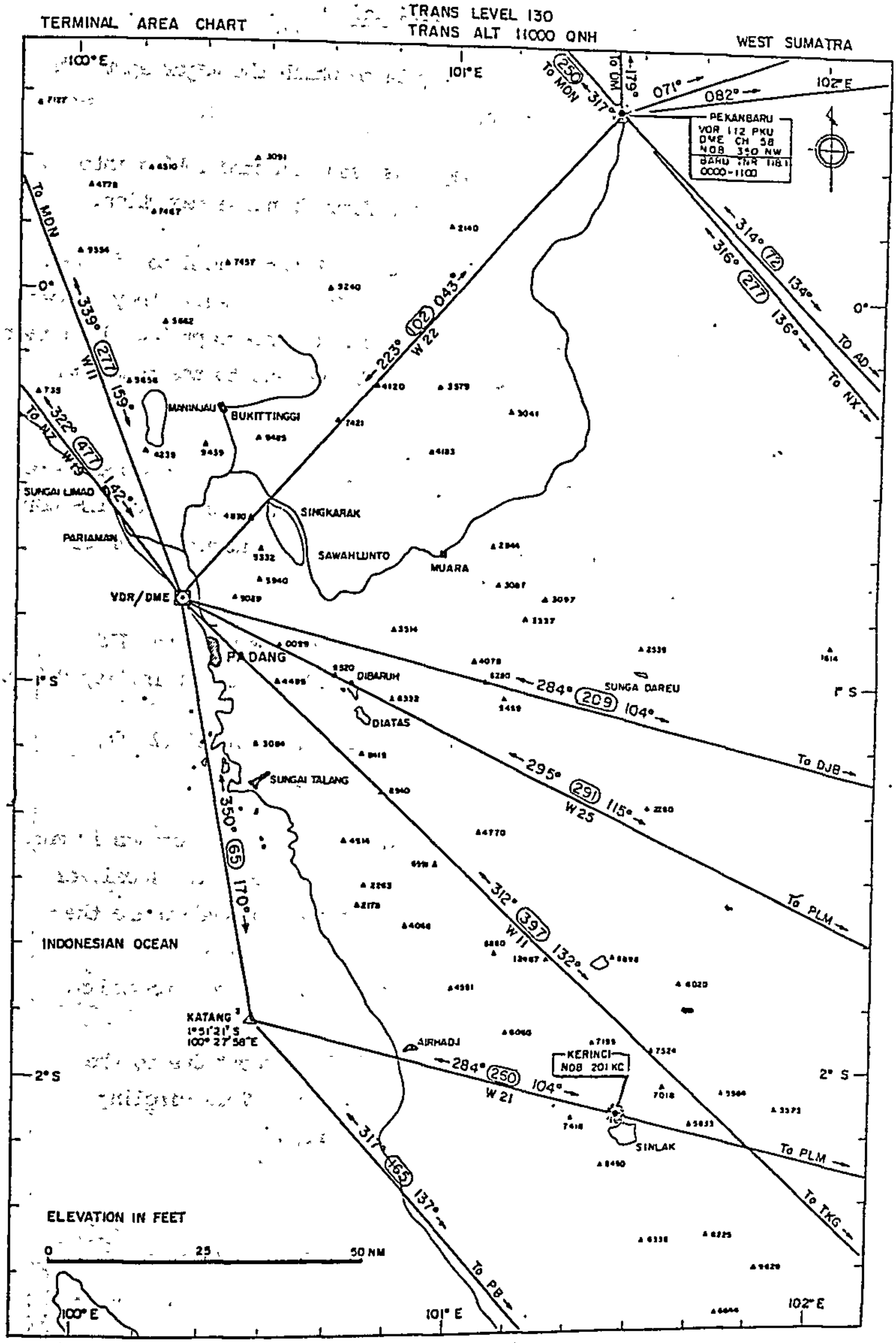


Figure 15.2.3 TERMINAL AREA CHART

ILS Approach (Refer to Figure 15.2.4 and 5)

ILS Approach is planned for Runway 34 to which the major approach traffic from Jakarta will be made.

The glide slope angle of 3.0 deg. has been selected taking into consideration international standards and aircraft noise reduction.

Approaching aircraft from the fix "Katang Katang" head to 350 deg. VOR inbound. At the holding point (13 DME, VOR R-170 deg.), they descend changing the heading to 006 deg., NDB inbound, to intercept the localizer course, then it intercepts the glide slope to descend to the touchdown point.

There will be no problem in establishing this procedure since there is no obstruction that affects the obstacle clearance surface of ILS nor noise problem to Padang City as shown in the noise contour (Refer to Figures 16.1.6 and 7 in Chapter 16).

The ideal aircraft operations minimum is obtained for the ILS category-I operations, i.e., Decision Height *220 ft and visibility 800 m.

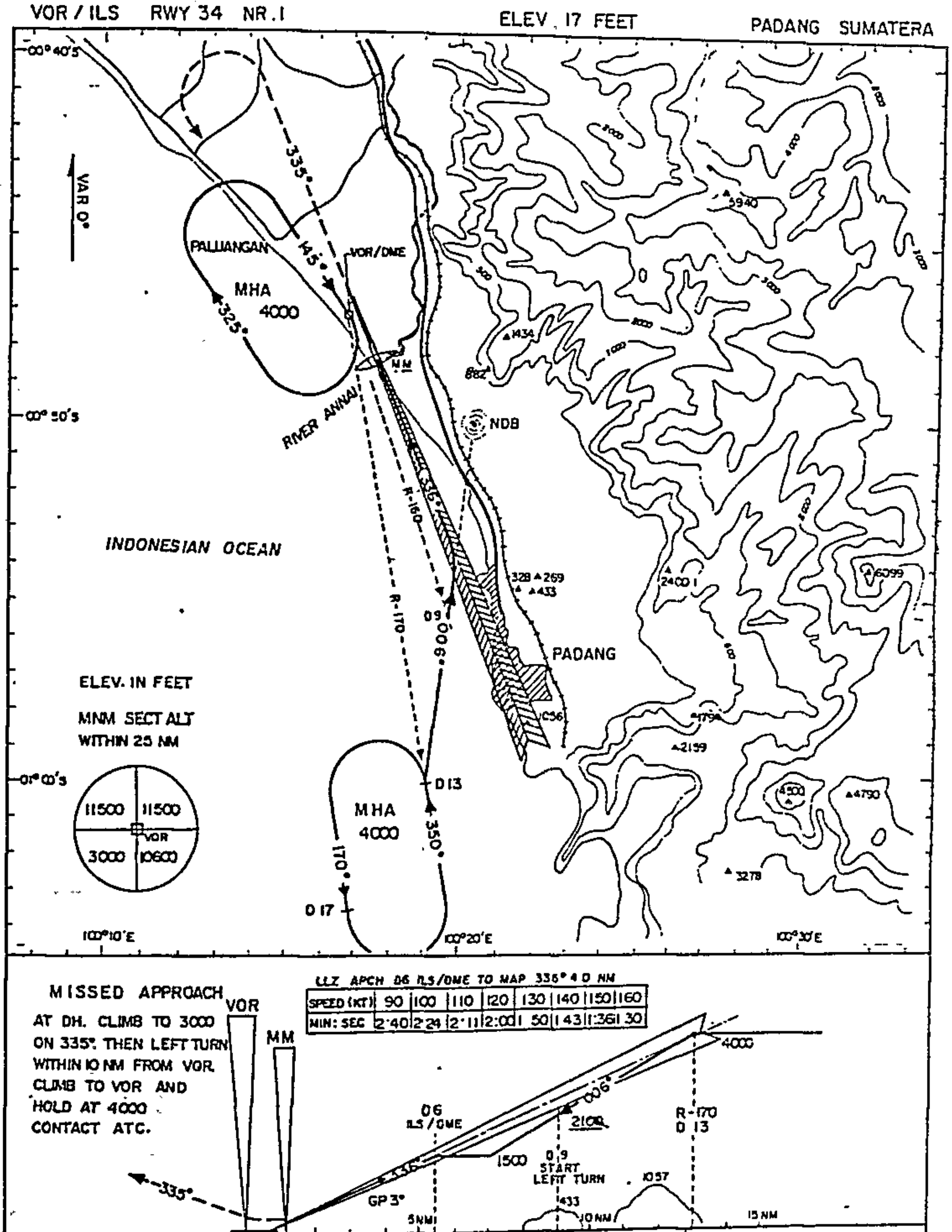
* 220 ft is obtained adding the touch down zone level (20 ft) to the category-I operation minimum (200 ft).

As for the VOR/ILS NR-2 approach, the intermediate approach is made based on the VOR base-turn (2 minutes leg) to intercept the localizer course although the other segments of the approach procedure are the same with the previously mentioned ILS/VOR NR-1 approach.
This procedure is effective for the aircraft approaching from Medan.

ILS circling is available only west of the airport due to the mountainous terrain in the easterly circling area. This circling restriction does not affect the approach planning.

INSTRUMENT APPROACH CHART | AERODROME | NEW TABING AIRPORT

VOR / ILS RWY 34 NR.1 | ELEV. 17 FEET | PADANG SUMATERA



LLZ APCH D6 ILS/DME TO MAP 336° 4 D NM

SPEED (KT)	90	100	110	120	130	140	150	160
MIN: SEC	2'40	2'24	2'11	2:00	1 50	1 43	1:36	1 30

STA TO RWY 34

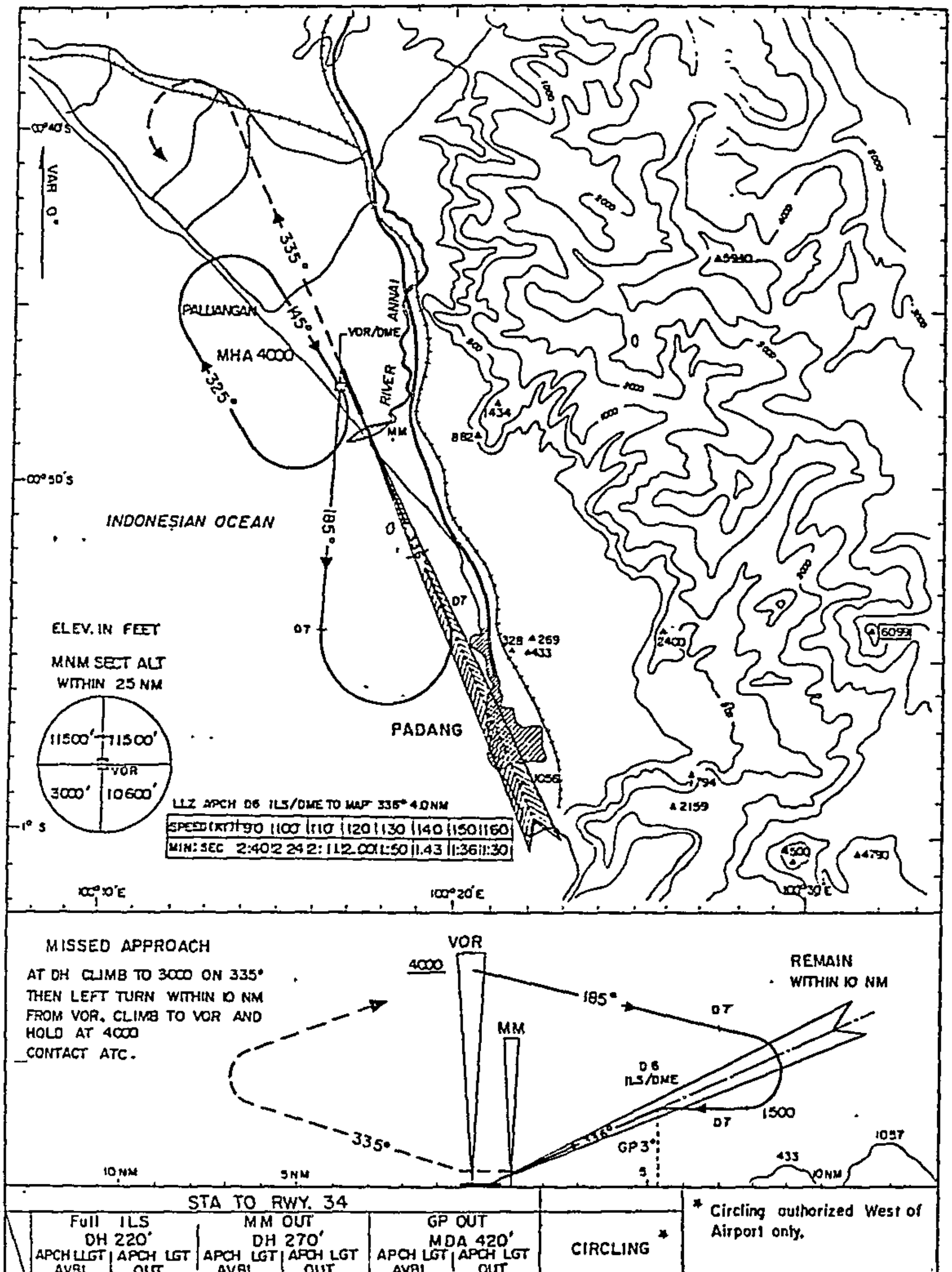
	FULL ILS DH 220'		MM OUT DH 270'		GP OUT MDA 420'		CIRCLING *
	APCH LGT AVBL	APCH LGT OUT	APCH LGT AVBL	APCH LGT OUT	APCH LGT AVBL	APCH LGT OUT	
	RVR or VIS	RVR or VIS	RVR or VIS	RVR or VIS	RVR or VIS	RVR or VIS	MDA – VIS
A	800 M	1200 M	1000 M	1200 M	1200 M	1400 M	500' - 1900 M
B							520' - 2800 M
C							620' - 3700 M
D			1200 M			1600 M	720' - 4600 M

* Circling authorized West of Airport only.

Figure 15.2.4 ILS APPROACH CHART (NR.1)

INSTRUMENT APPROACH CHART — AERODROME — NEW TABING AIRPORT

VOR / ILS RWY 34 NR 2 — ELEV. 17 FEET — PADANG SUMATERA



	STA TO RWY. 34						
	Full ILS DH 220'		MM OUT DH 270'		GP OUT MDA 420'		CIRCLING *
	APCH LGT AVBL	APCH LGT OUT	APCH LGT AVBL	APCH LGT OUT	APCH LGT AVBL	APCH LGT OUT	
	RVR or VIS	RVR or VIS	RVR or VIS	RVR or VIS	RVR or VIS	RVR or VIS	MDA – VIS
A	800 M	1200 M	1000 M	1200 M	1200 M	1400 M	500'-1900M
B							520 -2800M
C							620 -3700M
D			1200 M			1600 M	720 -4600M

* Circling authorized West of Airport only.

Figure 15.2.5 ILS APPROACH CHART (NR2)

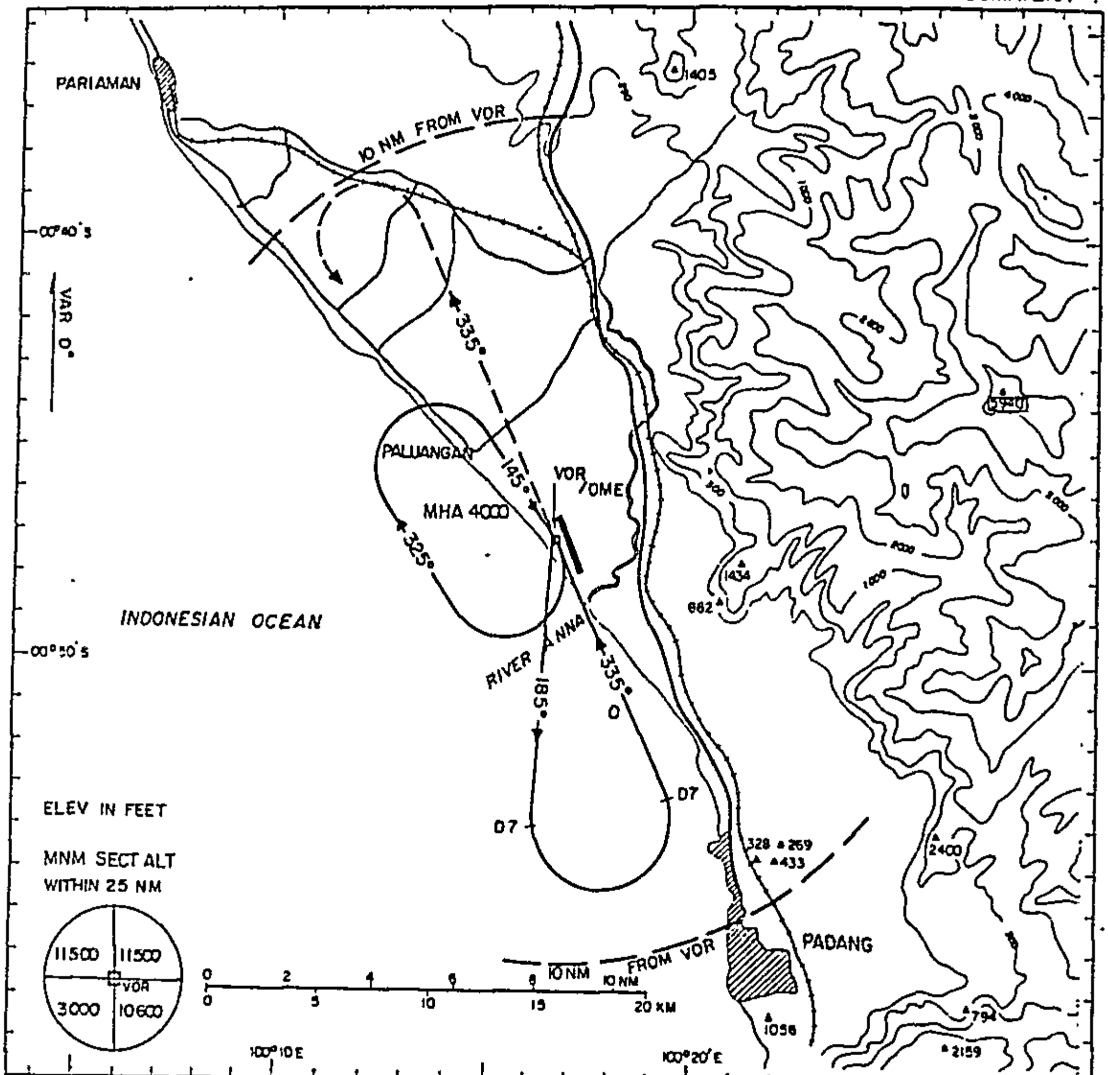
VOR Approach (Refer to Figures 15.2.6 and 7)

It is possible to establish VOR/DME straight-in approaches for both Runways 34 and 16.

After flying over the VOR/DME, the aircraft commences a base turn procedure and descends on the final approach course, as shown in Figures 15.2.6 and 7. A two minute base turn is applied for Runway 34 to avoid the aircraft noise in Padang City.

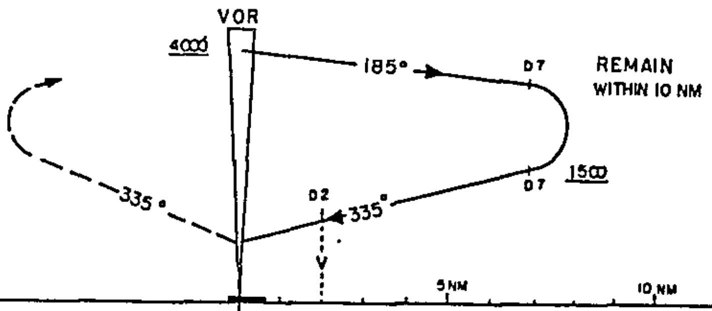
INSTRUMENT APPROACH CHART | AERODROME | NEW TABING AIRPORT

VOR / DME RWY 34 | ELEV. 17 FEET | PADANG SUMATERA



MISSED APPROACH

AT VOR CLIM TO 3000 ON 335° FROM VOR. THEN LEFT TURN WITHIN 10 NM FROM VOR CLIM TO VOR AND HOLD AT 4000. CONTACT ATC.



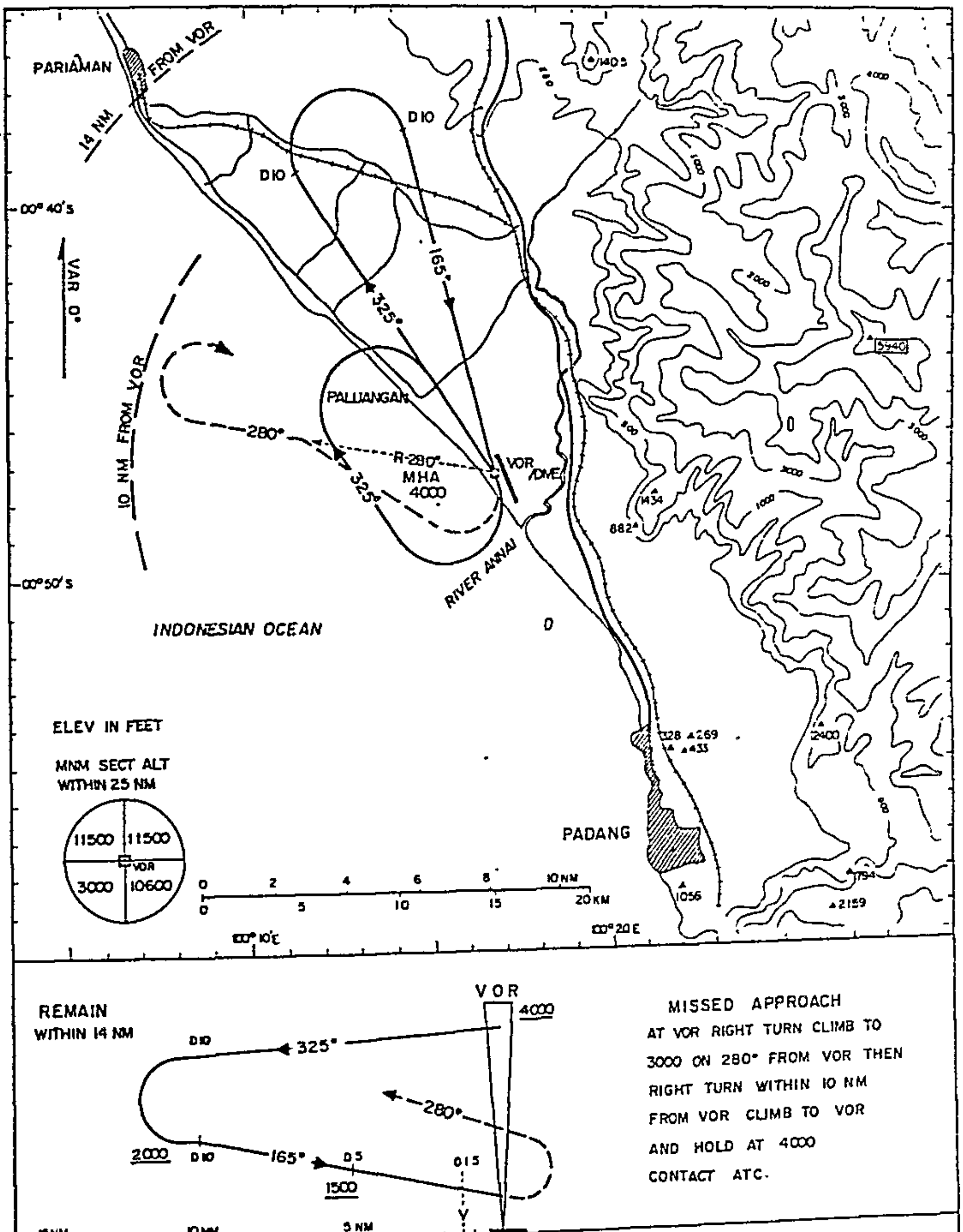
	STA TO RWY 34 MDA 420' APCH LGT AVBL	STA TO RWY 34 MDA 420' APCH LGT OUT	CIRCLING * MDA - VIS
A	RVR VIS 1200 M	RVR VIS 1600 M	500' - 1900 M
B	RVR VIS 1200 M	RVR VIS 1600 M	520' - 2800 M
C		VIS 2000 M	620' - 3700 M
D	RVR VIS 1400 M	VIS 2600 M	720' - 4600 M

* Circling authorized West of Airport only.

Figure 15.2.6 VOR APPROACH CHART (NR.1)

INSTRUMENT APPROACH CHART · AERODROME · NEW TABING AIRPORT

VOR / DME RWY 16 · ELEV 17 FEET · PADANG SUMATERA



OPERATING MINIMA

	STA TO RWY 16 MDA 420' APCH LGT AVBL	APCH LGT OUT	CIRCLING * MDA - VIS
A	RVR VIS 1200 M	RVR VIS 1600 M	500' −1900 M
B			520' −2800 M
C		VIS 2000 M	620' −3700 M
D	RVR VIS 1600 M	VIS 2600 M	720' −4600 M

* Circling Authorized West of airport only. --

Figure 15.2.7 VOR APPROACH CHART (NR.2)

NDB Approach

Since the NDB approach will most likely be the VOR/DME approach, the figures and explanation are eliminated.

Take-off Procedures (Refer to Figure 15.2.8.)

It is impossible to establish direct climb up courses for Jakarta, and Pekanbaru, except to Medan, since the high mountainous terrain on the east side makes them almost impossible.

Accordingly, aircraft taking off from the airport must climb up, and then turn to fly over the VOR/DME at the defined altitude or more in order to clear the mountains. Then, aircraft takes tracks to the destinations. In the case of take-off for Medan, the aircraft flies by VOR outbound R-322 after straight climb up (RWY 34) or the reverse climb up (RWY 16).

Note: Flight Course above Padang City

There will be no aircraft under IFR conditions flying over the developed area of Pandang city if these aircraft operation procedures are followed.

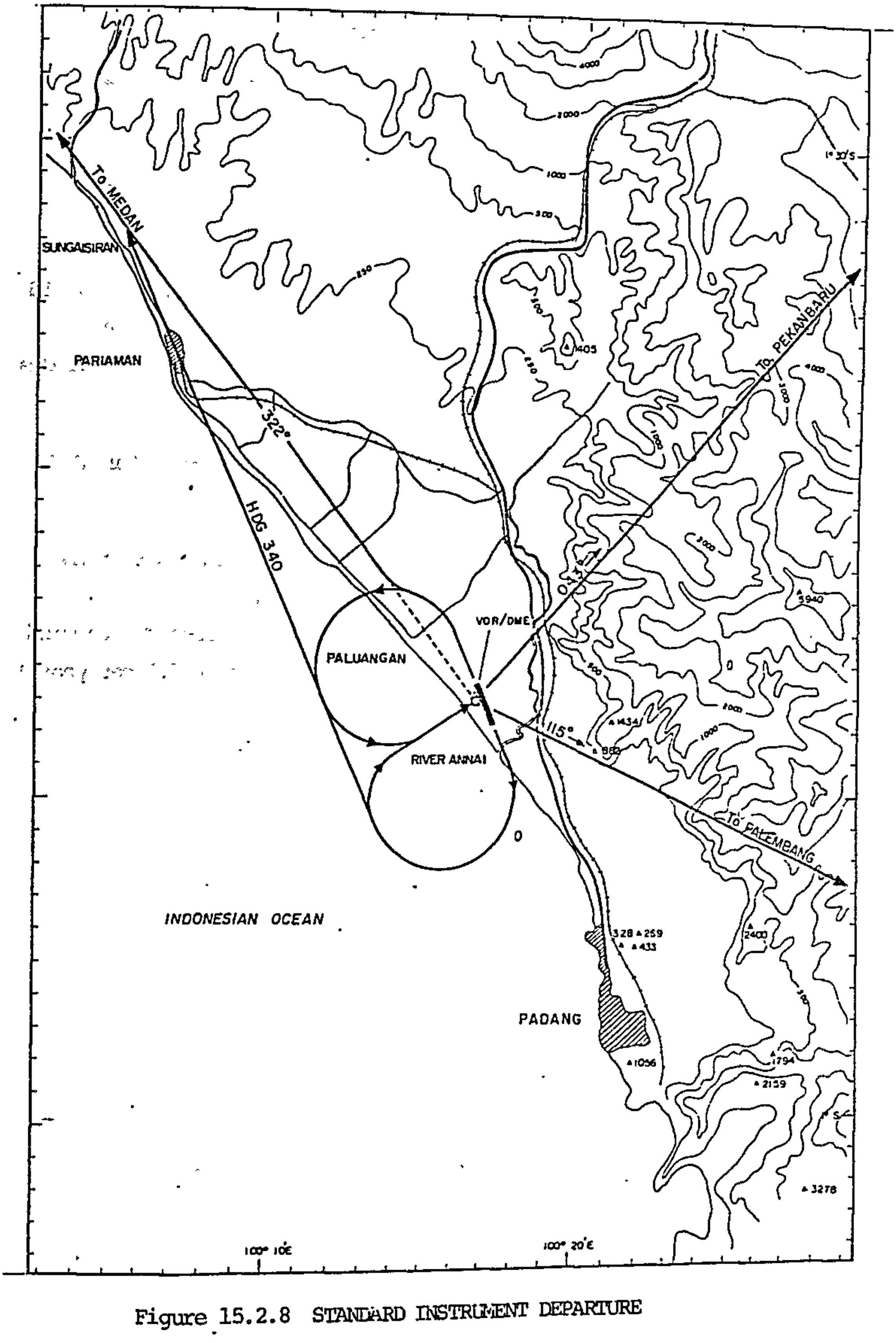


Figure 15.2.8 STANDARD INSTRUMENT DEPARTURE

15.3 Runway Usability

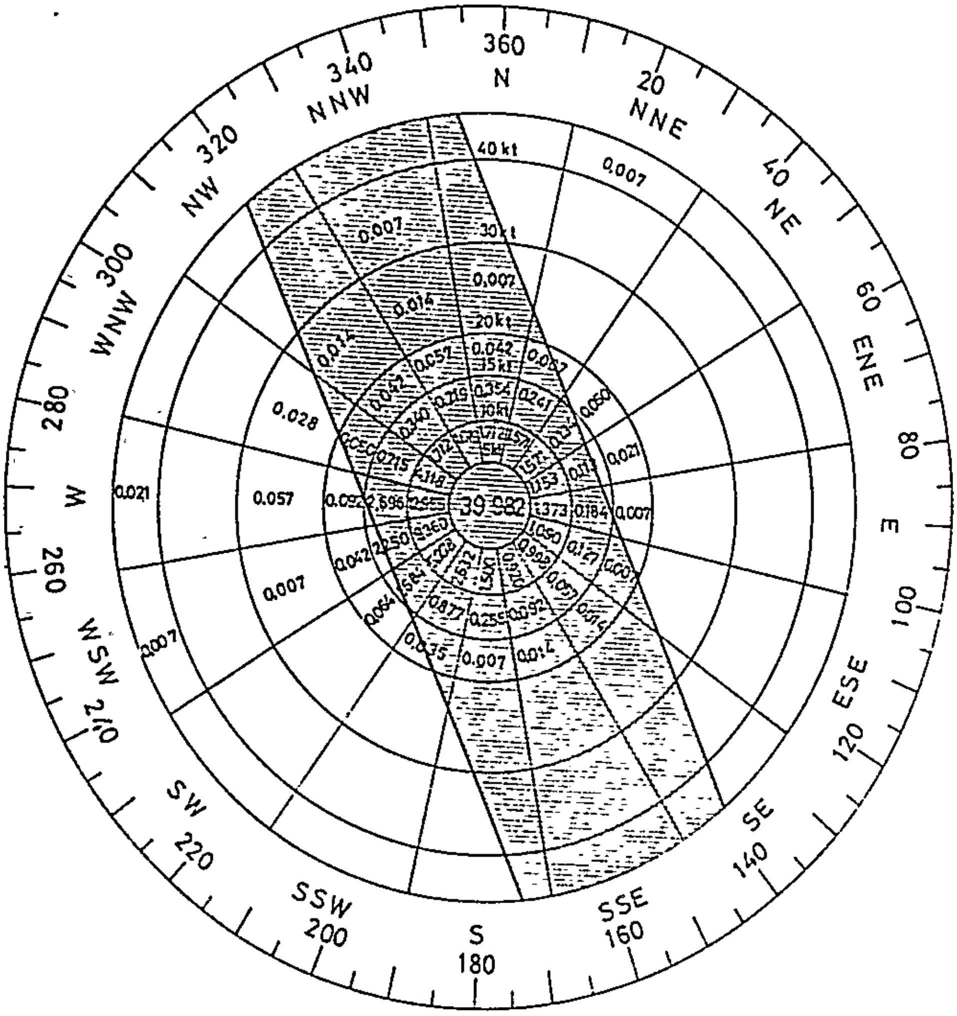
15.3.1 Runway Usability by Wind Conditions

Figures 15.3.1 and 15.3.2 show the wind coverage map for the new airport.

Since the meteorological data at the new airport site is not yet available, the meteorological data at the existing Tabing Airport has been applied for planning purposes to the new airport site based on the assumption that conditions at Tabing Airport and the new site would not be very different. The terrain conditions are exactly the same at both sites facing the Indonesian Sea on the west side and mountainous terrain on the east side.

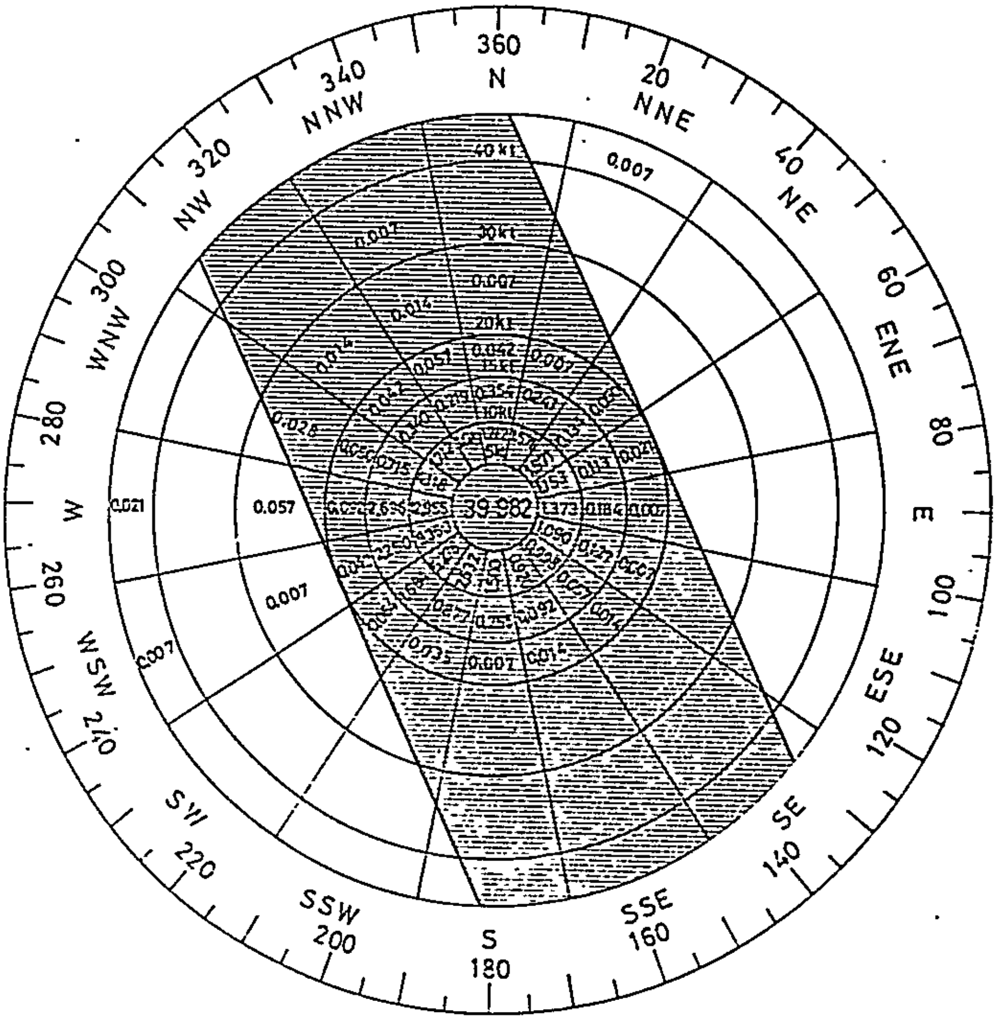
97.97% of wind coverage results from the condition less than 13 kt cross wind, and 99.90% less than 20 kt cross wind.

This means that the wind condition is quite good and most of the airport operation time will not be affected by the wind conditions (99.90% wind coverage means that the airport will be closed due to wind conditions, for a total number of operating hours of only 5.5 per year.)



Source	:	Tabing Airport
Period	:	1976 to 1978 (3 years)
Cross Wind	:	13 knots
RWY Orientation	:	N 24° W
WIND COVERAGE	:	97.97 percent

Figure 15.3.1 WIND COVERAGE MAP (Cross Wind 13 kt)



Source	:	Tabing Airport
Period	:	1976 to 1978 (3 years)
Cross Wind	:	20 knots
RWY Orientation	:	N 24° W
WIND COVERAGE	:	99.90 percent

Figure 15.3.2 WIND COVERAGE MAP (Cross Wind 20 kt)

15.3.2 Total Runway Usability

The wind coverage represents only wind conditions, and does not include other factors which affect the aircraft operation i.e., cloud height and visibility.

Hence, this subsection studies the runway usability taking into consideration wind, visibility and ceiling height.

The overall runway usability is defined by the following formula.

$$P = \frac{I \times Iw + C \times Cw}{100}$$

where, P: Runway Usability

I: Possibility of occurrence of the defined meteorological conditions (visibility and ceiling height) that exceed the aircraft operational minimum in the main approach runway.

Iw: Wind coverage of main approach runway on the conditions under 20 kt cross wind component and 5 kt tail wind.

C: Possibility of occurrence of the defined meteorological conditions that exceed the aircraft operational minimum in the sub-approach runway.

CW: Wind coverage of sub-approach runway on the conditions under 20 kt cross wind component.

The following approach procedures and the operational minimum, as reported in the previous subsection, are applied to the calculation of the runway usability.

RWY Use	Procedures	Operational Minimum DH/MDA	VIS
RWY 34 (Main)	ILS RWY 34 Approach	220 ft -	800 m
RWY 16 (Sub)	VOR RWY 16 Approach	420 ft -	1200 m

Table 15.3.1 shows the correlation between the ceiling height and visibility, which is tabulated based on the analysis of the meteorological observation data for the past three years (1976 - 1978) at Tabing Airport Meteorological Station.

The possibility "I" could be obtained from the Table 15.3.2 counting the frequency of meteorological conditions more than 200 ft in the ceiling and more than 800 m in the visibility.

"I" is 99.57%.

Figure 15.3.3 depicts the possibility "Iw" i.e., 91.76%. This wind coverage has been made under the following conditions;

- Approach direction : Runway 34
- Cross wind : Not more than 20kt
- Tail wind : Not more than 5kt

Table 15.3.1 CORRELATION TABLE OF CEILING HEIGHT AND VISIBILITY

CLOUD Q'TY	CEILING (ft) \ VISIBILITY (m)	- 400	400 - 500	500 - 600	600 - 700	700 - 800	800 - 900	900 -1000	1000 -1200	1200 -1400	1400 - 1600	1600 - 2000	2000 -2400	2400 - 2800	2800 -3200	3200 - 3600	3600 - 4000	4000 -4400	4400 - 5000	5000 -	Total
8/5	100								7												7
	100 - 200		2	2					1												5
	200 - 300	2	2						2		1		2		2			1		4	16
	300 - 400	3	3	8	2	3			5				12		10			9		28	83
	400 - 500		1	4		1	2		11		2		15		10			30		90	166
	500 - 600	4	2	5	1	1			6		2	1	10	1	11			27		173	244
	600 - 700	1	1		1		1		11		1		17		22			26		294	475
	700 - 800												4		7			9		271	291
	800 - 900																	4		139	143
	900 - 1000												1					2		167	170
	1000 - 1100																	1		48	49
	1100 - 1200																				
	1200 - 1300																			24	24
	1300 - 1400																				
	1400 - 1500																			1	1
	1500 -								1				1		4			12		2943	2961
¯8/5		2	1		1	1	1	1	9		1		15		45			90		9333	9499
TOTAL		12	12	19	4	6	4	1	53	0	7	1	77	1	111	0	0	211	0	13615	14134

Source: Tabing Airport
Period: 1976 to 1978 (3 years)

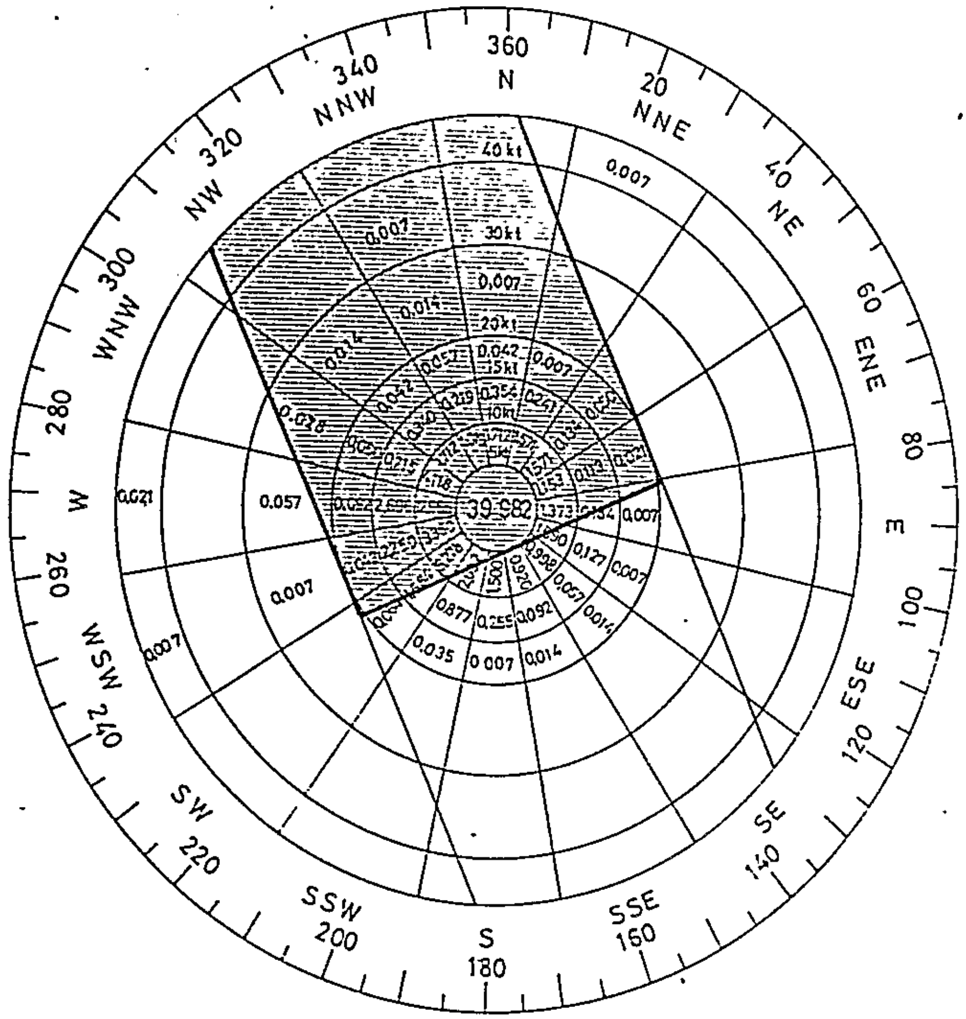
Table 15.3.2 CORRELATION TABLE OF CEILING HEIGHT AND VISIBILITY (RUNWAY 34 APPROACH)

CLOUD Q'TY	CEILING (ft) \ VISIBILITY (m)	- 400	400 - 500	500 - 600	600 - 700	700 - 800	800 - 900	900 - 1000	1000 - 1200	1200 - 1400	1400 - 1600	1600 - 2000	2000 - 2400	2400 - 2800	2800 - 3200	3200 - 3600	3600 - 4000	4000 - 4400	4400 - 5000	5000 -	Total
8/5	100								7												7
	100 - 200		2	2					1												5
	200 - 300	2	2						2		1		2		2			1		4	16
	300 - 400	3	3	8	2	3			5				12		10			9		28	83
	400 - 500		1	4		1	2		11		2		15		10			30		90	166
	500 - 600	4	2	5	1	1			6		2	1	10	1	11			27		173	244
	600 - 700	1	1		1		1		11		1		17		22			26		294	475
	700 - 800												4		7			9		271	291
	800 - 900																	4		139	143
	900 - 1000												1					2		167	170
	1000 - 1100																	1		48	49
	1100 - 1200																				
	1200 - 1300																			24	24
	1300 - 1400																				
	1400 - 1500																			1	1
	1500 -								1				1		4			12		2943	2961
-8/5		2	1		1	1	1	1	9		1		15		45			90		9333	9499
TOTAL		12	12	19	4	6	4	1	53	0	7	1	77	1	111	0	0	211	0	13615	14134

Aircraft can be operated in these conditions.

$$I = \frac{14,134 - 61}{14,134} = 0.9957$$

Source: Tabing Airport
Period: 1976 to 1978 (3 years)



Source : Tabing Airport

Period : 1976 to 1978

Allowed Cross Wind : 20 kt

Allowed Tail Wind : 5 kt

WIND COVERAGE RWY34 = 91.76%

Figure 15.3.3 WIND COVERAGE MAP OF RWY34 APPROACH.

As for the "C" and "Cw" of the sub-approach (RWY 16), the possibilities are calculated by the same procedures.

Table 15.3.3 shows that "C" is 98.73%. Figure 15.3.4 indicates that "Cw" is 8.14%.

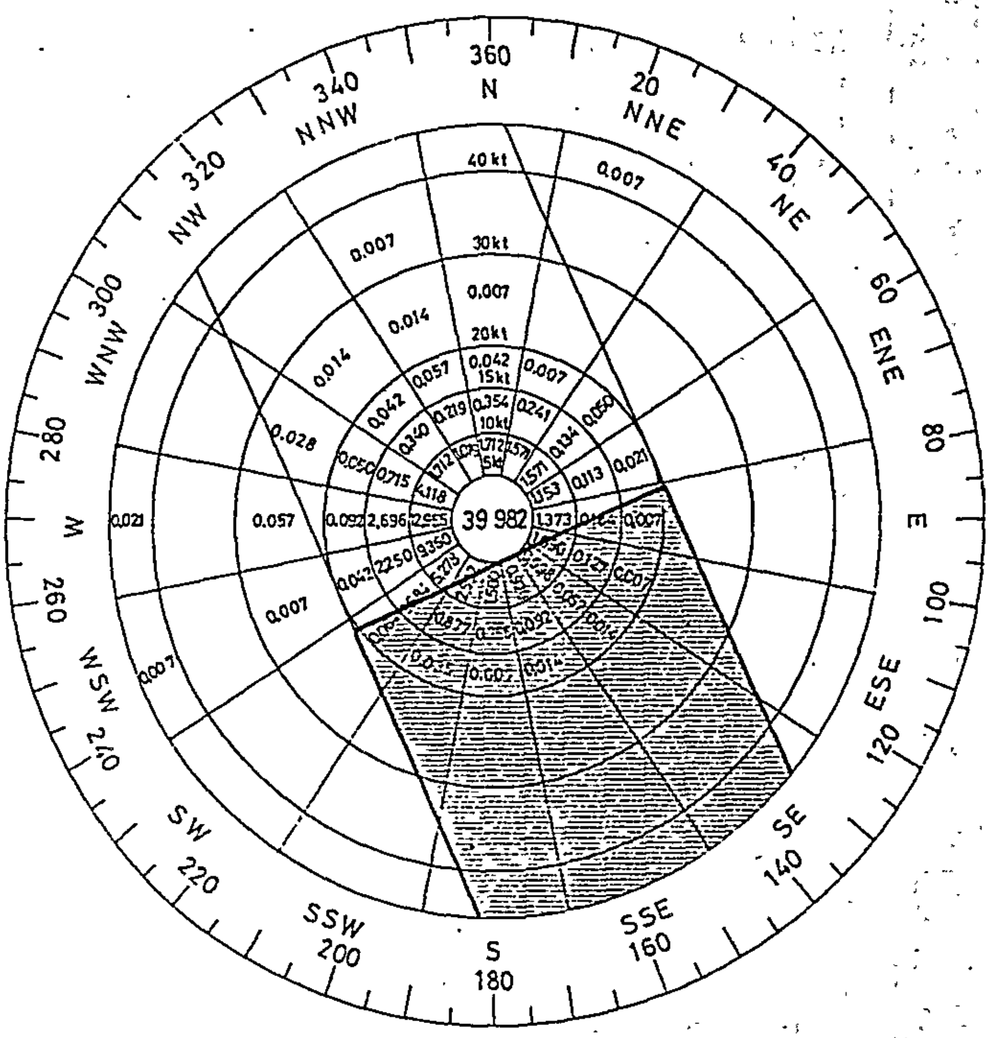
Table 15.3.3 CORRELATION TABLE OF CEILING HEIGHT AND VISIBILITY
(RUNWAY 16 APPROACH)

CLOUD Q'TY	CEILING (ft) / VISIBILITY (m)	-400	400 - 500	500 - 600	600 - 700	700 - 800	800 - 900	900 - 1000	1000 - 1200	1200 - 1400	1400 - 1600	1600 - 2000	2000 - 2400	2400 - 2800	2800 - 3200	3200 - 3600	3600 - 4000	4000 - 4400	4400 - 5000	5000 -	Total
8/5 -	100								7												7
	100 - 200		2	2					1												5
	200 - 300	2	2						2		1		2		2			1		4	16
	300 - 400	3	3	8	2	3			5				12		10			9		28	83
	400 - 500		1	4		1	2		11		2		15		10			[illegible]		[illegible]	[illegible]
	500 - 600	4	2	5	1	1			6		2	1	10	1	11			27		173	244
	600 - 700	1	1		1		1		11		1		17		22			26		294	475
	700 - 800												4		7			9		271	291
	800 - 900																	4		139	143
	900 - 1000												1					2		167	170
	1000 - 1100																	1		48	49
	1100 - 1200																				
	1200 - 1300																			24	24
	1300 - 1400																				
	1400 - 1500																			1	1
	1500 -								1				1		4			12		2943	2961
- 8/5		2	1		1	1	1	1	9		1		15		45			90		9333	9499
TOTAL		12	12	19	4	6	4	1	53	0	7	1	77	1	111	0	0	211	0	13615	14134

Aircraft can be operated in these conditions.

$$C = \frac{14,134 - 180}{14,134} = 0.9873$$

Source: Tabing Airport
Period: 1976 to 1978 (3 years)



Source : Tabing Airport
Period : 1976 to 1978
Allowed Cross Wind : 20 kt
WIND COVERAGE RWY16 = 8.14%

Figure 15.3.4 WIND COVERAGE MAP OF RWY16 APPROACH.

The runway usability is calculated as follows:

$$P = \frac{\overset{I}{99.57} \times \overset{Iw}{91.76} + \overset{C}{98.73} \times \overset{Cw}{8.14}}{100} = 99.40\%$$

As a result, more than 99% of the runway usability is obtained for the new airport, provided that the operation procedures of RWY 34 ILS Approach and RWY 16 VOR Approach are applied, and 20 kt cross wind component is allowed. This value of more than 99% usability means that the new airport could be operated very efficiently with little disruption to aircraft operations due to weather conditions.

CAPTER 16 SUBSIDIARY CONSIDERATIONS

16.1 Aircraft Noise

16.1.1 Calculation Model for WECPNL

WECPNL (Weighted Equivalent Continuous Perceived Noise Level) has been applied to the aircraft noise measures, as reported in Chapter 12. The calculation model for the WECPNL is described here.

The WECPNL is defined as follows:

$$WECPNL\ (i) = 10 \log_{10} [\sum^{j} \text{anti log}\ (EPNL\ ij)/j] + 10 \log_{10} N - 39.4$$

Where, j: Type of aircraft and type of flight patterns

N: Total weighted number of flight at " i " point

N = N day + 3 N evening + 10 N night

i: Any selected point

The take off profile is determined, as shown in Figure 16.1.1, to be a function of distance to destination and type of aircraft. Hence, the distance to aircraft from the any point, or the so called "Slant Distance" is calculated as shown in Figure 16.1.2. Since EPNL (Effective Percieved Noise Level) for every aircraft has been obtained as a function of the slant distance as is indicated in Figure 16.1.3. $EPNL_{ij}$ at "i" point can be calculated based on each aircraft type and flight pattern.

Accordingly, WECPNL at "i" point can be calculated by the aforementioned formula.

A precise calculation by computer is required to obtain the ECPNL.

There is, however, a simplified method based on the assumption that PNL is approximately equivalent to dB(A) + 13 and that the expected aircraft are civil aircraft which are considered to have approximately the same power level in type and also to take off and land under the same ...

conditions. WECPNL is simplified to the following formula, as indicated in Chapter 12.

$$WECPNL = \overline{dB(A)} + 10 \log_{10} N - 27$$

The precise calculation of the former model is applied here for aircraft noise evaluation and assessment.

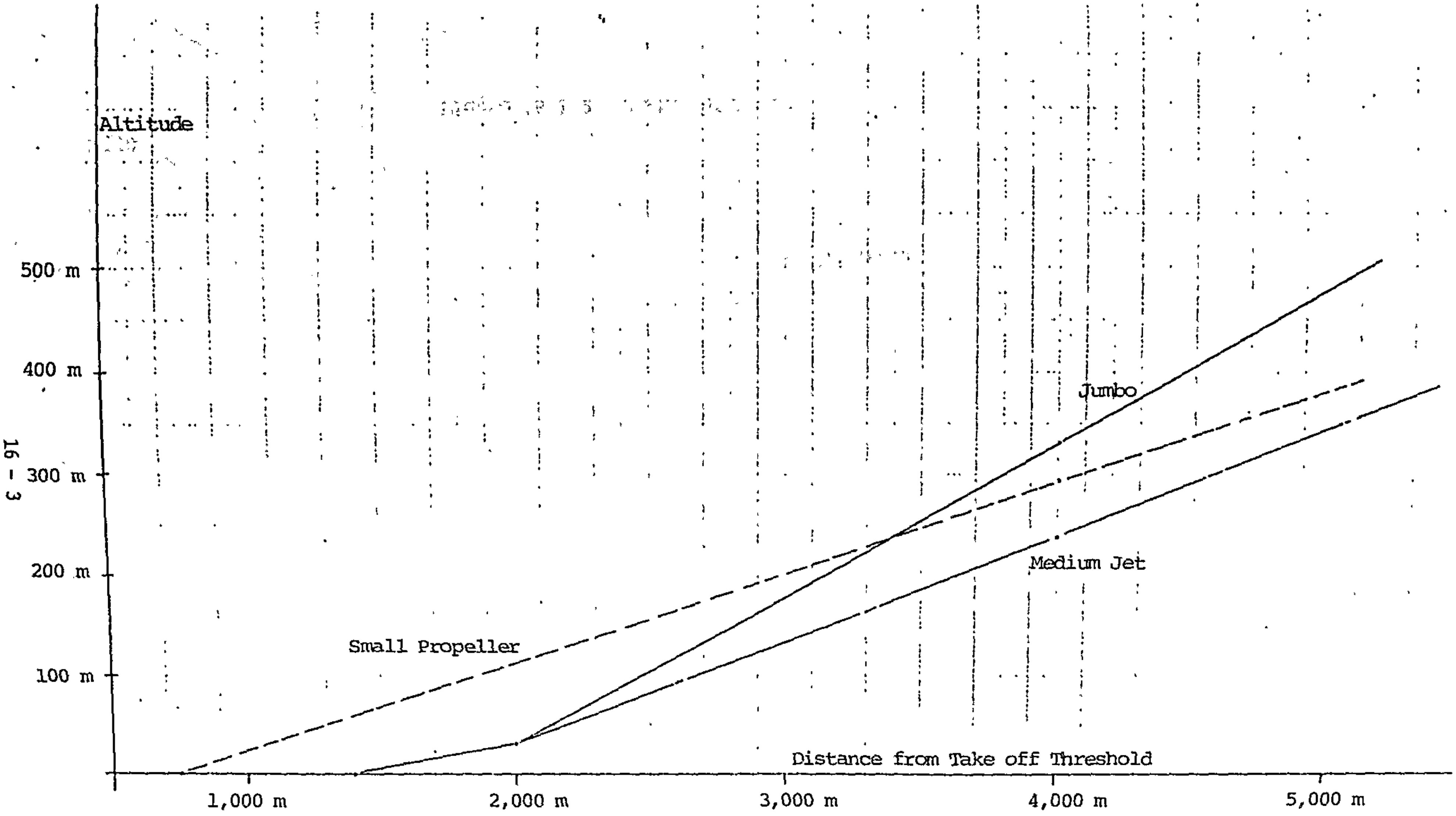


Figure 16.1.1 TAKE OFF PROFILE

Slant Distance (S.D.) = $\sqrt{AP^2 + AB^2}$

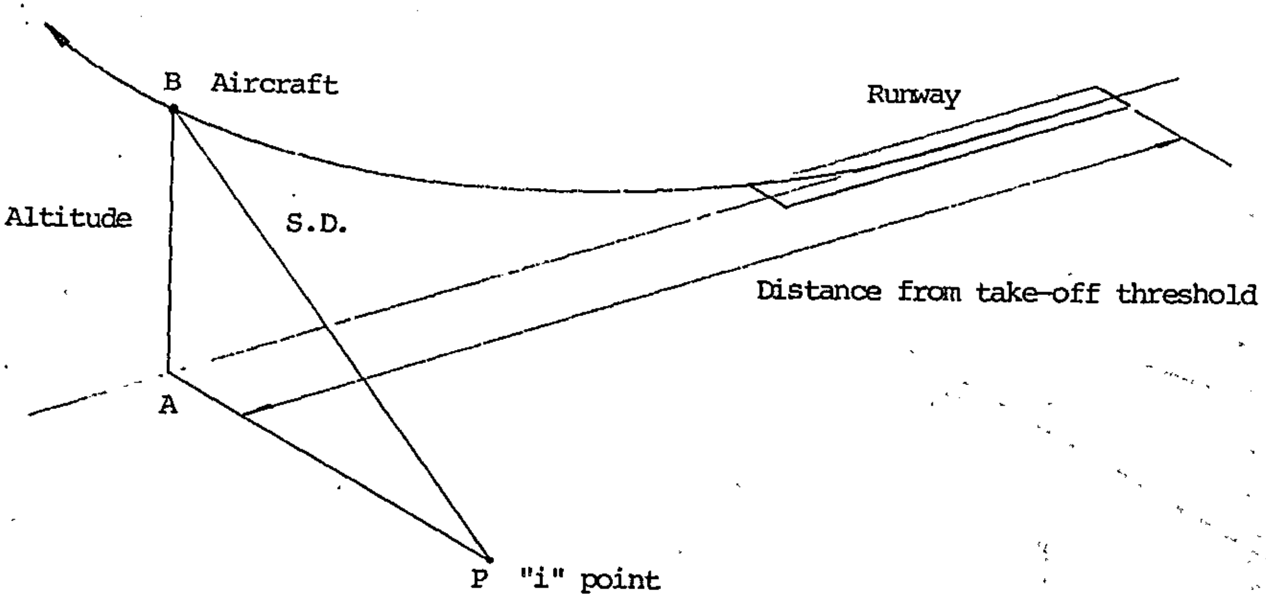


Figure 16.1.2 SLANT DISTANCE

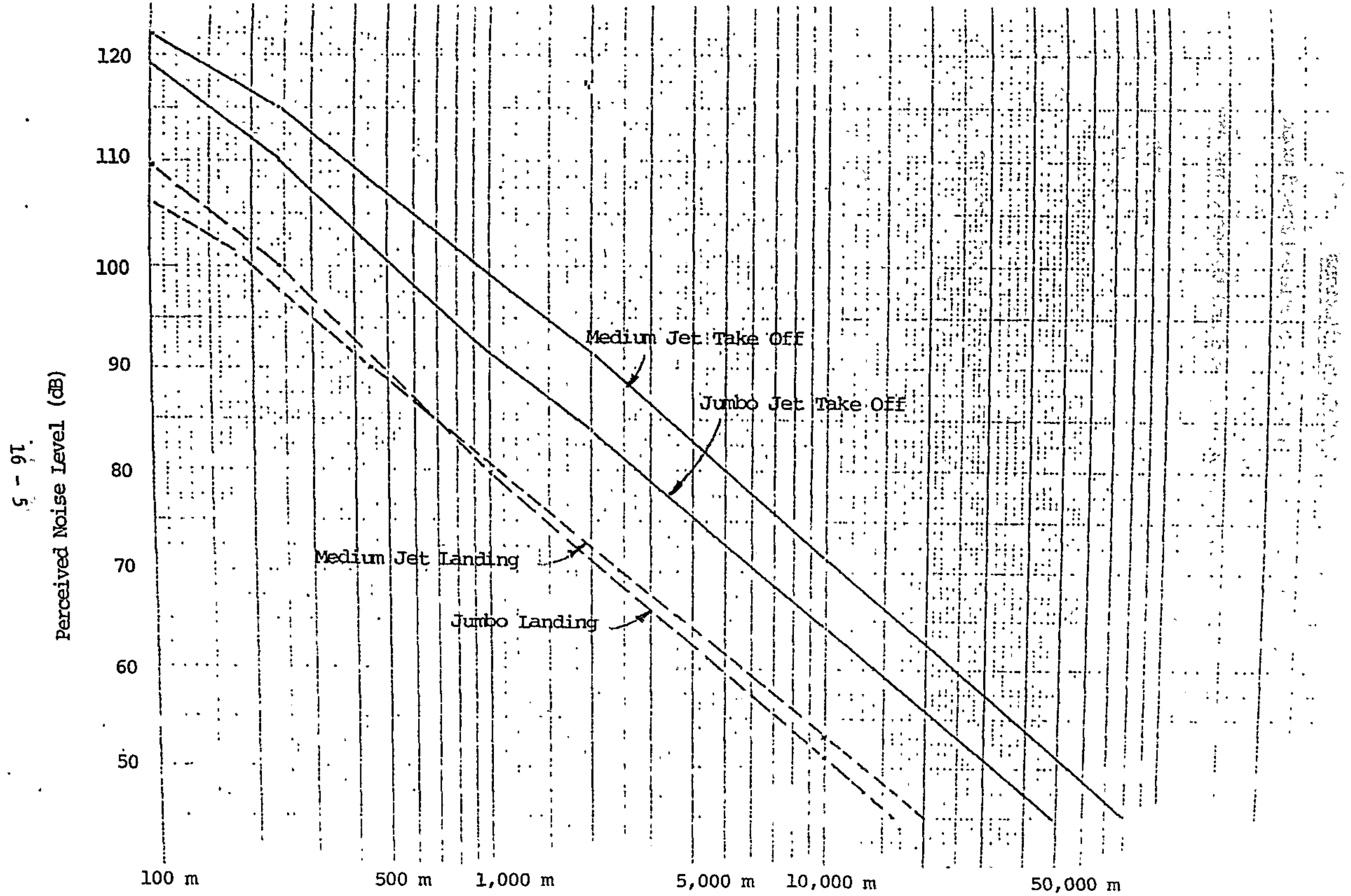


Figure 16.1.3 PNL AND DISTANCE FROM AIRCRAFT

16.1.2 Basic Conditions for the WECPNL Calculations

The aircraft noise contours have been calculated based upon the conditions tabulated in Table 16.1.1.

Actually, a high speed computer is used and the contours are plotted using an XY plotter.

Since the area covered by the WECPNL 70 for the years 1990 is understood to be wider than those for the other years in the project period, the contours for the year 1990 are mainly used for airport planning in the Study.

The contours for the year 2005 were also determined to indicate the trend of the reduction in aircraft noise and its impact and the anticipated condition for Phase II.

Table 16.1.1 BASIC CONDITIONS FOR NOISE CALCULATION

Item	Conditions
Targetted Year	Phase-I: 1990 Phase-II: 2005
Traffic Pattern	As shown on Figures 16.1.4 and 5.
Ratio of RWY Use	RWY34: 86% RWY16: 14%
Number of Flights	As tabulated in Tables 16.1.2 and 3.
Runway Length	2,500 m
Glide Slope Angle	3.0 deg.
Background Sound Pressure Level	40 dB

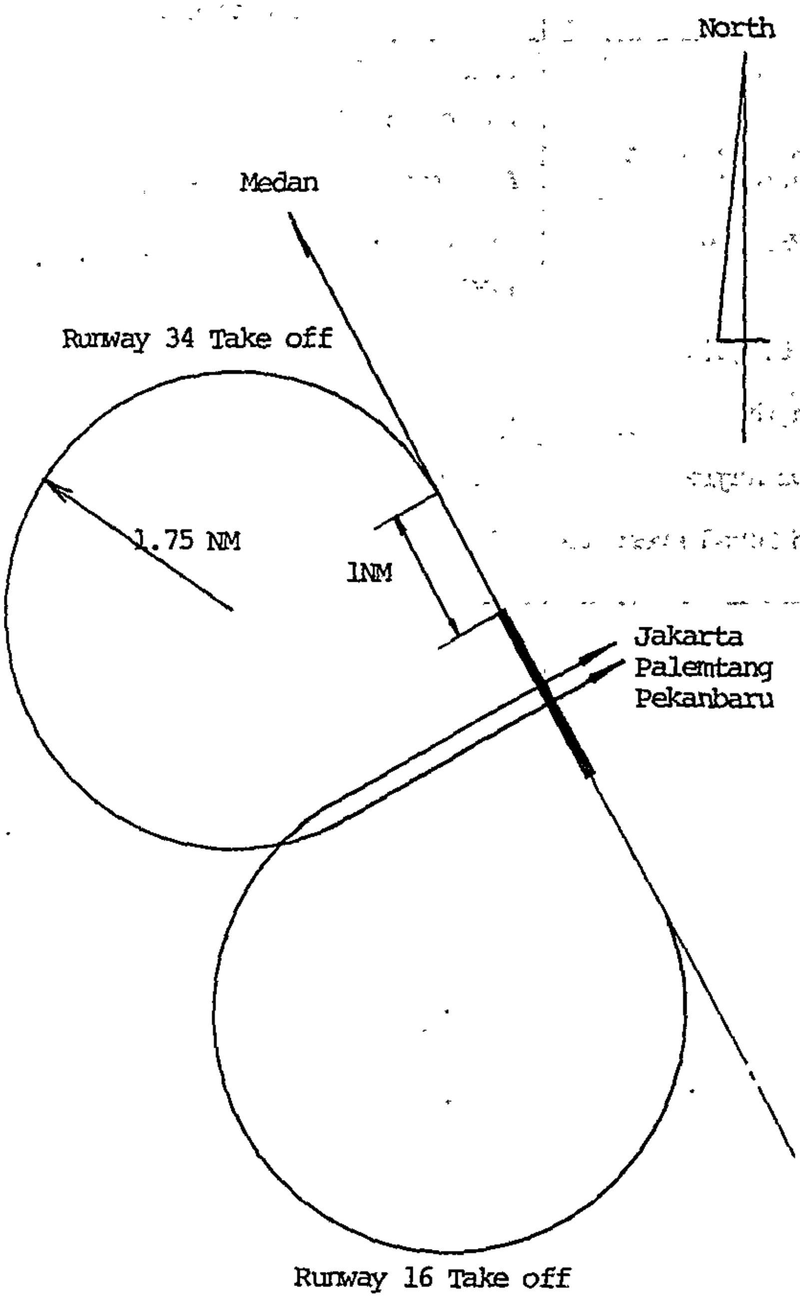


Figure 16.1.4 TRAFFIC PATTERN FOR NOISE CONTOUR CALCULATION

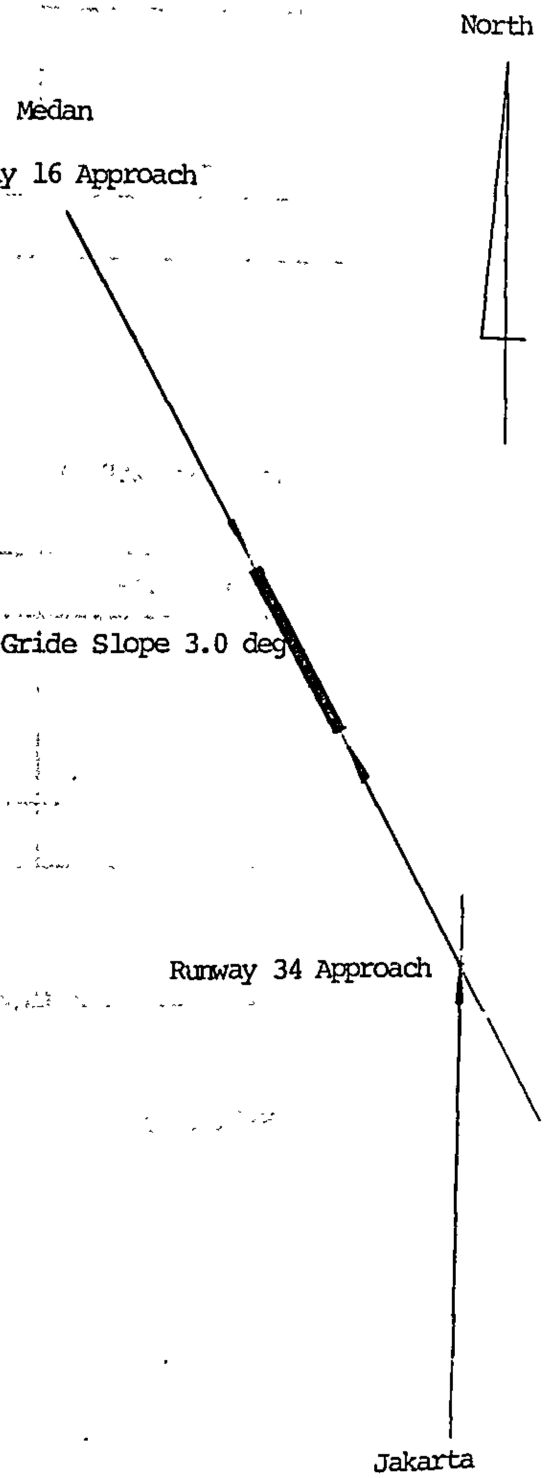


Figure 16.1.5 TRAFFIC PATTERN FOR NOISE CONTOUR CALCULATION

Table 16.1.2 NUMBER OF FLIGHTS (Year 1990)

Aircraft	Day Time	Night Time	Total
Wide Body	10	2	12
Medium Jet	24	-	24
Stol	4	-	4
Total	38	2	40

Table 16.1.3 NUMBER OF FLIGHTS (Year 2005)

Aircraft	Day Time	Night Time	Total
Jumbo	10	2	12
Wide Body	36	6	42
Stol	12	-	12
Total	58	8	66

Jumbo: B-747

Wide Body: DC-10, A-300, New Medium Jet Class

Medium Jet: DC-9-30, F-28

Stol: F-27, DHC-6, YS-11, etc.

16.1.3 Calculated Noise Contours

Figures 16.1.5 and 6 show the WECPNL noise contours for the new airport site for the years 1990 and 2005, respectively.

Figure 16.1.6 WECPNL NOISE CONTOUR (YEAR 1990)

Figure 16.1.7 WECPNL NOISE CONTOUR (YEAR 2005)

16.2 Considerations on Future Land Use

Land use controls are classified broadly into the land use zoning regulations based on aircraft noise and height restrictions, etc. which are related to safe aircraft operations.

Each regulation or requirement is explained in detail hereinafter and the controls for future land use in the vicinity of new airport are proposed taking into account the existing local conditions, ICAO Aerodrome Manual Parts 3 and 8, Aviation law and environmental standards of Japan, FAA, etc.

1) Considerations on Aircraft Noise

The existing land in the vicinity of the new airport is very sparsely inhabited and the land use consists of rice fields, coconut tree plantations, natural forest, and waste land, etc.

The agricultural use of this area will be more positively encouraged by the implementation of the irrigation works presently planned by the local government of West Sumatra.

The agricultural use except for poultry is compatible with aircraft noise and will contribute economically to the Province using the land even close to the airport which would otherwise be left as waste or idle land because of the serious exposure to noise from the airport operations.

Table 16.2.1 compares the land use controls for the airport vicinity in Japan, USA, and France. The proposed controls are based on Japanese standards which is the most severe among the three. The airport vicinity, is somewhat virgin land, and is not expected to be developed extensively for other than agricultures in the foreseeable future. It is therefore easy to control.

The existing houses which are exposed to a noise level higher than WECPNL 85 may be removed because they cannot be soundproofed because of their existing structural condition.

Table 16.2.1. LAND USE CONTROLS FOR NOISE

Conversion: WECPNL = NEF + 48 = N-10

Japanese		USA		French		Proposed for Ketaping	
WEC-PNL	Standard	NEF	Standard	N	Standard	WEC-PNL	Standard
More than 70	No construction of schools, hospitals, etc. is permitted.	Less than 30	Necessary noise reduction measures required for schools, hospitals, churches. Compatible with residential, commercial, hotel, offices, outdoor recreational, industrial.	Less than 84	No bldg. restrictions	More than 70	No schools, hospitals, etc. is permitted.
More than 75	No construction of residences is permitted.	More than 30	Compatible with commercial, outdoor recreational and industrial. Schools, hospitals, churches, theaters, etc. are not permitted.	More than 84	New residential development to be avoided.	More than 75	No new residences basically are permitted. Agricultural, commercial and industrial land use only recommended.
More than 80	Noiseproof consturction for existing residence is necessary.	More than 40	Outdoor recreational (non-spectator) is only compatible. Necessary noise reduction measures for industrial and commercial bldg.	More than 89	Nö school, hospital, residential bldg. and public bldg. permitted.	More than 85	Prohibited area for new residences. Agricultural, outdoor recreational, commercial, and industrial land use are recommended. For more than 95, only agricultural use or sound abatement plantation are recommended.
More than 90	Compensation for removal of the existing residences.			More than 96	No building permitted.		

2) Considerations related to aircraft operations

The obstacle limitation surfaces consisting of approach surfaces, take off climb surfaces, inner horizontal surface, transitional surfaces, and conical surfaces are established in accordance with ICAO Annex 14 for the precision approach runway which is 2500 meters long.

Height limitations for structures and trees are required for the above stated surfaces in order to keep any structures below the surface elevations and to maintain a safe operation for aircraft

An obstruction clearance zone without structures or trees should be established around the air navigation facilities such as VOR/DME, GP, etc. for adequate and safe operations, for the area necessary to maintain the clear and continuous visibility from the control tower to all the final approaches, traffic patterns, runway and centerline of taxiways, and for the area within 230 meters from the runway centerline.

At this point the elevation of the transition surface becomes 11 meters above the runway, and the extended runway safety area is a rectangle with a width of 300 meters and a length of 240 meters measured from the end of 60 meter long overruns.

In addition to the above limitations, the following regulations are considered necessary:

- Business and activity with a potential fire hazard to the surrounding property of the airport,
- Signs, and lights to create a hazard for aircraft,
- Smoke, electronic and radio interference, accumulation of refuse or trash, glare, heat emission, odorous matter, etc.

3) Proposed Controls

(1) Land use zoning

From the view point of compatibility with the noise, the zoning standard described in Table 16.2.1 is proposed for the airport vicinity.

Continuance of the existing land use is considered desirable if the height of trees will be maintained to satisfy the height limitation, and no new residential building will be permitted in the area exposed to higher than WECPNL 75.

(2) Height limitation

All the structures and trees are restricted in height so as not to infringe upon the obstacle limitation surface.

For the surfaces on the runway 16 side (the northern side), the height restrictions should be enforced for the surfaces to be established when the planned 2500 meter long runway is extended to 3500 meters.

(3) Obstacle clearance

From the standpoint of safety and efficient operations of aircraft and the air navigation system, any structures and trees should be avoided in the area indicated in Figure 16.2.1.

(4) Reservation of Housing Area for the airport staff

About 70 ha of the land is to be reserved along the airport access road as indicated in Figures 14.6.1 and 15.2.1 so that the noise level above WECPNL 75 will not affect this area and the acquisition of the existing rice field will not actually be required.

This area will be able to accommodate the houses for 2000 families including 400 singles, schools, public facilities, parks, etc. which will be anticipated by the year 2005.

The required area is estimated in paragraph 4) of this section.

(5) Others

The areas required for the runway extension to 3500 meters and the possible future maintenance base should be reserved by maintaining existing land use.

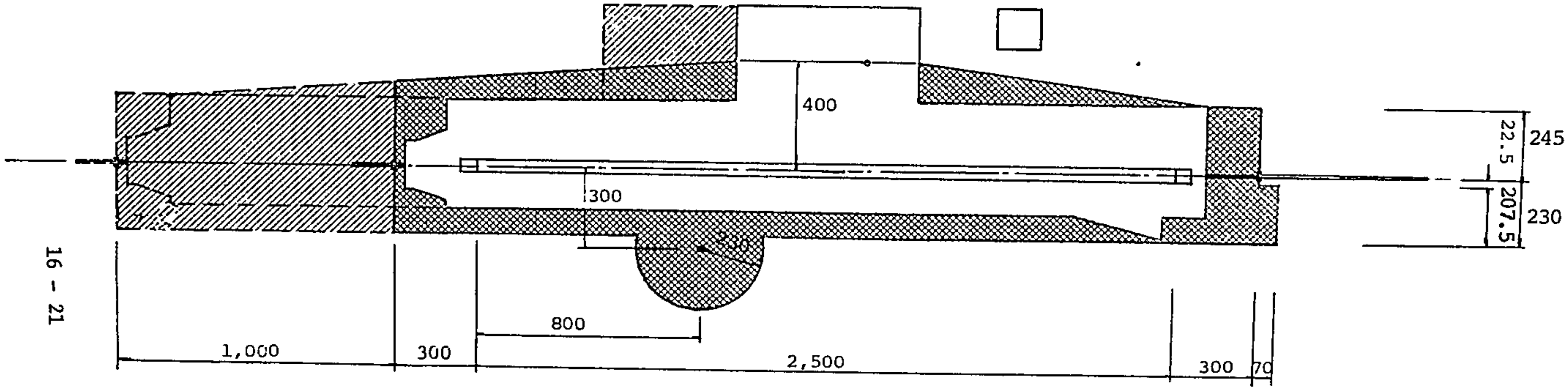


Figure 16.2.1 OBSTACLE CLEARANCE ZONE

LEGEND

The area necessary for present operations

Area reserved for future extension

4) The area required for housing

Airport employees has been estimated and is shown in Table 12.3.1 to accommodate 950 and 2200 persons for Phase I and II respectively.

Although the number of employees living close to the airport generally depends on the distance from the airport to the Central Business District (CBD) about 50 to 90 percent of the airport employees in Japan are said to live within the vicinity of their respective airports.

The percent of employees who will live close to the Ketaping airport is assummed to be 90 based on a safe assumption considering the airport distance from the CBD and the tendency stated above.

The land areas required for housing have been estimated and are shown for both Phases I and II in tabular form in Table 16.2.2.

Table 16.2.2 THE AREA REQUIRED FOR HOUSING

		Phase I	Phase II
1	No. of Employees living in the airport vicinity.	90% of 950:860	90% of 2200:2000
2	No. of Families	80%*1 of 1:690	1600
3	No. of Single Occupants	20%*1 of 1:170	400
4	Houses for Families	400 m^2*2 x 690: 27.6 ha.	400 m^2 x 1600: 64 ha.
5	Apartments for Single Occupants	2000m^2*3 x $\frac{170}{30}$: 1.2 ha.	2000m^2 x $\frac{400}{30}$: 2.8 ha.
6	Schools	3 ha.	3 ha.
7	Public Facilities (Mosque, hospital, assembly hall, park, etc.)	2 ha.	2 ha.
8	Total	Sum of 4 thru 7: 34 ha.	72 ha.

*1: The proportion of married and single persons has been estimated to be 80 and 20 percent respectively.

*2: The space required for a one house unit including a portion of the internal roads is assumed to be 400 m^2 considering the existing conditions at Tabing airport, and in the light of similar experience in Indonesia and Japan.

*3: The single employees are assummed to live in a 3 story apartment with an accommodation of 10 rooms on one floor of 500 sq. m in area. An area of 2000 sq. m will be required for one apartment building including the surrounding space, a portion of the internal roads, etc.

16.3 Airport Organization

The existing organization chart of Tabing Airport is attached as Appendix 2.3.1 of this report.

A proposed organization for the new airport operations has been established for Phase I and Phase II in accordance with the following factors:

i) The existing organization of Tabing Airport

ii) The current organization for other major airports in Indonesia, such as Ujung Pandang, Medan, Menado, etc. and

iii) The forecast number of airport employees for DGAC as listed in Table 12.3.1.

The organization chart and the required number of staff for Phase I and II are shown in Figures 16.3.1 and 2, and Table 16.3.1.

The new organization for the airport administration and operation will belong to the DGAC. It totals 410 personnel in Phase I and 880 personnel in Phase II.

The organization will consist of 15 sections as shown in Figure 16.3.1 and these sections can be classified into 3 major groups, i.e. Air Safety, Engineering and Administration. Although these 15 sections can function under the directions of the airport manager in Phase I, the Phase II operation will be made by 3 directions as shown in Figure 16.3.2 considering effective functioning of the large number of DGAC staff.
(The function of the organization is explained in the Appendix 16.3.1.)

In these 15 sections, the following sections will require shift-work in order to provide safe and efficient operations for the airport and also maintain airport security.

Air Safety:	Flight Operations	4 shifts
	Air Traffic Control	"
	Fire Fighting	"
	Communications	"
	Navaids	"

Security: Security Guard .... 4 shifts

The planned shift work operating hours (0600h to 2100h) can be divided into 4 categories;

i) No. 1 shift: 0600h to 1300h

ii) No. 2 shift: 0900h to 1600h

iii) No. 3 shift: 1400h to 2100h

iv) No. 4 shift: Off duty

During the busier hours of operation, the two shifts will overlap. One of the 4 shift groups will repeat from No. 1 shift to No.4 shift, thus working 36 hours in an average week with a day-off every 4 days normally.

In Phase II three divisions, consisting of Air Safety, Engineering and Administration, will be established for the increased number of staff (a total of 880 personnel).

Table 16.3.1. PROPOSED ORGANIZATION FOR THE NEW KETAPING AIRPORT

Year	Number of Staff				
	1985	1990	1995	2000	2005
Airport Manager	1	1	1	1	1
Director of Administration Division				1	1
General Affairs Section	7	10	12	20	22
Personnel Section	7	10	12	20	22
Accounting Section	6	9	13	25	62
Security Section	17	24	52	84	164
Business Section (Terminal)	10	18	30	40	62
Fire Fighting & Rescue Section	33	44	65	84	124
Dispensary	2	4	7	15	18
Director of Engineering Division				1	1
Construction Section	11	21	35	44	51
Electrical Section	9	21	30	40	46
Mechanical Section	7	9	10	24	28
Terminal Maintenance Section	15	25	40	60	80
Director of Air Safety Division				1	1
Flight Operations Section	9	16	25	28	30
Air Traffic Control Section	9	15	25	28	38
Navaids Section	13	17	33	65	101
Communication Section	9	16	20	24	28
Total	165	260	410	605	880

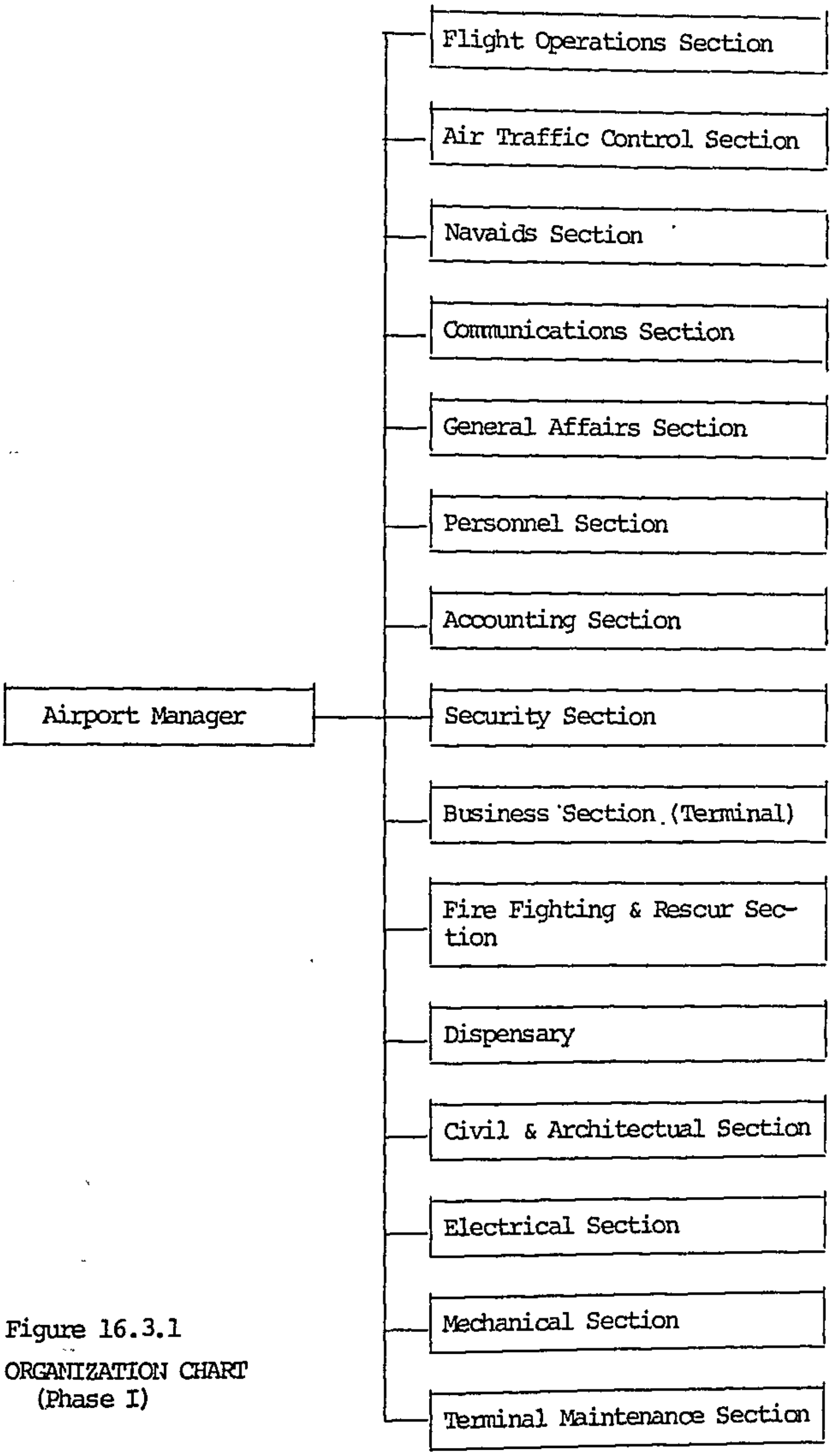


Figure 16.3.1
ORGANIZATION CHART
(Phase I)

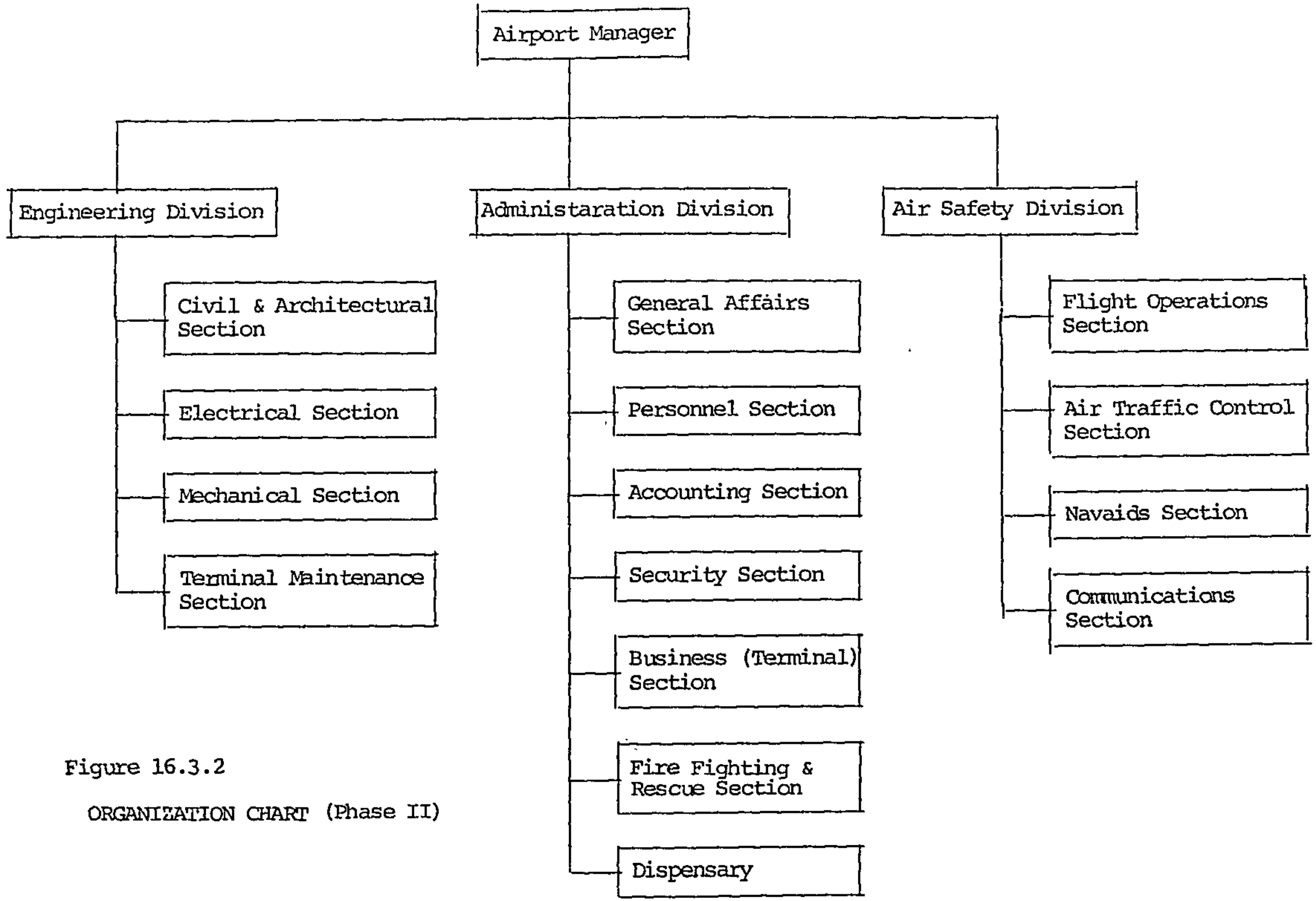


Figure 16.3.2

ORGANIZATION CHART (Phase II)

CHAPTER 17 CONSTRUCTION SCHEDULE AND COST ESTIMATES

17.1 Construction Conditions

17.1.1 Soil and Rainfall

The results of the soil investigation made in Aug., 1981, reveal that poorly graded sand underlies the proposed airport site uniformly having a relatively low water content of 8 percent except for the wettish area.

In the wettish area, sand with water content of 30 percent exists.

Based on these soil classifications and water contents, a value of 0.9 was assumed for the conversion coefficient of soil (compacted soil volume vs. original soil volume before excavation).

Rainfall intensity is set at 80 mm/hr as described "14.3. 2. stormwater drainage system plan."

17.1.2 Construction Materials

1) Sand and gravel

Although sand and gravel can easily be found at the upper stream of neighboring rivers in the vicinity such as Batang Anai, its quality and quantity should be confirmed for detailed design purposes.

2) Cement, Asphalt and Steels

There is no problem in acquiring portland cement since cement production plays an important role in the industrial development of Padang.

Most of the asphalt used in the airport construction must be imported.

Locally produced steel materials should be used as much as possible.

17.2 Civil Works

17.2.1 Temporary works

Construction of temporary roads is required before the start of airport construction.

At present, the proposed site can be reached by vehicle via Bua-jan 1 and Pasar Ketaping however,this road is a rather long detour coming from Padang City by means of the existing highway.

In addition to this, it is necessary to across the Talao Bunga with a small boat.

An airport access road is therefore necessary to be constructed. as soon as possible to carry construction equipment and materials to the airport site.

First of all, the airport access road requires two bridges which need a longer construction period than the road on ground. Therefore, the existing dust road that branches off the existing highway and reaches the construction site of the bridge over Batang Anai, is to be widened and improved so as to be utilized as temporary road as shown in Figure 17.2.1.

The airport access road shall be partially constructed in advance with the construction of another bridge.

Meanwhile, widening and some structural improvement of the existing road that reaches Olobangau from Pasar Ketaping and new construction of a temporary road with some 1.7 km as shown in Figure 17.2.1 will allow earthwork equipment and temporary materials to be carried to the airport site before the completion of the airport access road.

Abovementioned temporary works shall start as soon as possible after acquiring land and should be completed within one quarter year together with other temporary works including site office, motor pool, etc.

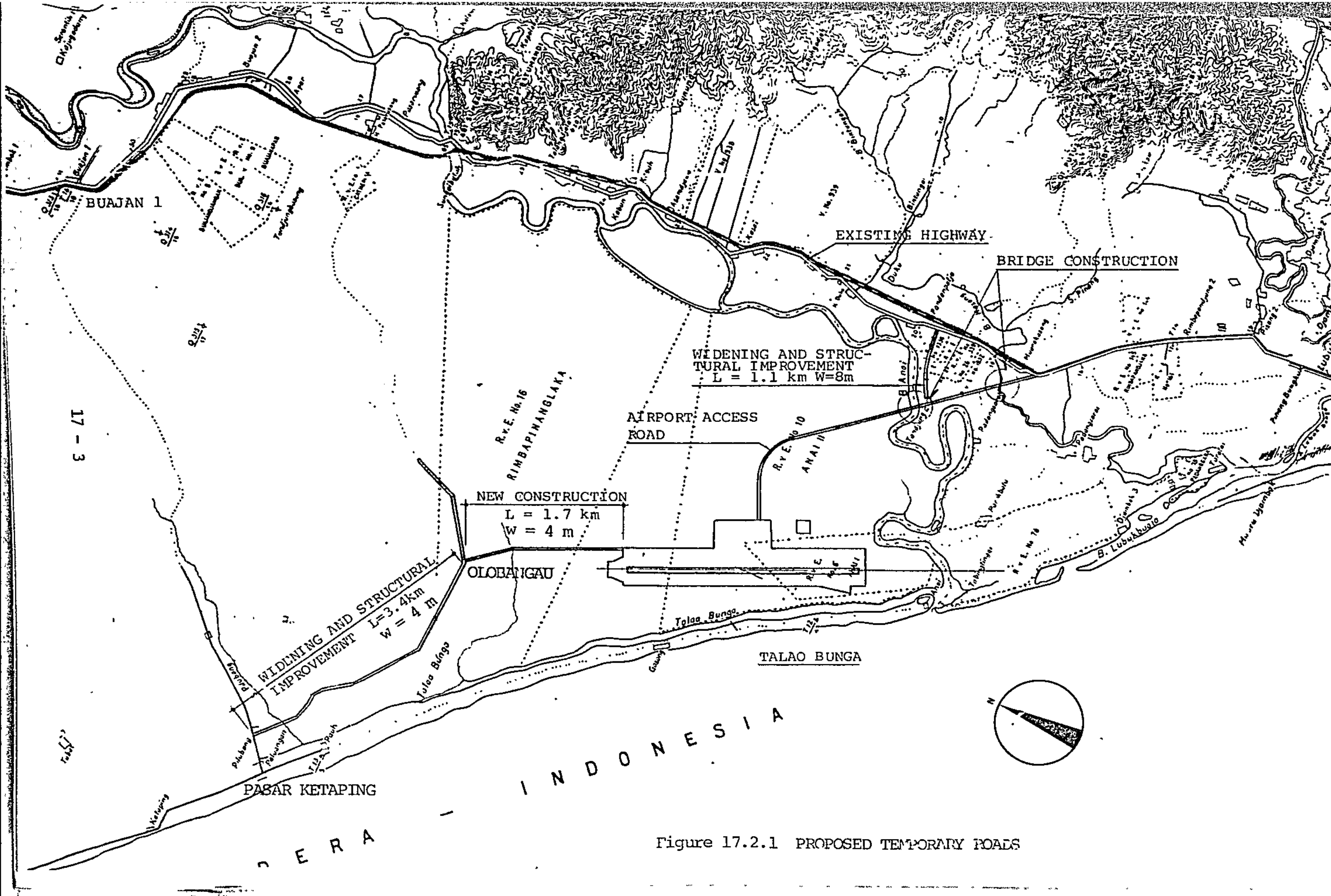


Figure 17.2.1 PROPOSED TEMPORARY ROADS

17.2.2 Earthwork

Earthwork is to start immediately after completion of the aforementioned temporary road.

As described in "14.3.1 Grading Plan," the quantities of excavation work and embankment work are 290,000m^3 and 370,000m^3 respectively.

Sufficient trafficability for bulldozers and scrapers is anticipated based on the in-situ soil conditions.

Meanwhile, top soil in the bush and forest areas will be removed up to 30 cm depth and a part of this removed top soil can be utilized as fertile soil after temporary stockpiling.

About a 5 percent contingency was considered in the cost estimate of earthwork in order to include the possible increase in the volume of earthwork resulting from the detailed topographic and hydrogical surveys made during the detailed engineering stage.

17.2.3 Pavement Work

Pavement work should start immediately after completion of the airport access road and will take approximately one and one-half years to complete.

An asphalt plant and concrete plant are planned to be installed at the proposed NIB site.

In-situ sand stabilized by cement will be utilized as subbase course to reduce the construction cost for the flexible pavement for runway and taxiways.

17.3 Building Works

Building works, including the passenger terminal building, cargo terminal building etc., should start immediately at the same time with the abovementioned pavement works after completion of access road.

All of the buildings will be of reinforced concrete except for the storage area of the cargo terminal building which will be of steel frame structure.

Cost estimates for the buildings have been based on the unit construction price presented by DGAC.

17.4 Other Works

Lighting facility works, including the installation of cables, manholes, approach lights, runway lights etc. will start during the site preparation phase and finish within one half year after completion of the pavement construction. A half year is required for installation of lighting facilities on the pavement.

17.5 Construction Schedules

Table 17.5.1 summarizes the construction schedule for each construction item discussed before.

As can be seen in the table, approximately three and a half years are required for the completion of all the necessary constructions.

After completion, one half year is required for flight check, test operation for various navaids, maturity flight, etc.

Meanwhile, about two years are required for topographic survey, soil investigation, detailed design and tender evaluation after completion of this Feasibility Study. Therefore, inauguration of construction will be set around April, 1984 and completion around Oct., 1987.

The opening of the new airport will be scheduled around April, 1988.

Table 17.5.1 CONSTRUCTION SCHEDULE

1st Phase Const.
2nd Phase Const.

Work Items \ Calendar Year	1981	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
															Design Year for the 1st Phase					
Feasibility Study and Engineering Services	F/S	Topo. Soil	D/D	T/E	C/S				Opening time											
Land Acquisition and Compensation																				
CONSTRUCTION																				
1 Temporary Works																				
2 Access Road																				
3 Site Preparation																				
4 Pavement																				
5 Car Parking Area and Internal Road																				
6 Passenger Terminal Building																				
7 Cargo Terminal Building																				
8 Administration and Other Building																				
9 Lighting																				
10 Radio Navaids, Telecommunications and Meteorological Facilities																				
11 Utilities																				
Management and Test Operations							AO	TO												
Informed completion time of related projects by others					Padang bypass road ▽															
	Power transmission line by PLN ▽																			
		Straightening of B. Anai ▽																		

F/S Feasibility Study
Topo. Topographical survey
Soil Soil investigation
D/D Detail design and Tender document
T/E Tender evaluation
C/S Construction supervision
AO Establishment of airport organization
TO Test op-rations, various flight checks, etc.

17.6 Construction Cost Estimate

Construction cost estimate has been executed based on the master plan.

Cost estimates are based on the following assumptions:

1) Unit construction prices are based on the data collected from DGAC, DPU during the Study team's stay in Indonesia.

2) Exchange rates are set at US$1 = Rp.625 = Jap.Yen 220.

3) Items of foreign portion and local portion are the same as described in Chapter 9, and

4) Percentages for engineering fee and contingency are the same values as indicated in Chapter 9.

The construction cost is estimated by item and year, as tabulated in Table 17.6.1 and 17.6.2. Construction cost for Phase I is estimated to be 27.47 billion Rupiah however, it can be reduced to 26.55 billion Rupiah if land acquisition and construction of the airport access road are executed by Bina Marga.

Construction cost can be further reduced to 26.23 billion Rupiah if the transmission line for power supply is constructed by PLN (Government Electricity Enterprise).

Table 17.6.1. ESTIMATED CONSTRUCTION COST

Unit: Million Rupiah

Item				Phase I			Phase II			Total		
				Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total
Civil Works	Temporary Roads			45	24	69	-	-	-	45	24	69
	Access Road			428	244	672	460	296	756	888	540	1,428
	Earthwork			780	580	1,360	415	225	640	1,195	805	2,000
	Drainage Work			49	78	127	19	49	68	68	127	195
	Pavement Work			2,883	1,989	4,872	1,120	612	1,732	4,003	2,601	6,604
	Carparking Area			239	375	614	90	53	143	329	428	757
	Miscelaneous Work			324	31	355	-	-	-	324	31	355
	SUB TOTAL			4,748	3,321	8,069	2,104	1,235	3,339	6,852	4,556	11,408
Building and Equipment Work	Passenger Terminal Bldg.			2,929	2,449	5,378	3,211	2,251	5,462	6,140	4,700	10,840
	Cargo Terminal Bldg.			207	253	460	222	271	493	429	524	953
	Administration and Other Bldg.			426	283	709	92	137	229	518	420	938
	SUB TOTAL			3,562	2,985	6,547	3,525	2,659	6,184	7,087	5,644	12,731
Air Navigation System Work	Lighting			978	379	1,357	643	322	965	1,621	701	2,322
	Radio Navaids, Telecommunications, etc.			2,340	241	2,581	1,050	110	1,160	3,390	351	3,741
	SUB TOTAL			3,318	620	3,938	1,693	432	2,125	5,011	1,052	6,063
Utilities Works	Power Supply System	Transmission Line		135	117	252	-	-	-	135	117	252
		Power Supply in Airport		1,065	305	1,370	465	83	548	1,530	388	1,918
	Water Supply System			286	140	426	181	89	270	467	229	696
	Sewerage			457	225	682	171	84	255	628	309	937
	Incinerator			135	7	142	-	-	-	135	7	142
	SUB TOTAL			2,078	794	2,872	817	256	1,073	2,895	1,050	3,945
TOTAL OF WORKS				13,706	7,720	21,426	8,139	4,582	12,721	21,845	12,302	34,147
Engineering				2,056	1,158	3,214	1,221	687	1,908	3,277	1,845	5,122
Land Acquisition and Compensation	Airport	Land Acquisition		-	203	203	-	-	-	-	203	203
		Compensation	Coconut Trees	-	44	44	-	-	-	-	44	44
			Houses by Land Acquisition	-	2	2	-	-	-	-	2	2
			Houses exposed to noise	-	18	18	-	-	-	-	18	18
	Access Road	Land Acquisition		-	62	62	-	-	-	-	62	62
		Compensation		-	1	1	-	-	-	-	1	1
	SUB TOTAL			-	330	330	-	-	-	-	330	330
Contingency				1,576	921	2,497	936	527	1,463	2,512	1,448	3,960
GRAND TOTAL				17,338	10,129	27,467	10,296	5,796	16,092	27,634	15,925	43,559

Exchange rate: US$1 = Rp. 625 = Jap.Yen 220

Table 17.6.2 ESTIMATED ANNUAL CONSTRUCTION COST

Unit: Million Rupiah

Year		Foreign portion	Local portion	Total
Phase I	1982	-	91	91
	1983	339	372	711
	1984	843	570	1,413
	1985	1,912	1,244	3,156
	1986	7,792	4,378	12,170
	1987	6,338	3,412	9,750
	1988	114	62	176
	Sub Total	17,338	10,129	27,467
Phase II	1993	278	15	293
	1994	268	151	419
	1995	4,058	2,296	6,354
	1996	5,692	3,334	9,026
	Sub Total	10,296	5,796	16,092
Total		27,634	15,925	43,559

CHAPTER 18 FINANCIAL AND ECONOMIC ANALYSIS

18.1 Introduction

This chapter describes the financial and economic analyses for the Padang Airport Development project, which are based on the master planning and cost estimates which are described in Chapters 14 - 17. The purpose and the basic concept of the financial and economic analyses are explained in detail in Chapter 10 - 11 and Appendix 11. This chapter discusses further analysis based on the more detailed cost estimates obtained from the master planning. In order to avoid unwarranted redundancy, however, the overlapping arguments with those in the previous chapters are reduced to a minimum.

18.2 Financial Analysis

The financial analysis for the project is essentially completed in Chapter 10. This section updates only the construction cost estimates based on the more detailed master planning, and analyses its impacts on the borrowing policy and airport charges pricing policy.

18.2.1 Detailed Construction Estimates

Detailed current and capital expenditures are projected as shown in Tables 18.2.1 and 18.2.2, on the basis of the construction and other cost estimates which were prepared and discussed in Chapter 17.

18.2.2 Financial Projection

As indicated in Chapter 10, the financial analysis has been made based on the assumption that the personnel salaries will be raised at the same pace with the real income growth of the economy. Table 18.2.3 summarises the airport revenues from aircraft operations for the key years. Table 18.2.4 summarises the revenues and expenditures based on the cost estimate in the master planning. Table 18.2.5 shows the same projection except for personnel and material costs unit prices of which are allowed to increase by 5.5 and 2.25 percent per year respectively (See Para. 10.3.2 for the detail explanation). Table 18.2.6 presents the projection which estimates the necessary increase in airport charges to allow the current airport revenues to meet both the current and capital expenditure requirements.

Table 18.2.1 OPERATION AND MAINTENANCE COST

(1981 Rp. million)

YEAR	OPERATION PERSONEL	ADMIN.	MATE'L	UTIL.	O-TOTAL	MAINTENANCE RUNWAY	BUILD.	EQUIP.	OTHERS	M-TOTAL	O + M TOTAL	SAVED O + M
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	182	0	205	77	464	49	65	197	29	340	804	-895
1989	198	0	222	105	525	49	65	197	29	340	865	-895
1990	214	0	240	105	559	49	65	197	29	340	899	-895
1991	238	0	267	105	610	49	65	197	29	340	950	-895
1992	263	0	296	105	664	49	65	197	29	340	1004	-895
1993	288	0	324	105	717	49	65	197	29	340	1057	-895
1994	312	0	351	105	768	49	68	197	29	343	1111	-895
1995	337	0	379	140	856	49	68	197	29	343	1199	-895
1996	369	0	415	140	924	49	68	197	29	343	1267	-895
1997	401	0	451	140	992	72	127	207	39	445	1437	-895
1998	433	0	487	140	1060	72	127	207	39	445	1505	-895
1999	465	0	522	140	1127	72	127	207	39	445	1572	-895
2000	497	0	558	175	1230	72	127	207	39	445	1675	-895
2001	542	0	609	175	1326	72	127	207	39	445	1771	-895
2002	587	0	660	175	1422	72	127	207	39	445	1867	-895
2003	633	0	711	175	1519	72	127	207	39	445	1964	-895
2004	678	0	762	175	1615	72	127	207	39	445	2060	-895
2005	723	0	812	260	1795	72	127	207	39	445	2240	-895
2006	723	0	812	260	1795	72	127	207	39	445	2240	-895
2007	723	0	812	260	1795	72	127	207	39	445	2240	-895
2008	723	0	812	260	1795	72	127	207	39	445	2240	-895
2009	723	0	812	260	1795	72	127	207	39	445	2240	-895
2010	723	0	812	260	1795	72	127	207	39	445	2240	-895
TOTAL	10975	0	12331	3842	27148	1449	2372	4671	807	9299	36447	-20585

Source: JICA Estimates

Table 18.2.2 CONSTRUCTION AND EQUIPMENT COST

(1981 Rp. million)

YEAR	CONSTRUCTION RUNWAY	BUILD.	OTHERS	REPLACE	C-SUB	EQUIPMENT NAVI.	OTHERS	REPLACE	F-SUB	PERIPHERAL AC.ROAD	HIGHWAY	UTIL.	P-SUB	TOTAL
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	83	0	0	0	83	0	0	0	0	0	0	0	0	83
1983	164	0	482	0	646	0	0	0	0	0	0	0	0	646
1984	305	0	643	0	948	0	0	0	0	336	0	0	336	1284
1985	1344	546	643	0	2533	0	0	0	0	336	0	0	336	2869
1986	3742	3274	643	0	7659	1969	0	0	1969	0	0	1436	1436	11064
1987	2089	2727	643	0	5459	1969	0	0	1969	0	0	1436	1436	8864
1988	0	0	160	0	160	0	0	0	0	0	0	0	0	160
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	267	0	0	267	0	0	0	0	0	0	0	0	267
1994	0	0	381	0	381	0	0	0	0	0	0	0	0	381
1995	1574	2061	763	0	4398	0	0	643	643	378	0	357	735	5776
1996	1009	3856	764	0	5629	195	0	1287	1482	378	0	716	1094	8205
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10310	12731	5122	0	28163	4133	0	1930	6063	1428	0	3945	5373	39599

Source: JICA Estimates

Table 18.2.3 BENEFIT BY AIRCRAFT MOVEMENT

LAND CHARGE (A/C*LAND CHARGE PER A/C)

YEAR	JUMBO		WIDE BODY		NEW MEDIUM JET		MEDIUM JET		SMALL JET		L/M PROPELLER		STOL/SP		TOTAL
1985	0	0	590	151810	0	0	3478	39900	2318	26933	1160	56430	590	17100	137.4
1990	0	0	3478	229615	0	0	2318	39900	4636	26933	0	0	1160	17100	388.4
1995	0	0	5226	229615	1748	100035	4636	39900	0	0	0	0	1748	17100	596.1
2000	2318	437760	3478	229615	590	100035	5226	39900	0	0	0	0	2318	17100	795.2
2005	3478	437760	4066	229615	1160	100035	6954	39900	0	0	0	0	3478	17100	1090.9
2010	3478	437760	4066	229615	1160	100035	6954	39900	0	0	0	0	3478	17100	1090.9

ROUTE AIR NAVIGATION FACILITY CHARGE(AC*WEIGHT FACTOR*DISTANCE FACTOR)

YEAR	JUMBO			WIDE BODY			NEW MEDIUM JET			MEDIUM JET			SMALL JET			L/M PROPELLER			STOL/SP			TOTAL
1985	0	0	0	590	52	9	0	0	0	3478	21	7	2318	16	3	1160	26	9	590	11	3	112.2
1990	0	0	0	3478	68	9	0	0	0	2318	21	9	4636	160	3	0	0	0	1160	11	3	481.1
1995	0	0	0	5226	68	7	1748	38	9	4636	21	3	0	0	0	0	0	0	1748	11	3	345.0
2000	2318	109	9	3478	68	7	590	38	5	5226	21	3	0	0	0	0	0	0	2318	11	3	429.5
2005	3478	109	9	4066	68	7	1160	38	5	6954	21	3	0	0	0	0	0	0	3478	11	3	595.2
2010	3478	109	9	4066	68	7	1160	38	5	6954	21	3	0	0	0	0	0	0	3478	11	3	595.2

Source: JICA Estimates

Table 18.2.4 PROJECTED REVENUES AND EXPENDITURES

(1981 Rp. million)

YEAR	REVENUES	LAND.FEE	NAV.FEE	P S C	RENT	EXPEND.	PERSONEL	MATERIAL	MAINTE.
1981	0.	0.	0.	0.	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.	0.	0.	0.	0.
1985	0.	0.	0.	0.	0.	0.	0.	0.	0.
1986	0.	0.	0.	0.	0.	0.	0.	0.	0.
1987	0.	0.	0.	0.	0.	0.	0.	0.	0.
1988	900.3	256.3	268.8	267.5	107.8	804.0	182.0	282.0	340.0
1989	1097.6	315.5	359.6	303.2	119.5	865.0	198.0	327.0	340.0
1990	1345.6	388.4	481.1	344.1	132.0	899.0	214.0	345.0	340.0
1991	1403.9	423.2	450.1	384.0	146.7	950.0	238.0	372.0	340.0
1992	1474.1	461.0	421.2	428.9	163.0	1004.0	265.0	401.0	340.0
1993	1555.9	502.3	394.1	478.5	181.0	1057.0	288.0	429.0	340.0
1994	1651.5	547.2	368.7	534.4	201.2	1111.0	312.0	456.0	343.0
1995	1761.0	596.1	345.0	596.4	223.5	1199.0	337.0	519.0	343.0
1996	1885.4	631.5	360.5	650.0	243.3	1267.0	369.0	555.0	343.0
1997	2018.8	669.0	376.6	708.3	265.0	1437.0	401.0	591.0	445.0
1998	2162.7	708.6	393.5	772.1	288.5	1505.0	433.0	627.0	445.0
1999	2317.7	750.7	411.1	841.8	314.1	1572.0	465.0	662.0	445.0
2000	2484.2	795.2	429.5	917.5	342.0	1675.0	497.0	733.0	445.0
2001	2665.4	847.1	458.5	995.0	364.8	1771.0	542.0	784.0	445.0
2002	2860.0	902.4	489.4	1079.0	389.2	1867.0	587.0	835.0	445.0
2003	3068.7	961.3	522.4	1169.8	415.2	1964.0	633.0	886.0	445.0
2004	3293.5	1024.1	557.6	1268.9	442.9	2060.0	678.0	937.0	445.0
2005	3534.8	1090.9	595.2	1376.3	472.5	2240.0	723.0	1072.0	445.0
2006	3534.8	1090.9	595.2	1376.3	472.5	2240.0	723.0	1072.0	445.0
2007	3534.8	1090.9	595.2	1376.3	472.5	2240.0	723.0	1072.0	445.0
2008	3534.8	1090.9	595.2	1376.3	472.5	2240.0	723.0	1072.0	445.0
2009	3534.8	1090.9	595.2	1376.3	472.5	2240.0	723.0	1072.0	445.0
2010	3534.8	1090.9	595.2	1376.3	472.5	2240.0	723.0	1072.0	445.0

Source: JICA Estimates

Table 18.2.5 PROJECTED REVENUES AND EXPENDITURES (WITH REAL INCREASE IN PERSONNEL COST)

(1981 Rp. million)

YEAR	REVENUES	LAND.FEE	NAV.FEE	P S C	RENT	EXPEND.	PERSONN'L	MATERIAL	MAINTE.
1981	0.	0.	0.	0.	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.	0.	0.	0.	0.
1985	0.	0.	0.	0.	0.	0.	0.	0.	0.
1986	0.	0.	0.	0.	0.	0.	0.	0.	0.
1987	0.	0.	0.	0.	0.	0.	0.	0.	0.
1988	900.3	256.3	268.8	267.5	107.8	934.3	264.8	329.5	340.0
1989	1097.6	315.5	359.6	303.2	119.3	1034.6	303.9	390.7	340.0
1990	1345.6	388.4	481.1	344.1	132.0	1108.0	346.5	421.5	340.0
1991	1403.9	423.2	450.1	384.0	146.7	1211.2	406.5	464.7	340.0
1992	1474.1	461.0	421.2	428.9	163.0	1326.2	474.0	512.2	340.0
1993	1555.9	502.3	394.1	478.5	181.0	1447.8	547.5	560.3	340.0
1994	1651.5	547.2	368.7	534.4	201.2	1577.8	625.8	609.0	343.0
1995	1761.0	596.1	345.0	596.4	223.5	1764.8	713.1	708.7	343.0
1996	1885.4	631.5	360.5	650.0	243.3	1941.7	823.8	774.9	343.0
1997	2018.8	669.0	376.6	708.3	265.0	2233.2	944.5	843.7	445.0
1998	2162.7	708.6	393.5	772.1	288.5	2436.2	1075.9	915.3	445.0
1999	2317.7	750.7	411.1	841.8	314.1	2652.1	1219.0	988.1	445.0
2000	2484.2	795.2	429.5	917.5	342.0	2938.2	1374.5	1118.7	445.0
2001	2665.4	847.1	458.5	995.0	364.8	3249.9	1581.4	1223.4	445.0
2002	2860.0	902.4	489.4	1079.0	389.2	3584.3	1806.9	1332.3	445.0
2003	3068.7	961.3	522.4	1169.8	415.2	3946.2	2055.7	1445.5	445.0
2004	3293.5	1024.1	557.6	1268.9	442.9	4331.1	2322.9	1563.1	445.0
2005	3534.8	1090.9	595.2	1376.3	472.5	4886.9	2613.3	1828.6	445.0
2006	3534.8	1090.9	595.2	1376.3	472.5	5071.8	2757.1	1869.7	445.0
2007	3534.8	1090.9	595.2	1376.3	472.5	5265.5	2908.7	1911.8	445.0
2008	3534.8	1090.9	595.2	1376.3	472.5	5468.5	3068.7	1954.8	445.0
2009	3534.8	1090.9	595.2	1376.3	472.5	5681.3	3237.5	1998.8	445.0
2010	3534.8	1090.9	595.2	1376.3	472.5	5904.3	3415.5	2043.8	445.0

MULTIPLIER FOR REVENUES = 1.0000
INFLATION FOR REVENUES = 1.0000
INFLATION FOR PERSONEL = 1.0550
INFLATION FOR MATERIALS = 1.0225
INFLATION FOR MAINTENANCE =1.0000

Source: JICA Estimates

Table 18.2.6 FINANCIAL ANALYSIS

(1981 Rp. million)

	FUND USE			FUND SOURCE		BASE
YEAR	CAPITAL	EXPEND.	LOAN	DISB.	NECESSARY	REVENUES
1981	0.	0.	0.	0.	0.	0.
1982	83.0	0.	0.	83.0	0.	0.
1983	646.0	0.	2.5	646.0	2.5	0.
1984	1284.0	0.	21.9	1284.0	21.9	0.
1985	2869.0	0.	60.4	2869.0	60.4	0.
1986	11064.0	0.	146.5	11064.0	146.5	0.
1987	8864.0	0.	478.4	8864.0	478.4	0.
1988	160.0	954.3	749.7	160.0	1683.9	900.5
1989	0.	1034.6	796.1	0.	1830.7	1097.6
1990	0.	1108.0	877.7	0.	1985.6	1345.6
1991	0.	1211.2	1059.2	0.	2270.4	1403.9
1992	0.	1326.2	1764.9	0.	3091.0	1474.1
1993	267.0	1447.8	2306.2	267.0	3754.0	1555.9
1994	381.0	1577.8	2274.9	381.0	3852.7	1651.5
1995	5776.0	1764.8	2236.4	5776.0	4001.2	1761.0
1996	8205.0	1941.7	2359.7	8205.0	4301.4	1885.4
1997	0.	2233.2	2556.0	0.	4789.1	2018.8
1998	0.	2436.2	2506.0	0.	4942.2	2162.7
1999	0.	2652.1	2473.3	0.	5125.4	2317.7
2000	0.	2938.2	2447.5	0.	5385.7	2484.2
2001	0.	3249.9	2769.8	0.	6019.6	2665.4
2002	0.	3584.3	3237.6	0.	6821.8	2860.0
2003	0.	3946.2	3153.0	0.	7099.2	3068.7
2004	0.	4331.1	3032.2	0.	7363.3	3295.5
2005	0.	4886.9	2871.4	0.	7758.4	3534.8
2006	0.	5071.8	2610.7	0.	7682.5	3534.8
2007	0.	5265.5	1825.8	0.	7091.3	3534.8
2008	0.	5468.5	1205.3	0.	6673.8	3534.8
2009	0.	5681.3	1165.4	0.	6846.7	3534.8
2010	0.	5904.3	1136.1	0.	7040.4	3534.8

GRACE PERIOD = 5
REPAYMENT TERM = 15
LOAN INTERST = 0.0300

Source: JICA Estimates

Based on this projection, the necessary revenue increases are estimated as measured in the increase ratio of the necessary revenues to the base revenues (same as in Chapter 10). The increase ratios for the key years are estimated as follows.

	1990	1995	2000	2005
Increase ratio	1.48	2.27	2.17	2.19

The increase ratios are slightly lower than the ones calculated in Chapter 10, primarily because the construction cost estimates based on the present projections are lower than for the previous case. Nevertheless, it is necessary to implement a steep charge increase in order to raise the necessary fund requirements for both capital and current expenditures solely from the current airport charges.

18.3 Economic Analysis

As in the financial analysis, the economic analysis is also esentially completed for the base case projection. This section completes the economic analysis by conducting a sensitivity analysis on traffic projections and cost estimates. The analysis first updates the cost estimates based on the master planning. As explained fully in Chapter 11, the economic prices are assumed to be the same as the financial market prices used in the financial analysis.
Second, the sensitivity analysis will be conducted on the assumption that traffic and cost projections are subject to a certain stochastic uncertainty. This will provide a basis for judgement on the probabilitic distribution of the economic profitability of the project. Third, the analysis will be made on the economic profitability of the first phase construction. This is to supply pertinent information for future potential financing agencies.

18.3.1 <u>Base Case Projection</u>

The base case projection is updated based on the cost estimates obtained in Chapter 17. Other projected items are explained in Chapter 11.

Cost and benefit projections are extended to the year 2010. This is about 25 years after the end of the Phase-I development. For projecting benefits, it is assumed that they will stabilize after 2005 because the Phase II development is designed to meet the demand level up to 2005.

<u>Benefits to the Airlines</u>: In addition to the benefit items which are explained and estimated in Chapter 11, and additional benefit item is estimated in terms of cost reduction for airline operations. This cost reduction is due to the larger aircrafts which airlines would introduce into operation at Padang as the airport capacity is developed. The estimation is completed as follows. First, the operating cost for an aircraft including personnel, fuel, and capital depreciation cost is estimated for each aircraft category operated at Padang. Then, for each year and based on the route structure and the operating aircraft mix as projected in Chapter 3, the average operating cost for the present aircraft mix at Padang is compared with that for the projected aircraft mix. Finally, the total cost reduction is estimated by multiplying the per passenger operating cost reduction by the number of passengers without the project. Table 18.3.1 summarises the operating cost for each aircraft type. Table 18.3.2 summarises the projected cost reduction of aircraft operation which will accrue to airline as benefit.

Table 18.3.1 AIRCRAFT OPERATING COST

	Rp million per hour
Jumbo	8.5
Wide body	5.7
New Medium Jet	5.1
Medium Jet	2.8
Small Jet	2.3
LP/MP	0.9
STOL/SP	0.7

Source: JICA estimates

Table 18.3.2. BENEFITS TO AIRLINES (OPERATING COST REDUCTION)

Year	Number of Passengers	Without Case Op.Cost/PAX	Without Case Op. Cost	With Case Op.Cost/PAX	With Case Op. Cost	Benefit
1981	(X1,000Pax)	(RP/PAX)	(MIL.RP)	(RP/PAX)	(MIL.RP)	(MIL.RP)
2			-		-	-
3			-		-	-
4			-		-	-
1985	400	77,500	-	77,500	-	-
6	470	73,500	-	73,500	-	-
7	540	69,500	-	69,500	-	-
8	"	"	37,530	65,500	35,370	2,160
9	"	"	"	61,500	33,210	4,320
1990	"	"	"	57,500	31,050	6,480
1	"	"	"	58,560	31,622	5,903
2	"	"	"	59,620	32,195	5,335
3	"	"	"	60,680	32,767	4,763
4	"	"	"	61,740	33,340	4,190
1995	"	"	"	62,800	33,912	3,618
6	"	"	"	59,200	31,968	5,562
7	"	"	"	55,600	30,024	7,506
8	"	"	"	52,000	28,080	9,450
9	"	"	"	48,400	26,136	11,394
2000	"	"	"	44,800	24,192	13,338
1	"	"	"	44,060	23,792	13,738
2	"	"	"	43,320	23,393	14,137
3	"	"	"	42,580	22,993	14,537
4	"	"	"	41,850	22,594	14,936
2005	"	"	"	41,100	22,194	15,336
6	"	"	"	"	"	"
7	"	"	"	"	"	"
8	"	"	"	"	"	"
9	"	"	"	"	"	"
2010	"	"	"	"	"	"
						233,388

Table 18.3.3 presents the base projection which consolidates cost estimates shown in Tables 18.2.1 and 18.2.2 and the benefits projections. As shown in the table, EIRR is estimated to be 45.4 percent. This is a comfortably high rate, which underscores the necessity and potential economic profitability of this project to the national economy.

Table 18.3.3 ECONOMIC ANALYSIS COST AND BENEFIT FOR NEW AIRPORT

(1981 Rp. million)

	COST				BENEFITS						
					OVERFLOWING		SAVED				
YEAR	CONST- RUCTION	O + M COST	SAVED O + M	TOTAL	PAX	CARGO	PASS.	ACCESS	OTHER	TOTAL	NET BENEFITS
1981	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1982	83.0	0.	0.	83.0	0.	0.	0.	0.	0.	0.	-83.0
1983	646.0	0.	0.	646.0	0.	0.	162.3	-99.8	0.	62.5	-583.5
1984	1284.0	0.	0.	1284.0	0.	0.	185.1	-113.8	0.	71.3	-1212.7
1985	2869.0	0.	0.	2869.0	0.	0.	202.9	-124.8	0.	78.1	-2790.9
1986	11064.0	0.	0.	11064.0	0.	0.	230.3	-141.6	0.	88.7	-10975.3
1987	8864.0	0.	0.	8864.0	0.	0.	260.7	-160.3	0.	100.4	-8763.6
1988	160.0	804.0	-896.0	68.0	3015.1	195.6	260.7	-160.3	2160.0	5471.1	5403.1
1989	0.	865.0	-896.0	-31.0	6423.5	413.5	260.7	-160.3	4320.0	11257.4	11288.4
1990	0.	899.0	-896.0	3.0	10312.6	658.6	260.7	-160.3	6480.0	17551.6	17548.6
1991	0.	950.0	-896.0	54.0	14114.3	923.5	260.7	-160.3	5908.0	21046.3	20992.3
1992	0.	1004.0	-896.0	108.0	18396.6	1215.7	260.7	-160.3	5335.0	25047.8	24939.8
1993	267.0	1057.0	-896.0	428.0	23116.0	1545.0	260.7	-160.3	4763.0	29524.4	29096.4
1994	381.0	1111.0	-896.0	596.0	28447.1	1910.2	260.7	-160.3	4190.0	34647.7	34051.7
1995	5776.0	1199.0	-896.0	6079.0	34346.2	2317.5	260.7	-160.3	3618.0	40382.2	34303.2
1996	8205.0	1267.0	-896.0	8576.0	39458.8	2703.8	260.7	-160.3	5562.0	47825.0	39249.0
1997	0.	1437.0	-896.0	541.0	45008.4	3129.7	260.7	-160.3	7506.0	55744.5	55203.5
1998	0.	1505.0	-896.0	609.0	51082.4	3595.9	260.7	-160.3	9450.0	64228.7	63619.7
1999	0.	1572.0	-896.0	676.0	57724.4	4107.7	260.7	-160.3	11394.0	73326.5	72650.5
2000	0.	1675.0	-896.0	779.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82263.6
2001	0.	1771.0	-896.0	875.0	72319.4	5298.6	260.7	-160.3	13738.0	91456.4	90581.4
2002	0.	1867.0	-896.0	971.0	80316.0	5989.4	260.7	-160.3	14137.0	100542.9	99571.9
2003	0.	1964.0	-896.0	1068.0	88968.1	6749.6	260.7	-160.3	14537.0	110355.1	109287.1
2004	0.	2060.0	-896.0	1164.0	98406.8	7586.5	260.7	-160.3	14936.0	121029.6	119865.6
2005	0.	2240.0	-896.0	1344.0	108632.0	8507.5	260.7	-160.3	15336.0	132575.9	131231.9
2006	0.	2240.0	-896.0	1344.0	108632.0	8507.5	260.7	-160.3	15336.0	132575.9	131231.9
2007	0.	2240.0	-896.0	1344.0	108632.0	8507.5	260.7	-160.3	15336.0	132575.9	131231.9
2008	0.	2240.0	-896.0	1344.0	108632.0	8507.5	260.7	-160.3	15336.0	132575.9	131231.9
2009	0.	2240.0	-896.0	1344.0	108632.0	8507.5	260.7	-160.3	15336.0	132575.9	131231.9
2010	0.	2240.0	-896.0	1344.0	108632.0	8507.5	260.7	-160.3	15336.0	132575.9	131231.9

AT DISCOUNT RATE 13.0 PERCENT

B/C RATIO = 8.664

NPV = 131551.637

FIRR(%) = 45.3929

Source: JICA Estimates

18.3.2 Sensitivity Analysis

This section describes the sensitivity analysis. The sensitivity analysis is accomplished by changing the assumptions for the various components of cost and benefit items. This is made in order to form some confidence boundary related to the economic analysis. Two basic items are selected to make the sensitivity analysis. One is traffic projection, and the other, construction cost.

The traffic projections are either raised or reduced by 10 percent, and the EIRR is calculated for each case. The construction cost estimates are raised or reduced by 10 percent and their EIRR are calcualted. The results of sensitivity analysis are listed in Table 18.3.4.

Table 18.3.4 SENSITIVITY ANALYSIS
(EIRR in percent)

	Percent Charge in Cost/Benefit Items	
	-10%	+10%
Benefits		
Passenger traffic	41.0	49.6
Cargo traffic	45.1	45.7
Costs		
Construction cost	47.8	43.3
O&M cost	45.5	45.3

Memo Item: EIIR for Base Case = 45.4 percnet

The sensitivity analysis shows that the economic profitability of the project depends crucially on the passenger traffic. EIRR changes about 9 percent in response to a 10 percent change in the passenger traffic volume both upwards or downwards. The second item which affects the profitability of the project is construction cost, a 10 percent change of which changes EIRR about 5 percent in both directions. The trend of the passenger traffic volume should therefore be closely monitored.

18.3.3 Economic Analysis on Phase I Development

Since construction is completed in two phases and financing of the project accordingly is planned in two stages, it would be useful to make available the information on the economic profitability of the Phase I development only to potential financing donors. Assume that only Phase I development is implemented, that the project life is up to 2010, and that the Phase I development can sustain the demand up to 2000 (i.e. benefits and O&M cost items will be stabilized after 2000). Table 18.3.5. presents the cost and benefit projection on those assumptions. EIRR, benefit cost ratio, and net present value are calculated for this case, and are compared with the base case as shown below. It is concluded that even Phase I development alone can yield high return, which would give assurance to the potential financing institutions who may consider the Phase I development independently of Phase II.

COMPARISON OF BASE CASE WITH PHASE I DEVELOPMENT

	Base Case	Phase I development
EIRR (Percent)	45.4	45.5
At discount rate 13 percent:		
B/C Ratio	8.58	9.05
NPV (1981 Rp million)	130,148	116,165

Table 18.3.5 ECONOMIC ANALYSIS (PHASE I DEVELOPMENT ONLY)

	COST				BENEFITS						
YEAR	CONSTRUCTION	O + M COST	SAVED O + M	TOTAL	OVERFLOWING PAX	OVERFLOWING CARGO	SAVED PASS.	SAVED ACCESS	OTHER	TOTAL	NET BENEFITS
1981	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1982	83.0	0.	0.	83.0	0.	0.	0.	0.	0.	0.	-83.0
1983	646.0	0.	0.	646.0	0.	0.	162.3	-99.8	0.	62.5	-583.5
1984	1284.0	0.	0.	1284.0	0.	0.	185.1	-113.8	0.	71.3	-1212.7
1985	2869.0	0.	0.	2869.0	0.	0.	202.9	-124.8	0.	78.1	-2790.9
1986	11064.0	0.	0.	11064.0	0.	0.	230.3	-141.6	0.	88.7	-10975.3
1987	8864.0	0.	0.	8864.0	0.	0.	260.7	-160.3	0.	100.4	-8763.6
1988	160.0	804.0	-896.0	68.0	3015.1	195.6	260.7	-160.3	2140.0	5471.1	5403.1
1989	0.	865.0	-896.0	-31.0	6423.5	413.5	260.7	-160.3	4320.0	11257.4	11288.4
1990	0.	899.0	-896.0	3.0	10512.6	658.6	260.7	-160.3	6480.0	17551.6	17548.6
1991	0.	950.0	-896.0	54.0	14114.3	923.5	260.7	-160.3	5908.0	21046.3	20992.3
1992	0.	1004.0	-896.0	108.0	18396.6	1215.7	260.7	-160.3	5335.0	25047.8	24939.8
1993	267.0	1057.0	-896.0	428.0	23116.0	1545.0	260.7	-160.3	4763.0	29524.4	29096.4
1994	0.	1111.0	-896.0	215.0	28447.1	1910.2	260.7	-160.3	4190.0	34647.7	34432.7
1995	0.	1199.0	-896.0	303.0	34346.2	2317.5	260.7	-160.3	3618.0	40382.2	40079.2
1996	0.	1267.0	-896.0	371.0	39458.8	2703.8	260.7	-160.3	5562.0	47825.0	47454.0
1997	0.	1335.0	-896.0	439.0	45008.4	3129.7	260.7	-160.3	7506.0	55744.5	55305.5
1998	0.	1403.0	-896.0	507.0	51082.4	3595.9	260.7	-160.3	9450.0	64228.7	63721.7
1999	0.	1470.0	-896.0	574.0	57724.4	4107.7	260.7	-160.3	11394.0	73326.5	72752.5
2000	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2001	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2002	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2003	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2004	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2005	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2006	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2007	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2008	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2009	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6
2010	0.	1573.0	-896.0	677.0	64934.5	4669.7	260.7	-160.3	13338.0	83042.6	82365.6

AT DISCOUNT RATE 15.0 PERCENT

B/C RATIO = 9.052

NPV = 110164.984

EIRR(%) = 45.5089

Source: JICA Estimates

CONCLUSIONS

CONCLUSIONS

SELECTION OF THE NEW AIRPORT

After discussing the comprehensive study presented in Part III, it is recommended that a new airport be constructed at KETAPING, facing the Indonesian sea and located some 25 km north of Padang city. Completion should be accomplished by the end of 1987 and the new airport will serve as a replacement for the existing Tabing airport. This conclusion was reached for the following major reasons:

- The new airport construction is estimated to be much cheaper than the redevelopment of the existing airport because of the low cost of land acquisition and compensation and this will imply less affect from delays and acquisition problems on the progress of the construction and the airport operation in the future;

- The excavation of the Hill is a prerequisite for the redevelopment of the existing airport. It is not, however, considered practically feasible from the environmental view point;

- There is no significant limitation to expansion of the new airport to cope with unexpected changes in demand while the further expansion of the existing airport is not considered economically justifiable;

- If the existing airport is redeveloped because of the advantage in allowing possible step by step redevelopment in line with the demand, the airport would sooner or later suffer from social problems arising from noise pollution etc.,

- The new airport construction will give a beneficial opportunity to the local government to utilize for other purposes the existing airport area of some 280 ha. The new airport construction provides an opportunity to develop an almost virgin area in the future; and

- The new airport construction is judged to be economically feasible from the national economic view point.

THE NEW AIRPORT MASTER PLANNING

1) The new airport construction project at Ketaping, Padang is indispensable to the regional economic development and unity of the country and its urgency and importance are strongly backed by the high internal rate of return (EIRR) of 45.4 percent.

2) The preparations including request for financial assistance, topographic survey, soil investigation, etc. should be initiated at the earliest possible date so that the engineering services including basic design, detailed design, preparation of tender documents, assistance in evaluation of the contractors, etc. can be completed by early 1984.

3) The first phase construction work should be started in 1984 so that the airport can become operational in early 1988.

4) The first phase facilities for the new airport are to be so designed to cope with the demand in 1995 and to be utilized without any expansion works until 1996 when the second phase of construction planned based on the year 2005 demand will be completed.

5) The existing Tabing airport should be improved with an overlay of the runway, taxiway and apron, expansion of the passenger terminal building, and completion of the runway extension to 2,150 meters to accomodate A300 in 1983 and is to be used until early 1988 when the new airport operation will be inaugurated.