4.3 Peak Demand Forecasts

4.3.1 Methodology

The annual air traffic demands of the 20 airports estimated in the previous section are broken down into daily and hourly demands for estimating the future requirements of major airport facilities.

The planning basis applied in this Study is the air traffic volumes in peak hour of average day in peak month, which are estimated based on the flowchart of FIGURE 4.3.1.

4.3.2 Basic Assumptions

(1) Future Route Structure and Shares by Route

The future air route structure of each of the 20 airports is assumed the same as at present. The route shares in terms of the number of air passengers on respective routes are also assumed the same as at present as shown in TABLE 4.3.1.

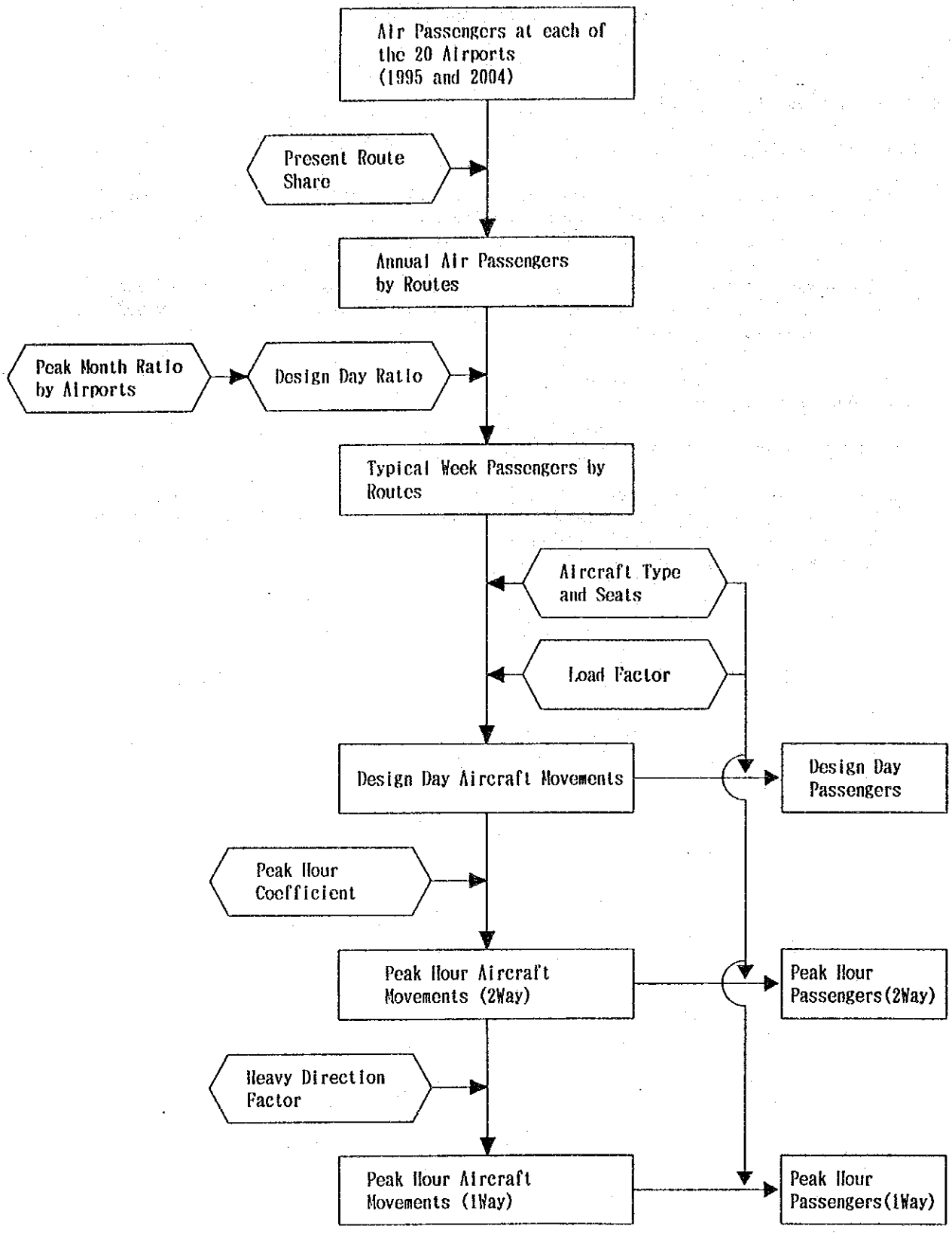

FIGURE 4.3.1 Flowchart for Air Traffic Breakdown

TABLE 4.3.1 Present Route Shares in Number of Air Passengers (1)

1. Tanjung Pinang		2. Pekanbaru		3. Gunung Sitoli		4. Palembang		5. Semarang	
Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)
Pekanbaru	33	Jakarta	40	Medan	100	Jakarta	65	Jakarta	70
Jakarta	30	Batam	17			Jambi	8	Surabaya	16
P. Pinang	22	Medan	12			P. Pinang	8	Pangkalan Bun	7
Tg. B. Karimun	7	Tg. Pinang	9			Padang	6	Banjarmasin	4
Singkep	5	Rengat	5			Bengkulu	3	Bandung	3
Batam	3	Padang	4			Bandung	3		
		Palembang	4			Batam	2		
		Tg. B. Karimun	3			Tg. Pandang	2		
		Malaka	1			Pekanbaru	1		
		Singapore	5			Dumai	1		
						Rengat	1		
Total	100	Total	100	Total	100	Total	100	Total	100

6. Pontianak		7. Sampit		8. Palangkaraya		9. Tarakan		10. Tana Toraja	
Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)
Jakarta	76	Banjarmasin	53	Banjarmasin	27	Balikpapan	73	U. Pandang	
Ketapang	7	Palangkaraya	32	Jakarta	25	Kalimarau	18		
Balikpapan	3	Pangkalan Bun	13	Sampit	15	Tawau	4		
Sintang	3	Kuala Pumbuang	2	Balikpapan	12	Longbawan	3		
Batam	3			Pangkalan Bun	11	Nunukan	2		
Putusibau	2			Muara Tewe	6				
Pangkalan Bun	2			Buntok	4				
Nangapinoh	1								
Singapore	2								
Kuching	1								
Total	100	Total	100	Total	100	Total	100	Total	100

TABLE 4.3.1 Present Route Shares in Number of Air Passengers (2)

11. Palu		12. Gorontalo		13. Ambon		14. Ternate		15. Mataram	
Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)
U. Pandang	54	Manado	65	U. Pandang	57	Manado	51	Denpasar	60
Balikpapan	19	Palu	35	Sorong	11	Ambon	22	Surabaya	25
Gorontalo	14			Ternate	10	Gebe	9	Bima	10
Toli-Toli	6			Biak	9	Galela	7	Sumbawa	5
Poso	4			Langgur	6	Kao	4		
Luwuk	3			Mongole	2	Labuha	3		
				Sanana	2	Sanana	3		
				Bandanaira	2	Marotai	1		
				Namlea	1				
Total	100	Total	100	Total	100	Total	100	Total	100

16. Bima		17. Jayapura		18. Wamena		19. Kaimana		20. Merauke	
Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)	Route	Share (%)
Mataram	38	Biak	49	Jayapura	83	Pak-Pak	53	Jayapura	64
Denpasar	25	Wamena	23	Oksibil	4	Nabire	40	Bade	9
Ruteng	14	Merauke	12	Karubaga	4	Timika	7	Tana Merah	6
Labuhan Bajo	8	Timika	8	Kelia	3			Senggo	5
Maumere	6	Nabire	6	Bokondini	3			M. Tanah	4
Tambolaka	4	Sarmi	1	Tiom	3			Kepi	4
Bajawa	3	Tana Merah	1					Kimam	4
Ende	2							Okaba	4
Total	100	Total	100	Total	100	Total	100	Total	100

(2) Peak Month Ratio

The future peak month ratio at each airport, which indicates the degree of traffic concentration at peak month, is assumed the same as at present. The present peak month ratio is shown in TABLE 4.3.2 together with other major characteristics on the air traffic at each airport.

TABLE 4.3.2 Present Peak Month Ratio and Other Characteristics on Airport Traffic

Airport	Peak Month Ratio (1989)		Load Factor		Transit Ratio
	Passengers	Aircraft Movements	Annual Average	Peak Month	
1. Tanjung Pinang	1/9.3 (Jul)	1/11.1 (Dec)	60%	71%	8%
2. Pekanbaru	1/9.9 (Jul)	1/11.2 (Jun)	81%	82%	5%
3. Gunung Sitoli	1/10.0 (Aug)	1/8.6 (Aug)	71%	81%	0%
4. Palembang	1/10.3 (Jul)	1/11.1 (Nov)	N.A	N.A	4%
5. Semarang	1/10.0 (Jul)	1/11.2 (May)	72%	86%	1%
6. Pontianak	1/9.1 (Jul)	1/10.5 (Jul)	70%	78%	2%
7. Sampit	1/9.9 (Jul)	1/10.8 (Mar)	75%	93%	3%
8. Palangkaraya	1/10.5 (Jul)	1/10.9 (Dec)	64%	73%	16%
9. Tarakan	1/9.1 (Jul)	1/9.7 (Oct)	69%	73%	2%
10. Tana Toraja	1/7.0 (Jul)	1/8.4 (May)	55%	80%	0%
11. Palu	1/9.2 (Jul)	1/9.4 (May)	70%	87%	17%
12. Gorontalo	1/9.4 (Jul)	1/10.7 (Aug)	55%	69%	26%
13. Ambon	N.A	N.A	N.A	57%	34%
14. Ternate	1/9.4 (Mar)	1/10.8 (Dec)	56%	62%	6%
15. Mataram	1/9.6 (Jul)	1/11.6 (Oct)	67%	80%	10%
16. Bima	1/9.5 (May)	1/10.4 (May)	60%	66%	47%
17. Jayapura	1/9.2 (Jul)	1/10.7 (Dec)	N.A	68%	1%
18. Wamena	1/10.6 (Jul)	1/10.4 (Oct)	54%	65%	0%
19. Kaimana	1/9.3 (Jul)	1/10.4 (Jul)	N.A	N.A	40%
20. Merauke	1/8.9 (Jul)	1/10.0 (Aug)	67%	81%	0%

Note : N.A = Data Not Available

(3) Aircraft Type and Seats

1) Present Situation and Future Plans of Air Transport Services

At the 20 airports studied, a wide variety of aircraft from DC9s with 100 available seats to BN2As with 8 seats are operated by major domestic airlines such as Garuda Indonesia, Merpati Nusantara, Bouraq and Mandala, and by minor pioneer airlines such as DAS, SMAC, Sempati, Deraya, etc., for regional air transport at present.

After the commencement of joint operation with Garuda Indonesia in September, 1989, most domestic air routes are served by Merpati

The operation of Garuda's F28s is now limited to a part of Sumatra and Kalimantan.

The Garuda's DC9s operated only in Jawa and Sumatra at present are scheduled to be replaced with F100s with almost same seating capacity by around 1993.

Under the policy of joint operation, the Garuda Indonesia will in future serves exclusively for international flights with B747s or DC10s, and for major domestic trunk routes connecting Jakarta to Medan, Denpasar, Surabaya, Ujung Pandang with the present A300s or the recently ordered MDIIs and A330s with approximately 300 seats.

All the other domestic routes will be joint operated by Merpati Nusantara/Garuda Indonesia with the DC9s, F100s, F28s and F27s.

Although B737-300s have recently been procured by Garuda Indonesia, this aircraft is not considered appropriate for this Study because of the required long runway length of about 2,500 m in comparison with the available capacity of 125 seats.

Bouraq Indonesia with a base in Balikpapan serves mainly for Kalimantan and Sulawesi with HS748s as the maximize aircraft.

Mandala airlines, with L188s being the maximum aircraft, operates only Semarang and Ambon airports out of the study 20 airports.

No definite future aircraft plans were given from both Bouraq Indonesia and Mandala airlines.

2) Aircraft Category and Seat Capacity

Aircraft seat capacities by aircraft categories are assumed as shown in TABLE 4.3.3 taking into account the present seat capacities and required runway length of aircraft owned at present or scheduled to be owned by Indonesian airline companies as explained above, and the classification in REPELITA V.

TABLE 4.3.3 Aircraft Category and Seat Capacity

Aircraft Category	Aircraft Type	Seat Capacity		Remarks
		Present-1995	1995-2004	
WB	A300	250	250	
MJ	DC9 F100	100	150*	* 150 seater aircraft is assumed to replace the present DC9.
SJ	F28	65 - 85 *	85	* F28-MK3000 : 65 F28-MK4000 : 85
SP	F27 HS748 CN235	45 - 55 *	55	* F27-MK200 : 45 F27-MK500 : 55 HS748 : 45 CN235 : 45
STOL	CS212 DHC6	20	20	
LA	BN2A BNT C404	10	10	

2) Aircraft Expected for Respective Routes

In this Study, the following criteria are established for a standard of aircraft introduction as shown in TABLE 4.3.4 considering economical aircraft operations and passenger convenience.

TABLE 4.3.4 Standard of Aircraft Introduction

Aircraft Category	Annual route passengers
WB	500,000 +
MJ	150,000 - 500,000
SJ	50,000 - 150,000
SP	20,000 - 50,000
STOL	10,000 - 20,000
LA	- 10,000

The present aircraft and present runway length of destination airport are also taken into account for the assumption of future aircraft to be put in service in 1995.

(4) Load Factor

The load factors in peak month and peak hour are set as shown in TABLE 4.3.5 based on the present average of the 20 airports and the planning value generally adopted for domestic routes.

TABLE 4.3.5 Planning Value of Load Factor

	1995	2004
Peak Month	75%	70%
Peak Hour	80%	80%

(5) Peak Hour Coefficient

Peak hour coefficient is defined as a ratio of peak hour aircraft movements to daily aircraft movements.

Based on regression analysis on the present aircraft movements at various Indonesian airports including the 20 airports, a formula was derived as follows : (refer to FIGURE 4.3.2)

$$Cp = 1.38/SQRT\ (Md)$$

where,

Cp : Peak hour coefficient
Md : Daily aircraft movements

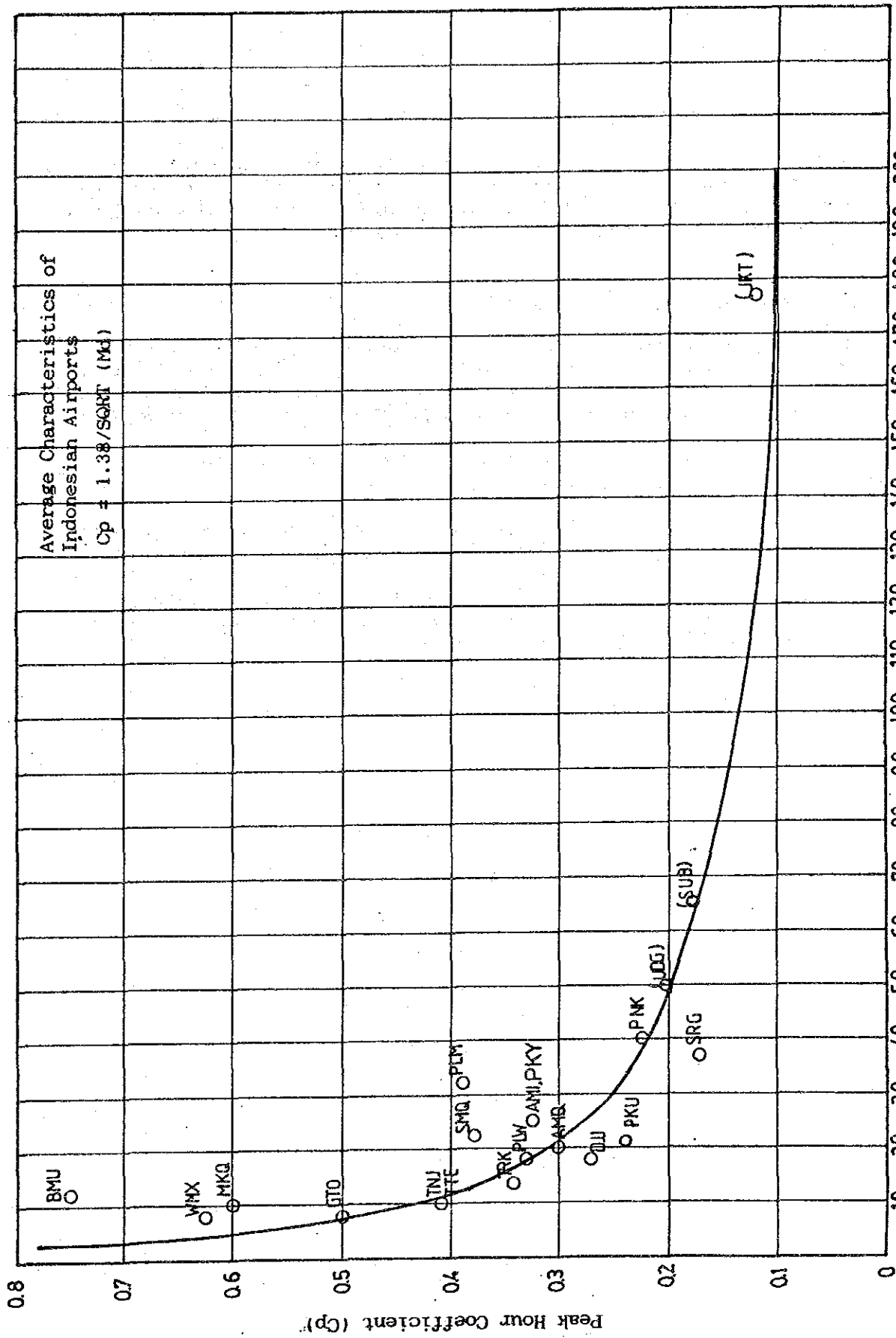

FIGURE 4.3.2 Daily Aircraft Movements and Peak Hour Coefficient

(6) Heavy Direction Factor

Heavy direction factor, which is a ratio of one way aircraft movements (departure or arrival, whichever heavier) to the two way aircraft movements in peak hour, is set as 0.6 based on the analysis of present flight schedule at the 20 airports.

4.3.3 Planning Target Traffic Volumes

Based on the methodology shown in the workflow of FIGURE 4.3.1 and the basic assumption described in 4.3.2, the planning target traffic volumes, i.e., daily traffic demands and peak hour traffic demands are forecast as summarized in TABLES 4.3.6 and 4.3.7 respectively.

The weekly passengers and aircraft movements by routes for each of the 20 airports are shown in Appendix 4.3.1.

At Pekanbaru, Semarang, Pontianak and Sampit airports, the operation of larger aircraft in 1995 may be justified from the viewpoint of economical aircraft operations and in consideration of the present operation hour at these airports. The aircraft movements and passengers corresponding to the introduction of such larger aircraft are shown with parentheses for reference.

TABLE 4.3.6 Daily Air Traffic Demands

	Airport	Present (1990)							Pax.	1995						Pax.	2004						
		Pax. #1 (1989)	Aircraft Movements							Aircraft Movements							Aircraft Movements						
			MJ	SJ	SP	STOL	LA	Total		MJ	SJ	SP	STOL	LA	Total		RB	MJ	SJ	SP	STOL	LA	Total
1	Tanjung Pinang	260			6	2		8	350			8	4		12	540			6	4	6		16
2	Pekanbaru	1,180		12	2	6		20	1,630	#2 (8)	22 (10)	4 (4)	10 (10)		36 (32)	2,460		10	22	4	8		44
3	Gunung Sitoli	30				4		4	45				4		4	70					4		4
4	Palembang	1,740	14	8	8			30	2,420	18	16	6			40	3,740	8	12	14	10			44
5	Semarang	1,740		20	8	6		34	2,330	#2(18)	32 (10)	8 (8)	2 (2)		42 (38)	3,430	6	12	10	12			40
6	Pontianak	1,320		12	10	4	14	40	1,780	#2 (8)	20 (10)	10 (10)	6 (6)	22 (22)	58 (56)	2,550		18	4	6	12	4	44
7	Sanpit	240				6	14	20	330			#2 (4)	10 (6)	24 (18)	34 (28)	500				6	18	2	26
8	Palangkaraya	480		4	2	4	16	26	630		6	2	12	20	40	930			8	6	16		30
9	Tarakan	300			6	4	2	12	390			8	6	4	18	570			8	2	2	4	16
10	Tana Toraja	25				2		2	65				4		4	100					6		6
11	Palu	680		4	8	2	4	18	780		4	12	6	4	26	1,190			10	12	12		34
12	Gorontalo	220			8			8	280			8			8	390			4	4			8
13	Ambon	520		10	2	4		16	690		10	2	6		18	940		4	8	2	10		24
14	Ternate	210			6	6		12	270			6	6		12	400				8	8		16
15	Mataram	700		2	8	8		18	890		8	6	10		24	1,260			12	4	4		26
16	Bima	250			6	6		12	310			6	6		12	450				10	8		16
17	Jayapura	520	2	4	6	2		14	660	2	4	8	2		16	930		4	4	6	2		16
18	Wamena	150			4	4		8	250			4	8		12	350				8	4		12
19	Kaimana	35				2		2	45				4		4	70					4		4
20	Merauke	100		2		2		4	140		2		4		6	200			2		6		8

Note : #1) Present daily passengers are estimated figures
#2) ( ) indicates the movements if larger aircraft is assumed to be put in services.

TABLE 4.3.7 Hourly Air Traffic Demands (1)

Year 1995

	2 Way Traffic										1 Way Traffic									
	Aircraft Movements							Passengers			Aircraft Movements							Passengers		
	WB	MJ	SJ	SP	STOL	LA	Total	Arr. & Dep.	Tran-sit	Total	WB	MJ	SJ	SP	STOL	LA	Total	Arr.or Dep.	Tran-sit	Total
1. Tanjung Pinang				3	2		5	140	24	164				2	1		3	96	8	104
2. Pekanbaru		(2)	5 (3)	1 (1)	2 (2)		8 (8)	376 (398)	40 (42)	416 (440)		(1)	3 (2)	1 (1)	1 (1)		5 (5)	251 (262)	13 (14)	264 (276)
3. Gunung Sitoli					2		2	32		32					1		1	16		16
4. Palembang		3	4	5			12	676	56	732		2	2	3			7	411	17	428
5. Semarang		(4)	7 (2)	2 (2)	1 (1)		10 (9)	554 (533)	10 (11)	564 (544)		(2)	4 (1)	1 (1)	1 (1)		6 (5)	324 (280)		324 (280)
6. Pontianak		(1)	3 (2)	2 (2)	1 (1)	4 (4)	10 (10)	310 (322)	14 (14)	324 (336)		(1)	2 (1)	2 (1)	(1)	2 (2)	6 (6)	224 (208)		224 (208)
7. Sampit				(1)	3 (2)	5 (5)	8 (8)	82 (108)	6 (8)	88 (116)				(1)	2 (1)	3 (3)	5 (5)	56 (84)		56 (84)
8. Palangkaraya			2	1	3	3	9	154	58	212			1	1	2	1	5	108	20	128
9. Tarakan				3	2	1	6	142	6	148				2	1	1	4	96		96
10. Tana Toraja					2		2	32		32					1		1	16		16
11. Palu			1	4	1	1	7	168	68	236			1	2	1		4	130	26	156
12. Gorontalo				4			4	84	60	144				2			2	53	19	72
13. Ambon			4	1	1		6	164	168	332			3	1			4	164	84	248
14. Ternate				3	2		5	124	16	140				2	1		3	88		88
15. Mataram			2	3	3		8	258	58	316			1	3	1		5	194	22	216
16. Bima				4	5		9	92	164	256				2	3		5	76	60	136
17. Jayapura		1	2	1	1		5	268	0	268		1	2	1	1		5	268		268
18. Wamena				3	2		5	140		140				2	1		3	88		88
19. Kaimana					2		2	14	18	32					1		1	10	6	16
20. Merauke			2		4		6	168		168			1		3		4	100		100

Note: 1. Transit passengers of 2 way traffic are double counted

2. ( ) indicates the movement if larger aircraft is assumed to be put in services.

TABLE 4.3.7 Hourly Air Traffic Demands (2)

Year 2004

	2 Way Traffic										1 Way Traffic									
	Aircraft Movements							Passengers			Aircraft Movements							Passengers		
	WB	MJ	SJ	SP	STOL	LA	Total	Arr. & Dep.	Transit	Total	WB	MJ	SJ	SP	STOL	LA	Total	Arr.or Dep.	Transit	Total
1. Tanjung Pinang			2	2	2		6	218	38	256			2	1	1		4	181	15	196
2. Pekanbaru		2	4	1	2		9	532	56	588		1	3	1	1		6	365	19	384
3. Gunung Sitoli					2		2	32		32					1		1	16		16
4. Palembang	2	3	3	2			10	972	80	1.052	1	2	2	1			6	595	25	620
5. Semarang	1	3	2	3			9	812	16	828	1	2	1	2			6	596		596
6. Pontianak		4	1	1	3	1	10	620	28	648		2	1	1	2		6	375	9	384
7. Sampit				2	5	1	8	164	12	176				1	3	1	5	100		100
8. Palangkaraya			2	2	4		8	210	78	288			1	1	3		5	144	16	160
9. Tarakan			2	1	1	2	6	204	8	212			1	1	1	1	4	136		136
10. Tana Toraja					4		4	64		64					3		3	48		48
11. Palu			2	3	3		8	224	92	316			1	2	2		5	195	40	235
12. Gorontalo			2	2			4	130	94	224			1	2			3	115	41	156
13. Ambon		1	2	1	3		7	172	176	348		1	1	1	2		5	174	90	264
14. Ternate				3	3		6	160	20	180				2	2		4	113	7	120
15. Mataram			5	1	2		8	340	76	416			3	1	1		5	237	27	264
16. Bima				4	5		9	92	164	256				3	3		6	100	80	180
17. Jayapura		2	1	2	1		6	402	10	412		2	1	1	1		5	368		368
18. Wamena				4	1		5	192		192				2	1		3	104		104
19. Kaimana					2		2	14	18	32					1		1	10	6	16
20. Merauke			2		4		6	168		168			1	1	3		4	100		100

Note. 1. Transit passengers of 2 way traffic are double counted

CHAPTER 5. FACILITY REQUIREMENT ANALYSES

CHAPTER 5. FACILITY REQUIREMENT ANALYSES

5.1 General

The future requirements of civil and building facilities for each of the 20 airports are analyzed based on the estimated future air traffic demands for years 1995 and 2004 respectively.

The future requirement of the ancillary equipment in buildings (X-ray, baggage claim device, etc.) and the airport maintenance equipment are analyzed for the year 1995 only and the estimation for 2004 is excluded for the following reasons:

- An air traffic demand forecast for 2004 is carried out to check if rehabilitation works such as runway extensions, apron expansions etc., are in compliance with the framework of long-term airport development.

- The above equipment is not an essential element of long-term airport development framework, as equipment will be provided corresponding to the size of airport facilities or system of maintenance at that time.

5.2 Civil Facilities

5.2.1 Runway

The runway length requirements at each of the 20 airports are calculated based on the performance of aircraft expected in the future with conditions of maximum payload and longest route distance.

The required width of runways are based on the minimum requirements of ANNEX-14, ICAO.

The requirements of runway dimensions at each airport are summarized in TABLE 5.2.1 and the conditions for runway length calculations are shown in APPENDIX-5.2.1.

TABLE 5.2.1. Future Runway Requirements

Airport	Present (1990)		1995		2004	
	Largest Aircraft	Dimensions	Largest Aircraft	Dimensions	Largest Aircraft	Dimensions
1. Tg. Pinang	F27	1,406x30	F27	1,750x30	F28	1,850x30
2. Pekanbaru	F28	2,150x30	F28 (DC9)	2,150x30 (2,150x45)	DC9	2,150x45
3. Gn. Sitoli	CS2	900x30	CS2	900x30	CS2	900x30
4. Palembang	DC9	2,200x45	DC9	2,200x45	A300	2,500x45
5. Semarang	F28	1,650x30	F28 (DC9)	1,750X30 (2,150x45)	A300	2,500x45
6. Pontianak	F28	1,650X30	F28 (DC9)	1,850X30 (2,200x45)	DC9	2,200x45
7. Sampit	CS2	855x23	CS2 (F27)	855x30 (1,650x30)	F27	1,650x30
8. Palangkaraya	F28	1,850x30	F28	1,850x30	F28	1,850x30
9. Tarakan	F27	1,650x30	F27	1,650x30	F28	1,750x30
10. Tana Toraja	CS2	900x23	CS2	900x23	CS2	900x23
11. Palu	F28	1,850x30	F28	1,850x30	F28	1,850x30
12. Gorontalo	F27	1,650x30	F27	1,650x30	F28	1,700x30
13. Ambon	F28	1,850x45	F28	1,850x45	DC9	2,250x45
14. Ternate	F27	1,420x30	F27	1,650x30	F27	1,650x30
15. Mataram	F28	1,600x30	F28	1,650x30	F28	1,650x30
16. Bima	F27	1,400x30	F27	1,650x30	F27	1,650x30
17. Jayapura	DC9	1,850x45	DC9	1,850x45	DC9	1,850x45
18. Wamena	F27	1,500x30	F27	1,850x45	F27	1,850x45
19. Kaimana	CS2	1,500x30	CS2	1,500x30	CS2	1,500x30
20. Merauke	F28	1,850x30	F28	1,850x30	F28	1,850x30

Note: 1. Future runway dimensions indicate the minimum requirements or present dimensions whichever larger.

2. ( ) indicates the dimensions if larger aircraft is assumed to be put in services.

5.2.2 Runway Strip

The requirements for the length and width of runway strip are based on the required runway length and the minimum requirements of ANNEX-14, ICAO with the following assumptions:

*1 Operational category of runway in 1995 in terms of precision, non-precision approach, etc. is the same as at present.

*2 For the year 2004, the airports served by Jet aircraft are equipped with ILS or MLS and categorized into precision approach runways.

5.2.3 Taxiway

A complete parallel taxiway with perpendicular exits will be justified if considered economically feasible, such as when more than four instrument approaches occur during the peak hour and or the operation of wide-body jet aircraft becomes frequent.

None of the 20 airports will be provided with this parallel taxiway considering the relatively small air traffic in peak hour. (Refer to TABLE 4.3.7)

5.2.4 Apron

The required number of aircraft stands on aprons is estimated based on the peak hour aircraft movements and in compliance with the following formula:

$$S = \sum_{i} (Ni \times \frac{Ti}{60}) + a$$

where; S : Required number of aircraft stands

Ni : Number of arriving aircraft of type (i) in peak hours

Ti : Gate occupancy time of aircraft of type (i)

a : One extra stand for largest aircraft

The gate occupancy times of each aircraft type are adopted as shown in TABLE 5.2.2.

TABLE 5.2.2 Gate Occupancy Time on Apron

Aircraft	Actual (min)	Adopted Time (min)
A300	60	70
DC9/F28	50	60
F27/CS2/BN2	30	40

The required number of aircraft stands at each of the 20 airports are summarized in TABLE 5.2.3.

TABLE 5.2.3 Aircraft Stand Requirements

	Airport	Present (1990)					1995					2004					
		DC9	F28	F27	CS2	Total	DC9	F28	F27	CS2	Total	A300	DC9	F28	F27	CS2	Total
1	Tanjung Pinang			4		4			3	1	4			3	1	1	5
2	Pekanbaru		4	6		10	(2)	4 (2)	1 (1)	1 (1)	6 (6)		2	3	1	1	7
3	Gunung Sitoli				2	2				2	2					2	2
4	Palembang	7			7	14	3	2	2		7	2	2	2	1		7
5	Semarang		4	4		8	(3)	5 (1)	1 (1)	1 (1)	7 (6)	2	2	1	2		7
6	Pontianak		9			9	(2)	3 (1)	2 (1)	2 (2)	7 (6)		3	1	1	2	7
7	Sampit				4	4			(2)	5 (3)	5 (5)				2	3	5
8	Palangkaraya		3		1	4		2	1	2	5			2	1	2	5
9	Tarakan			4		4			3	2	5			2	1	2	5
10	Tana Toraja				2	2				2	2					3	3
11	Palu		1	1	2	4		2	2	1	5			2	2	2	6
12	Gorontalo			3	1	4			3		3			2	2		4
13	Ambon		5			5		4	1		5		2	1	1	2	6
14	Ternate			2	2	4			3	1	4				3	2	5
15	Mataram		1	2	2	5		2	2	1	5			4	1	1	6
16	Bima			3	1	4			3	2	5				3	2	5
17	Jayapura	7				7	2	2	1	1	6		3	1	1	1	6
18	Wamena			3		3			3	1	4				3	1	4
19	Kaimana				3	3				2	2					2	2
20	Merauke		2			2		2		2	4			2		2	4

Note: ( ) indicates the number if larger aircraft is assumed to be put in services

5.3 Building Facilites and Ancillary Equipment

5.3.1 Passenger Terminal Building

The total floor requirement of passenger terminal buildings is estimated as shown in TABLE 5.3.1 based on the future 2-way passengers (arriving, departing and transit passengers) during the peak hour by multiplying unit floor space per passenger.

The unit floor spaces for domestic passenger terminal and international terminal are set at 6.0 m2 and 9.0 m2 as mentioned in Chapter 3.

TABLE 5.3.1 Total Floor Area Requirement of Passenger Terminal Buildings (Domestic)

Airport	Present (As of 1990)		1995		2004	
	2 Way Peak H Pax.	Total Floor Area (m^2)	2 Way Peak H Pax.	Total Floor Area (m^2)	2 Way Peak H Pax.	Total Floor Area (m^2)
1. Tanjung Pinang	69	1,062	152	912	237	1,422
2. Pekanbaru	237	4,728	396 (419)	2,376 (2,514)	560	3,360
3. Gunung Sitoli	35	216	32	192	32	192
4. Palembang	614	2,116	704	4,224	1,012	6,072
5. Semarang	267	1,850	559 (538)	3,354 (3,228)	820	4,920
6. Pontianak	294	2,280	317 (329)	1,902 (1,974)	634	3,804
7. Sampit	87	216	85 (112)	510 (672)	170	1,020
8. Palangkaraya	172	600	183	1,098	249	1,494
9. Tarakan	90	440	145	870	208	1,248
10. Tana Toraja	32	128	32	192	64	384
11. Palu	196	1,610	202	1,212	270	1,620
12. Gorontalo	95	1,254	114	684	177	1,062
13. Ambon	246	2,569	248	1,488	260	1,560
14. Ternate	75	400	132	792	170	1,020
15. Mataram	282	1,604	287	1,722	378	2,268
16. Bima	132	500	174	1,044	174	1,044
17. Jayapura	190	1,345	268	1,608	407	2,442
18. Wamena	130	708	140	840	192	1,152
19. Kaimana	17	90	23	138	23	138
20. Merauke	160	518	168	1,008	168	1,008

Note : ( ) indicates the case of larger aircraft introduction.

5.3.2 Administration and Operation Buildings

The future requirements of total floor area of administration and operation buildings are estimated in accordance with the following formula:

$$A = (9.0 \times N) \times \frac{1}{r}$$

where; A : Total floor area of administration building (sq.m)

N : Number of administrative staff

r : Proportion of administrative function area to total floor area

The explanation on the above equation is made hereinafter.

(1) Figure 5.3.1 shows the correlation between the number of present total DGAC staff and the number of present annual passengers at each of the 20 airports.

The future numbers of total DGAC staff are estimated from the forecast annual passengers by applying the equation shown in the figure which indicates the average characteristics of the 20 airports relation.

(2) The future numbers of administrative staff are estimated applying the present average proportions in number of administrative staff to total DGAC staff, i.e., 20% for Classes I and II airports, 23% for Class III airports and 27% for Classes IV and V airports.

(3) Meanwhile, nine sq.m per administrative staff member is adopted as a unit floor area for the part of administrative function including offices for administrative staff and airport manager, secretary rooms etc. This is derived by applying the unit floor area of six sq.m, which is generally adopted in office planning for working staff, to the office for administrative staff.

(4) The proportion in area of the part of administrative function to total floor area of administration building varies depending on the size and activities of airports. The present average proportions by each airport class are 52% for Class I airports, 57% for Class II airports, 69% for Class III airports, and 46% for Classes IV and V airports.

Therefore, the beforementioned equation can be read that the unit floor areas per administrative staff member for total floor area of the building are 17, 16, 13 and 20 sq.m for Classes I, II, III, and IV and V airports respectively.

The required total floor areas of administration building at each of the 20 airports are estimated as shown in TABLE 5.3.2.

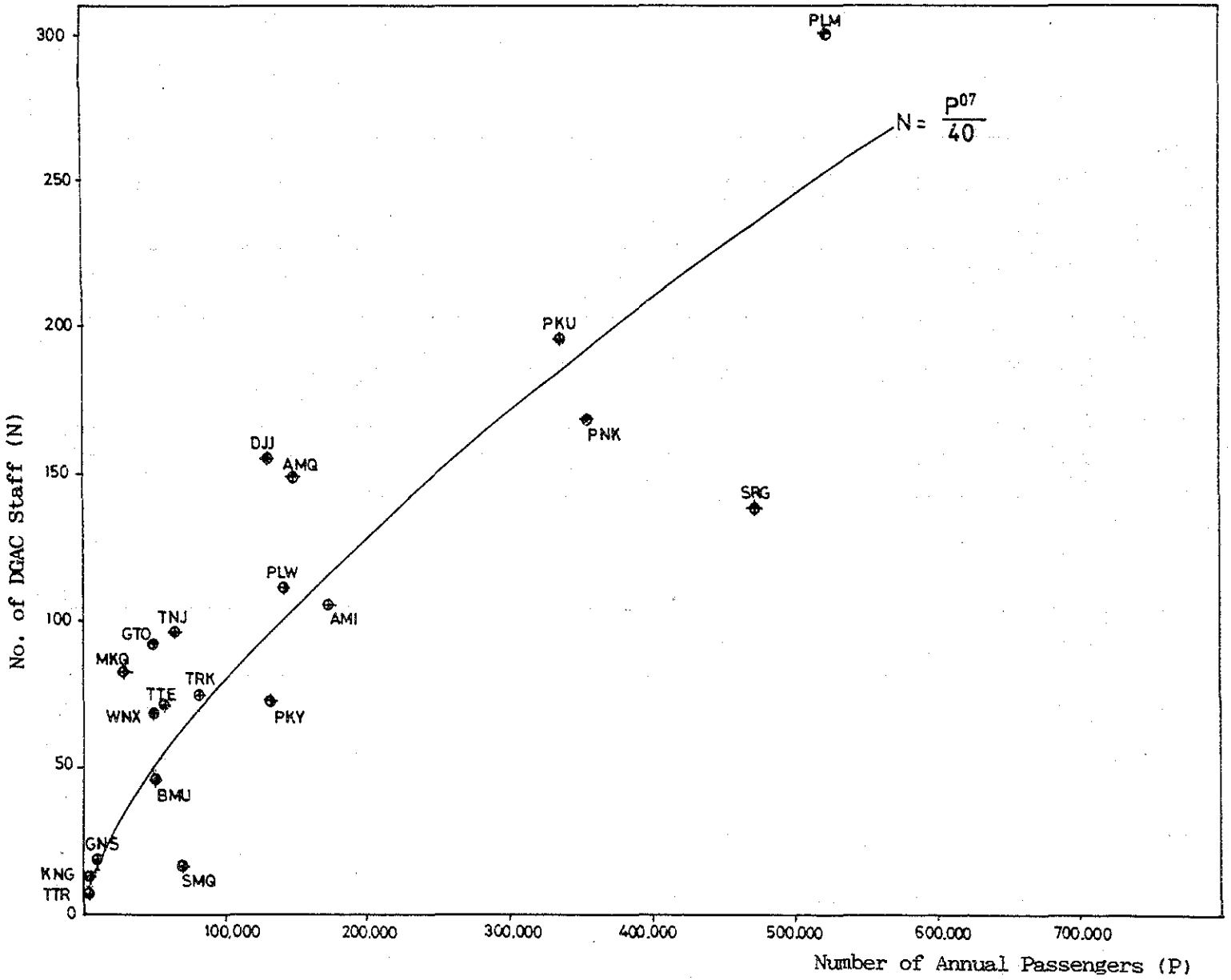

FIGURE 5.3.1 Correlation between Number of Annual Passengers and DGAC Staff

TABLE 5.3.2. Floor Area Requirements of Administration and Operation Buildings

Airport	Airport Class	Present (As of 1990)		1995		2004	
	Class	Adm. Staff	Floor Area (m2)	Adm. Staff	Floor Area (m2)	Adm. Staff	Floor Area (m2)
1. Tg. Pinang	III	22	384	22	286	25	325
2. Pekanbaru	II	47	452	48	816	65	1,040
3. Gn. Sitoli	IV	5	190	6	120	7	140
4. Palembang	I	59	467	66	1,122	89	1,513
5. Semarang	II	47	312	62	992	82	1,312
6. Pontianak	I	39	548	48	816	62	992
7. Sampit	V	17	48	21	420	28	560
8. Palangkaraya	II	19	240	26	416	34	544
9. Tarakan	III	16	192	20	260	25	325
10. Tana Toraja	IV	3	147	6	120	7	140
11. Palu	II	25	342	28	448	37	592
12. Gorontalo	III	22	264	22	286	22	286
13. Ambon	II	25	343	25	400	33	528
14. Ternate	III	19	120	19	247	20	260
15. Mataram	III	27	565	36	468	46	598
16. Bima	III	14	200	17	221	22	286
17. Jayapura	II	35	399	35	560	35	560
18. Wamena	III	18	241	18	234	18	234
19. Kaimana	V	3	35	5	100	7	140
20. Merauke	III	19	392	19	247	19	247

5.3.3 Ancillary Equipment in Buildings

(1) Type of Equipment for Requirement Analyses

The future requirements of ancillary equipment in buildings are estimated for the following equipment:

- X-ray baggage screening units
- Walk-through metal detectors
- Baggage claim devices
- Air conditioning in control tower and departure lounge in passenger terminal.

Although explosive detectors, hand metal detectors and sanitary facilities including toilets and faucets are already provided at the study airports, these are excluded from the requirement analyses for the following reasons:

*1 The existing explosive detectors are not effective for detecting plastic bombs or nitro-based explosives.

*2 Hand metal detectors are considered as back-up equipment against the failure of X-ray baggage screening units or walk through metal detectors. However if such failure occurs, manual security checks such as body checks or baggage opening are desirable for a more reliable security check.

(2) Requirement Standards

1) X-ray baggage screening units

- Installation criteria: Airports served by F27 or larger aircraft

- Required number : Based on the following formula by IATA.

$$N = \frac{(a + b) \times w}{y}$$

where; N : Required number of X-ray unit
a : Number of departing passengers
b : Number of transit passengers
w : Average number of hand carried bags (=2)
y : Capacity of X-ray unit (=600 pieces/hr)

2) Walk-through metal detectors

Walk-through metal detectors shall be provided to pair with X-ray baggage screening units.

3) Baggage claim devices

- Installation Criteria: Airports served by DC9 or larger aircraft

- Number of Devices : Based on the required length and type of device

4) Air conditioning

The required capacity of air conditioning is calculated for departure lounge of the passenger terminal building and VFR room of control tower.
The requirement is calculated based on the future floor area of the above rooms and in accordance with the following formula:

$Q = A \times q$ A : Area to be air conditioned
q : cooling load (BTU/m^2.hr)

= 800 for C-TWR
= 600 for Dep. lounge

(3) Analyzed Results

The future requirements of ancillary equipment in buildings are summarized in TABLE 5.3.3 for the year 1995.

TABLE 5.3.3 Future Requirements of Ancillary Equipment in Buildings

Airport	1995					
	X-Ray Baggage Screening Unit	Walk Through Detector	Baggage Claim Device	Cooling Load (BTU) of Air Conditioning		
				Control Tower	Departure Lounge	
					INT'L	DOM
1. Tanjung Pinang	1	1	0	19,000	28,500	107,000
2. Pekanbaru	2	2	0	17,500	524,000	
3. Gunung Sitoli	0	0	0	---	---	32,100
4. Palembang	1	1	1	16,000	---	280,000
5. Semarang	1	1	0	17,500	---	180,000
6. Pontianak	2	2	0	20,500	65,000	244,500
7. Sampit	0	0	0	---	---	36,900
8. Palangkaraya	1	1	0	20,500	---	83,900
9. Tarakan	1	1	0	20,500	16,000	63,000
10. Tana Toraja	0	0	0	---	---	19,600
11. Palu	1	1	0	23,800	---	180,000
12. Gorontalo	1	1	0	20,500	---	116,000
13. Ambon	2	2	0	19,000	131,000	202,000
14. Ternate	1	1	0	24,000	---	57,700
15. Mataram	1	1	0	20,000	---	205,000
16. Bima	1	1	0	39,700	---	89,300
17. Jayapura	1	1	1	12,700	---	175,500
18. Wamena	1	1	0	20,000	---	89,800
19. Kaimana	0	0	0	---	---	21,500
20. Merauke	1	1	0	13,000	---	65,500

5.4 Airport Maintenance Equipment

5.4.1 Type of Equipment for Requirement Analyses

Table 5.4.1 shows all the equipment covered by the present DGAC inventory, the equipment previously requested by DGAC to BAPPENAS and the equipment to be studied in this Section.

Although various kinds of equipment are utilized for airport maintenance at present, the equipment for this Study is limited to those for preventative maintenance purposes.

TABLE 5.4.1 Airport Maintenance Equipment for this Study

Name	DGAC Inventory	Previous Request to BAPPENAS	Equipment for this Study
Mower	O	O	O
Tractor	O	O	O
Handy Mower	O		O
Grass Collector		O	
Sweeper	O	O	O
Dump Truck	O		O
Truck	O		
Truck Tipper	O	O	
Trailer	O		
Roller	O		
Vibrating Roller		O	
Asphalt Finisher	O		
Asphalt Distributor	O		
Asphalt Mixing Plant	O		

Note : 1) Grass collectors are excluded taking into account the present grass cutting and collecting system.

2) Trucks, truck tippers and trailers will be substituted with dump trucks with multi-purpose use.

5.4.2 Requirement Standards

(1) Mowers (Disc type mowers)

The required number of mowers are calculated based on the following formula and flowchart shown in FIGURE 5.4.1.

Required number of mowers (N)

$$= \frac{AD}{CM \times ME \times WH} + 1 \text{ (for stand-by)}$$

where; AD : Area to be mowed per day (m^2/day)
CM : capability of mower (= 3,500 m^2/hr)
ME : Machine efficiency (= 0.7)
WH : Working hours per day (= 5 hrs)

Area to be mowed per day can be calculated as follows:

$$AD = \frac{TA}{CT \times WE}$$

where; TA : Total area to be mowed (m^2)
CT : Cycle time (day/cycle)
WE : Work efficiency (=0.7)

Cycle time is calculated as:

$$CT = \frac{\text{(Allowable height of grass - 5 cm) x 30 (days)}}{\text{Growth speed of grass (cm/month)}}$$

The total area to be mowed consisting of;

* Graded area in runway strip (based on required runway length and graded area)
* Runway end safety area
* Apron surrounding area (based on present practice).

and the growth speed of grass are shown in APPENDIX-5.4.1 for each of the 20 airports.

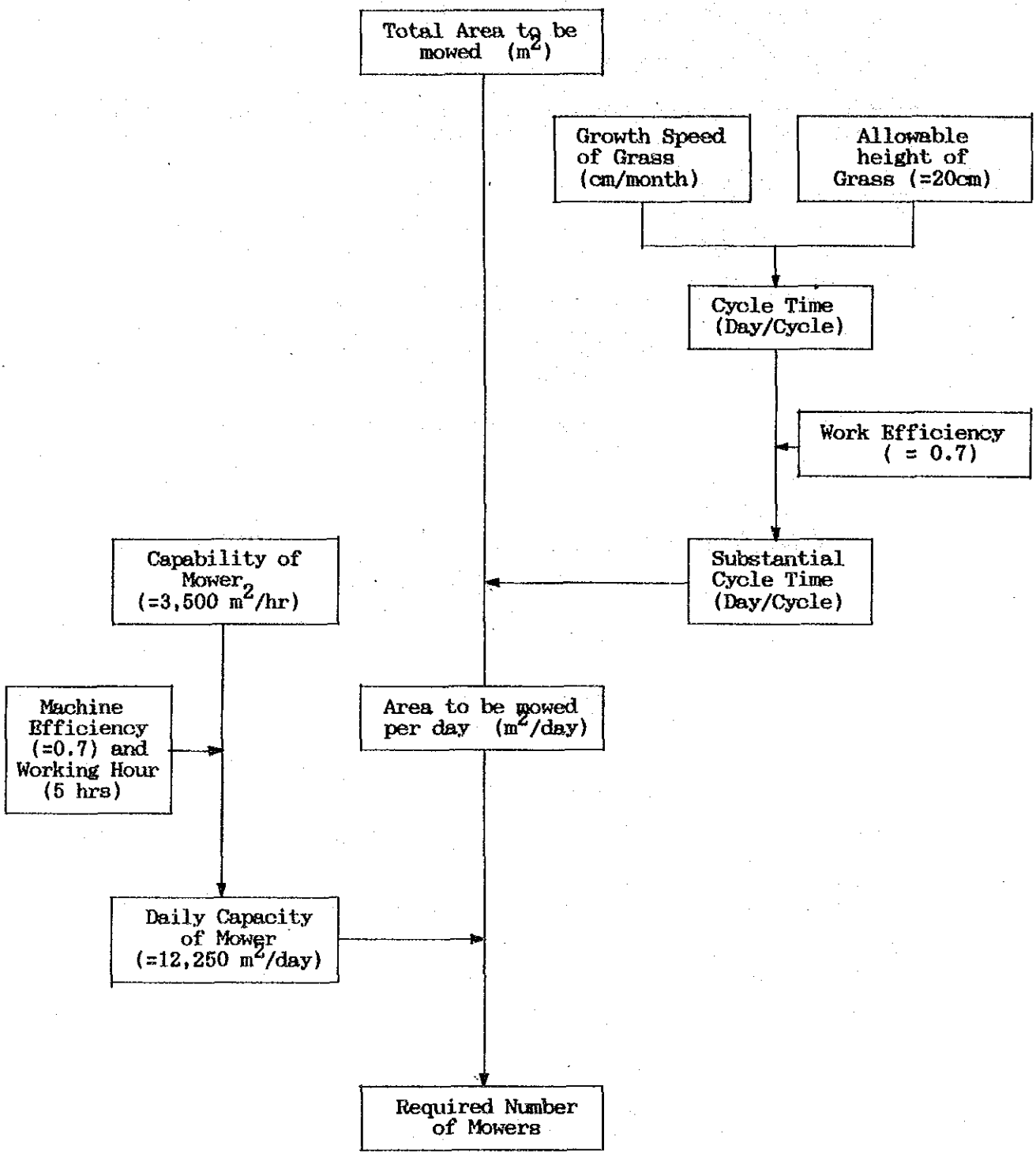

FIGURE 5.4.1 Flowchart for Calculation of Required Mowers

(2) Tractors

The required number of tractors shall be the same as for mowers.

(3) Handy Mowers

The requirement standard of handy mowers is basically the same as that of mowers with following differences:

*1 Area to be mowed:

- Area within 1 m from edge of pavement and open drainage facilities
- Landside area

*2 Capability of handy mower: 110 m^2/hr

The total area for grass cutting by handy mowers and the growth speed of grass at respective airports are indicated in APPENDIX-5.4.1.

(4) Sweepers

- Provision criteria : Airports served by Jet aircraft
- Number to be provided: 1 unit per airport

(5) Dump Trucks

- Provision criteria : All airports
- Number to be provided: 1 unit per airport

5.4.3 Analyzed Results

The requirements of the airport maintenance equipment in 1995 are summarized in TABLE 5.4.2.

TABLE 5.4.2 Future Requirements of Airport Maintenance Equipment

Airport	1995				
	Mower	Tractor	Handy Mower	Sweeper	Dump Truck
1. Tanjung Pinang	3	3	2	0	1
2. Pekanbaru	4	4	3	1	1
3. Gunung Sitoli	2	2	1	0	1
4. Palembang	4	4	2	1	1
5. Semarang	5	5	4	1	1
6. Pontianak	3	3	2	1	1
7. Sampit	2	2	1	0	1
8. Palangkaraya	5	5	4	1	1
9. Tarakan	3	3	2	0	1
10. Tana Toraja	2	2	1	0	1
11. Palu	2	2	1	1 (*1)	1
12. Gorontalo	3	3	2	0	1
13. Ambon	5	5	4	1	1
14. Ternate	4	4	4	0	1
15. Mataram	2	2	1	1	1
16. Bima	2	2	1	0	1
17. Jayapura	6	6	5	1	1
18. Wamena	2	2	2	0	1
19. Kaimana	3	3	5	0	1
20. Merauke	3	3	2	1	1

Note : (*1) Sweepers will not be provided at Palu airport due to strong winds

CHAPTER 6. EVALUATION OF EXISTING FACILITIES

CHAPTER 6. EVALUATION OF EXISTING FACILITIES

6.1 Summary

The existing facilities and equipment at each of the 20 airports are quantitatively or qualitatively evaluated based on the facility evaluation criteria which are established in Chapter 3 of this report, and classified into one of three degrees with regard to the urgency of rehabilitation of facilities or renewal of equipment.

It should be noted that, in this chapter, the quantitative evaluation is made for present air traffic demands such as aircraft operated at present, present peak demands etc., or for present operational demands, but not for the future requirements. The qualitative evaluation such as for the deteriorated conditions of pavements, the deterioration and distresses of building structures and finishings etc., is of course made for the function originally allocated to such facilities and equipment.

The evaluation results are summarized in TABLES 6.1.1 and 6.1.2.

In the tables, the facilities and equipment judged "A" (i.e., rehabilitation or renewal urgently required) are then assessed in terms of practicability and effectiveness of the implementation of such rehabilitation work or renewal as follows:

A (0) : Implementation practicable

A (X_1): Implementation scheduled by other programs

A (X_2): Implementation not effective or not recommendable

A (X_3): Implementation impracticable

The reasons for the above assessment to each facility/equipment are described later in respective sections.

Table 3.4.1 Evaluation Results of Civil and Building Facilities and Ancillary Equipment

Facility	Evaluation Item	1.Tanjung Pinang	2.Pekan-baru	3.Gunung Sitoli	4.Palem-bang	5.Semar-ang	6.Ponti-anak	7.Sampit	8.Palang-karaya	9.Tarakan	10.Tana Toraja	11.Palu	12.Goron-talo	13.Ambon	14.Tern-ate	15.Mata-ram	16.Bima	17.Jayap-ura	18.Wamena	19.Kai-mana	20.Mera-uke
A.1.Runway	1)Length	A (O)	C	C	C	A (x2)	A (O)	C	C	C	C	C	C	C	A (O)	A (O)	A (O)	C	A (x)	C	C
	2)Width	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A (O)	C	C
	3)Longitudinal Slope	C	C	-	C	-	-	-	-	-	A (O)	C	-	-	-	-	-	-	C	-	-
	4)Transverse Slope	-	-	C	C	C	C	-	-	C	C	C	-	-	C	C	C	-	C	C	C
	5)Pavement Strength	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	C	C	C	C
	6)Pavement Deterioration	C	B	A (O)	A (O)	C	C	A (O)	C	A (O)	B	C	C	A (O)	B	C	C	B	B	A (x2)	A (O)
A.2.Runway Strip	1)Width	A (x3)	A (x3)	A (O)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (x3)	A (O)
	2)Width of Graded Area	C	A (x3)	C	A (x3)	C	C	A (O)	A (O)	A (O)	A (O)	C	C	C	A (O)	C	C	A (O)	A (x3)	C	A (O)
	3)Transverse Slope	A (O)	-	C	-	C	C	-	-	C	C	C	A (x1)	-	A (O)	-	C	-	C	C	-
A.3.Taxiway	1)Width	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A (O)	C	C
	2)Longitudinal Slope	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3)Transverse Slope	-	-	-	-	C	C	C	-	-	-	C	-	-	C	-	-	-	-	-	C
	4)Pavement Strength	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	5)Pavement Deterioration	C	B	A (O)	B	C	A (O)	C	C	B	B	C	C	A (O)	B	C	A (O)	B	A (x1)	A (x1)	A (O)
A.4.Apron	1)Number of Aircraft Stands	C	C	C	C	C	C	C	A (O)	A (O)	C	A (O)	C	C	C	A (O	A (O)	A (O)	A (X2)	C	A (O)
	2)Location	A (x3)	A (x3)	C	A (x3)	C	A (x3)	B	B	B	B	B	B	B	A (x3)	B	A (x3)	B	A (x3)	B	C
	3)Slope	-	-	-	-	C	C	C	-	-	-	-	-	-	C	-	-	-	-	-	-
	4)Pavement Strength	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	5)Pavement Deterioration	B	B	A (O)	A (x1)	C	B	C	C	B	B	C	C	A (O)	B	A (O)	A (O)	C	A (x1)	A (x1)	A (O)
B.1.Passenger Terminal Building	1)Function	C	C	C	A (x2)	A (O)	A (O)	B	B	A (x1)	C	C	C	C	A (O)	C	A (x1)	C	B	C	A (O)
	2)Structure	B	B	C	A (x2)	C	B	C	C	B	C	C	C	C	C	C	B	A (x2)	C	C	A (O)
	3)Finishing	A (x1)	A (O)	C	A (x2)	C	B	C	A (x1)	B	C	C	C	A (x1)	C	C	A (x1)	A (x2)	C	B	A (O)
B.2.Control Tower	1)Visibility	C	C	-	C	C	C	-	C	C	-	C	C	C	C	C	-	C	C	-	C
	2)Structure	C	-	-	-	C	C	-	C	C	-	C	C	-	C	-	-	-	C	-	A (x3)
	3)Finishing	C	A (x3)	-	B	C	C	-	B	C	-	C	C	B	C	C	-	B	C	-	B
B.3.Administration & Operation Building	1)Function	C	A (x1)	C	A (x2)	C	C	A (x2)	B	C	C	B	B	B	A (x2)	C	C	B	C	B	C
	2)Structure	C	B	C	B	B	C	C	C	C	C	C	C	B	C	B	C	B	C	C	B
	3)Finishing	B	A (x1)	B	A (x2)	B	B	A (x2)	C	C	B	C	C	A (x2)	C	B	C	A (x2)	B	C	A (O)
B.4.X-Ray Metal Detector		A (O)	A (O)	-	C	C	C	-	A (O)	A (O)	-	C	A (O)	C	A (O)	A (O)	A (O)	C	A (O)	-	A (O)
B.5.Walk Through Metal Detector		A (O)	A (O)	-	C	C	C	-	A (O)	A (O)	-	C	A (O)	C	A (O)	A (O)	A (O)	C	A (O)	-	A (O)
B.6.Baggage Claim Device		-	C	-	A (x2)	-	-	-	-	-	-	-	-	-	-	-	-	A (x3)	-	-	-
B.7.Air Conditioning	1)Control Tower	C	C	-	C	C	C	-	C	B	-	B	C	A (O)	A (O)	C	-	C	A (O)	-	C
	2)Departure Lounge	A (O)	C	A (O)	B	C	A (O)	A (O)	B	A (O)	A (O)	C	A (O)	B	A (O)	A (O)	A (O)	A (O)	A (O)	A (O)	A (O)

TABLE 6.1.2 Evaluation Results of Airport Maintenance Equipment

Airport	Mower	Tractor	Handy Mower	Sweeper	Dump Truck
1. Tanjung Pinang	A (O)	B	A (O)	-	C
2. Pekanbaru	B	B	C	C	C
3. Gunung Sitoli	A (O)	A (O)	C	-	A (O)
4. Palembang	B	C	A (O)	C	C
5. Semarang	A (O)	A (O)	A (O)	A (O)	C
6. Pontianak	B	C	A (O)	A (O)	C
7. Sampit	A (O)	A (O)	A (O)	-	A (O)
8. Palangkaraya	B	C	A (O)	A (O)	C
9. Tarakan	A (O)	C	A (O)	-	C
10. Tana Toraja	A (O)	A (O)	A (O)	-	A (O)
11. Palu	C	C	A (O)	A (X2)	A (O)
12. Gorontalo	A (O)	A (O)	A (O)	-	C
13. Ambon	A (O)	A (O)	A (O)	C	C
14. Ternate	A (O)	C	A (O)	-	C
15. Mataram	C	C	C	A (O)	C
16. Bima	A (O)	A (O)	A (O)	-	C
17. Jayapura	A (O)	A (O)	A (O)	A (O)	C
18. Wamena	A (O)	A (O)	A (O)	-	A (O)
19. Kaimana	A (O)	A (O)	A (O)	-	A (O)
20. Merauke	A (O)	C	A (O)	A (O)	A (O)

6.2 Civil Facilities

The existing civil facilities including runways, runway strips, taxiways and aprons at each of the 20 airports are evaluated as summarized in TABLE 6.1.1 based on the evaluation criteria established in Chapter 3. The details of the evaluation are indicated in Appendix 6.2.1.
Hyphens in the table mean that no evaluation can be made due to lack of data and information.

The facilities evaluated "A" are then assessed in terms of practicability or effectiveness of implementation of rehabilitation work as indicated in TABLE 6.2.1.

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (1)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
A.1 Runway 1) Length			
- Tg. Pinang	250 m extension	A(0)	- No major difficult in implementation (Note: Site preparation and removal of obstructive hills under way for operation of F28 in accordance with REPELITA V program)
- Semarang	100 m extension	A(X_2)	- No immediate effect (Note: Present weight restriction cannot be completely solved due to the obstructive hills located to the south)
- Pontianak	200 m extension	A(0)	- No major difficulties in implementation - Even if the previous master plan is executed in the future, the existing runway and its extended portion may be utilized as a parallel taxiway with minor change

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (2)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Ternate	230 m extension	A(O)	- No major difficulties in implementation
- Mataram	50 m extension	A(O)	- Ditto
- Bima	250 m extension	A(O)	- No major difficulties in implementation
- Wamena	350 m extension	A(X_2)	- No immediate effect (Note: The present weight restriction cannot be completely solved due to the obstructive hills infringing the approach surface on one side) - Extension to the other side requires 5 m high embankment
A.1 Runway 2) Width			
- Wamena	Widening to 45 m	A(O)	- No major difficulties in implementation
A.1 Runway 3) Longitudinal Slope			
- Tana Toraja	Partial overlay	A(O)	- No major difficulties in implementation (Note: maximum overlay 20 cm thick)
A.1 Runway 6) Pavement Deterioration			
- Gn. Sitoli	Overlay	A(O)	- Not major difficulties in implementation

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (3)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Palembang	Overlay	A(O)	- No major difficulties in implementation
- Sampit	Ditto	A(O)	- Ditto
- Tarakan	Overlay for the remaining part	A(O)	- Ditto
- Ambon	Overlay	A(O)	- Ditto
- Kaimana	Ditto	$A(X_1)$	- Scheduled to be implemented by DIP 1990/91
- Merauke	Ditto	A(O)	- No major difficulties in implementation
A.2 Runway Strip 1) Width			
- Tg. Pinang	Widening to each side to 150 m from 75 m	$A(X_3)$	- Complete relocation of present terminal required
- Pekanbaru	Ditto	$A(X_3)$	- Ditto
- Gn. Sitoli	Widening to each side to 75 m from 40 m	A(O)	- No major difficulties in implementation
- Palembang	Widening to each side to 150 m from 75 m	$A(X_3)$	- Complete relocation of present terminal required
- Semarang	Widening to north side to 150 m from 75 m	$A(X_3)$	- Relocation of river required
- Pontianak	Ditto	$A(X_3)$	- Complete relocation of present terminal required

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (4)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Sampit	Widening to each side to 75m from 30 m	$A(X_3)$	- Land aquisition and relocation of public road required
- Palangkaraya	Widening to each side to 150 m	$A(X_3)$	- Complete relocation of present terminal required
- Tarakan	Widening to each side to 150 m from 45 m	$A(X_3)$	- Ditto
- Tana Toraja	Widening to each side to 75 m from 32 m	$A(X_3)$	- Ditto
- Palu	Widening to each side to 150 m from 75 m	$A(X_3)$	- Ditto
- Gorontalo	Widening to each side to 150 m from 75 m	$A(X_3)$	- Additional land acquisition required
- Ambon	Widening to each side to 150 m from 75 m	$A(X_3)$	- Complete relocation of present terminal required
- Ternate	Widening to 150 m	$A(X_3)$	- Ditto
- Mataram	Widening to each side to 150 m from 75 m	$A(X_3)$	- Additional land acquisition required
- Bima	Widening to each side to 150 m from 75 m	$A(X_3)$	- Complete relocation of present terminal required
- Jayapura	Widening to each side to 150 m from 75 m	$A(X_3)$	- Additional land acquisition required.

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (6)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Wamena	Widening to each side to 150 m from 30 m	A(X_3)	- Complete relocation of present terminal required
- Kaimana	Widening to each side to 75 m from 40 m	A(X_3)	- Complete relocation of present terminal required
- Merauke	Widening to each side to 150 m	A(O)	- No major difficulties in implementation
A.2 Runway Strip 2) Width of Graded Area			
- Pekanbaru	Partial widening for precision approach to 150 m from 75 m	A(X_3)	- Widening requires the relocation of existing apron
- Palembang	Partial widening for precision approach to 150 m from 75 m	A(X_3)	- Widening requires the relocation of existing apron
- Sampit	Widening to north side to 40 m from 34 m (Relocation of open drainage)	A(O)	- No major difficulties in implementation
- Palangkaraya	Widening to south side to 75 m from 60 m (Relocation of open drainage)	A(O)	- No major difficulties in implementation
- Tarakan	Widening to each side to 75 m from 45 m	A(O)	- No major difficulties in implementation

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (6)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Tana Toraja	Widening to each side to 40 m from 32 m	A(O)	- No major difficulties in implementation
- Ternate	Widening to south side to 75 m from 45 m	A(O)	- No major difficulties in implementation
- Jayapura	Partial widening to precision approach to 105 m from 75 m (Relocation of open drainage)	A(O)	- No major difficulties in implementation
- Wamena	Widening each side to 75 m	A(X_3)	- Widening requires the complete relocation of existing terminal area
- Merauke	Widening to west side to 75 m from 45 m (Relocation of open drainage)	A(O)	- No major difficulties in implementation
A.2 Runway Strip 3) Transverse Slope			
- Tg. Pinang	Partial grading for improving upward slope	A(O)	- No major difficulties in implementation
- Gorontalo	Partial grading for improving upward slope	A(X_1)	- Scheduled to be implemented by DIP 1990/91
- Ternate	Partial grading for improving steeper slope	A(O)	- No major difficulties in implementation

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (7)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
A.3 Taxiway 1) Width			
- Wamena	Widening to 23 m from 20 m	A(O)	- No major difficulties in implementation
A.3 Taxiway 5) Pavement Deteriora-tion			
- Gunung Sitoli	Overlay	A(O)	- No major difficulties in implementation
- Pontianak	Overlay	A(O)	- No major difficulties in implementation
- Ambon	Overlay	A(O)	- No major difficulties in implementation
- Bima	Overlay	A(O)	- No major difficulties in implementation
- Wamena	Overlay	$A(X_1)$	- Scheduled to be im-plementated by DIP 1990/91
- Kaimana	Overlay	$A(X_1)$	- Scheduled to be im-plementated by DIP 1990/91
- Merauke	Overlay	A(O)	- No major difficulties in implementation

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (8)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
A.4 Apron 1) Number of Aircraft Stands			
- Palangkaraya	Expansion	A(O)	- No major difficulties in implementation - Not infringing the present transitional surface.
- Tarakan	Expansion	A(O)	- No major difficulties in implementation (Note: configuration on apron to be rearranged)
- Palu	Expansion	A(O)	- No major difficulties in implementation - Not infringing the present transitional surface.
- Mataram	Expansion	A(O)	- No major difficulties in implementation - Not infringing the present transitional surface.
- Bima	Expansion	A(O)	- No major difficulties in implementation (Note: configuration on apron to be rearranged)
- Jayapura	Expansion	A(O)	- No major difficulties in implementation - Not infringing the present transitional surface.
- Wamena	Expansion	$A(X_2)$	- Existing apron located within the graded area in runway strip.

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (9)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Merauke	Expansion	A(O)	- No major difficulties in implementation
A.4 Apron 2) Location			
- Tg. Pinang	Relocation	A(X_3)	- Complete relocation of terminal area required
- Pekanbaru	Relocation	A(X_3)	- Complete relocation of terminal area required
- Palembang	Relocation	A(X_3)	- Complete relocation of terminal area required
- Pontianak	Relocation	A(X_3)	- Complete relocation of terminal area required
- Ternate	Relocation	A(X_3)	- Complete relocation of terminal area required
- Bima	Relocation	A(X_3)	- Complete relocation of terminal area required
- Wamena	Relocation	A(X_3)	- Complete relocation of terminal area required
A.4 Apron 5) Pavement Deteriora-tion			
- Gunung Sitoli	Overlay	A(O)	- No major difficulties in implementation
- Palembang	Overlay	A(X_1)	- Scheduled to be imple-mented by DIP 1990/91
- Ambon	Overlay	A(O)	- No major difficulties in implementation
- Mataram	Overlay	A(O)	- No major difficulties in implementation

TABLE 6.2.1 Assessment of Urgent Rehabilitation Work for Civil Facilities (10)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Bima	Overlay	A(O)	- No major difficulties in implementation
- Wamena	Overlay	$A(X_1)$	- Scheduled to be imple-mented by DIP 1990/91
- Kaimana	Overlay	$A(X_1)$	- Scheduled to be imple-mented by DIP 1990/91
- Merauke	Overlay	A(O)	- No major difficulties in implementation

6.3 Building Facilities and Ancillary Equipment

6.3.1 Building Facilities

The existing buildings such as passenger terminals, control tower, administration and operation buildings are qualitatively or quantitatively evaluated for each of the 20 airports in accordance with the established evaluation criteria. The evaluation results are indicated in Appendix 6.3.1 and summarized in TABLE 6.1.1.

It is noted that:

1) At Gunung Sitoli and Sampit airports, evaluation is made for the new passenger terminal buildings which are already completed.

2) At Tarakan airport, evaluation is made of the existing passenger terminal building because the new building is not yet completed.

3) As few airports have complete data required for the evaluation of eye level in control tower, practical evaluation is made by visual inspection on visibility of runway surface on site.

4) Since there are no control towers at Gunung Sitoli, Sampit, Tana Toraja and Kaimana airports, no evaluations are made for these airports.

5) At Bima airport where construction of a new control tower is underway and the existing one is temporary, no evaluations are made.

6) At Wamena airport, evaluation is made of a newly completed control tower.

7) At Gunung Sitoli, where the existing passenger terminal building is scheduled to be utilized as an administration building, the total floor area, structure and finishing of the existing passenger building are evaluated as those of the administration building.

8) Since the control towers at Pekanbaru, Palembang, Ambon, Mataram and Jayapura airports are structurally integrated with the administration buildings, evaluation for the structural performance of these control towers is, therefore, included in the structural evaluation for the administration buildings.

The items evaluated "A" are then assessed in terms of practicability or effectiveness of implementation of rehabilitation work as indicated in TABLE 6.3.1.

TABLE 6.3.1 Assessment of Urgent Rehabilitation Work for Building Facilities (1)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
B.1 Passenger Terminal Building			
1) Function			
- Palembang	Expansion	A(X_2)	- Twice the present area required in 1995 - Existing bldg. too deteriorated for internal renovation - Construction of new bldg. in accordance with the master plan recommended
- Semarang	Expansion	A(O)	- To be expanded keeping pace with the apron expansion recently completed - Existing bldg. capable of internal renovation.

TABLE 6.3.1 Assessment of Urgent Rehabilitation Work for Building Facilities (2)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Pontianak	Expansion of check-in lobby and dom. departure lounge	A(O)	- Minor expansion for temporary use until the construction of new bldg. in accordance with the master plan
- Tarakan	Expansion	A(X_1)	- New pax. bldg. scheduled to be constructed by DIP 1990/91
- Ternate	Expansion	A(O)	- No major difficulties in implementation - Existing bldg. capable of internal renovation
- Bima	Expansion	A(X_1)	- Expansion of 360 sq.m scheduled to be implemented by DIP 1990/91
- Merauke	Expansion	A(O)	- Twice the present area required in 1995, but existing bldg. capable of renovation because of simple structure.
B.1 Pax. Bldg.			
2) Structure			
- Palembang	Renovation of wooden structure	A(X_2)	- Too much deterioration by leaks and termites and too complicated to renovate - Restructuring not cost effective
- Jayapura	Renovation of wooden and R.C. structures	A(X_2)	- Too much deterioration and too complicated to renovate - Restructuring not cost effective

TABLE 6.3.1 Assessment of Urgent Rehabilitation Work for Building Facilities (3)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Merauke	Renovation of wooden structure	A(O)	- Simple structure for renovation
B.1 Pax. Bldg.			
3) Finishing			
- Tg. Pinang	Renovation of clad and flat roofs	A(X_1)	- Scheduled to be imple-mented by DIP 1990/91
- Pekanbaru	Renovation of water proofing to roof	A(O)	- No major difficulties in implementation
- Palembang	- Renovation of roof and con-cealed eaves gutter of Dom. Dep. bldg.	A(X_2)	- Too much deterioration to renovate
	- Renovation of water proofing to roof of Dom. Arr. bldg.	A(O)	- No major difficulties in implementation
- Palangkaraya	Renovation where floor settlement	A(X_1)	- Scheduled to be imple-mented by DIP 1990/91
- Ambon	Renovation of water proofing to roof	A(X_1)	- Renovation underway together with expansion work
- Bima	Renovation of deformed ceiling	A(X_1)	- Scheduled to be imple-mented by DIP 1990/91 (420 sq.m)
- Jayapura	Renovation of clad roof, roof drains and guttering	A(X_2)	- Too much deterioration to renovate.

TABLE 6.3.1 Assessment of Urgent Rehabilitation Work for Building Facilities (4)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Merauke B.2 Control Tower	Renovation of clad roof, roof drains and guttering	A(O)	- No major difficulties because of simple structure
2) Structure - Merauke B.2 Control Tower	Setting vertical of leaning tower	A(X_3)	- Impossible - Construction of new tower recommended
3) Finishing - Pekanbaru B.3 Administration and Operation Building	Widening of catwalk	A(X_3)	- Difficult to widen
1) Function - Pekanbaru	Expansion	A(X_1)	- New bldg. completed in 1989
- Palembang	Expansion	A(X_2)	- Too much deterioration and too complicated for internal renovation - New building accordance with the master plan recommended
- Sampit	Expansion	A(X_2)	- Existing bldg. of 48 sq.m in temporary use, not worthy of expansion

TABLE 6.3.1 Assessment of Urgent Rehabilitation Work for Building Facilities (5)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
- Ternate	Expansion	A(X_2)	- Twice the present floor area required in 1995 - New building to be considered
B.3 Administration and Operation Building			
3) Finishing			
- Pekanbaru	Renovation of flat roof and roof drains caused by inadequate expansion	A(X_1)	- New bldg. completed in 1989
- Palembang	Renovation of flat roof and roof drains caused by inadequate expansion	A(X_2)	- Renovation of finishings require drastic renovation of structures
- Sampit	Renovation of clad roof	A(X_2)	- Existing temporary bldg. bad deterioration
- Ambon	Renovation of roofing and construction joints	A(X_2)	- Renovation of finishings require drastic renovation of structures
- Jayapura	Renovation of flat and clad roofs and concealed eaves gutter	A(X_2)	- Renovation of finishings require drastic renovation of structures
- Merauke	Renovation of clad roof	A(0)	- No major difficulties because of simple structure

6.3.2 Ancillary Equipment in Buildings

The performance of the existing building ancillary equipment such as X-ray, baggage screening units, baggage claim devices, air conditioning, sanitary facilities etc., are qualitatively evaluated at first and classified into one of three degrees of urgency of replacement/repair as summarized in TABLE 6.3.2.

The numbers of existing equipment are then compared to the present requirements which can be estimated based on the requirement criteria referred to in Chapter 5, and classified into one of A, B, or C in terms of urgency of renewal/addition of equipment.

It is noted that:

1) For X-ray baggage screening units, walk-through metal detectors, and baggage claim devices, quantitative evaluations in terms of sufficiency of equipment are made only for the airports where its provision is required.

2) The quantitative evaluation of air conditioning in control towers is made only for airports where control towers are located at present so that Gunung Sitoli, Sampit, Tana Toraja, Kaimana and Bima airports are excluded from the evaluation.

3) The quantitative evaluation of air conditioning in departure lounges at Gunung Sitoli and Sampit airports, where new passenger buildings are constructed but not yet operating, is made for the new buildings. The same is made for existing buildings at Tarakan and Bima airports where a new building or planned expansion of departure lounge are already for next years budget but not yet designed.

The evaluation results are summarized in TABLE 6.1.1 and the details are shown in Appendix 6.3.2.

The items evaluated "A" (i.e., renewal or addition of equipment urgently required) are then assessed in terms of practicability or effectiveness of implementation of such renewal as indicated in TABLE 6.3.3.

TABLE 6.3.2 Qualitative Evaluation for Building Ancillary Equipment

Item		Qualitative Evaluation	1.Tanjung Pinang	2.Pekan-baru	3.Gunung Sitoli	4.Palem-bang	5.Sema-rang	6.Ponti-anak	7.Sampit	8.Palang-karaya	9.Tarakan	10.Tana Toraja	11.Palu	12.Geron-talo	13.Ambon	14.Terna-te	15.Mata-ram	16.Bima	17.Jaya-pura	18.Wame-na	19.Kaima-na	20.Merau-ke
X-Ray Baggage Screening Unit		A	1	2	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1
		B	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		C	0	0	0	2	1	2	0	0	0	0	1	0	2	0	0	0	1	0	0	0
Walk Through Metal Detector		A	1	2	0	3	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1
		B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		C	0	0	0	1	1	2	0	0	0	0	1	0	2	0	0	0	1	0	0	0
Baggage Claim Device		A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		C	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Air Conditioning		A	0	0	0	3	2	0	0	0	0	0	0	0	2	0	3	0	2	2	0	2
		B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		C	5	12	0	15	10	11	0	5	13	0	15	5	16	3	5	2	10	10	0	3
Toilet	Passenger Terminal Building	A							X													
		B				X				X								X				X
		C	X	X	X		X	X			X	X	X	X	X	X	X		X	X	X	
	Administration Building	A			X											X						
		B							NA	X					X		X	X	NA	NA	NA	NA
		C	X	X		X	X	X			X	X	X	X								
Faucet	Passenger Terminal Building	A																				
		B	X			X			X		X							X	X		NA	X
		C		X	X		X	X		X		X	X	X	X	X	X			X		
	Administration Building	A			X																	
		B	X	X		X			NA						X		X	X	NA	NA	NA	NA
		C					X	X		X	X	X	X	X		X						

Note : 1 Figure in the table: The number of existing equipment
2. NA : Not Available
3. X : Position of the evaluation of equipment

TABLE 6.3.3 Assessment of Urgent Rehabilitation Work for Ancillary Equipment in Buildings (1)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
B.4 and 5 X-ray Baggage Screening Units and Walkthrough Metal Detec-tors			
- Tg. Pinang	Renewal	A(O)	- No difficulties in installation
- Pekanbaru	Renewal	A(O)	- No difficulties in installation
- Palangkaraya	Renewal	A(O)	- No difficulties in installation
- Tarakan	Renewal	A(O)	- No difficulties in installation
- Gorontalo	Renewal	A(O)	- No difficulties in installation
- Ternate	New Provision	A(O)	- No difficulties in installation
- Mataram	Renewal	A(O)	- No difficulties in installation
- Bima	New Provision	A(O)	- No difficulties in installation
- Wamena	New Provision	A(O)	- No difficulties in installation
- Merauke	Renewal	A(O)	- No difficulties in installation

TABLE 6.3.3 Assessment of Urgent Rehabilitation Work for Ancillary Equipment in Buildings (2)

Evaluation Item/ Airport	Required Rehabilitation Work	Assess-ment	Reason for the Assessment
B.6 Baggage Claim Devices			
- Palembang	New Provision	A(X_2)	- Area for installation available, but if once installed, difficult to replace - Postponement until the construction of new pax. bldg. recommended
- Jayapura	New Provision	A(X_3)	- Area for installation not available
B.7 Air Conditioning			
1) Control Tower			
- Ambon	Addition	A(O)	- No difficulties in installation
- Ternate	Addition	A(O)	- No difficulties in installation
- Wamena	New provision	A(O)	- No difficulties in installation
B.7 Air Conditioning			
1) Departure Lounge			
- 15 airports other than Pekanbaru, Palembang, Semarang, Palangkaraya and Palu	New Provision or addition	A(O)	- No difficulties in installation

6.4 Airport Maintenance Equipment

The performance of the existing airport maintenance equipment such as mowers, sweepers, tractors, dump trucks etc., at each of the 20 airports are first evaluated qualitatively based on the evaluation criteria in Section 3.4 and classified into one of three degrees in terms of the necessity of replacement/repair. TABLE 6.4.1 summarizes the numbers of respective maintenance equipment by evaluation rankings of A, B and C at each airport.

The existing airport maintenance equipment is then evaluated in terms of sufficiency of equipment at each airport by equipment type, comparing the numbers of equipment judged "C" (i.e., normal condition) with the numbers required at present. The sufficiency of respective equipment at each airport is classified into one of A, B or C which expresses the degree of urgency for renewal or addition of equipment as indicated in Appendix 6.4.1 and summarized in TABLE 6.1.2.

With regard to the assessment for practicability or necessity of renewal/addition of equipment, no renewals/additions are assessed impracticable or unnecessary other than the provision of a sweeper at Palu airport where strong winds do not necessitate its provision.

TABLE 6.4.1 Qualitative Evaluation for Airport Maintenance Equipment

Item	Evaluation Rank	1.Tanjung Pinang	2.Pekan-baru	3.Gunung Sitoli	4.Palem-bang	5.Sema-rang	6.Ponti-anak	7.Sampit	8.Palang-karaya	9.Tarakan	10.Tana Toraja	11.Palu	12.Goron-talo	13.Ambon	14.Terna-te	15.Mata-ram	16.Bima	17.Jaya-pura	18.Wame-na	19.Kaima-na	20.Merau-ke
Mower	A	0	0	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	0
	B	0	1	0	1	0	0	0	0	2	0	0	0	1	1	1	0	0	0	0	1
	C	1	3	0	2	1	2	0	3	1	0	2	1	0	0	3	1	0	1	0	0
Tractor	A	0	1	0	0	0	0	0	0	2	0	0	3	0	0	0	0	0	1	0	2
	B	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	C	2	3	0	3	1	5	0	4	2	0	3	1	1	4	5	1	2	1	0	3
Handy Mower	A	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0
	B	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	5	2	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Sweeper	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Dump Truck	A	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	C	1	1	0	2	1	1	0	1	1	0	0	1	1	1	1	1	1	0	0	0
Truck	A	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trailer	A	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	1	0	0	0	0	1	0	1	2	0	0	0	0	1	0	0	0	0	0	1
Roller	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	1	2	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0

Note : Figures in the table indicate the numbers of existing equipment

CHAPTER 7. IDENTIFICATION OF DETAILED SITE SURVEY ITEMS

CHAPTER 7. IDENTIFICATION OF DETAILED SITE SURVEY ITEMS

7.1 General

The facilities of which problems were identified in Chapter 2 and judged in Chapter 6 that urgent rehabilitation works are required are to be surveyed in detail for the preparation of preliminary design of such rehabilitation works. The required detailed site surveys for the 20 airports including topographic surveys, soil investigations etc., are discussed in this Chapter.

7.2 Detailed Site Survey Items of the 20 Airports

To correspond with the required rehabilitation works of which implementation is considered practicable as assessed in TABLE 6.2.1 for civil facilities and in TABLE 6.3.1 for building facilities, necessary site survey items are identified and shown in TABLES 7.2.1 and 7.2.2 for civil and building facilities respectively.

The details of the topographic survey areas, the points of soil investigations and building survey area are indicated in Appendix 7.2.1.

TABLE 7.2.1 Detailed Site Survey Items for Civil Facilities

Airport	Runway							Runway Strip					Taxiway						Apron					
	Rehabilitation Works			Site Survey				Rehabilitation Works	Site Survey				Rehabilitation Works	Site Survey					Rehabilitation Works		Site Survey			
				Topo Survey		Soil Inv.			Topo Survey		Soil Inv.			Topo Survey		Soil Inv.					Topo Survey		Soil Inv.	
	Extension	Widening	Overlay	Profile Cross Section	Plane Table	Core Sampling	CBR Test	Grading	Profile Cross Section	Plane Table	Core Sampling	CBR Test	Widening	Overlay	Profile Cross Section	Plane Table	Core Sampling	CBR Test	Expansion	Overlay	Profile Cross Section	Plan Table	Core Sampling	CBR Test
1. Tanjung Pinang	0	-	-	0	0	-	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Pekanbaru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Gunung Sitoli	-	-	0	0	-	0	0	0	0	-	-	-	-	0	0	-	0	0	-	0	0	-	0	0
4. Palembang	-	-	0	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Semarang	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Pontianak	0	-	-	0	0	-	0	-	-	-	-	-	-	0	0	-	0	0	-	-	-	-	-	-
7. Sampit	-	-	0	0	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8. Palangkaraya	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	0	-	0	-	-	0
9. Tarakan	-	-	0	0	-	0	0	0	0	-	-	-	-	-	-	-	-	-	0	-	0	-	-	0
10. Tana Toraja	-	-	0	0	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11. Palu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	-	-	0
12. Gorontalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13. Ambon	-	-	0	0	-	0	0	-	-	-	-	-	-	0	0	-	0	0	-	0	0	-	0	0
14. Ternate	0	-	-	0	0	-	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15. Mataram	0	-	-	0	0	-	0	-	-	-	-	-	-	-	-	-	-	-	0	0	0	-	0	0
16. Bima	0	-	-	0	0	-	0	-	-	-	-	-	-	0	0	-	0	0	0	0	0	-	0	0
17. Jayapura	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	0	-	0	-	-	0
18. Wamena	-	0	-	0	-	0	0	-	-	-	-	-	0	-	0	-	0	0	-	-	-	-	-	-
19. Kaimana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20. Merauke	-	-	0	0	-	0	0	0	0	-	-	-	-	0	0	-	0	0	0	0	0	-	0	0

TABLE 7.2.2 Detailed Site Survey Items for Buildings

Airport/Building Name	Rehabilitation Works		Site Survey	
	Expansion	Renovation or Repair	Survey-1 *1	Survey-2 *2
1. Tanjung Pinang				
- Pax T. Bldg				
- C.T				
- Adm./OPS Bldg.				
2. Pekanbaru				
- Pax T. Bldg		0		0
- C.T/Adm & Ops Bldg.				
3. Gunung Sitoli				
- New Pax T. Bldg				
- Adm Bldg.(Old pax).				
4. Palembang				
- Dom Dep.Bldg				
Dom.Arr/Intl.Bldg		0		0
C.T/Adm & Ops Bldg.				
5. Semarang				
- Pax T.Bldg.	0		0	
- C.Tower				
- Adm.Bldg (1)				
- Adm.Bldg (2)				
6. Pontianak				
- Dom Dep.Bldg	0		0	
- Dom.Arr/Intl.Bldg				
- C.T/Adm & Ops Bldg.				
- Adm.				
7. Sampit				
- New Pax.T. Bldg.				
- Adm.Bldg.				
8. Palangkaraya				
- Pax T.Bldg.				
- C.Tower				
- Adm.&Ops.Bldg.				
9. Tarakan				
- Pax T.Bldg.				
- C.Tower				
- Adm.&Ops.Bldg.				
10. Tana Toraja				
- Pax T.Bldg.				
- Adm.&Ops.Bldg.				
11. Palu				
- Pax T.Bldg.				
- C.Tower				
- Adm.&Ops.Bldg.				
12. Gorontalo				
- Pax T.Bldg.				
- C.Tower				
- Adm.&Ops.Bldg.				
13. Ambor				
- Pax T.Bldg.				
- C.T/Adm.Ops.Bldg.				
14. Ternate				
- Pax T.Bldg.	0		0	
- C.Tower				
- Adm.&Ops.Bldg.				
15. Mataram				
- Pax T.Bldg.				
- C.T/Adm.Ops.Bldg.				
- Adm.Bldg.				
16. Bima				
- Pax T.Bldg.				
- Adm.Bldg.				
17. Jayapura				
- Pax T.Bldg.				
- C.T/Adm.Ops.Bldg.				
18. Wamena				
- Pax T.Bldg.				
- C.Tower				
- Adm.&Ops.Bldg.				
19. Kaimana				
- Pax T.Bldg.				
- C.T/Adm.Ops.Bldg.				
20. Merauke				
- Pax T.Bldg.	0	0	0	0
- Adm.Ops.Bldg.	-	0		0
- C.Tower				

Note :
Survey - 1
- Building Survey (Preparation of Structural Plan Cross Section and Detail of Structure
- Topographic Survey(Plane Table)
- Soil Investigation (Boring)

Survey - 2
- Survey of damaged area

CHAPTER 8. SELECTION OF 10 AIRPORTS FOR REHABILITATION AND MAINTENANCE PLANNING

CHAPTER 8. SELECTION OF 10 AIRPORTS FOR REHABILITATION AND MAINTENANCE PLANNING

8.1 Selection Method

Ten airports are selected from the 20 airports for the preparation of succeeding airport rehabilitation and maintenance plans.

Selection is made by consideration of the following aspects;

1) The airports to be selected should contain the requirement for urgent rehabilitation works to ensure aviation safety and unrestricted air transportation.

2) Such rehabilitation works should be practicable in implementation and be effective for the objective of the works.

3) The airports to be selected should play an important role for national economic development, national safety or national tourism development, or

4) The airports to be selected should be typical of Indonesian airports. In this sense, the selected 10 airports should cover all airport classes from Class I to Class V based on DGAC categorization, should cover all regions from Sumatera to Irian Jaya, and should also cover all the aircraft types operated at present.

The selection method of 10 airports is explained hereunder in line with the flowchart shown in FIGURE 8.1.1.

1) The existing facilities and equipment of the 20 airports are quantitatively or qualitatively evaluated in Chapter 6 based on the established evaluation criteria in terms of urgency of rehabilitation.

2) The facilities and equipment which are judged "A" (i.e., rehabilitation urgently required) are also evaluated in Chapter 6 in terms of practicability and effectiveness of implementation of the rehabilitation work (Refer to TABLES 6.1.1 and 6.1.2).

3) Facilities and equipment which have direct connection with aviation safety or air traffic demands are selected as the major elements for selection.
The evaluation items of each facility or equipment are classified into the following, and the items i) and ii) below are selected.

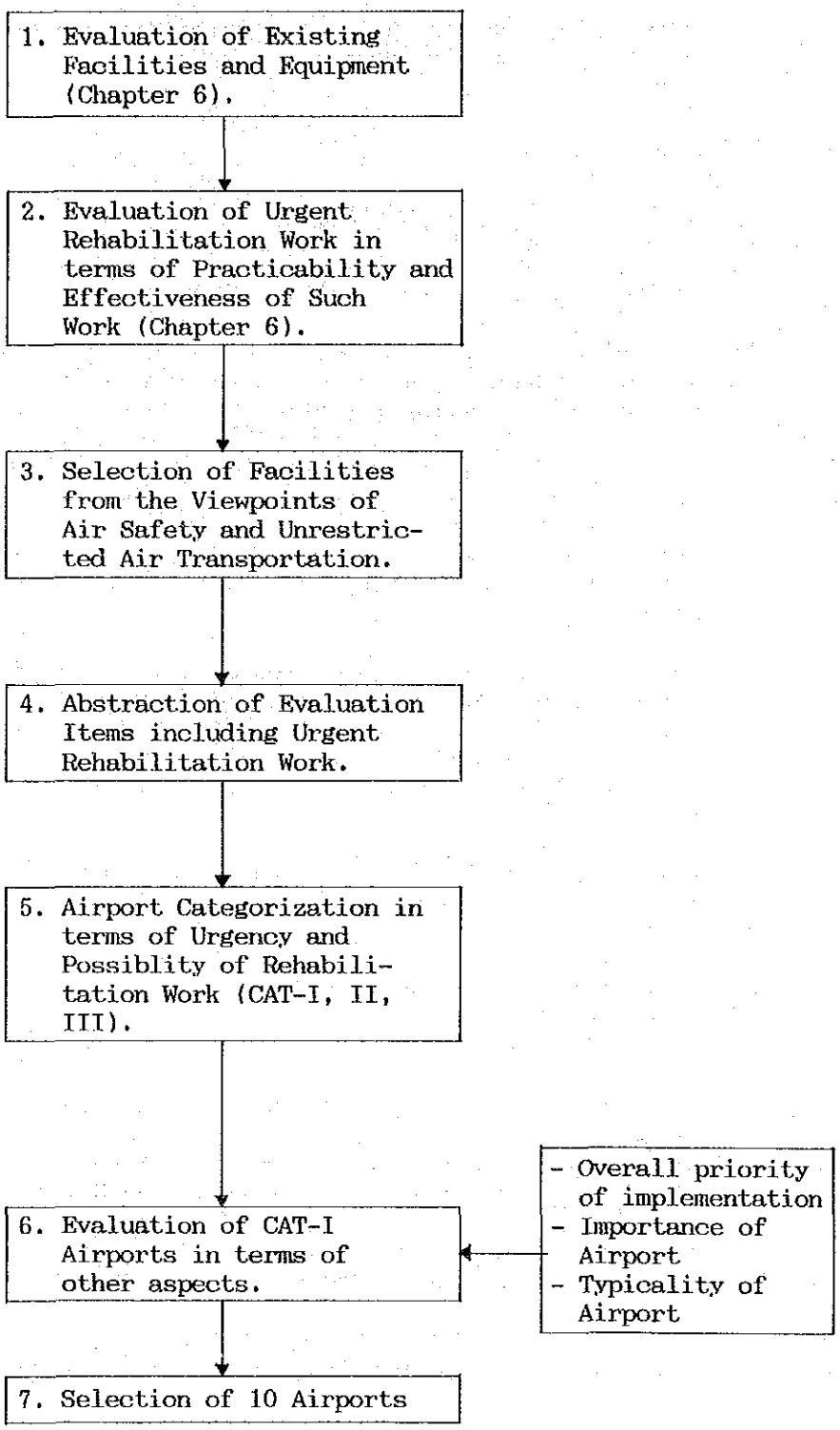

FIGURE 8.1.1 Flowchart for Selection of 10 Airports

i) Problem items of facilities which may hinder aviation safety

- Runway : Width, longitudinal slope, transverse slope, pavement deterioration.
- Runway Strip : Width, width of graded area, transverse slope.
- Taxiway : Width, longitudinal slope, transverse slope, pavement deterioration.
- Apron : Location, slope, pavement deterioration.
- Contol Tower : Visibility, structure.
- Administration and Operation building : Function, structure.

ii) Problem items of facilities which may restrain air traffic demands

- Runway : Length, pavement strength.
- Taxiway : Pavement strength.
- Apron : Number of aircraft stands, pavement strength.
- Passenger Terminal Building : Function

iii) Problem items other than the above

- Pax. building : Structure, finishing
- Control Tower : Finishing
- Administration and Ops. building : Finishing
- Ancillary equipment in buildings.
- Airport maintenance equipment

4) From the above items i) and ii), the evaluation items including urgent rehabilitation work in any of the 20 airports are abstracted as one step of the selection procedures. If there are no "A" items in any of the 20 airports for certain evaluation, the item is eliminated

5) Based on the abovementioned process, the 20 airports are classified into one of the following 3 categories;

CAT-I : Airports which require urgent rehabilitation work to ensure aviation safety and unrestricted air transportation without much difficulty in implementation. (In practice, airport which contain more than one A (O) are assigned to this category)

CAT-II : Airports which require urgent rehabilitation work but where implementation is impraticable or with much difficulty. (In practice, airport which contains only A (x) are assigned to this category)

CAT-III : Airports which do not require urgent rehabilitation work to ensure aviation safety and unrestricted air transportation. (Airport which do not contain A)

The airports classified into CAT-II or CAT-III are eliminated from further selection process.

6) The airports classified into CAT-I are then relatively evaluated by the number of practicable rehabilitation works which implicate overall priority of implementation of the airport rehabilitation.

The CAT-I airports are also evaluated from the viewpoints of the contribution to national economic development or national security. In this study, three indices of gateway airport to region, base airport to tourism development and border airport are used to express the importance of each airport.

The 10 airports shall be selected so as to cover all airport classes, all regions and all aircraft types, so that the rehabilitation and maintenance plans for these airports can be extended to other airports in Indonesia.

7) As a result of the comprehensive evaluation explained above, 10 airports are selected for the succeeding airport rehabilitation and maintenance planning.

8.2 Selection of 10 Airports

Based on the selection method described in previous section 8.1, the following ten airports are selected from the 20 airports as shown in TABLE 8.2.1:

1. Gunung Sitoli
2. Palembang
3. Semarang
4. Pontianak
5. Sampit
6. Ambon
7. Ternate
8. Mataram
9. Bima
10. Merauke

The main reasons for the selection of these 10 airports are summarized in TABLE 8.2.2.

TABLE 8.2.2 Reasons for the Selection

Airport	Priority of Implementation	Importance of Airport	Typicality of Airport
1. Gunung Sitoli	o		
2. Palembang		o	
3. Semarang			o (As Class II)
4. Pontianak	o	o	
5. Sampit			o (As Class V)
6. Ambon	o	o	
7. Ternate	o		
8. Mataram	o	o	
9. Bima	o		
10. Merauke	o		

(Note: There is information that a new airport will be constructed at Gunung Sitoli for tourism development at Nias Island. If this plan is implemented, the rehabilitation work for the existing airport may not be economically justified. However due to the uncertainty of the implementation schedule of the new airport construction and the urgency of pavement rehabilitation for this airport, Gunung Sitoli airport was selected as one of the 10 airports).

TABLE 8.2.1 Selection of 10 Airports for Rehabilitation and Maintenance Plans

Facility	Evaluation Item	1.Tanjung Pinang	2.Pekan-baru	3.Gunung Sitoli	4.Palem-bang	5.Semar-ang	6.Ponti-anak	7.Sampit	8.Palang-karaya	9.Tarakan	10.Tana Toraja	11.Palu	12.Goron-talo	13.Ambon	14.Ter-nate	15.Mata-ram	16.Bima	17.Jayap-ura	18.Wamena	19.Kai-mana	20.Mera-uke
A.1.Runway	1)Length	A (O)	C	C	C	A (x2)	A (O)	C	C	C	C	C	C	C	A (O)	A (O)	A (O)	C	A (X2)	C	C
	2)Width	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A (O)	C	C
	3)Longitudinal Slope	C	C	-	C	-	-	-	-	-	A (O)	C	-	-	-	-	-	-	C	-	-
	6)Pavement Deterioration	C	B	A (O)	A (O)	C	C	A (O)	C	A (O)	B	C	C	A (O)	B	C	C	B	B	A (x1)	A (O)
A.2.Runway Strip	1)Width	A (x3)	A (x3)	A (O)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (X3)	A (O)
	2)Width of Graded Area	C	A (x3)	C	A (X3)	C	C	A (O)	A (O)	A (O)	A (O)	C	C	C	A (O)	C	C	A (O)	A (X3)	C	A (O)
	3)Transverse Slope	A (O)	-	C	-	C	C	-	-	C	C	C	A (X2)	-	A (O)	-	C	-	C	C	-
A.3.Taxiway	1)Width	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A (O)	C	C
	5)Pavement Deterioration	C	B	A (O)	B	C	A (O)	C	C	B	B	C	C	A (O)	B	C	A (O)	B	A (X1)	A (x1)	A (O)
A.4.Apron	1)Number of Aircraft Stands	C	C	C	C	C	C	C	A (O)	A (O)	C	A (O)	C	C	C	A (O)	A (O)	A (O)	A (X2)	C	A (O)
	2)Location	A (X3)	A (X3)	C	A (X3)	C	A (X3)	B	B	B	B	B	B	B	A (X3)	B	A (X3)	B	A (X3)	B	C
	5)Pavement Deterioration	B	B	A (O)	A (X1)	C	B	C	C	B	B	C	C	A (O)	B	A (O)	A (O)	C	A (X1)	A (x1)	A (O)
B.1.Passenger Terminal Building	1)Function	C	C	C	A (X3)	A (O)	A (O)	B	B	A (X1)	C	C	C	C	A (O)	C	A (X1)	C	B	C	A (O)
B.2.Control Tower	2)Structure	C	B	-	B	C	C	-	C	C	-	C	C	C	C	C	-	B	C	-	A (X3)
B.3 Adm.&Ops. Building	1) Function	C	A (X1)	C	A (X2)	C	C	A (X2)	B	C	C	B	B	B	A (X2)	C	C	B	C	B	C
Airport Category(CAT)		I	II	I	I	I	I	I	I	I	I	I	II	I	I	I	I	I	I	II	I
Overall Priority if Implementation				O			O							O	O	O	O				O
Importance of Airport	Gateway to Region				O	O	O		O			O		O		O		O			
	Tourism Development										O			O		O			O		
	Border Airport	O			O		O			O				O							O
Airport Classification	Class I Airport				O 526,000		O 359,000														
	II					O 524,000			O 133,000			O 143,000		O 150,000				O 144,000			
	III	O 69,000								O 82,000					O 57,000	O 187,000	O 49,000		O 49,000		O 28,000
	IV			O 9,000							O 5,000										
	V							O 69,000													
Classification by Regions	Sumatra	O		O	O																
	Jawa & NT					O										O	O				
	Kalimantan						O	O	O	O											
	Sulawesi & Maluku										O	O		O	O						
	Irian Jaya																	O	O		O
Classification by Operated Aircraft	DC9				O													O			
	F28					O	O		O			O		O		O					O
	F27/HS748	O								O					O		O		O		
	CS2/DH6			O				O			O										
Selected 10 Airports				O	O	O	O	O						O	O	O	O				O

CHAPTER 9. SELECTION OF FACILITIES AND EQUIPMENT

CHAPTER 9. SELECTION OF FACILITIES AND EQUIPMENT

9.1 General

The ten airports selected in Chapter 8 do not always require the rehabilitation for every facility and item of equipment. These airports include facilities where rehabilitation is not considered urgent or facilities for which implementation of the rehabilitation works is impracticable.

This chapter will determine facilities and maintenance equipment for each of the selected 10 airports. Maintenance and rehabilitation plans shall be prepared for each comprising: preliminary design; cost estimates; and the schedule for implementation.

9.2 Selection Criteria

Based on the nature of rehabilitation required the following criteria is used to select the facilities and equipment to be rehabilitated.

1) The facilities and equipment to be selected shall require urgent rehabilitation.

2) Rehabilitation works which require much investment will not conflict with the existing airport master plans.

3) The required rehabilitation works are not part of other projects.

4) The rehabilitation works will not require the review of existing airport master plan nor new master plan study.

5) The rehabilitation works can be implemented without serious difficulty.

9.3 Selection of Facilities and Equipment for the 10 Airports

Actually, the same criteria as discussed above was applied in Chapter 6 for the evaluation of each facility and item of equipment.

All the facilities and equipment to which A(o) rating was given in TABLE 6.1.1 are, therefore, the subject of maintenance and rehabilitation planning in principle.

Additionally it must be rated that Semarang airport has insufficient runway length for F28 aircraft and require a runway extension to 1,850m for releasing the weight restriction imposed at present. However implementation of the runway extension requires circumspection since it does not completely solve the problem due to obstructive hills located to the south. Furthermore its cost-effectiveness will be discussed by

reviewing the existing master plan which proposes a new runway.

Consequently the application of selection criteria to the runway extension at Semarang airport removes it from the projects for rehabilitation planning.

In addition, the detailed site surveys including topographic survey, soil investigation and building survey which were performed for the selected 10 airports gave and precise information to be considered in this selection stage as described below.

1) Longitudinal slope of runways at Palembang and Ambon

The runway profile leveling at Palembang airport revealed that the distance between longitudinal slope changes does not comply with the ICAO recommendation for the aircraft operating at present. Also the profile leveling at Ambon airport revealed the slope exceeding that recommended by ICAO.

The works to solve the above deficiencies at these two airports are selected for preparation of the rehabilitation plan as a result of applying the selection criteria.

2) Pavement Strength at Pontianak, Sampit, Mataram and Bima

The soil investigations carried out at these airports revealed that the following pavements do not have enough strength to bear the load of the largest aircraft presently serving the airport.

i) Taxiway pavement in Pontianak airport (Old taxiway and apron)
ii) Runway pavement in Sampit airport
iii) Apron pavement in Mataram airport
iv) Taxiway and apron pavements in Bima airport

As these facilities were originally evaluated in Chapter 6 to be A(o) for their deteriorated surface conditions, consideration to increase the pavement strength will be made in the planning stage.

3) Width of Graded Area in Runway Strip at Sampit

The width of graded area in runway strip at Sampit airport complies with ICAO recommendation according to the topographic survey result. Its widening is therefore not required and will be excluded from the rehabilitation plans.

4) Runway Strip at Bima

The runway strip at Bima airport, being located within 1 m above mean sea level, suffers from flooding due to high tide. Reviewing against the selection criteria, the grading to overcome the problem will be

added to the rehabilitation plans.

5) Structures in Passenger Terminal at Merauke

Building survey for this airport clarified that the wooden structure of passenger terminal building is still stable and does not require urgent rehabilitation. It will, therefore, be excluded from the subject of planning.

6) Finishings in Passenger Terminal at Palembang

Palembang airport has deficient waterproofing of the flat roof over the existing domestic arrival/international passenger building. The rehabilitation for this building will be included in the planning.

The civil and building facilities with the defects shown in TABLE 9.3.1 are finally selected for the preparation of rehabilitation plans.

TABLE 9.3.2 indicates the airport maintenance equipment which are required in the maintenance plans for the 10 selected airports.

TABLE 9.3.1 Civil and Building Facilities Selected for Rehabilitation Plans

Facility	Evaluation Item	1.Gunung Sitoli	2.Palembang	3.Semarang	4.Pontianak	5.Sampit	6.Ambon	7.Ternate	8.Mataram	9.Bima	10.Merauke
A.1.Runway	1)Length	-	-	-	O	-	-	O	O	O	-
	2)Longitudinal Slope	-	O	-	-	-	O	-	-	-	-
	3)Pavement Strength	-	-	-	-	O	-	-	-	-	-
	4)Pavement Deterioration	O	O	-	-	O	O	-	-	-	O
A.2.Runway Strip	1)Width	O	-	-	-	-	-	-	-	-	O
	2)Width of Graded Area	-	-	-	-	-	-	O	-	-	O
	3)Transverse Slope	-	-	-	-	-	-	O	-	O	-
A.3.Taxiway	1)Pavement Strength	-	-	-	O	-	-	-	-	O	-
	2)Pavement Deterioration	O	-	-	O	-	O	-	-	O	O
A.4.Apron	1)Number of Aircraft Stands	-	-	-	-	-	-	-	O	O	O
	2)Pavement Strength	-	-	-	-	-	-	-	O	O	-
	3)Pavement Deterioration	O	-	-	-	-	O	-	O	O	O
B.1.Passenger Terminal Building	1)Function	-	-	O	O	-	-	O	-	-	O
	2)Finishing	-	O	-	-	-	-	-	-	-	O
B.2.Administration and Operation Building	1)Finishing	-	-	-	-	-	-	-	-	-	O
B.3.X-Ray Baggage Screening Unit		-	-	-	-	-	-	O	O	O	O
B.4.Walk Through Metal Detector		-	-	-	-	-	-	O	O	O	O
B.5.Air Conditioning	1)Control Tower	-	-	-	-	-	O	O	-	-	-
	2)Departure Lounge	O	-	-	O	O	-	O	O	O	O

TABLE 9.3.2 Airport Maintenance Equipment Selected for Maintenance Plans

Airport	Mower	Tractor	Handy Mower	Sweeper	Dump Truck
1. Gunung Sitoli	○	○	-	-	○
2. Palembang	-	-	○	-	-
3. Semarang	○	○	○	○	-
4. Pontianak	-	-	○	○	-
5. Sampit	○	○	○	-	○
6. Ambon	○	○	○	-	-
7. Ternate	○	-	○	-	-
8. Mataram	-	-	-	○	-
9. Bima	○	○	○	-	-
10. Merauke	○	-	○	○	○

CHAPTER 10. PRELIMINARY DESIGN FOR AIRPORT MAINTENANCE EQUIPMENT

CHAPTER 10. PRELIMINARY DESIGN FOR AIRPORT MAINTENANCE EQUIPMENT

10.1 General

"Airport maintenance plans" used in this Report means the planning of renewal of and also additions to the airport maintenance equipment. For the airport maintenance equipment selected in Table 9.3.2 of Chapter 9, preliminary design including the determination of number to be provided, preparation of outline specifications, spare parts plan etc., is carried out for the equipment described in this Chapter.

10.2 Number of Equipment for Renewal/Addition

10.2.1 Basic Considerations

In estimating the number of equipment to be renewed or to be newly provided, two basic considerations are given as follows:

1) The numbers of equipment to be available at each airport shall correspond with the airport size after the planned rehabilitation works such as runway extension, widening of graded area etc., have been implemented.

   The future requirements for each type of equipment which are shown in TABLE 5.4.2 of Chapter 5 for the year 1995 were estimated using the condition that such rehabilitation works would be completed by 1995, and therefore meet the above consideration.

2) The existing maintenance equipment which was judged as Class "C" i.e., normal operational condition, in TABLE 6.4.1 of Chapter 6 is assumed to be still operational in 1995.

10.2.2 Numbers of Equipment to be Provided

By subtracting the number of equipment available at present from the future requirements, the numbers of equipment to be provided at each airport is shown in TABLE 10.2.1.

TABLE 10.2.1 Number of Maintenance Equipment to be Newly Provided

Equipment		1. Gunung Sitoli	2. Palem-bang	3. Semarang	4. Ponti-anak	5. Sampit	6. Ambon	7. Ternate	8. Mataram	9. Bima	10. Merauke
1. Mower	Requirement	2	-	5	-	2	5	4	-	2	3
	Available	0	-	1	-	0	0	0	-	1	0
	New	2	-	4	-	2	5	4	-	1	3
2. Tractor	Requirement	2	-	5	-	2	5	-	-	2	-
	Available	0	-	1	-	0	1	-	-	1	-
	New	2	-	4	-	2	4	-	-	1	-
3. Handy Mower	Requirement	-	2	4	2	1	4	4	-	1	2
	Available	-	0	0	0	0	0	1	-	0	0
	New	-	2	4	2	1	4	3	-	1	2
4. Sweeper	Requirement	-	-	1	1	-	-	-	1	-	1
	Available	-	-	0	0	-	-	-	0	-	0
	New	-	-	1	1	-	-	-	1	-	1
5. Dump Truck	Requirement	1	-	-	-	1	-	-	-	-	1
	Available	0	-	-	-	0	-	-	-	-	0
	New	1	-	-	-	1	-	-	-	-	1

NOTE: Required numbers of mower and tractor include one unit for stand-by.

10.3 Outline Specifications of Equipment

10.3.1 Basic Requirements

In determining the outline specifications for respective type of airport maintenance equipment, the following basic requirements are taken into consideration.

1) The airport maintenance equipment to be provided shall, as far as practicable, be the same type as used at present considering the interchangeability of parts and operater familiarity.

2) Spare parts of the equipment to be provided shall be readily available in the Indonesian market.

3) The airport maintenance equipment to be provided shall be of "maintenance-free" type taking into account the present budget and manpower constraints on maintenance activities.

4) The airport maintenance equipment to be provided shall be economic in it's operation. Equipment with low fuel consumption will be highly recommended.

5) Spare parts to be provided shall be the Manufacturers recommended Spare Parts for at least one year's use and shall include routine maintenance and consumables.

10.3.2 Outline Specifications

(1) Mowers

Equipment:

Type	: Disk type
Number of Disk	: 4 nos.
Number of Knife	: 12 nos.
Cutter Bar Width	: Approx. 1,600mm
Weight	: 300 - 350kg
Horse Power	: Minimum 30 - 35 HP

Spareparts:

V-Belt	: 2 nos.
Blade Knife	: 24 nos.
Oil	: 1 set
Grease	: 1 set

(2) Tractors

Equipment:

Type	: Four-wheel, two-wheel drive, diesel engine driven type.
Overall Length	: 3,100 - 3,500mm
Overall Width	: 1,600 - 1,700mm
Overall Height	: 2,100 - 2,500mm
Weight	: 1,600 - 2,400kg
Engine Capacity	: 2,000 - 3,000cc
PTO Horse Power	: 40 - 50 HP

Spareparts

Fan Belt	: 1 no.
Air Filter	: 1 no.
Fuel Filter	: 1 no.
Tire	: 2 nos.
Battery	: 1 no.
Lamp	: 1 set
Engine Oil Filter	: 4 nos.
Power Steering Oil Filter	: 1 no.
Transmission Oil Filter	: 1 no.
Suction Oil Filter	: 4 nos.
Oil	: 1 set
Grease	: 1 set

(3) Handy Mowers

Equipment:

Type	: Shoulder type
Overall Length	: Approx. 1,800mm
Overall Weight	: Approx. 5 kg

Spareparts

Knife Blade	: 2 nos.
Ignition Plug	: 1 no.
Grease	: 1 set

(4) Sweepers

Equipment

Type	: Truck-type vacuum sweeper
Overall Length	: Approx. 7,000mm
Overall Width	: Approx. 2,500mm
Overall Height	: Approx. 3,500mm
Sweeping Width	: Approx. 3,000mm
Dust Tank Capacity	: 5 - 6cu.m

Spareparts

Fan Belt	: 2 nos.
Engine Oil Filter	: 2 nos.
Air Filter	: 2 nos.
Fuel Filter	: 2 nos.
Tire	: 2 nos.
Battery	: 2 nos.
Lamp	: 1 set
Windshield Wiper Blade	: 1 set
Main Brush	: 1 no.
Side Brush	: 1 no.
Dust Tunk Filter	: 1 no.
V-Belt	: 2 nos.
Oil	: 1 set
Grease	: 1 set

(5) Dump Trucks

Equipment:

Overall Length	: Approx. 6,000mm
Overall Width	: Approx. 2,200mm
Overall Height	: Approx. 2,500mm
Loading Capacity	: 4,000kg

Spareparts:

Engine Oil Filter	: 1 no.
Fan Belt	: 2 nos.
Air Filter	: 1 no.
Fuel Filter	: 1 no.
Tire	: 2 nos.
Battery	: 2 nos.
Lamp	: 1 set
Windshield Wiper Blade	: 1 set
Oil	: 1 set
Grease	: 1 set

CHAPTER 11. PRELIMINARY DESIGN FOR THE FACILITIES TO BE REHABILITATED

CHAPTER 11. PRELIMINARY DESIGN FOR THE FACILITIES TO BE REHABILITATED

11.1 General

This chapter explains the preliminary design results made for the rehabilitation works for all the civil and building facilities selected in Chapter 9. The preliminary design is carried out based on the detailed site survey results consisting of topographic survey, soil investigation and building survey.

The design results are shown in Volume - 3 DRAWINGS.

11.2 Civil Facilities

11.2.1 Runway

The defects with regard to runways listed in TABLE 9.3.1 can be rehabilitated by selecting an appropriate construction method. The following table shows the relation ship between the types of defect and the rehabilitation works to be executed for respective airports.

TABLE 11.2.1 Type of Defect on Runway and Rehabilitation Works

	Type of Defects				Rehabilitation Works
	Length	Longitudinal Slope	Pavement Strength	Pavement Deterioration	
Gunung Sitoli				o	Overlay
Palembang		o		o	Overlay
Pontianak	o				Extension
Sampit			o	o	Overlay
Ambon		o		o	Overlay
Ternate	o				Extension
Mataram	o				Extension
Bima	o				Extension
Merauke				o	Overlay

The preliminary design of runway works will be discussed as part of the rehabilitation work items.

(1) Runway Extension

The existing runway length at Pontianak, Ternate, Mataram and Bima airports is not sufficient for present aircraft operations and shall be extended.

The runway extensions are designed so that the largest aircraft the currently serving 4 airports can operate with full payload on the present air routes.

1) Required Length for Extension

As calculated in Appendix B-3 of this report, each airport requires the following additional runway length for full payload operations with the present aircraft.

TABLE 11.2.2 Required Length for Runway Extension

Airport	Aircraft in Operation	Existing Runway Length(m)	Longest Route	Required Runway Length(m)	Length for Extension(m)
Pontianak	F28	1,650	Pontianak-Balikpapan	1,850	200
Ternate	F27	1,420	Ternate-Ambon	1,650	230
Mataram	F28	1,600	Mataram-Surabaya	1,650 *1	50
Bima	F27	1,400	Bima-Denpasar	1,650 *2	250

Note *1: This extension shall be re-evaluated if DC-9 type aircraft are put into service as planned by airlines at present.

*2: The longest route served by F27 is Bima-Mataram. As these is no refueling facility in Mataram, the runway extension is required for Bima-Denpasar route via Mataram.

2) Direction of Runway Extension

The directions of runway extension are determined considering site conditions and through discussions with DGAC as explained in TABLE 11.2.3.

TABLE 11.2.3 Direction of Runway Extension

Airport	Extension Direction	Reasons for Determination
Pontianak	RWY 33	1. The existing runway and extended part to RWY33 may be used for parallel taxiway when existing Master Plan is realized. 2. Extension of RWY15 requires diversion of public road and river. 3. Land acquisition for extension area has been completed in line with the Master Plan.
Ternate	RWY 32	1. Extension of RWY14 is not preferable because of the existence of Mt. Hiri 5.3 km from runway which obstructs traffic. 2. Construction of new diverting road is in progress in line with DGAC program to extend the runway for RWY32.
Mataram	RWY 09	1. Extension of RWY27 is not preferred due to existence of the mosque infringing approach surface. 2. Land acquisition and negotiation for the relocation of Midang River corresponding for RWY09 extension is in progress.
Bima	RWY 13	1. Extension of RWY31 is not preferred due to the existence of obstructive hills 5 km from runway. 2. Extension of RWY31 requires the diversion of river.

3) Other Geometric Components

ICAO recommends a paved shoulder on both sides of a runway in order to prevent aircraft engines from ingestion a foreign objects. However the extended part of the runways except for Mataram airport will not be provided with paved shoulders for the following reasons:

i) Existing runways at Pontianak, Ternate Bima have no paved shoulders at present.

ii) Engine spacing of the aircraft such as F28, F27 operating at these airports are relatively narrow as compared with the runway width, so that the probability of the ingestion of foreign materials is considered low risk.

Paved overrun 60m long with the same width as runway and the turning pad with same dimension as the existing one will be provided at the end of an extended part of a runway.

In accordance with ICAO recommendations, the extended part of runway will be provided with a 75m wide graded area on each side of the runway. A runway end safety area 90m long and twice the width of runway will also be provided.

4) Pavement

Pavement structures for extended part of the runway are designed based on the soil investigation results and in accordance with FAA method in principle. Japanese pavement design standard published by JCAB (Civil Aviation Bureau of Japan) is also used for the pavement design of overrun and shoulder as FAA does not specify them.

i) Design Conditions

Design conditions for the pavement of extended part of runway are summarized in TABLE 11.2.4.

TABLE 11.2.4 Pavement Design Conditions for Runway Extension

Airport	Type of Pavement	Design Aircraft	No. of Annual Departures	Design CBR
Pontianak	Flexible	F28	1,200	6.5% *1
Ternate	Flexible	F27	1,200	31.7% *2
Mataram	Flexible	F28	1,200	4.2%
Bima	Flexible	F27	1,200	7.0% *3

Note: *1. Existing soil at runway extension area with the field CBR of 0.42 is not suitable for the pavement subgrade, and shall be replaced with the selected materials. This value (6.5%) indicates the combined CBR of subgrade with 1.0 m thick subgrade replacement.

*2. Subgrade CBR of 20% is applied for the pavement design as the maximum practical value.

*3. The existing soil at runway extension area shall be replaced with selected materials due to low bearing capacity (Field CBR = 0.9%). 7.0% is the improved value by 1.0m thick subgrade replacement.

ii) Required Pavement Thickness and Structure

TABLE 11.2.5 shows the total required thickness and composition of the pavement for the extended parts of a runway using FAA recommendations.

Total pavement thickness for overrun and shoulder is a half the thickness of runway in accordance with JCAB standard.

TABLE 11.2.4 Required Pavement Thickness

unit:cm

	Pontianak	Ternate	Mataram	Bima
Surface Course	4	4	4	4
Binder Course	6	6	6	6
Base Course	15	15	15	15
Subbase Course	19	10	34	11
Total Thickness	44	35	59	36

(2) Runway Overlay

Pavement overlays on runways are required at the following 5 airports:

- Gunung Sitoli
- Palembang
- Sampit
- Ambon, and
- Ternate

The purpose of runway overlay at these airports varies depending on the causes for which the overlay is required, and is divided into the following:

i) Runway overlay for correcting the defects on pavement surface. This type of overlay is required at Gunung Sitoli and Merauke airports.

ii) Runway overlay for increasing the pavement strength together with correcting the defects on pavement surface. Sampit airport is categorized into this type. and

iii) Runway overlay for correcting the longitudinal slope and pavement surface condition. Palembang and Ambon airports belong to this type of overlay.

1) Runway Overlay at Gunung Sitoli and Merauke

Existing 900m long runway in Gunung Sitoli airport was overlaid with bituminous concrete in 1989 over the length of 700m on RWY27 side. Remaining unoverlaid part (200m long by 30m wide) on RWY 09 side is severely ravelled and needs bituminous concrete overlay.

Merauke airport has also a severely ravelled surface over an area of 300m long by 20m wide midway down the runway. This part also requires an overlay of bituminous concrete.

Since these overlays are required to correct the deteriorated surface condition and not for structural problems, minimum practical thickness of 3cm is applied.

Average overlay thickness is 11cm and 8cm for Gunung Sitoli and Merauke respectively as analyzed from the present runway profile.

2) Runway Overlay at Sampit

There are many alligator cracks on the runway pavement surface which are caused probably by weak subgrade due to high ground water table. The pavement surface on RWY 13 side is severely weathered and the gravel of subbase course is exposed. Furthermore it was revealed that the existing pavement with total thickness of 25cm does not have sufficient strength to bear the load of present CS212 type aircraft.

The runway overlay to increase the pavement strength is designed in accordance with the FAA design method, and based on the following conditions.

Design aircraft	: CS212
Design CBR	: 0.9% (based on Field CBR test results)
Equivalent Factor	: 1.5 for existing surface course
	: 2.0 for new binder course

Minimum required thickness of overlay is 23cm and the average overlay thickness is 32cm by analyzing the present runway profile.

3) Runway Overlay at Palembang and Ambon

Palembang

There are many slope changes along the runway profile of Palembang airport. Although the present longitudinal slopes meet the requirement of code letter 4C recommended by ICAO, the middle part, over 1,350M of the 2,200m long runway does not meet the ICAO requirement with regard to the distance between longitudinal slope changes.

Thus, a runway overlay is planned to correct this deficiency. The basic policy and the planning criteria are;

- to satisfy the ICAO recommendation
- to secure minimum practical overlay thickness of 3cm, and
- to minimize the volume of overlay material as much as possible.

The planned runway profile is shown in Volume-3 DRAWINGS. The maximum and average thickness of overlay are 120cm and 42cm respectively.

Ambon

Ambon airport has 1,850m long runway, which is categorized 4D according to ICAO classification. The longitudinal slope of both runway ends is about 1.0%, and exceeds the ICAO recommendation which specifies the maximum slope to be 0.8% for the first and last quarter of a runway length.

The runway overlay to correct this problem is planned on the same principles and conditions as described for Palembang airport. The planned runway profile is indicated in Volume-3. The maximum and average overlay thicknesses are 120cm and 49cm respectively.

11.2.2 Runway Strip

Problems regarding the runway strip in Gunung Sitoli, Ternate, Bima and Merauke correspond with the following rehabilitation works by which the problems can be solved.

i) Widening of runway strip : Width at Gunung Sitoli and Merauke

ii) Widening of graded area : Width of graded area at Ternate and Merauke

iii) Grading of runway strip : Transverse slope at Ternate

iv) Provision of perimeter dyke : Flooding by seawater at Bima

(1) Widening of Runway Strip

Gunung Sitoli and Merauke airports are classified 1B and 3C respectively according to ICAO. The existing runway strip at Gunung Sitoli needs to be widened from 40m to 75m in terms of the distance from runway centerline, while the present runway strip width of 75m at Merauke airport is to be widened to 150m in accordance with ICAO recommendations.

As these airports have no limitation in area for widening, required works is only the felling of trees and bushes in the widened area.

(2) Widening of Graded Area

Ternate airport has a 1,600m long runway strip. At present, only 45m to 55m width is secured for the graded area situated south of the runway over the entire length of the runway strip. There is steep slope of 4 to 5m height beyond the graded area.

For widening the existing graded area, felling of coconut trees, earth filling and slope protection works are required.

The widening of graded area at Merauke airport can be made by relocating the existing open sodded channel which runs parallel to the runway at 45m from the runway centerline.

(3) Grading of Runway Strip

At Ternate airport, the transverse slope of a part of runway strip is about 5% over a 200m length, and exceeds 2.5% which is the maximum slope of graded area as recommended by ICAO.

This area is to be filled to satisfy the above recommendation.

(4) Provision of Perimeter Dyke

Bima airport is located close to the sea and its elevation is less than 1m above mean sea level. Due to this extremely low elevation of the airport, runway strip is flooded once a month by seawater when the tide is high.

It is planned to construct a dyke along the perimeter of the runway strip with a flap gate valve at the mouth of the airport drainage.

11.2.3 Taxiway

Taxiway overlay is required at Gunung Sitoli, Pontianak, Ambon, Bima and Merauke airports, and divided into 2 types according to the purpose of overlay. One is the overlay for correcting the deteriorated surface condition; this is required at Gunung Sitoli, Ambon and Merauke. The other is the overlay for increasing pavement strength and for correcting defects in pavement surface; this applies to Pontianak and Bima.

1) Taxiway Overlay at Gunung Sitoli, Ambon and Merauke

At Gunung Sitoli, the surface condition of the taxiway is similar to the runway.
Aggregates in the surface course are exposed due to ravelling.

The taxiway pavement surface at Ambon airport has the same ravelled condition as the runway surface.

Merauke airport taxiway is severely cracked and in a ravelled condition.

Since the taxiway overlays at these airport are required to correct the deteriorated surface conditions, and not for structural problems, the practical minimum thickness of 3cm is applied.

Analyzing the existing taxiway profile, average overlay thickness at these 3 airports are :

Gunung Sitoli	: 10cm
Ambon	: 49cm (This results from thick overlay on the runway as aforementioned.)
Merauke	: 4cm

2) Taxiway Overlay at Pontianak and Bima

A-taxiway at Pontianak, which was constructed together with an old apron and is not used by normal scheduled flights at present, has severe alligator cracks over its entire area. The taxiway in Bima airport is severely ravelled due to flooding by seawater. Furthermore, it was revealed by analyzing the soil investigation results that the taxiways at these airports have insufficient pavement strengths for the present aircraft.

The taxiway overlay to increase the pavement strength at these two airports is shown in TABLE 11.2.5.

TABLE 11.2.5. Outlines of Taxiway Overlay Design for Pontianak and Bima

	Pontianak	Bima
Design Aircraft	F28	F27
Design CBR	0.6%	2%
Existing Pavement Thickness	83cm	53cm
Equivalent Factor		
(for existing surface)	1.5	2.0
(for new binder course)	2.0	2.0
Minimum Required Overlay Thickness	8cm	12cm
Average Overlay Thickness	14cm	14cm

Note: Design CBR and equivalent factor for existing surface course are based on field CBR test results and Marshal Stability test results respectively.

11.2.4 Apron

(1) Apron Expansion

Apron expansion is planned for Mataram, Bima and Merauke, and to meet the requirements in year 1995 considering the nature of rehabilitation works defined in Chapter 1.

1) Required Size of Apron

The number of aircraft stands required at these three airports in the year 1995 are estimated in TABLE 5.2.3 of Chapter 5.

The size and dimension of aprons are determined based on the following conditions:

i) Present parking configurations are maintained.

ii) Spot-in and spot-out to/from any aircraft stands can be made without restriction by other adjustment parking aircraft.

iii) Steering angle for maneuvering is 50 degrees.

iv) Clearance between aircraft is in compliance with ICAO recommendations.

v) Clearance between outer main wheel of aircraft and pavement edge is also in compliance with ICAO.

Required number of aircraft stands and dimensions of apron at respective airports are summarized in TABLE 11.2.6.

TABLE 11.2.6 Required Aircraft Stand and Dimension

Airport	Number of Aircraft Stands		Dimension	
	Present	Required	Present Size (m)	Required Size (m)
Mataram	1:F28 2:F27 2:CS212	2:F28 2:F27 1:CS212	W= 204 D= 60	W= 214 D= 60
Bima	3:F27 1:CS212	3:F27 2:CS212	W= 120 D= 69	W= 142 D= 69
Merauke	2:F28	2:F28 2:DHC6	W= 160 D= 45	W= 160 D= 46.5

3) Pavement

Pavement structures for the expanded parts of the apron are designed on the soil investigation results and in accordance with FAA methods in principle.

1) Design Conditions

Design conditions for the pavement of the expanded parts of apron are summarized in TABLE 11.2.7.

TABLE 11.2.7 Pavement Design Conditions for Apron Expansion

Airport	Type of Pavement	Design Aircraft	No. of Annual Departures	Design CBR
Mataram	Flexible	F28	1,200	2.7%
Bima	Flexible	F27	1,200	2.0%
Merauke	Flexible	F28	1,200	20.0%

ii) Required Pavement Thickness and Structure

TABLE 11.2.8 shows the total required thickness and composition of the pavement for the expanded parts of the apron which is designed by application of FAA methods.

A fuel-resistant coating shall be applied on the expanded part of apron to prevent damage from oil spillage.

TABLE 11.2.8. Required Pavement Thickness

unit:cm

	Mataram	Bima	Merauke
Surface Course	4	4	4
Binder Course	6	6	6
Base Course	15	15	15
Subbase Course	49	50	10
Total Thickness	74	75	35

(2) Apron Overlay

Apron overlays are required at Gunung Sotoli, Ambon, Mataram, Bima and Merauke airports, and are divided into 2 types according to the purpose of overlay. One is the overlay for correcting the deteriorated surface condition; this is required at Gunung Sitoli, Ambon and Merauke. The other is the overlay for increasing pavement strength and for correcting defects on the pavement surface; this is applies to Mataram and Bima.

1) Apron Overlay at Gunung Sitoli, Ambon and Merauke

The surface condition of apron pavement at Gunung Sitoli is almost similar to the taxiway pavement and is in a ravelled condition. The apron overlay to correct this ravelled surface condition will be made

with the minimum overlay thickness of 3cm. Average thickness of overlay will be 8cm.
A fuel-resistant coating shall be applied on top of the surface course to prevent damage from oil spillage.

Existing apron pavement at Ambon consists of two pavement types; one is bituminous overly on top of an old rigid pavement, the other being a rigid pavement constructed in 1990.

Pavement overlay for the apron at Ambon airport is planned for the existing bituminous pavement where reflection cracks were found over the entire area. Minimum 8cm thick bituminous concrete will be overlaid to prevent further reflection cracking. Average overlay thickness will be 17cm. The existing reflection cracks shall be sealed prior to application of bituminous concrete with proper sealing materials. A fuel-resistant coating shall be applied after the bituminous overlay.

Merauke airport has also two types of apron pavement. Bituminous pavement overlaid on top of the old rigid pavement is severely ravelled and contains many reflection the cracks. Rigid pavement also contains many cracks.

The same minimum thickness and construction method as described for Ambon is applied to Merauke airport. Average overlay thickness, considering the undulation of the existing surface level, will be 9cm.

2) Apron Overlay at Mataram and Bima

The apron pavement at Mataram and Bima airports does not have enough strength to support the load of present aircraft.

The pavement overlay design for the apron at Mataram airport, which has a thickness of 59cm is based on the following design conditions:

Design Aircraft	: F28
Design CBR	: 2.7% (based on field CBR test)
Equivalent Factor	
(for existing surface)	: 2.0
(for new binder course)	: 2.0

The minimum overlay thickness is 10cm in accordance with FAA and the average overlay thickness will be 14cm considering the undulation of the pavement surface.

The overlay design for the apron at Bima airport is made by applying the same design conditions as for the taxiway. Minimum required thickness is 12cm, and the average thickness of overlay is 22cm.

Application of a fuel-resistant coating is necessary also for these apron overlays.

11.3 Building Facilities and Ancillary Equipment

11.3.1 Passenger Terminal Building

(1) Expansion of Passenger Terminal Building

As indicated in TABLE 9.3.1, there are four airports where present functional deficiencies (especially in terms of floor space) of passenger terminal building will be improved. These are;

- Semarang
- Pontianak
- Ternate, and
- Bima

Expansion plans for passenger terminal building at these airports are made based on the number of one-way passengers expected in year 1995 as estimated in TABLE 4.3.7.

1) Semarang

In peak hour, existing baggage claim area with total floor area of 132 sq.m is extremely congested by passengers, welcomers and restaurant guests due to lack of adequate floor area and inadequate location of restaurant entrance which faces directly onto the baggage the claim area.

A new arrival building with the floor area of 432 sq.m will be provided north east of the existing building. This new building is structurally separated from the existing building to avoid complicated connections. By this relocation, the existing baggage claim area and baggage breakdown area can be renovated and made into a baggage make-up area and enlarged restaurant area.

The existing check-in lobby, which has floor area of 280 sq.m is also crowded with passengers due to the lack of check-in counters especially for the Semarang-Jakarta shuttle service, will be expanded by another 315 sq.m to the east.

Some associated works will be required by these expansion works. These are;

- diversion of a part of the terminal road, and
- diversion of an open drain.

2) Pontianak

There are two passenger terminal buildings at Pontianak; one for domestic departures and the other for domestic arrival and international services. The main problem of the passenger terminal building is the congestion at the check-in lobby in the domestic departure building. This is caused by L-shaped counter layout which leads to conflicting passenger movements in the check-in lobby.

In this planning an additional 315 sq.m check-in lobby is provided towards the northeast of the existing terminal building to make the counter layout straight and to meet future requirements.

Departure lounge for domestic use appears to be in an overcrowded at peak hours, and will be expanded by another 72 sq.m to both sides.

The existing departure lounge is a composite structure of steel and concrete. The expansion will be made in the steel structure portion for constructional and economic reasons.

3) Ternate

The Passenger terminal building at Ternate airport is broadly divided into 2 halves by partitions; landside half for the public hall and airside half for departure lounge, check-in lobby and baggage claim area. Each functional area in the airside half has a floor area approximately half the present requirement and needs to be expanded.

Check-in lobby will be expanded by relocating the partition towards the land side to the line of the existing columns, thus providing a total floor area of 78 sq.m.

Departure lounge will be expanded by another 54.5 sq.m to the northeast. Present canteen will be relocated into the expanded part.

Baggage claim area will be expanded by relocating the partition to the southwest. By this expansion, the existing restaurant needs to be relocated and will be accommodated in the new expanded area.

4) Merauke

The passenger terminal building as Merauke airport has insufficient floor area for check-in lobby and departure lounge. At present, the check-in lobby has a floor area of only 65 sq.m as compared to the requirement of 100 sq.m for the present air traffic, while the departure lounge is only 65 sq.m compared to 90 sq. for present needs.

To solve the seriously crowded conditions in these areas, expansion will be made towards the landside by an additional 138 sq.m to cater for the traffic demands in year 1995.

These expansion works require minor modifications to the car parking area.

(2) Rehabilitation of Finishings

As indicated in TABLE 9.3.1, Palembang and Merauke airports have defective building finishings that need rehabilitation. The results of rehabilitation plans are described below for each airport.

1) Palembang Airport

Existing domestic arrival building is provided with a flat roof. Due to severe deterioration and cracks in the mortar-cement waterproofing, the offices and public hall under the flat roof suffer from many leaks.

The existing flat roof with total area of approximately 300 sq.m shall be provided with a membrane waterproofing laid on the existing mortar-cement finish and given an adequate slope for roof drainage.

2) Merauke

Existing roof of the passenger terminal building with total area of approximately 1,000 sq.m is provided with corrugated asbestos roofing material.

This roofing material, which appears to be in a severely deteriorated condition, shall be replaced completely with new corrugated non-asbestos roofing material, paying attention to the toxic properties of asbestos material.

A 10m wide canopy fascia facing airside and sloping down to the building has rotted totally and the fascia edge has fallen off from the building structures. This canopy fascia will be reconstructed completely with wooden structural material and non-asbestos corrugated roofing.

11.3.2 Administration and Operation Building

(1) Rehabilitation of Finishings

1) Merauke

The existing roof made of corrugated asbestos material appears to be in the same deteriorated condition as the passenger terminal building.

Complete re-roofing with new corrugated non-asbestos material is planned for the existing roof with total area of 400 sq.m.

11.3.3 Ancillary Equipment to Buildings

(1) Number of Equipment to be Provided

The required numbers of X-ray baggage screening units and walk-through metal detectors are based on the number of one-way peak hour passengers expected in 1995. These were calculated in TABLE 5.3.3 of Chapter 5.

With regard to the air conditioning, the required number of units can be estimated based on;

- Cooling load necessary for the floor area to be air conditioned
- Present capacity of air conditioning unit, if available
- Cooling capacity per unit.

As discussed in Section 11.3.1, the departure lounges in passenger terminal building need to be expanded at Pontianak, Ternate and Merauke airports. The air conditioning units required at these airports shall meet the floor areas after expansion.

TABLE 11.3.1 summarizes the number of items of equipment to be provided at the respective airports.

TABLE 11.3.1 Number of Ancillary Equipment to be Newly Provided

Equipment		1.Gunung Sitoli	2.Palembang	3.Semarang	4.Pontianak	5.Sampit	6.Ambon	7.Ternate	8.Mataram	9.Bima	10.Merauke
1.X-ray Baggage Screening Unit	Requirement	-	-	-	-	-	-	1	1	1	1
	Available	-	-	-	-	-	-	0	0	0	0
	New	-	-	-	-	-	-	1	1	1	1
2.Walk-Through Metal Detector	Requirement	-	-	-	-	-	-	1	1	1	1
	Available	-	-	-	-	-	-	0	0	0	0
	New	-	-	-	-	-	-	1	1	1	1
3.Air-Conditioning (C-TWR)	Required Capacity(BTU)	-	-	-	-	-	19,000	24,000	-	-	-
	Available (BTU)	-	-	-	-	-	9,600	12,000	-	-	-
	Addition Required(BTU)	-	-	-	-	-	9,400	12,000	-	-	-
	Required No.	-	-	-	-	-	1 a)	1 a)	-	-	-
4.Air-Conditioning (Dep. Lounge)	Required Capacity(BTU)	32,100	-	-	244,500	32,100	-	57,700	205,000	68,000	65,500
	Available (BTU)	-	-	-	-	-	-	-	-	-	-
	Addition Required(BTU)	32,100	-	-	244,500	32,100	-	57,700	205,000	68,000	65,500
	Required No.	1 b)	-	-	3 d)	1 b)	-	1 c)	3 d)	1 c)	1 c)

NOTE a):Cooling Capacity per unit = 12,000 BTU
b):Cooling Capacity per unit = 42,000 BTU
c):Cooling Capacity per unit = 87,000 BTU
d):Combination of b) and c)

(2) Outline Specifications of Equipment

Outline specifications of the X-ray baggage screening unit, walk-through metal detector and air conditioning unit are to meet the respective functional requirements of the equipment considering the size of airport where they are to be provided.

These are described below.

No specific spare parts will be required.

1) X-Ray Baggage Screening Unit

Handling Capacity	: Approx. 2,500 pieces/hour
Overall Length	: 2,000 - 2,400mm
Overall Width	: 800 - 900mm
Overall Height	: 1,300 - 1,700mm
Overall Weight	: 700 - 900kg
Maximum Baggage Size	: 600mm (Width), 400mm (Height) Length unlimited.
CRT Display	: Monochrome

2) Walk-Through Metal Detector

Detection Zoning	: Upper, Medium, Lower
Overall Width	: 900 - 1,100mm
Overall Height	: Approx. 2,200mm

3) Air Conditioning Unit

a) Packaged - Type (A)
Cooling Capacity : Approx. 42,000 BTU

b) Packaged - Type (B)
Cooling Capacity : Approx. 87,000 BTU

c) Room - Type
Cooling Capacity : Approx. 12,000 BTU

CHAPTER 12. AIRPORT MAINTENANCE AND REHABILITATION PLANS

CHAPTER 12. AIRPORT MAINTENANCE AND REHABILITATION PLANS

12.1 General

This Chapter summarizes the outlines of rehabilitation works necessary for each airport, based on the results of maintenance and rehabilitation plans which were studied in Chapters 10 and 11 for each item of equipment and facility .

12.2 Outlines of Rehabilitation Works and Maintenance Equipment by Airports

TABLES 12.2.1 through 12.2.10 indicate the outlines of the rehabilitation works for civil and building facilities including ancillary equipment to the buildings as well as the airport maintenance equipment to be provided to each of the selected 10 airports.

TABLE 12.2.1 Required Rehabilitation Works and Maintenance Equipment

- Gunung Sitoli -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Overlay	- Pavement overlay with bituminous concrete to the remaining unoverlaid part of runway. For rehabilitating the deteriorated surface. 200m long x 30m wide. 11cm thick in average.
2) Widening of Runway Strip	- Felling of trees and bushes for widening from 40m to 75m
3) Taxiway Overlay	- Pavement overlay with bituminous concrete for rehabilitating the deteriorated surface. Overlaid area; 950 sq.m. 10cm thick in average.
4) Apron Overlay	- Pavement overlay with bituminous concrete for rehabilitating the deteriorated surface. Overlaid area; 2,400 sq.m. 8cm thick in average. Jet-fuel resistant coat to be applied.
5) Air-Conditioning in Pax. Bldg.	- Provision of one packaged-type air-conditioning unit in departure lounge Cooling Capacity; 42,000 BTU
Maintenance Equipment	
1) Mower	- Provision of 2 disk-type mowers
2) Tractor	- Provision of 2 tractors
3) Dump Truck	- Provision of One 4-ton dump truck

TABLE 12.2.2 Required Rehabilitation Works and Maintenance Equipment

- Palembang -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Overlay	- Pavement overlay with bituminous concrete for correcting both the surface distortion and longitudinal slope. 2200m long x 45m wide. 42cm thick in average.
	- Associated works; Partial provision of paved shoulder of 7.5m wide and 38cm thick (Paved area; 7,500 sq.m)
2) Rehabilitation of Finishings in Pax. Bldg.	- Membrane waterproofing on the flat roof of domestic arrival/international passenger terminal building. (Area; 300 sq.m)
Maintenance Equipment	
1) Handy Mower	- Provision of 2 shoulder-type handy mowers.

TABLE 12.2.3 Required Rehabilitation Works and Maintenance Equipment

- Semarang -

Work Items	Description of Works
Rehabilitation Works	
1) Expansion of Pax. Bldg.	- Expansion of Check-in lobby (315 sq.m) and addition of check-in counters - Relocation and expansion of baggage claim area (432 sq.m) - Modification of existing baggage claim area to a part of restaurant - Associated works: Diversion of terminal road and drainage
Maintenance Equipment	
1) Mower	- Provision of 4 disk-type mowers
2) Tractor	- Provision of 4 tractors
3) Handy Mower	- Provision of 4 shoulder-type handy mowers
4) Sweeper	- Provision of One truck-type vacuum sweeper

TABLE 12.2.4 Required Rehabilitation Works and Maintenance Equipment

- Pontianak -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Extension	- Extension from 1650 to 1850m for full load operation of F28. 200m long x 30m wide. 54cm thick flexible pavement on 1m subgrade replacement. - Associated Works; 1) Provision of 150m wide runway strip and 90m long runway end safety area 2) Relocation of public road and drainage 3) Relocation of VASIS and other airport ground lights.
2) Taxiway Overlay	- Pavement overlay to A-TWY (Old taxiway and apron) for strengthening and rehabilitating severely cracked condition. Overlaid area: 9,800 sq.m. 14cm thick in average.
3) Expansion of Pax. Bldg.	- Expansion of Departure lounge (72 sq.m) - Expansion of check-in lobby by 135 sq.m to make the check-in counter linear for avoiding passengers queue crossing.
4) Air Conditioning in Pax. Bldg.	- Provision of 3 package-type air conditioning units in departure lounge. Cooling capacity: 87,000 BTU
Maintenance Equipment	
1) Handy Mower	- Provision of 2 shoulder-type handy mowers
2) Sweeper	- Provision of one truck-type vacuum sweeper

TABLE 12.2.5 Required Rehabilitation Works and Maintenance Equipment

- Sampit -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Overlay	- Pavement overlay with bituminous concrete for strengthening and rehabilitating severely cracked condition. 855m long x 23m wide. 32cm thick in average.
2) Air Conditioning in Pax. Bldg.	- Provision of one package type air conditioning unit in departure lounge Cooling capacity: 42,000 BTU
Maintenance Equipment	
1) Mower	- Provision of 2 disk-type mowers
2) Tractor	- Provision of 2 tractors
3) Handy Mower	- Provision of One shoulder-type handy mower
4) Dump Truck	- Provision of one 4-ton dump truck.

TABLE 12.2.6 Required Rehabilitation Works and Maintenance Equipment

- Ambon -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Overlay	- Pavement overlay with bituminous concrete for correcting both the longitudinal slope and raveled surface. 1,850m long x 45m wide. 49cm thick in average.
2) Taxiway Overlay	- Pavement overlay with bituminous concrete for rehabilitating raveled surface condition. Overlaid area; 2,600 sq.m. 49cm thick in average.
3) Apron Overlay	- Pavement overlay with bituminous concrete to the existing overlaid part for rehabilitating reflection cracks. Overlaid area: 16,200 sq.m. Average thickness 17cm. Jet-fuel resistant coat to be applied.
4) Air-Conditioning	- Provision of one room-type air-conditioning unit in control tower cab. Cooling capacity: 12,000 BTU.
Maintenance Equipment	
1) Mower	- Provision of 5 disk-type mowers
2) Tractor	- Provision of 4 tractors
3) Handy Mower	- Provision of 4 shoulder-type handy mowers

TABLE 12.2.7 Required Rehabilitation Works and Maintenance Equipment

- Ternate (1) -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Extension	- Extension from 1420m to 1650m for full load operation of F27. 230m long x 30m wide. 35cm thick flexible pavement. - Associated Works: 1) Provision of 150m wide runway strip (Max. fill height = 7.5m) and 90m long runway end safety area 2) Relocation of VASIS and other airport ground lights.
2) Widening of Graded Area	- Partial widening of the graded area in runway strip from 45m to 75m. Coconut tree felling to be associated.
3) Grading of Runway Strip	- Earth filling to the existing runway strip partially exceeding 2.5% for correction of transverse slope.
4) Expansion of Pax. Bldg.	- Expansion of departure lounge by 54 sq.m. - Expansion of baggage claim area and relocation of restaurant - Internal rearrangement to expand the check-in lobby
5) X-ray Baggage Screening Unit	- Provision of one X-ray baggage screening unit
6) Walk-Through Metal Detector	- Provision of one walk-through metal detector
7) Air Conditioning in C-TWR	- Provision of one room-type air conditioning unit in control tower cab. Cooling Capacity: 12,000 BTU
8) Air Conditioning in Pax. Bldg.	- Provision of one package-type air conditioning unit in departure lounge. Cooling Capacity: 87,000 BTU

TABLE 12.2.7 Required Rehabilitation Works and Maintenance Equipment

- Ternate (2) -

Work Items	Description of Works
Maintenance Equipment	
1) Mower	- Provision of 4 disk-type mowers
2) Handy Mower	- Provision of 2 shoulder-type handy mowers.

TABLE 12.2.8 Required Rehabilitation Works and Maintenance Equipment

- **Mataram** -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Extension	- Extension from 1600m to 1650m for full load operation of F28 for present longest Mataram-Surabaya route. 59cm thick flexible pavement. - Associated Works: 1) Provision of 150m wide runway strip and 90m long runway end safety area 2) Provision of paved shoulder (30cm thickness) 3) Relocation of approach lights and VASIS
2) Apron Expansion	- Expansion by 10m width to accommodate 2: F28, 2: F27 and 1: CS2 aircraft in total. 74cm thick flexible pavement.
3) Apron Overlay	- Pavement overlay with bituminous concrete for strengthening and rehabilitating cracked surface. Overlaid area: 12,300 sq.m. 14cm thickness in average. Fuel-resistant coat to be applied.
4) X-ray Baggage Screening Unit	- Provision of one X-ray baggage screening unit
5) Walk-Through Metal Detector	- Provision of one walk-through metal detector
6) Air-Conditioning in Pax. Bldg.	- Provision of 3 package-type units (2 unit with cooling capacity of 87,000 BTU and one with 42,000 BTU capacity) in departure lounge.
Maintenance Equipment	
1) Sweeper	- Provision of one truck-type vacuum sweeper

TABLE 12.2.9 Required Rehabilitation Works and Maintenance Equipment

- **Bima (1)** -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Extension	- Extension from 1400m to 1650m for full load operation of F27. 250m long x 30m wide. 36cm thick flexible pavement on 1.0m thick replaced subgrade. - Associated Works: 1) Provision of 150m wide runway strip and 90 long runway end safety area 2) Diversion of river 3) Relocation of VASIS and other airport ground lights
2) Provision of Perimeter Dyke	- Construction of dyke along the perimeter runway strip and the provision of anti-backwater gate at airport drainage mouth for protection of sea water intrusion.
3) Taxiway Overlay	- Pavement overlay with bituminous concrete for strengthening and rehabilitating the severely raveled surface. Overlaid area; 2,500 sq.m. Average overlay thickness: 14cm
4) Apron Expansion	- Expansion by 20cm for accommodating 3: F27 and 2: CS2 type aircraft with flexible pavement of 75cm thickness. Fuel-resistant coat to be applied.
5) Apron Overlay	- Pavement overlay with bituminous concrete for strengthening and correcting the sererely raveled surface. 22cm thick in average. Overlaid area; 8,300 sq.m. Fuel-resistant coat to be applied.
6) X-Ray Baggage Screening Unit	- Provision of one X-ray baggage screening unit

TABLE 12.2.9 Required Rehabilitation Works and Maintenance Equipment

- Bima (2) -

Work Items	Description of Works
7) Walk-Through Metal Detector	- Provision of one walk-through metal detector
8) Air Conditioning in Pax. Bldg.	- Provision of one package-type air conditioning unit with cooling capacity of 87,000 BTU.
Maintenance Equipment	
1) Mower	- Provision of one disk-type mower
2) Tractor	- Provision of one tractor
3) Handy Mower	- Provision of one shoulder-type handy mower

TABLE 12.2.10 Required Rehabilitation Works and Maintenance Equipment

- Merauke (1) -

Work Items	Description of Works
Rehabilitation Works	
1) Runway Overlay	- Pavement overlay with bituminous concrete for the center part of runway severely raveled. Overlaid area: 300m long x 30m wide. Average thickness: 8cm
2) Widening of Runway Strip	- Felling of trees and bushes for widening from 75m to 150m
3) Widening of Graded Area	- Relocation of existing open drainage parallel to the runway to secure 75m wide graded area and associated grading works.
4) Taxiway Overlay	- Pavement overlay with bituminous concrete for correcting cracked surface. Area to be overlaid: 5,200 sq.m. Overlay thickness: 4cm.
5) Apron Expansion	- Expansion for accommodating 2: F28 and 2: CS2 type aircraft with flexible pavement of 35cm thickness. Fuel-resistant coat to be applied.
6) Apron Overlay	- Pavement overlay with bituminous concrete for rehabilitating cracked surface condition. Overlay thickness: 9cm. Area to be overlaid: 7,200 sq.m. Fuel-resistant coat to be applied.
7) Expansion of Pax. Bldg.	- Expansion of passenger terminal building for expanding check-in lobby and departure lounge.
8) Rehabilitation of Finishings in Pax. Bldg.	- Removal of existing deteriorated clad roof and replacement with new corrugated non-asbestos roofing material. - Renewal of a part of canopy fascia.
9) Rehabilitation of Finishings in Adm. and Ops. Bldg.	- Reroofing to existing deteriorated clad roof with new corrugated non-asbestos roofing material. (400 sq.m)

TABLE 12.2.10 Required Rehabilitation Works and Maintenance Equipment

- Merauke (2) -

Work Items	Description of Works
10) X-ray Baggage Screening Unit	- Provision of one X-ray baggage screening unit
11) Walk-through Metal Detector	- Provision of one walk-through metal detector
12) Air Conditioning in Pax. Bldg.	- Provision of one package-type air conditioning unit in departure lounge. Cooling capacity: 87,000 BTU
Maintenance Equipment	
1) Mower	- Provision of 3 disk-type mowers
2) Handy Mower	- Provision of 2 shoulder-type handy mowers
3) Sweeper	- Provision of one truck-type vacuum sweeper
4) Dump Truck	- Provision of One 4-ton dump truck

CHAPTER 13. PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES

CHAPTER 13 PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES

13.1 General

This chapter explains the possible implementation schedule and cost estimates of the rehabilitation works at each of the 10 airports, based on the maintenance and rehabilitation plans given in Chapters 10 through 12.

13.2 Project Implementation Schedule

After this Study, various actions will be required for realization, such as project formation, financial arrangements, detailed design, construction tendering, etc.

Since this Study covers a wide variety of rehabilitation works and procurement of equipment at different airports, some alternatives on project formation can be considered, thus leading to different implementation periods. Indefinite budgetary source for the implementation at the present time also makes it difficult to estimate a probable implementation schedule as a whole.

Therefore the construction period for each of the planned rehabilitation works regarding the civil and building facilities is summarized in TABLE 13.2.1.

Table 13.2.1 Construction Periods for Rehabilitation Works (1)

Airports	Rehabilitation Works	Construction Period (Month)	
		Mobili-zation	Construc-tion
1.Gunung Sitoli	1) Runway Overlay	2	1
	2) Widening of Runway Strip		2
	3) Taxiway Overlay		1
	4) Apron Overlay		1
2. Palembang	1) Runway Overlay	1	11
	2) Rehabilitation of Finishings in Pax. Bldg.		1
3. Semarang	1) Expansion of Pax. Bldg.	1	9
4. Pontianak	1) Runway Extension	2	6
	2) Taxiway Overlay		1
	3) Expansion of Pax. Bldg.		3
5. Sampit	1) Runway Overlay	2	3
6. Ambon	1) Runway Overlay	2	8
	2) Taxiway Overlay		1
	3) Apron Overlay		1
7. Ternate	1) Runway Extension	2	12*
	2) Widening of Graded Area		2
	3) Grading of Runway Strip		1
	4) Expansion of Pax. Bldg.		9
8. Mataram	1) Runway Extension	1	3
	2) Apron Expansion		1
	3) Apron Overlay		1

NOTE: *: including 6 months for stability of bank settlement.

Table 13.2.1 Construction Periods for Rehabilitation Works (2)

Airports	Rehabilitation Works	Construction Period (Month)	
		Mobili-zation	Construc-tion
9. Bima	1) Runway Extension	1	5
	2) Provision of Perimeter Dyke		2
	3) Taxiway Overlay		1
	4) Apron Expansion		1
	5) Apron Overlay		1
10. Merauke	1) Runway Overlay	2	1
	2) Widening of Runway Strip		2
	3) Widening of Graded Area		2
	4) Taxiway Overlay		1
	5) Apron Expansion		1
	6) Apron Overlay		1
	7) Expansion of Pax. Bldg.		7
	8) Rehabilitation of Finishings in Pax. Bldg.		2
	9) Rehabilitation of Finishings in Adm. & Ops. Bldg.		2

13.3 Project Cost Estimates

13.3.1 Assumptions for Cost Estimates

The project costs are estimated based on the following assumptions:

a) Construction costs and procurement costs of equipment are based on the unit construction prices and equipment costs as of November 1990.

b) Exchange rates are fixed at US$1.00 = Rp.1,860 = ¥130

c) Foreign currency portion of the project costs includes the following items:

- Procurement cost for the imported materials and equipment
- Procurement cost for the imported construction equipment
- The general expenses and profit for the foreign contractors and engineering firms
- Wages for foreign staff

d) Indonesian currency portion of the project cost includes the following items:

- Operation costs of the construction equipment including fuel and lubricants
- Procurement costs of the construction materials which are available in Indonesia such as aggregate and lumber
- Transportation costs for procured materials and labour employed in Indonesia
- The contractors' expenses and profits, for both foreign and local, for the amounts paid in Indonesian currency
- Wages for Indonesian laborers

e) Contingencies are estimated to be about 10% of the sum of the total cost of construction works, soil investigation and topographic survey and engineering services cost.

f) Price escalation is not considered in this estimation.

13.3.2 Project Cost

The project cost required for the rehabilitation works and the procurement of airport maintenance equipment are shown in Table 13.3.1.

Table 13.3.1 Estimated Project Cost for 10 Airports (1)

Unit:Million Rp.

Name of Airport	Rehabilitation / Maintenance	Work Items	Rupiah Portion	Foreign Portion	Total
1.Gunung Sitoli	Rehabilitation Works	1) Runway Overlay	266	397	663
		2) Widening of Runway Strip	6	1	7
		3) Taxiway Overlay	36	51	87
		4) Apron Overlay	54	76	130
		5) Air Conditioning in Pax. Bldg.	1	7	8
		6) Sub-total	363	532	895
		7) Engineering Services	36	53	89
		8) Contingency	40	59	99
		9) Total	439	644	1,083
	Maintenance Equipment	1) Mower	0	34	34
		2) Tractor	0	162	162
		3) Dump Truck	0	84	84
		4) Sub-total	0	280	280
		5) Engineering Services	0	28	28
		6) Contingency	0	31	31
		7) Total	0	339	339
	Grand Total		439	983	1,422
2. Palembang	Rehabilitation Works	1) Runway Overlay	13,980	20,090	34,070
		2) Rehabilitation of Finishings in Pax. Bldg.	4	4	8
		3) Sub-total	13,984	20,094	34,078
		4) Engineering Services	1,398	2,009	3,407
		5) Contingency	1,538	2,210	3,748
		6) Sub-total	16,920	24,313	41,233
	Maintenance Equipment	1) Handy mower	0	2	2
		2) Sub-total	0	2	2
		3) Engineering Services	0	0	0
		4) Contingency	0	0	0
		5) Total	0	2	2
	Grand Total		16,920	24,315	41,235
3. Semarang	Rehabilitation Works	1) Expansion of Pax. Bldg.	154	298	452
		2) Sub-total	154	298	452
		3) Engineering Services	15	30	45
		4) Contingency	17	33	50
		5) Total	186	361	547
	Maintenance Equipment	1) Mower	0	82	82
		2) Tractor	0	351	351
		3) Handy Mower	0	3	3
		4) Sweeper	0	353	353
		5) Sub-total	0	789	789
		6) Engineering Services	0	79	79
		7) Contingency	0	87	87
		8) Total	0	955	955
	Grand Total		186	1,316	1,502
4. Pontianak	Rehabilitation Works	1) Runway Extension	1,357	1,019	2,376
		2) Taxiway Overlay	773	1,109	1,882
		3) Expansion of Pax. Bldg.	110	111	221
		4) Air Conditioning in Pax. Bldg.	3	31	34
		5) Sub-total	2,243	2,270	4,513
		6) Engineering Services	224	227	451
		7) Contingency	247	250	497
		8) Total	2,714	2,747	5,461
	Maintenance Equipment	1) Handy Mower	0	3	3
		2) Sweeper	0	371	371
		3) Sub-total	0	374	374
		4) Engineering Services	0	37	37
		5) Contingency	0	41	41
		6) Total	0	452	452
	Grand Total		2,714	3,199	5,913

Table 13.3.1 Estimated Project Cost for 10 Airports (2)

Unit:Million Rp.

Name of Airport	Rehabilitation / Maintenance	Work Items	Rupiah Portion	Foreign Portion	Total
5. Sampit	Rehabilitation Works	1) Runway Overlay	2,144	3,126	5,270
		2) Air Conditioning in Pax. Bldg.	1	7	8
		3) Sub-total	2,145	3,133	5,278
		4) Engineering Services	215	313	528
		5) Contingency	236	345	581
		6) Total	2,596	3,791	6,387
	Maintenance Equipment	1) Mower	0	36	36
		2) Tractor	0	143	143
		3) Handy Mower	0	2	2
		4) Dump Truck	0	71	71
		5) Sub-total	0	252	252
		6) Engineering Services	0	25	25
		7) Contingency	0	28	28
		8) Total	0	305	305
	Grand Total		2,596	4,096	6,692
6. Ambon	Rehabilitation Works	1) Runway Overlay	13,586	19,477	33,063
		2) Taxiway Overlay	407	584	991
		3) Apron Overlay	949	1,361	2,310
		4) Air Conditioning in C-TWR	1	3	4
		5) Sub-total	14,943	21,425	36,368
		6) Engineering Services	1,494	2,143	3,637
		7) Contingency	1,644	2,357	4,001
		8) Total	18,081	25,925	44,006
	Maintenance Equipment	1) Mower	0	103	103
		2) Tractor	0	316	316
		3) Handy Mower	0	6	6
		5) Sub-total	0	425	425
		6) Engineering Services	0	43	43
		7) Contingency	0	47	47
		8) Total	0	515	515
	Grand Total		18,081	26,440	44,521
7. Ternate	Rehabilitation Works	1) Runway Extention	3,666	4,436	8,102
		2) Widening of Graded Area	168	180	348
		3) Grading of Runway Strip	27	22	49
		4) Expansion of Pax. Bldg.	60	61	121
		5) X-Ray Baggage Screening Unit	46	463	509
		6) Walk-Through Metal Detector	5	52	57
		7) Air Conditioning in C-TWR	1	3	4
		8) Air Conditioning in Pax. Bldg.	1	12	13
		9) Sub-total	3,974	5,229	9,203
		10) Engineering Services	397	523	920
		11) Contingency	437	575	1,012
		12) Total	4,808	6,327	11,135
	Maintenance Equipment	1) Mower	0	90	90
		2) Handy Mower	0	6	6
		3) Sub-total	0	96	96
		4) Engineering Services	0	10	10
		5) Contingency	0	11	11
		6) Total	0	117	117
	Grand Total		4,808	6,444	11,252

Table 13.3.1 Estimated Project Cost for 10 Airports (3)

Unit:Million Rp.

Name of Airport	Rehabilitation / Maintenance	Work Items	Rupiah Portion	Foreign Portion	Total
8. Mataram	Rehabilitation Works	1) Runway Extension	227	446	673
		2) Apron Expansion	12	41	53
		3) Apron Overlay	605	867	1,472
		4) X-Ray Baggage Screening Unit	46	463	509
		5) Walk-Through Metal Detector	5	52	57
		6) Air Conditioning in Pax. Bldg.	3	31	34
		7) Sub-total	898	1,900	2,798
		8) Engineering Services	90	190	280
		9) Contingency	99	209	308
		10)Total	1,087	2,299	3,386
	Maintenance Equipment	1) Sweeper	0	366	366
		2) Sub-total	0	366	366
		3) Engineering Services	0	37	37
		4) Contingency	0	40	40
		5) Total	0	443	443
	Grand Total		1,087	2,742	3,829
9. Bima	Rehabilitation Works	1) Runway Extension	491	1,010	1,501
		2) Provision of Perimeter Dyke	238	289	527
		3) Taxiway Overlay	127	178	305
		4) Apron Expansion	37	120	157
		5) Apron Overlay	613	878	1,491
		6) X-Ray Baggage Screening Unit	46	463	509
		7) Walk-Through Metal Detector	5	52	57
		8) Air Conditioning in Pax. Bldg.	1	12	13
		9) Sub-total	1,558	3,002	4,560
		10)Engineering Services	156	300	456
		11)Contingency	171	330	501
		12)Total	1,885	3,632	5,517
	Maintenance Equipment	1) Mower	0	19	19
		2) Tractor	0	82	82
		3) Handy Mower	0	2	2
		4) Sub-total	0	103	103
		5) Engineering Services	0	10	10
		6) Contingency	0	11	11
		7) Total	0	124	124
	Grand Total		1,885	3,756	5,641
10. Merauke	Rehabilitation Works	1) Runway Overlay	1,085	1,520	2,605
		2) Widening of Runway Strip	104	0	104
		3) Widening of Graded Area	71	131	202
		4) Taxiway Overlay	228	327	555
		5) Apron Expansion	4	18	22
		6) Apron Overlay	633	916	1,549
		7) Expansion of Pax. Bldg	155	164	319
		8) Rehabilitation of Finishings in Pax. Bldg	3	3	6
		9) Renovation of Finishings in Adm.& Ops. Bldg.	2	2	4
		10)X-Ray Baggage Screening Unit	46	463	509
		11)Walk-Through Metal Detector	5	52	57
		12)Air Conditioning in Pax. Bldg.	1	12	13
		13)Sub-total	2,337	3,608	5,945
		14)Engineering Services	234	361	595
		15)Contingency	257	397	654
		16)Total	2,828	4,336	7,194
	Maintenance Equipment	1) Mower	0	53	53
		2) Handy Mower	0	4	4
		3) Sweeper	0	368	368
		4) Dump Truck	0	77	77
		5) Sub-total	0	772	772
		6) Engineering Services	0	77	77
		7) Contingency	0	85	85
		8) Total	0	934	934
	Grand Total		2,828	5,300	8,128

CHAPTER 14. PROJECT APPRAISAL

CHAPTER 14. PROJECT APPRAISAL

14.1 General

This Chapter explains project appraisal for maintenance and rehabilitation works at the ten airports using the results studied in Chapters 10 through 13. The project appraisal includes evaluation of the maintenance and rehabilitation works and relevant priority at each airport.

The priority of maintenance and rehabilitation works in each airport is ranked in the following manner:

- First, the maintenance and rehabilitation works are broadly ranked in priority by the priority ranking criteria which is described in Section 14.2 regardless of the effects of implementation of the works.

- Second, the broadly ranked priority is modified among the items of the maintenance and rehabilitation works in each airport based on the results of evaluation, which considers the specific and individual nature and extent of deficiencies, the work proposed to remedy each deficiency the tangible and intangible benefits and costs, ease of the implementation of the works, etc.

The appraisal of the maintenance and rehabilitation works in this study is made mainly by qualitative evaluation because it is difficult to quantitatively measure the benefits on aviation safety or improvement of service level arising from an overlay for improving deteriorated pavement surface, widening of graded area, provision of airport security and maintenance equipment, etc., which are the major components of the rehabilitation works.

An economic analysis is employed only on some limited works with tangible benefits, such as extension of runway, apron and passenger terminal building, as a supplementary indicator to the qualitative evaluation of the works.

The details of the economic analysis are explained in Appendix-14.3.1.

It is noted that this study does not discuss the priority ranking between the ten airports. This is different from an airport development complete with all airport facilities, the maintenance and rehabilitation works are partial restoration of the existing facilities and replacement of malfunctioning and/or deteriorated equipment, and most benefits arising from such works are intangible. Therefore, it is difficult to produce a single indicator which represents the overall importance of maintenance and rehabilitation works of an airport, and which can be used for ranking priority between the airports.

14.2 Priority Ranking

The following three priorities are considered in the light of the definition of "Maintenance and Rehabilitation" explained in Section 1.5.

1st Priority : Construction work necessary for assuring aviation safety and for maintaining the present air traffic.

2nd Priority : Construction work necessary for realizing the present potential demand by increasing passenger payload, etc.

3rd Priority : Construction work necessary for assuring an adequate service level.

The maintenance and rehabilitation works are ranked in these three priorities to facilitate the further detailed ranking in accordance with the results of the evaluation of each item of maintenance and rehabilitation.

14.2.1 Criteria for Priority Ranking

The following two types of criteria as shown in TABLES 14.2.1 and 2 are prepared considering the different nature of works between rehabilitation works and airport maintenance equipment.

The respective priorities are given to the rehabilitation works and maintenance equipment according to the purpose of each work and item of equipment.

TABLE 14.2.1 Criteria for Priority Ranking of Rehabilitation Works

Priority	Definition	Rehabilitation Work Item
I	Construction work necessary for assuring aviation safety or maintaining present air traffic	- Runway overlay - Taxiway overlay - Apron overlay - Widening of graded area - Grading of runway strip - Provision of perimeter dyke - X-ray baggage screening unit - Walk through metal detector
II	Construction work necessary for realizing present potential demand or eliminating potential restraint to traffic demand	- Runway extension - Apron expansion - Expansion of passenger terminal building
III	Construction work necessary for assuring an adequate service level	- Widening of runway strip - Rehabilitation of finishings in passenger terminal building - Rehabilitation of finishings in administration and operations buildings - Air conditioning in control tower - Air conditioning in passenger terminal building

"The priority ranking of the above rehabilitation works shall be modified as necessary based on the specific and individual nature of the rehabilitation works required for each airport."

TABLE 14.2.2 Criteria for Priority Ranking of Airport Maintenance Equipment

Priority	Definition	Type of Equipment
I	Equipment for supporting aviation safety	- Mower - Tractor - Handy Mower - Sweeper
II	Equipment for supporting efficient maintenance activity	- Dump Truck
III	Equipment for assuring adequate service level	- No equipment