社会開発調査部報告書

No. 52

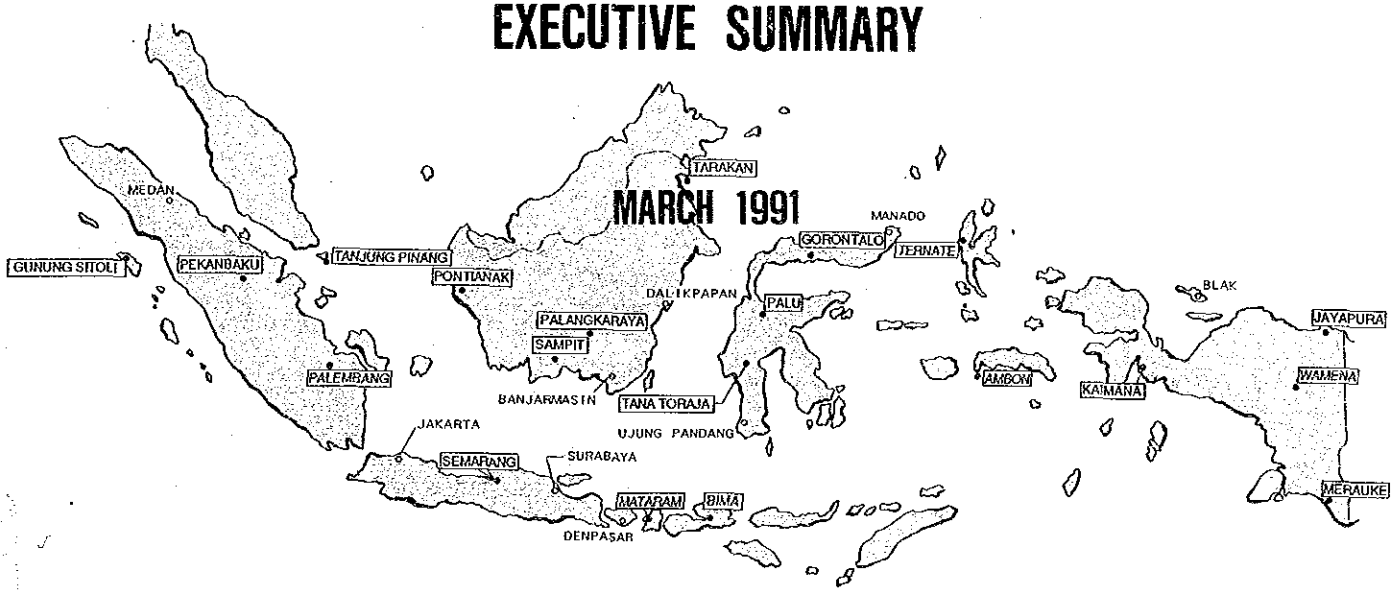
THE REPUBLIC OF INDONESIA

THE STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION IN THE REPUBLIC OF INDONESIA

FINAL REPORT

VOL. 1

EXECUTIVE SUMMARY



MARCH 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

THE REPUBLIC OF INDONESIA

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Japanese Government decided to conduct a study on the Master Plan of Airport maintenance and Rehabilitation in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Shota MORITA, Pacific Consultants International, from January 1990 to March 1991.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

March 1991

Kensuke Yanagiya
President
Japan International Cooperation Agency

Executive Summary

Table of Contents

PREFACE

PROJECT LOCATION MAP

CHAPTER 1. INTRODUCTION .....1 - 1

1.1 General .....1 - 1

1.2 Objectives and Scope of the Study .....1 - 2

1.3 Definition of Maintenance and Rehabilitation in the Study .....1 - 2

CHAPTER 2. NEED FOR THE PROJECT .....2 - 1

CHAPTER 3. OUTLINE OF THE STUDY .....3 - 1

3.1 Facility Evaluation Criteria .....3 - 1

3.2 Review of Air Traffic Demand Forecast .....3 - 1

3.3 Facility Requirements .....3 - 4

3.4 Evaluation of Existing Facilities .....3 - 4

3.5 Selection of 10 Airports .....3 - 8

3.6 Airport Maintenance and Rehabilitation Plans .....3 -10

3.7 Project Appraisal .....3 -11

3.8 Conclusions and Recommendations .....3 -15

3.9 Preparation of Airport Maintenance Manual .....3 -16

CHAPTER 4. RESULTS OF THE STUDY FOR 10 AIRPORTS .....4 - 1

4.1 Gunung Sitoli Airport .....4 - 1

4.1.1 Background of Gunung Sitoli Airport
4.1.2 Evaluation of Existing Facilities
4.1.3 Airport Maintenance and Rehabilitation Plans
4.1.4 Project Appraisal
4.1.5 Conclusions and Recommendations

4.2 Palembang Airport .....4 - 6

4.3 Semarang Airport .....4 -11

4.4 Pontianak Airport .....4 -15

4.5 Sampit Airport .....4 -20

4.6 Ambon Airport .....4 -24

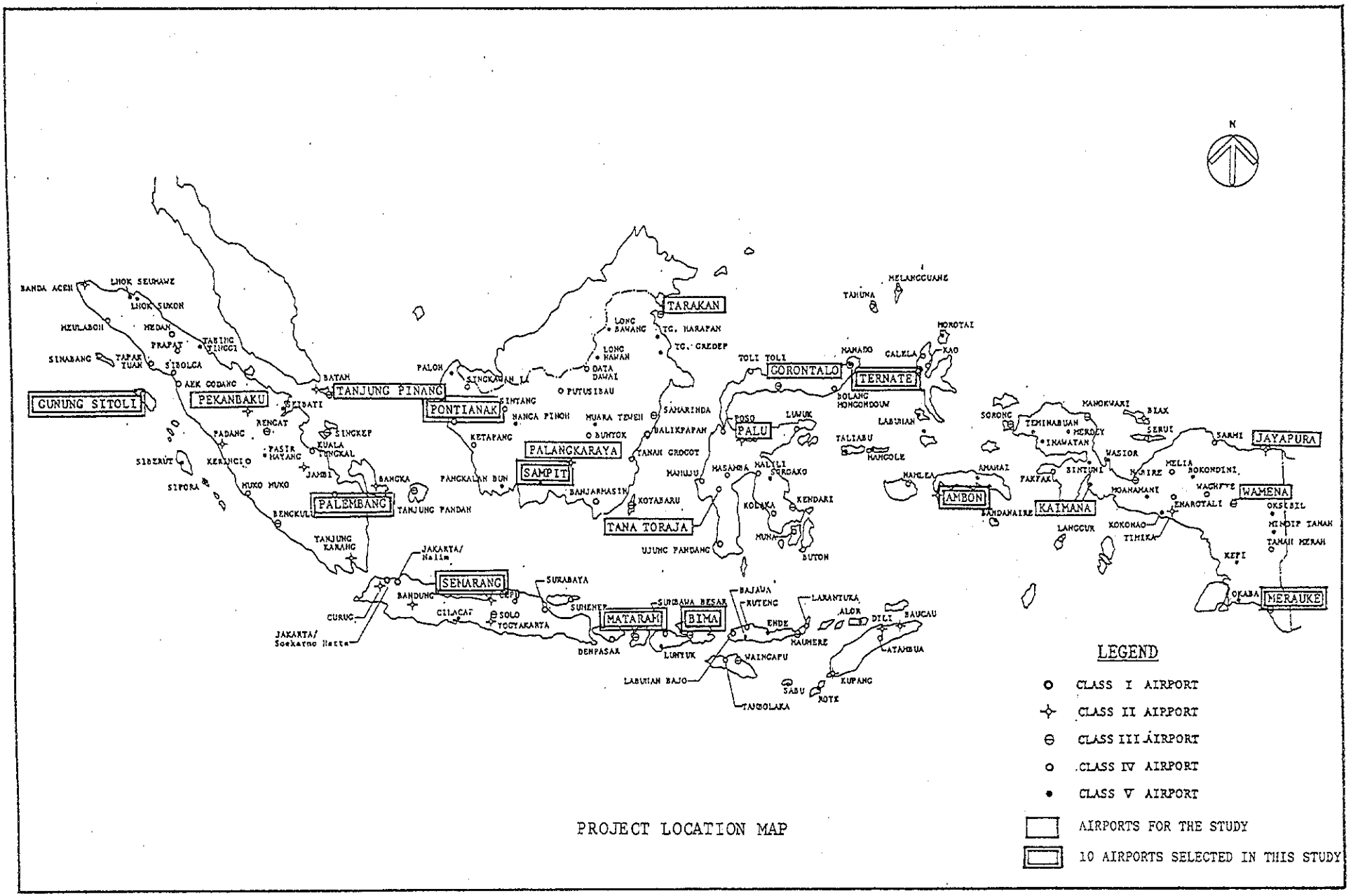
4.7 Ternate Airport .....4 -28

4.8 Mataram Airport .....4 -33

4.9 Bima Airport .....4 -38

4.10 Merauke Airport .....4 -43

MASTER PLAN (DRAWINGS) .....4 -48



PROJECT LOCATION MAP

CHAPTER 1. INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 General

Indonesia is the largest archipelago in the world, consisting of about 3,000 inhabited islands, which are spread over some 5,100km from east to west, and some 1,800km from north to south. Due to the dispersion of the islands over such a vast area, air transportation plays a vital role in promoting economic activities, national integration, regional economic balance, etc.

At present, there are 146 airports in Indonesia which are under the supervision of the Directorate General of Air Communications ("DGAC"). However, due mainly to financial constraints, most of these airports lack the facilities to provide a level of service appropriate for present air traffic needs.

Indonesia's current policy regarding the air transportation sector is detailed in the fifth Five-Year Development Plan (REPELITA V) embarked upon during the 1989/90 fiscal year. This policy is designed to increase aircraft operational efficiency, to enhance aviation safety and the capabilities of aviation personnel, and to effectively utilize existing airport facilities. The latter is to be achieved by proper maintenance and rehabilitation, which should overcome the operational and capacity problems of the existing airports which have resulted from insufficient investment in the past and/or the deterioration of aging facilities.

It is therefore considered urgent to implement cost effective improvements to the existing facilities, so as to assure both aviation safety and unrestricted civil air services for the present and short term traffic needs.

Under these circumstances, the Government of the Republic of Indonesia ("the Government of Indonesia") and the Government of Japan agreed that the Government of Japan could render technical assistance by the Study on the Master Plan of Airport Maintenance and Rehabilitation ("the Study") in the Republic of Indonesia. The scope of work was agreed upon between both Governments in October 1989.

Based on this agreement, the Japan International Cooperation Agency ("JICA"), the official agency responsible for the implementation of technical co operation programs of the Government of Japan, has been entrusted to carry out the Study. JICA organized the Study Team and officially commenced the Study in January 1990.

The Study has concluded, that based on a consideration of the technical aspects and the national economy, the Maintenance and Rehabilitation project with a design year of 1995 should be implemented urgently.

1.2 Objectives and Scope of the Study

The objectives of the Study are: to evaluate the present condition of 20 airports which were chosen by the Government of Indonesia for the Study; to establish short-term master plans for airport maintenance and rehabilitation for 10 airports to be selected from the 20 airports; and to prepare a maintenance manual for the major airport facilities and maintenance equipment.

The selected 20 airports are as follows:

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

The facilities and equipment to be covered in the Study consist of the following.

1)	Civil facilities :	Runway, Runway Strip, Taxiway and Apron
2)	Building facilities:	Passenger terminal building, Control tower, Administration and operation building, and ancillary equipment for the buildings (air conditioning, baggage claim device, X-ray baggage screening unit, walk through metal detector, and sanitary facilities including toilets and faucets)
3)	Airport maintenance equipment:	Mowers, Tractors, Handy Mowers, Sweepers and Dump Trucks

1.3 Definition of Maintenance and Rehabilitation in the Study

(1) Maintenance

"Maintenance" is defined in this Study as any activity to keep the operational functions in working order as well as to check and evaluate the present functioning of facilities and equipment. The basic components of maintenance are;

- Inspection,
- Routine maintenance, and
- Repair

"Inspection" means any measures to check and evaluate the operating conditions including spontaneous and scheduled checks.

"Routine maintenance" means any preventive measures to maintain a

facility or an equipment to its required operating condition in accordance with a plan specifying the time and sort of maintenance. This maintenance intends to prevent the occurrence of deficiency or malfunctioning of facilities and equipment, and is therefore classified into preventive maintenance.

"Repair" means any works to correct local deficiency of a facility or an equipment so as to operate them over the minimum service level required. This is required when inspection or routine maintenance discovers such deficiency, and therefore classified into corrective maintenance. Repair intends also to prevent or retard further occurrence of such deficiency.

(2) Rehabilitation

"Rehabilitation" is defined in this Study as follows:

1) Restoration of the capacity or performance of a facility without expanding the facility beyond its original condition. (e.g., restoration of pavement, renovation of buildings, renewal of equipment, etc.)

2) Expansion to allow more effective use of existing facilities, such as extensions of runways to allow aircraft presently in service to carry an increased payload, expansion of aprons and/or passenger terminal buildings to accommodate potential demands that are presently restricted.

CHAPTER 2. NEED FOR THE PROJECT

CHAPTER 2. NEED FOR THE PROJECT

2.1 Problems of the 20 Airports

The present conditions and problems of the 20 airports in terms of aviation safety, adequacy for present traffic demands, deterioration of facilities, structural deficiencies, etc. were identified in the result of the first site survey carried out in February and March, 1990.

The 20 airports are classified by the following major problems:

Table 2.1.1 Problems of 20 Airports (1)

Facilities and Equipment	Problems
1. Civil Facilities	1) Weight restrictions to present aircraft due to short runway length (Tanjung Pinang, Semarang, Pontianak, Ternate, Mataram, Bima and Wamena.)
	2) Insufficient width of runway and taxiway (Wamena)
	3) Insufficient width of runway strip and graded area (For all 20 Airports)
	4) Steeper runway slope than criteria (Tana Toraja)
	5) Pavement distresses on runway, taxiway and apron (Gunung Sitoli, Pontianak, Palembang, Sampit, Tarakan, Ambon, Bima, Mataram, Wamena, Kaimana and Merauke.)
	6) Insufficient number of aircraft stands (Palangkaraya, Tarakan, Palu, Mataram, Bima, Jayapura, Wamena and Merauke.)
	7) Apron location too close to runway (Tanjung Pinang, Pekanbaru, Palembang, Pontianak, Ternate, Bima and Wamena.)

Table 2.1.1 Problems of 20 Airports (2)

Facilities and Equipment	Problems
2. Building Facilities and Ancillary Equipment	1) Insufficient floor space of passenger terminal building, and administration and operation building (Pekanbaru, Palembang, Semarang, Pontianak, Sampit, Tarakan, Ternate, Bima, Wamena and Merauke.) 2) Deterioration or distresses on structures or finishings of passenger terminal building, administration and operation building and control tower (Tanjung Pinang, Pekanbaru, Palembang, Sampit, Palangkaraya, Ambon, Bima, Jayapura and Merauke.) 3) Unserviceable condition of X-ray baggage screening units and walk-through metal detectors (Tanjung Pinang, Pekanbaru, Palangkaraya, Tarakan, Gorontalo, Ternate (Not available), Mataram, Bima (Not available), Wamena (Not available) and Merauke.)
3. Airport Maintenance	1) Most airports suffer from the lack of mowers and tractors. The existing mowers and tractors have generally been used for more than 10 years and the spare parts are difficult to purchase because of the shortage of budget. (At most airports) 2) Since most airports have no sweepers, the pavement sweeping is generally executed by DGAC staff daily. (At most airports)

Table 2.1.1 Problems of 20 Airports (3)

Facilities and Equipment	Problems
3. Airport Maintenance	3) Due to inadequate maintenance budget and the lack of paving equipment, pavement repair as corrective maintenance is generally not executed. Even at airports where pavement repair is executed, it is general practice to use site-mixed asphalt of poor quality rather than hot mixed asphalt concrete. (At most airports) 4) Inadequate maintenance budget allows only partial re-painting of buildings. (At most airports)

The above problems will be divided into three groups, and importance ranked in the following order:

1. Problems of aviation safety to aircraft operation, such as deterioration of pavement surface.

2. Restriction of air traffic demand, such as payload restriction due to the shortage of the runway length.

3. Inadequate service level, such as no air conditioning in the departure lobby.

The following causes are pointed out on the above problems.

i) Maintenance, repair and management works to the airport facilities and maintenance equipment are not efficient due to the lack of funds, not enough operating staff, and poor training of staff.

ii) Differentials of aviation safety and service levels between central major airports and regional small airports expand due to failure to implement maintenance and rehabilitation works for the regional airports.

iii) The lack of authorized evaluation and selection criteria prevent systematic and fair determination of the maintenance and rehabilitation works.

iv) Inadequate repairs to equipment due to non-supply of spare parts shorten the life span of equipment.

Effective investment with proper financing are required to the existing airport facilities to solve these problems. The project for maintenance and rehabilitation works should be executed according to the results of this study.

Grade of distress of the facilities, importance of air safety, and also the role of air transportation in the region shall be taken into consideration in the planning and the implementation of the work. The project shall pursue the following policy:

1. The existing airport facilities and maintenance equipment shall be effectively utilized by efficient allocation of budget.

2. The facilities and equipment for maintenance and rehabilitation works shall be selected based on the criteria established in this study.

3. Safe air traffic operation shall be first priority.

4. Aviation safety and air transportation services of the regional airports will be up-graded by the maintenance and rehabilitation works, in the light of improvements in the regional differences in economic and social activities.

CHAPTER 3. OUTLINE OF THE STUDY

CHAPTER 3 OUTLINE OF THE STUDY

3.1 Facility Evaluation Criteria

The evaluation criteria for existing facilities and equipment were examined in order to objectively grasp the problems at each airport.

The evaluation of facilities and equipment is broadly classified into quantitative and qualitative evaluation. The former is made in terms of sufficiency in size and dimensions such as for the widths and lengths of runway, floor area of buildings, pavement strengths, etc., while the latter is made in terms of deterioration such as for pavement surface conditions, structure and finishing conditions of buildings, performance of equipment, etc.

In the evaluation criteria , three degrees of urgency or necessity are assigned to the facilities and equipment for maintenance and rehabilitation. Although the details of evaluation criteria are described in the Main Report, items of evaluation criteria and classification are listed in Table 3.1.1.

The facility evaluation criteria established in this Study are expected to be applied for the further study on the remaining 126 airports in Indonesia.

3.2 Review of Air Traffic Demand Forecast

The demand of future air traffic are estimated for the 20 airports.

The term rehabilitation in this Study means not only the restoration to original function or service levels but also the extension or expansion to allow more effective use of existing facilities which constrain present air traffic demands. Such rehabilitation work should at least cope with the future demands when completed.

In this Study, forecasts are made for the year 1995 as being the target year of rehabilitation plans, taking into account the probable implementation schedule of the rehabilitation work after the Study.

The forecasts also cover the air traffic demands in 2004 so as to check if the rehabilitation works planned for existing facilities are in compliance with the long-term airport development framework.

The result of the review of air traffic demand forecast is summarized for each condition for the 10 airports in Chapter 4.

Table 3.1.1 Item of Evaluation Criteria (1)

Facility		Evaluation Item	Classification
Civil Facilities	1. Runway	1) Quantitaive Evaluation Length, Width, Longitudinal Slope Transverse Slope, Pavement Strength 2) Qualitative Evaluation Pavement Deterioration	A: Rehabilitation urgently required B: Rehabilitation desirable in near future C: Rehabilitation not required
	2. Runway Strip	1) Quantitative Evaluation Width of Runway Strip, Width of Graded Area Transverse Slope	
	3. Taxiway	1) Quantitative Evaluation Width, Longitudinal Slope, Transverse Slope, Pavement Strength 2) Qualitative Evaluation Pavement Deterioration	
	4. Apron	1) Quantitative Evaluation Number of Aircraft Stands, Location, Slope, Pavement Strength 2) Qualitative Evaluation Pavement Deterioration	

Table 3.1.1 Item of Evaluation Criteria (2)

Facility		Evaluation Item	Classification
Building Facilities	5. Passenger Terminal Building Administration & Operation Building and Control Tower	1) Quantitative Evaluation Function (Floor Area, Number of Counters), Eye Level Elevation of Control Tower 2) Qualitative Evaluation Structure (Foundation, Super Structure Steel Structure)	A: Rehabilitation urgently required B: Rehabilitation desirable in near future C: Rehabilitation not required
		3) Qualitative Evaluation Finishing (Floor, Walls, Doors, Windows, Ceiling, Roof, Roof Drains, Handrails)	A: Rehabilitation urgently required B: Repair required C: Rehabilitation not required
Equipment	6. X-Ray Metal Detector, Walk Through Metal Detector, Baggage Claim Device and Air Conditioning	1) Quantitative Evaluation Equipment Availability	A: Renewal or addition of equipment urgently required B: Renewal or addition of equipment desirable in near future C: Renewal or addition of equipment not required

Facility		Evaluation Item	Classification
		2) Qualitative Evaluation Rusting, Break Down, Leakage, Strike, Abrasion, Smell, Noise Stain	A: Replacement of parts or complete renewal of equipment required B: Repair required C: Normal condition

3.3 Facility Requirements

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

Although the results of the estimation of the facility requirements are described in the Main Report, the result of the 10 selected airports are summarized in the condition of airports in Chapter 4 of this Executive Summary.

3.4 Evaluation of Existing Facilities

The existing facilities and equipment at each of the 20 airports are quantitatively or qualitatively evaluated based on the facility evaluation criteria established in this Study, 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 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 Table 3.4.1 and 3.4.2.

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 recommended

A (X_3): Implementation impracticable

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 (C)
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 3.4.2 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)

3.5 Selection of 10 Airports

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 need for urgent rehabilitation works to ensure aviation safety and unrestricted air transportation, and such rehabilitation works should be practicable and be effective for the objective of the works, or

2) The airports which contains a lot of maintenance and rehabilitation works to be implemented urgently should be selected. (Group - 1)

3) The airports which play an important role for national economic development, social activity or national tourism development should be selected. (Group - 2)

4) The typical airports in Indonesia should be selected. In this sense, the selected 10 airports should cover all airport classes from Class I to Class V of DGAC categorization, should cover all regions from Sumatra to Irian Jaya, and should also cover all the aircraft types operated at present. (Group - 3)

The major reasons for the selection of the 10 airports are summarized in Table 3.5.1 according to the above grouping.

Table 3.5.1 Major Reasons for the Selected Airports

Airport	High Priority of Implementation (Group-1)	Importance of Airport (Group-2)	Typicality of Airport (Group-3)
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		

3.6 Airport Maintenance and Rehabilitation Plans

Airport maintenance and rehabilitation plans consists of preliminary design, construction schedule and cost estimates. Airport maintenance plan covers the planning of renewal and addition of airport maintenance equipment. Airport rehabilitation plan covers the planning of civil and building facilities and ancillary equipment for the terminal building. The results of the detailed site survey consisting of topographic survey, soil investigation and building survey are applied to the airport rehabilitation plan.

Although the details of the results of planning are described in the Main Report, the results are briefly explained in the outline of individual airport of Chapter 4 together with the drawing of master plan.

3.7 Project Appraisal

3.7.1 General

The project appraisal includes evaluation of the maintenance and rehabilitation works and relevant priority at each of the 10 airports.

The priority of maintenance and rehabilitation works at 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 3.7.2 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 at each airport using 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 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 for the qualitative evaluation of the works.

It should be noted that this study does not discuss the priority ranking between the ten airports. This is different from an airport development project complete with all airport facilities, as 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 at an airport, and which can be used for ranking priorities between the airports.

3.7.2 Priority Ranking

The following three priorities are considered in the light of the definition of "Maintenance and Rehabilitation" explained in Section 1.3.

1st Priority : Construction work necessary for improving 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.

3.7.3 Criteria for Priority Ranking

The following two types of criteria as shown in TABLES 3.7.1 and 2 are prepared considering the different nature of works between rehabilitation works and airport maintenance equipment.

Table 3.7.1 Criteria for Priority Ranking of Rehabilitation Works

Priority	Definition	Rehabilitation Work Item
I	Construction work necessary for improving 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 rehabilitation works are modified as necessary based on the specific and individual nature of the rehabilitation works required for each airport. The modified "Priority" is indicated as "Order of Implementation" in the conclusions and recommendations of CHAPTER 4.

Table 3.7.2 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

3.8 Conclusions and Recommendations

i) It is required that necessary procedures be started for urgent implementation of the maintenance and rehabilitation works at the 10 airports.

The scope of works and the order of implementation for the 10 airports are shown in Chapter 4.

ii) It is expected that a similar study will be carried out for the other airports except these 10 airports by the Government of Indonesia as soon as possible, and that the study will confirm the necessary maintenance and rehabilitation requirements at these airports and will prepare necessary implementation plans.

iii) It is expected that the similar study will refer to the evaluation criteria and selection method for the facilities and equipment, and the policy for the selection of airport which were established in this study.

Prior to the execution of the similar study, inventories and the drawings of the existing airports should be prepared.

3.9 Preparation of Airport Maintenance Manual

An airport maintenance manual is prepared for the maintenance and operation of civil and building facilities and airport maintenance equipment. This manual is expected to enable systematic and efficient maintenance works for facilities and equipment.

CHAPTER 4. RESULTS OF THE STUDY FOR 10 AIRPORTS

CHAPTER 4. RESULTS OF THE STUDY FOR 10 AIRPORTS

The maintenance and rehabilitation works for the 10 airports selected in this Study shall be urgently carried out as described in CHAPTERS 2 and 3. The results of the study, including background, evaluation and master plan of airports are individually summarized for each airport in order to be useful in the implementation of the project.

4.1 Gunung Sitoli Airport

4.1.1 Background of Gunung Sitoli Airport

Gunung Sitoli is situated on Nias Island to the east of North Sumatra Province. Gunung Sitoli Airport is class IV in DGAC classification and gateway airport to tourist resources of the island.

Outline of the existing Gunung Sitoli Airport is summarized in Table 4.1.1.

4.1.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.1.2.

The most series problems of Gunung Sitoli Airport is a deteriorated runway. DGAC carried out overlay works of the runway financed by sector loan. They, however, had to stop the overlay work on the way at 700m of 900m total length due to shortage of the construction budget.

Remaining un-overlaid part (200m long by 30m wide) at RWY 09 side is severely raveled and needs urgent overlaying with bituminous concrete.

The surface condition of the taxiway and apron is similar to the runway. Aggregates in the surface course are exposed due to raveling.

Overlaying shall be urgently carried out.

Gunung Sitoli is classified 1B according to ICAO. The existing runway strip needs to be widened from 40m to 75m in terms of the distance from runway center line.

As this airport has no limitation in area for widening, required works is only the felling of trees and bushes in the widened area.

Widening area has already been prepared for this work.

4.1.3 Maintenance and Rehabilitation Plans

The maintenance and rehabilitation plans were prepared based on the above considerations. The result of the plan is shown in Figure 4.1.1.

Since the overlay is required to correct the deteriorated surface conditions not for structural problems, minimum practical thickness of 3cm is applied. Average thickness is 11cm as analyzed from the present runway profile. The pavement of taxiway and apron are the same condition as the runway which requires the overlay to correct the deteriorated surface. Average thickness of taxiway and apron are estimated as 10cm and 8cm respectively.

Construction period and cost estimates are summarized in Table 4.1.3.

4.1.4 Project Appraisal

The runway overlay is the most urgent work to be implemented.

Since there is no practical problem with 80m wide runway strip, widening of runway strip is considered to be of low order of implementation.

4.1.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for this airport. Description of works and order of implementation are summarized in Table 4.1.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.1.1 Outline of the Existing Gunung Sitoli Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
North Sumatera	Binaka	IV	DOM IB	1976	72 Ha	S : 01.16 E : 97.37	6 m	09 - 27	26 C	To meet ops. requirement	All Weather	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	990 x 80	Grass	-
Runway	990 x 30	Flexible	-
Taxiway	75 x 15	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
60 x 40	CS-212	2	Flexible	2,400m²	Self Maneuvering

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	216 + 190 m²	R.C. and Wood	2 Buildings
Operation Building	37 m²	R.C. and Wood	Temporary Bldg.
Administration Building	-	-	
Control Tower	-	-	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	0	-
Walk Through Metal Detector		-	0	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	-	0	-
	Departure Lounge	-	0	-
Mower		-	0	-
Tractor		-	0	-
Handy Mower		Shoulder type	2	-
Sweeper		-	0	-
Dump Truck		-	0	-

City/Town

Name	Population	Distance to A/P
Nias Island Gunung Sitoli		10 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	GNS-MES	SMAC	BNI	7	
DOM	GNS-PDG	SMAC	BNI	1	
				8/WEEK	

Note :

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	916	924	808	882	1,156
No. of Annual Passengers	8,275	9,978	9,226	9,381	3,632
Annual Freight Volume (kg)	64,547	77,243	73,418	80,607	79,401

Note :

Table 4.1.2 Air Traffic Demand and Airport Facility Requirement for Gunung Sitoli Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	90,000	140,000	200,000	
2. Annual Aircraft Movements	1,200	1,200	1,200	
3. Peak Hour Passengers	20	32	32	
4. Peak Hour Aircraft Movements (2 ways)	2	2	2	
5. Largest Aircraft	CS2	CS2	CS2	
6. Longest Route	Medan	Medan	Medan	
7. Reference Code	1B	1B	1B	
8. Runway				
- Length	900 m	S	N	
- Width	30 m	S	N	
9. Runway Strip				
- Length	990 m	S	N	
- Width	40 m	75 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	15 m	S	S	
11. Apron				
- Number of Aircraft Stands	DHC6: 2	DHC6: 2	DHC6: 2	
12. Passenger Terminal Building	216 m^2	S	S	
13. Administration and Operation Building	190 m^2	S	S	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	-	-	N	
- Walk Through Metal Detector	-	-	N	
- Baggage Claim Device	-	-	N	
- Air Conditioning	-	Dep.Lounge: 32,100 BTU	N	
15. Airport Maintenance Equipment				
- Mower	-	2	N	
- Tractor	-	2	N	
- Hand Mower	-	1	N	
- Sweeper	-	0	N	
- Dump Truck	-	1	N	

Note) N: Not estimated
S: Facility satisfied requirement

Table 4.1.3 Description of Works and Order of Implementation (Gunung Sitoli)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Runway Overlay	802
	2	Taxiway and Apron Overlay	263
	3	Widening of Runway Strip	8
	4	Air Conditioning in Passenger Terminal Building	10
Provision of Maintenance Equipment	1	Mover and Tractor	237
	2	Dump Truck	102
Construction Cost Total			1,422
Construction Period - 4 Months			
Effect of Implementation	(1) Rehabilitation works and provision of maintenance equipment will assure safer aircraft operations. (2) Improved service levels of air transportation. (3) Airport development will support the promotion of tourism development in Nias Island.		
Remarks	(1) Negotiation with the local government should be commenced for felling of trees and bushes which is required for widening of the runway strip. (2) Training of maintenance staff, strengthening of airport maintenance organization and provision of workshop and equipment garage should be considered for the operation, maintenance, and repair of new equipment.		

4.2 Palembang Airport

4.2.1 Background of Palembang Airport

Palembang Airport is class I in DGAC classification and the gateway airport to South Sumatra Province handling over 52 thousand passengers annually. The largest aircraft is DC9.

Outline of the existing Palembang Airport is summarized in Table 4.2.1.

4.2.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirement are as shown in Table 4.2.2.

Palembang Airport has pavement distresses on runway, insufficient width of runway strip and graded area, apron location too close to runway, pavement distresses on apron, and insufficient floor space and deterioration or distresses in the structure of the passenger terminal building, and in the administration and operation building.

Especially among the many problems, there are too many longitudinal slope changes along the runway, which does not meet the ICAO requirement. It is urgently required to improve this problem for safety of aircraft operations. The flat roof of the arrival building leaks due to deterioration, and waterproofing with membrane roofing material is considered necessary.

4.2.3 Maintenance and Rehabilitation Plans

The runway overlay to improve longitudinal slopes is a critical problem, and the maximum and average thickness of overlay are 120cm and 42cm respectively. The result of the plan are shown in Figure 4.2.1. Construction period and estimates are summarized in Table 4.2.3.

4.2.4 Project Appraisal

Although there is a large scale master plan of Palembang Airport prepared by French Consultant, any part of the plan is not realized and is not scheduled for implementation at present. On the other hand this Study proposes the urgent implementation of runway overlay works taking account of its importance. If the implementation schedule of previous master plan is fixed in near future, this costly runway overlay works would be better to be undertaken as one of the work items of the master plan.

4.2.5 Conclusion and Recommendations

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.2.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.2.1 Outline of the Existing Palembang Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
South Sumatera	St. Ahmad Badaruddin	II	INT'L/DOM 4C	1950	364 Ha	S : 02.54 E : 104.42	11.3 m	11 - 29	32.9 C	To meet ops. requirement	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	2,320 x 150	Grass	-
Runway	2,200 x 45	Flexible	-
Taxiway	A 80 x 23 B 160 x 23	Flexible	-

Apron	Aircraft Type		No. of Stand		Pavement	Area	Parking Configuration
A	DC-9		5		Flexible	17,651m²	Self Maneuvering
	CS-212		3				
B	DC-9	CS-212	2	4	Flexible	11,025m²	Self Maneuvering

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	2,116 m²	R.C. and Wood	Two Buildings
Operation Building	560 m²	R.C.	
Administration Building	467 m²	R.C.	
Control Tower	85 m²	R.C.	5 Stories
Cargo Terminal Building	650 m²	-	
Airport Maintenance Workshop	400 m²	-	
Fire Station	498 m²	-	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	3	-
Walk Through Metal Detector		-	4	-
Baggage Claim Device		-	1	-
Air Conditioning	Control Tower	32,000 BTU	2	-
	Departure Lounge	153,000 BTU	3	-
Mower		Disk type	3	-
Tractor		Diesel	4	-
Handy Mower		Shoulder type	4	-
Sweeper		Truck type	1	-
Dump Truck		-	2	-

Note :

City/Town

Name	Population	Distance to A/P
Palembang		11 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	PLM-JKT	GIA/MNA	DC9/F27	47	
DOM	PLM-DJB	GIA	F28	7	
DOM	PLM-PDG	GIA	DC9	7	
DOM	PLM-PGK	GIA	F28	7	
DOM	PLM-PKU	GIA	F28	4	
DOM	PLM-BDO	MNA	F27	7	
DOM	PLM-BTH	MNA	F27	6	
DOM	PLM-DUM	MNA	F27	2	
DOM	PLM-RGT	MNA	F27	3	
				90/WEEK	

Note :

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	14,199	14,401	12,814	14,330	14,610
No. of Annual Passengers	444,056	480,736	457,957	512,677	525,607
Annual Freight Volume (kg)	3,426,801	4,296,289	4,471,054	5,007,351	4,939,923

Table 4.2.2 Air Traffic Demand and Airport Facility Requirement for Palembang Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	546,000	759,000	1,170,000	
2. Annual Aircraft Movements	14,610	13,500	14,900	
3. Peak Hour Passengers	435	732	1,052	
4. Peak Hour Aircraft Movements (2 ways)	8	12	10	
5. Largest Aircraft	DC9	DC9	A300	
6. Longest Route	Padang	Padang	Padang	
7. Reference Code	4C	4C	4C	
8. Runway				
- Length	2,200 m	M	N	
- Width	45 m	45 m	N	
9. Runway Strip				
- Length	2,320 m	M	N	
- Width	75 m	150 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	2 Exit Taxiways	2 Exit Taxiways	2 Exit Taxiways	
- Width	23 m	18 m	18 m	
11. Apron				
- Number of Aircraft Stands	DC: 7 CS2: 7	DC9: 3 F28: 2 F27: 2	A300: 2 DC9: 2 F28: 2 F27: 1	
12. Passenger Terminal Building	2,116 m^2	4,224 m^2	6,072 m^2	
13. Administration and Operation Building	467 m^2	1,122 m^2	1,513 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	3	1	N	
- Walk Through Metal Detector	4	1	N	
- Baggage Claim Device	1	1	N	
- Air Conditioning	Control Tower: 32,000BTU Dep. Lounge: 153,000BTU	Control Tower: 16,000BTU Dep. Lounge: 280,000BTU	N	
15. Airport Maintenance Equipment				
- Mower	3	4	N	
- Tractor	4	4	N	
- Hand Mower	4	2	N	
- Sweeper	1	1	N	
- Dump Truck	2	1	N	

Note) N: Not estimated
M: Meet minimum requirement

Table 4.2.3 Description of Works and Order of Implementation (Palembang)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Runway Overlay	41,223
	2	Rehabilitation of Finishing in Passenger Terminal Building	10
Provision of Maintenance Equipment	1	Handy Mower	2
Construction Cost Total			41,235
Construction Period - 12 Months			
Effect of Implementation	Assure safer air transportation		
Remarks	The runway overlay planned in this Study would be better undertaken as one of the work items of the master plan if the master plan is implemented in the near future. Co-ordination is required with implementation of the master plan.		

4.3 Semarang Airport

4.3.1 Background of Semarang Airport

Semarang Airport is class II in DGAC classification and the gateway airport to Central Java Province handling 524 thousand passengers annually, and the largest aircraft is F28.

Outline of the existing Semarang Airport is summarized in Table 4.3.1.

4.3.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.3.2.

Expansion of the congested passenger terminal building shall be carried out as rehabilitation work, and airport maintenance equipment shall be provided because of it is below requirements.

4.3.3 Maintenance and Rehabilitation Plans

A new arrival building with the floor area of 432 sq.m will be provided north east of the existing building and the check-in lobby will be expanded by another 315 sq.m. Diversion of a part of the terminal road, and diversion of an open drain will be required by these expansion works. The result of the Study are as shown in Figure 4.3.1. Construction period and estimates are summarized in Table 4.3.3.

4.3.4 Project Appraisal

The solution of congestion problems in the passenger terminal building will eliminate the probable factors that constrain the present air traffic demand.

4.3.5 Conclusion and Recommendations

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.3.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.3.1 Outline of the Existing Semarang Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
Central Java	Ahnad Yani	II	DOM 3C			S : 06.59 E : 110.23	3 m	31 - 13	34.5C	23.00 - 14.00 GMT	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,770 x 150	Grass	-
Runway	1,650 x 30	Flexible	-
Taxiway	75 x 23	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
120 x 90	F28	4	Flexible	10,800m²	Self Maneuvering
	HS748	1			
	CN235	3			

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	1,850 m²	R.C. and Wood	
Operation Building	144 m²	R.C. and Wood	
Administration Building	312 m²	R.C. and Wood	2 Buildings
Control Tower	96 m²	-	1 Floor = 24 m²
Cargo Terminal Building	-	-	
Airport Maintenance Workshop	150 m²	-	
Fire Station	200 m²	-	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	1	-
Walk Through Metal Detector		-	1	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	16,000 BTU	1	-
	Departure Lounge	126,000 BTU	2	-
Mower		Disk type	1	-
Tractor		Diesel	1	-
Handy Mower		-	0	-
Sweeper		-	0	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Semarang		4.5 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	SRG-JKT	GIA/MNA	F28	56	
	SRG-SUB	MNA	F27	14	
	SRG-BDO	MNA	CN235	7	
	SRG-PKN	MNA	CN235	7	
	SRG-BDJ-BPN	BO	HS748	7	
	SRG-JKT	BO	HS748	7	
				98/WEEK	

Note :

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	10,317	11,348	11,292	11,847	11,977
No. of Annual Passengers	356,578	357,650	402,370	427,236	481,769
Annual Freight Volume (kg)	1,430,119	1,447,493	1,459,489	1,914,489	2,249,976

Note :

Table 4.3.2 Air Traffic Demand and Airport Facility Requirement for Semarang Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	531,000	711,000	1,050,000	
2. Annual Aircraft Movements	12,000	14,300	13,600	
3. Peak Hour Passengers	470	564	828	
4. Peak Hour Aircraft Movements (2 ways)	10	10	9	
5. Largest Aircraft	F28	F28	A300	
6. Longest Route	Jakarta	Jakarta	Jakarta	
7. Reference Code	3C	3C	3C	
8. Runway				
- Length	1,650 m	1,750 m	N	
- Width	30 m	30 m	N	
9. Runway Strip				
- Length	1,770 m	1,870 m	N	
- Width	75 m	30 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	23 m	15 m	15 m	
11. Apron				
- Number of Aircraft Stands	F28: 4 F27: 4	F28: 5 F27: 1 CS2: 1	A300: 2 DC9: 2 F28: 1 F27: 2	
12. Passenger Terminal Building	1,850 m^2	2,354 m^2	4,920 m^2	
13. Administration and Operation Building	312 m^2	992 m^2	1,312 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	1	1	N	
- Walk Through Metal Detector	1	1	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	Control Tower: 16,000BTU Dep. Lounge: 126,000BTU	Control Tower: 17,500BTU Dep. Lounge: 180,000BTU	N	
15. Airport Maintenance Equipment				
- Mower	1	5	N	
- Tractor	1	5	N	
- Hand Mower	0	4	N	
- Sweeper	0	1	N	
- Dump Truck	1	1	N	

Note) N: Not estimated

Table 4.3.3 Description of Works and Order of Implementation (Semarang)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Expansion of Passenger Terminal Building	547
Provision of Maintenance Equipment	1	Mower, Tractor, Handy Mower and Sweeper	955
Construction Cost Total			1,502
Construction Period - 10 Months			
Effect of Implementation	(1) Ensure safer aircraft operations (2) Release the probable factors which constrain the present traffic demand		
Remarks	Training of maintenance staff, strengthening of airport maintenance organization and provision of workshop and equipment garage should be considered for the operation, maintenance and repair of new equipment.		

4.4 Pontianak Airport

4.4.1 Background of Pontianak Airport

Pontianak Airport is class I in DGAC classification and gateway airport to West Kalimantan Province handling 327 thousand passengers annually, and the largest aircraft is F28. This airport is the border airport to Singapore and Burunei.

Outline of the existing Pontianak Airport is summarized in Table 4.4.1.

4.4.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.4.2.

Existing runway will require a 200m extension for full payload operation of F28 aircraft.
A master plan has been prepared for the development of this airport and new runway has been planned. The existing runway will become the future parallel taxiway. Therefore, the implementation of the runway extension is compatible with the long-term development of the airport.
It was revealed by analyzing the soil investigation results that the taxiway at this airport has inadequate pavement strength. Therefore, taxiway overlay work is required to increase the pavement strength.

4.4.3 Maintenance and Rehabilitation Plans

The results of the plan are shown in Figure 4.4.1. Diversion of existing open drain and road will be required by the runway extension works, and land acquisition has been already completed for these diversion works. Additional 315 sq.m check-in lobby and expansion of 72 sq.m to the departure lounge will be required in the passenger terminal building.

Construction period and cost estimates are summarized in Table 4.4.3.

4.4.4 Project Appraisal

The implementation for overlay work of B taxiway was originally ranked as priority I. However, the order of implementation for B taxiway of the two taxiways is judged to be low because of smaller traffic use than A taxiway which is new and is the main taxiway.
The extension of the runway will remove the restriction on payload for departing aircraft. The rehabilitation of the passenger terminal building will eliminate the present serious congestion.

4.4.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.4.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.4.1 Outline of the Existing Pontianak Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
West Kalimantan	Supadio	I	INT'L/DOM 3C	1942 as IAF Base	289.28 Ha	S : 00.09 E : 109.24	3 m	15 - 33	31 C	23.00 - 10.00 GMT	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,770 x 150	Grass	-
Runway	1,650 x 30	Flexible	-
Taxiway	78 x 18	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
148 x 80	F28	9	Flexible	11,760 m²	Self Maneuvering
90 x 60				5,400 m²	

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	2,280 m²	R.C. and Wood	
Operation Building	452 m²	R.C.	
Administration Building	96 m²	R.C. and Wood	
Control Tower	125 m²	R.C.	5 Stories
Cargo Terminal Building	-	-	
Airport Maintenance Workshop	508 m²	R.C.	
Fire Station	400 m²	R.C.	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	2	-
Walk Through Metal Detector		-	2	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	16,000 BTU	1	-
	Departure Lounge	48,000 BTU	3	-
Mower		Disk type	3	-
Tractor		Diesel	5	-
Handy Mower		-	0	-
Sweeper		-	0	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Pontianak		North 17 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
INT'L	PNK-SIN	MNA/GIA	F28	3	
INT'L	PNK-SIN	MNA	F28	3	
DOM	PNK-JKT	MNA/GIA	F28	28	
DOM	PNK-BPN	MNA/GIA	F28	2	
DOM	PNK-MKS	MNA/GIA	F28	2	
DOM	PNK-JKT	MNA	F27	14	
INT'L	PNK-KCH	MNA	F27	1	
DOM	PNK-JKT	BO	NS748	7	
				60/WEEK	

Note :

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	13,998	15,123	14,529	15,645	15,682
No. of Annual Passengers	299,797	325,324	324,461	355,439	353,774
Annual Freight Volume (kg)	3,098,696	3,036,327	3,266,771	3,483,364	3,102,381

Note :

Table 4.4.2 Air Traffic Demand and Airport Facility Requirement for Pontianak Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	353,000	474,000	679,000	
2. Annual Aircraft Movements	15,700	18,500	14,000	
3. Peak Hour Passengers	290	324	648	
4. Peak Hour Aircraft Movements (2 ways)	8	10	10	
5. Largest Aircraft	F28	F28	DC9	
6. Longest Route	Balikpapan	Balikpapan	Balikpapan	
7. Reference Code	3C	3C	3C	
8. Runway				
- Length	1,650 m	1,850 m	N	
- Width	30 m	30 m	N	
9. Runway Strip				
- Length	1,770 m	1,970 m	N	
- Width	75 m	30 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	2 Exit Taxiways	2 Exit Taxiways	2 Exit Taxiways	
- Width	18 m	15 m	15 m	
11. Apron				
- Number of Aircraft Stands	F28: 9	F28: 3 F27: 2 CS2: 2	DC9: 3 F28: 1 F27: 1 CS2: 2	
12. Passenger Terminal Building	2,280 m^2	1,902 m^2	3,804 m^2	
13. Administration and Operation Building	548 m^2	816 m^2	992 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	2	2	N	
- Walk Through Metal Detector	2	2	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	Control Tower: 16,000BTU Dep. Lounge: 48,000BTU	Control Tower: 20,500BTU Dep. Lounge : Int'l 65,000BTU Dom. 244,500BTU	N N	
15. Airport Maintenance Equipment				
- Mower	3	3	N	
- Tractor	5	3	N	
- Hand Mower	0	2	N	
- Sweeper	0	1	N	
- Dump Truck	1	1	N	

Note) N: Not estimated

Table 4.4.3 Description of Works and Order of Implementation (Pontianak)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Runway Expansion	2,875
	2	Expansion of Passenger Terminal Building	268
	3	Taxiway Overlay	2,277
	4	Air Conditioning in Passenger Terminal Building	41
Provision of Maintenance Equipment	1	Handy Mower and Sweeper	452
Construction Cost Total			5,913
Construction Period - 8 Months			
Effect of Implementation	(1) Assure safer and unrestrained air transportation (2) Release the probable factors constraining the present traffic demand		
Remarks	Rehabilitation works should be correlated with the implementation schedule of master plan.		

4.5 Sampit Airport

4.5.1 Background of Sampit Airport

Sampit Airport is class V in DGAC classification handling 30 thousand passengers annually and the largest aircraft is CS212. Sampit Airport handling the largest number of passengers among the class V airports.

Outline of existing Sampit Airport is summarized in Table 4.5.1.

4.5.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.5.2.

There are many alligator cracks on the runway pavement surface which are caused by soft subgrade due to high ground water level, and the pavement surface has weathered. Soil investigation indicates that runway has inadequate pavement strength and requires improvement by overlay works.

4.5.3 Maintenance and Rehabilitation Plans

The result of the plans are shown in Figure 4.5.1.
The runway in this airport requires an overlay of 23cm minimum and 32cm average thickness. The replacement of subgrade is the drastic method to improve the pavement on the weak foundation. This method, however, requires suspension of airport operations and high cost. A practical and economical countermeasure is to initially overlay the runway with minimum thickness of 7cm and to repair the deteriorated part of pavement after overlay when necessary.

Construction period and cost estimates are summarized in Table 4.5.3.

4.5.4 Project Appraisal

It is expected that aviation safety is secured by the implementation of runway overlay.

4.5.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.5.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.5.1 Outline of the Existing Sampit Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
Central Kalimantan	H.Asan	V	Dom 1B			S : 02.33 E : 112.58	45 m	13 - 31	25 - 31 C	23.00 - 04.00 GMT	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,000 x 160	Grass	-
Runway	895 x 23	Flexible	Kolakan
Taxiway	15 x 18	Flexible	Kolakan

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
90 x 40	C-212	3	Flexible	4,200m²	Self Maneuvering
60 x 40					

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	539 m²	R.C. and Wood	2 Buildings
Operation Building	108 m²	Wood	2 Buildings
Administration Building	48 m²	Wood	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	0	-
Walk Through Metal Detector		-	0	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	-	0	-
	Departure Lounge	-	0	-
Mower		-	0	-
Tractor		-	0	-
Handy Mower		-	0	-
Sweeper		-	0	-
Dump Truck		-	0	-

City/Town

Name	Population	Distance to A/P
Sampit		5 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	SMQ-BDJ	MNA/DAS	C212	7	
	SMQ-BDJ	MNA/DAS	BN-T	14	
	SMQ-PKY	MNA/DAS	C212	7	
	SMQ-PKY	BOURAQ	BN-T	7	
	SMQ-BDJ	BOURAQ	BN-T	14	
				49/WEEK	

Note :
SSR monitoring
(still installed)

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	7,471	6,104	7,041	8,754	8,108
No. of Annual Passengers	49,583	45,211	50,918	65,349	69,630
Annual Freight Volume (kg)	49,257	49,204	47,480	113,833	119,097

Note :

Table 4.5.2 Air Traffic Demand and Airport Facility Requirement for Sampit Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	72,000	100,000	151,000	
2. Annual Aircraft Movements	8,100	11,200	8,500	
3. Peak Hour Passengers	74	88	164	
4. Peak Hour Aircraft Movements (2 ways)	6	8	8	
5. Largest Aircraft	CS212	CS212	F28	
6. Longest Route	Banjarmasin	Banjarmasin	Banjarmasin	
7. Reference Code				
8. Runway				
- Length	855 m	M	N	
- Width	23 m	18 m	N	
9. Runway Strip				
- Length	1,000 m	M	N	
- Width	30 m	75 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	20 m	10.5 m	10.5 m	
11. Apron				
- Number of Aircraft Stands	CS2: 4	CS2: 5	F28: 2 CS2: 3	
12. Passenger Terminal Building	216 m^2	510 m^2	1,020 m^2	
13. Administration and Operation Building	48 m^2	420 m^2	560 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	0	0	N	
- Walk Through Metal Detector	0	0	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	0	Departure Lounge: 36,900BTU	N N	
15. Airport Maintenance Equipment				
- Mower	0	2	N	
- Tractor	0	2	N	
- Hand Mower	0	1	N	
- Sweeper	0	0	N	
- Dump Truck	0	1	N	

Note) N: Not estimated
M: Meet minimum requirement

Table 4.5.3 Description of Works and Order of Implementation (Sampit)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Runway Overlay	6,377
	2	Air Conditioning in Passenger Terminal Building	10
Provision of Maintenance Equipment	1	Mower, Tractor and Handy Mower	219
	2	Dump Truck	86
Construction Cost Total			6,692
Construction Period 5 Months			
Effect of Implementation	Ensures continuation of present air transportation and safer aircraft operation.		
Remarks	It is recommended that strengthening of organization, staff training and ancillary works such as provision of workshop, etc., be made in order to operate and maintain properly the maintenance equipment.		

4.6 Ambon Airport

4.6.1 Background of Ambon Airport

Ambon Airport is class II in DGAC classification and the border airport of Maluku Province, handling 147 thousand passengers annually, and the largest aircraft is F28.

Outline of the existing Ambon Airport is summarized in Table 4.6.1.

4.6.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.6.2.

The pavement of the runway, taxiway and apron are deteriorated and require overlay work. The runway in particular should be overlaid in order to improve the steep longitudinal slope of over 1.0% at both ends of the runway.

4.6.3 Maintenance and Rehabilitation Plans

Since the thickness of runway overlay requires 120cm at the thickest position and 49cm in average, the cost of overlay is very high. The thickness of the taxiway is 49cm in average due to the connection with runway at a thick overlay position.

Construction period and cost estimates are summarized in Table 4.6.3.

4.6.4 Project Appraisal

Improvement by overlay ensures safer air transportation.

4.6.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.6.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.6.1 Outline of the Existing Ambon Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
Maluku	Pattimura	II	DOM 3C	1974 as Civil Airport	99 Ha	S : 128.05 E : 03.42	10 m	22 4	28 C	22.00-09.00 GMT	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,970 x 150	Grass	-
Runway	1,850 x 45	Flexible	-
Taxiway	105 x 23	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
29.5 x 90	F28	5	Flexible/ Rigid	26,415m²	Self Maneuvering

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	2,569 m²	R.C. ,Steel & Wood	
Operation Building	-	-	Combined with Adm.
Administration Building	436 m²	R.C.	Including C/T
Control Tower	-	R.C.	4 Stories
Cargo Terminal Building	200 m²	R.C.	
Airport Maintenance Workshop	200 m²	R.C.	
Fire Station	240 m²	R.C.	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	2	-
Walk Through Metal Detector		-	2	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	9,600 BTU	1	-
	Departure Lounge	126,000 BTU	2	-
Mower		Disk type	1	-
Tractor		Diesel	1	-
Handy Mower		Shoulder type	0	-
Sweeper		Truck type	1	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Ambon	244,000	37 km

Transportation

Taxi	Bus	Others
Yes	Yes	Ferry

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	WAPP-WAA	MNA/GIA	F28	25	WAPP: AMBON
DOM	WAPP-WAPL	INDO AVKA	DHC6	9	WAAA: U.Pandang
DOM	WAPP-WAMT	MNA	F27	7	WAPL: Langgur
DOM	WAPP-WASS	MNA/GIA	F28	7	WAMT: Ternate
					WASS: Sorong
				48/Week	

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	7,056	7,775	8,247	7,772	7,986
No. of Annual Passengers	121,951	128,167	148,062	159,483	121,150
Annual Freight Volume (kg)	1,159,895	1,449,112	1,484,015	1,666,436	1,830,564

Note :

Note :

Note :

Table 4.6.2 Air Traffic Demand and Airport Facility Requirement for Ambon Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	147,000	196,000	281,000	
2. Annual Aircraft Movements	8,000	5,500	348	
3. Peak Hour Passengers	182	332	348	
4. Peak Hour Aircraft Movements (2 ways)	6	6	7	
5. Largest Aircraft	F28	F28	DC9	
6. Longest Route	Ujung Padang	Ujung Padang	Ujung Padang	
7. Reference Code				
8. Runway				
- Length	1,850 m	M	N	
- Width	45 m	45 m	N	
9. Runway Strip				
- Length	1,970 m	M	N	
- Width	75 m	150 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	23 m	23 m	23 m	
11. Apron				
- Number of Aircraft Stands	F28: 5	F28: 4 F27: 1	DC9: 2 F28: 1 F27: 1 CS2: 2	
12. Passenger Terminal Building	2,569 m^2	M	M	
13. Administration and Operation Building	343 m^2	400 m^2	528 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	2	2	N	
- Walk Through Metal Detector	2	2	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	Control Tower: 96,000BTU Dep. Lounge: 126,000BTU	Control Tower: 19,000BTU Dep. Lounge : Int'l 131,000BTU Dom. 202,000BTU	N	
15. Airport Maintenance Equipment				
- Mower	1	5	N	
- Tractor	1	5	N	
- Hand Mower	0	4	N	
- Sweeper	1	1	N	
- Dump Truck	1	1	N	

Note) N: Not estimated
M: Meet minimum requirement

Table 4.6.3 Description of Works and Order of Implementation (Ambon)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Runway Overlay	40,006
	2	Taxiway and Apron Overlay	3,995
	3	Air Conditioning in Control Tower	5
Provision of Maintenance Equipment	1	Mower, Tractor and Handy Mower	515
Construction Cost Total			44,521
Construction Period - 10 Months			
Effect of Implementation	Assure safer air transportation		
Remarks	The pavement overlay planned in this Study would be better undertaken as one of the work items of the master plan if the master plan is implemented in the near future. Co-ordination is required with the implementation of master plan in commencing the rehabilitation works.		

4.7 Ternate Airport

4.7.1 Background of Ternate Airport

Ternate Airport is class III in DGAC classification and Hub Airport for pioneer airports in north part of Maluku Province, handling 57 thousand passengers annually, and the largest aircraft is F27.

Outline of the existing Ternate Airport is summarized in Table 4.7.1.

4.7.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.7.2.

The present runway length 1,420m is 230m short for F27 aircraft to make the flight for longest sector to Ambon. Steep slope of graded area, narrow width of runway strip, shortage of space in passenger terminal building are serious problems to be urgently solved in this project.

4.7.3 Maintenance and Rehabilitation Plans

The maintenance and rehabilitation plans are prepared based on the above considerations. The result of the plan is shown in Figure 4.7.1.

The work of runway extension requires an embankment about 5m high. Extending the runway to the opposite end is not adequate due to hilly terrain on the extended line of the runway. Expansion of passenger terminal building and provision of security equipment are the most crucial works in this airport in order to solve the problem of passenger congestion in the terminal building. Expansion of check-in lobby, departure lounge and baggage claim area are planned for the passenger terminal building.

4.7.4 Project Appraisal

The work of runway extension requires a high embankment which results in very expensive civil works for limited economic benefits. (Rp 1.0 billion, EIRR = 0%). The runway extension is therefore placed in low priority in the order of implementation.
On the other hand, the expansion of the passenger terminal building is placed in top priority because of its high economic effect.
X-ray baggage screening unit and walk-through metal detector are involved in works of passenger terminal building and ranked top priority.

4.7.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.7.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.7.1 Outline of the Existing Ternate Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
North Maluku	Babullah	III	DOM 3C			S : 00.50 E : 127.23	15 m	14 - 32	30 C	23.00-09.00 GMT	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,700 x 90	-	-
Runway	1,420 x 30	Flexible	-
Taxiway	90 x 20	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
124 x 80	F27	1	Flexible	3,200m²	Self Maneuvering
	HS748	1			
	CS212	2			

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	400 m²	Steel	
Operation Building	-	-	
Administration Building	120 m²	R.C.	
Control Tower	100 m²	R.C.	4 Stories
Cargo Terminal Building	-	-	
Airport Maintenance Workshop	300 m²	R.C. & Steel	
Fire Station	250 m²	R.C.	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	0	-
Walk Through Metal Detector		-	0	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	12,000 BTU	1	-
	Departure Lounge	-	0	-
Mower		Disk type	1	-
Tractor		Diesel	4	-
Handy Mower		Shoulder type	1	-
Sweeper		-	0	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Ternate		4 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	TTK-MDC	MNA	F27	6	
	TTK-AMQ	MNA	F27	6	
	TTK-MDC	BO	HS748	4	
				16/Week	

Note :

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	4,007	4,072	4,228	3,968	3,808
No. of Annual Passengers	51,500	54,349	60,352	62,548	56,810
Annual Freight Volume (kg)	380,833	319,589	455,485	439,808	522,593

Note :

Table 4.7.2 Air Traffic Demand and Airport Facility Requirement for Ternate Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	60,000	79,000	114,000	
2. Annual Aircraft Movements	3,800	3,900	5,300	
3. Peak Hour Passengers	84	140	180	
4. Peak Hour Aircraft Movements (2 ways)	4	5	6	
5. Largest Aircraft	F27	F27	F27	
6. Longest Route	Ambon	Ambon	Ambon	
7. Reference Code	3C	3C	3C	
8. Runway				
- Length	1,420 m	1,650 m	N	
- Width	30 m	30 m	N	
9. Runway Strip				
- Length	1,700 m	1,770 m	N	
- Width	45 m	150 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	20 m	15 m	15 m	
11. Apron				
- Number of Aircraft Stands	F27: 2 CS2: 2	F27: 3 CS2: 1	F27: 3 CS2: 2	
12. Passenger Terminal Building	400 m^2	792 m^2	1,020 m^2	
13. Administration and Operation Building	120 m^2	247 m^2	260 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	0	1	N	
- Walk Through Metal Detector	0	1	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	Control Tower: 12,000BTU	Control Tower: 24,000BTU Dep. Lounge: 57,000BTU	N	
15. Airport Maintenance Equipment				
- Mower	1	4	N	
- Tractor	4	4	N	
- Hand Mower	1	4	N	
- Sweeper	0	0	N	
- Dump Truck	1	1	N	

Note) N: Not estimated

Table 4.7.3 Description of Works and Order of Implementation (Ternate)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Expansion of Passenger Terminal Building X-Ray Baggage Screen Unit Walk-Through Metal Detector	831
	2	Widening of Graded Area	421
	3	Grading of Runway Strip	59
	4	Air Conditioning in Passenger Terminal Building and Control Tower	21
	5	Runway Extension	9,803
Provision of Maintenance Equipment	1	Mower and Handy Mower	117
Construction Cost Total			11,252
Construction Period - 10 Months*			
Effect of Implementation	(1) Assure safer aircraft operations and unrestricted air transportation (2) Reduce regional disparity between this region and Java Island.		
Remarks	The runway extension work is placed in low priority in the order of implementation due to its low economic viability.		

Note

*: including 6 Months for stability of bank settlement.

4.8 Mataram Airport

4.8.1 Background of Mataram Airport

Mataram Airport is class III in DGAC classification, and the gateway to West Nusa Tenggara Province and main access infrastructures to the Province with tourist resort areas, handling 187 thousand passengers annually, and the largest aircraft is F28.

Outline of the existing Mataram Airport is summarized in Table 4.8.1.

4.8.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirement are shown in Table 4.8.2.

The present runway length is inadequate for F28 aircraft in Mataram-Surabaya route and imposes aircraft weight restrictions. At least 50m extension of the runway is required.
Apron has not sufficient pavement strength for F-28 aircraft and not enough space for aircraft parking.

4.8.3 Maintenance and Rehabilitation Plans

The maintenance and rehabilitation plans are prepared on the above considerations. The result of the plan is shown in Figure 4.8.1.

The relocation of approach lighting system is necessary for the runway extension.

The asphalt concrete overlay work of about 14cm thickness to increase the pavement strength is an urgent and indispensable rehabilitation work. In order to solve the capacity deficiency problems, and to cope with the demand at least up to 1995, the apron will be expanded by an asphalt concrete pavement 74cm thick and 10m wide.

Construction period and cost estimates are summarized in Table 4.8.3.

4.8.4 Project Appraisal

The apron overlay work is placed in top priority because of its urgency and to maintain the present air transportation.

The airline company proceeds a plan to introduce DC9 aircraft, which requires a longer runway than that planned in this Study. Taking account of the uneconomy and impracticability of runway extension in the rehabilitation works which will need re-extension of runway and re-location of approach lighting system for DC9, the order of implementation of runway extension is placed in low priority.

4.8.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.8.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.8.1 Outline of the Existing Mataram Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
West Nusatenggara	Selaparang	III	DOM 3C		24 Ha	S : 08.32 E : 116.04	15.40 m	12 - 30	27 C	21.00 - 04.00 GMT	Seasonal	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,720 X 150	Grass	-
Runway	1,600 X 30	Flexible	-
Taxiway	130 X 18	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
204 x 60	F28 F27	1	Flexible	12,240m²	Self Maneuvering
	HS748	2			
	CS212	2			

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	1,604 m²	R.C. and Wood	
Operation Building	200 m²	R.C. and Wood	
Administration Building	340 m²	R.C. and Wood	
Control Tower	100 m²	R.C.	
Cargo Terminal Building	-	-	
Airport Maintenance Workshop	100 m²	Wood	Temporary
Fire Station	440 m²	-	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	1	-
Walk Through Metal Detector		-	1	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	16,000 BTU	1	-
	Departure Lounge	-	0	-
Mower		Disk type	5	-
Tractor		Diesel	5	-
Handy Mower		Shoulder type	1	-
Sweeper		-	0	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Mataram	215,000	1 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	AMI-SUB	MNA/GIS	F28 - 4000	7	
	AMI-DPS	MNA	F27	49	
	AMI-BKU	MNA	F27	7	
	AMI-SWQ	MNA	CS121	7	
				70/Week	

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	5,452	5,790	6,578	7,276	6,680
No. of Annual Passengers	132,257	145,533	152,890	173,313	179,334
Annual Freight Volume (kg)	915,306	1,038,924	1,001,769	1,254,696	1,306,928

Note :

Note :

Note :

Table 4.8.2 Air Traffic Demand and Airport Facility Requirement for Mataram Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	205,000	260,000	370,000	
2. Annual Aircraft Movements	6,680	8,500	9,200	
3. Peak Hour Passengers	230	316	416	
4. Peak Hour Aircraft Movements (2 ways)	6	8	8	
5. Largest Aircraft	F28	F28	F28	
6. Longest Route	Surabaya	Surabaya	Surabaya	
7. Reference Code	3C	3C	3C	
8. Runway				
- Length	1,600 m	1,650 m	N	
- Width	30 m	30 m	N	
9. Runway Strip				
- Length	1,720 m	1,770 m	N	
- Width	75 m	150 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	18 m	15 m	15 m	
11. Apron				
- Number of Aircraft Stands	F28: 1 F27: 2 CS2: 2	F28: 2 F27: 2 CS2: 1	F28: 4 F27: 1 CS2: 1	
12. Passenger Terminal Building	1,604 m^2	1,722 m^2	2,268 m^2	
13. Administration and Operation Building	565 m^2	M	598 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	1	1	N	
- Walk Through Metal Detector	1	1	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	Control Tower 16,000BTU	Control Tower 20,0000BTU Dep. Lounge 205,0000TU	N	
15. Airport Maintenance Equipment				
- Mower	5	2	N	
- Tractor	5	2	N	
- Hand Mower	1	1	N	
- Sweeper	0	1	N	
- Dump Truck	1	1	N	

Note) N: Not estimated
M: Meet minimum requirement

Table 4.8.3 Description of Works and Order of Implementation (Mataram)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Apron Overlay	1,782
	2	X-Ray Baggage Screening Unit Walk-Through Metal Detector	685
	3	Apron Expansion	64
	4	Runway Extension	814
	5	Air Conditioning in Passenger Terminal Building	41
Provision of Maintenance Equipment	1	Sweeper	443
Construction Cost Total			3,829
Construction Period - 4 Months			
Effect of Implementation	(1) Ensure safer and unrestrained air transportation (2) This airport is the main access infrastructure to Lombok Island which will enable utilization of tourism resources.		
Remarks	The airline company has a plan to introduce DC9 aircraft. It is recommended that, for the implementation of rehabilitation works, co-ordination with the DC9 introduction plan be closely made.		

4.9 Bima Airport

4.9.1 Background of Bima Airport

Bima Airport is class III in DGAC classification and the transit airport in West Nusa Tenggara Province handling 49 thousand passengers annually, and the largest aircraft is F27.

Outline of the existing Bima Airport is summarized in Table 4.9.1.

4.9.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.9.2.

This airport is located in low land and the runway strip is swamped by sea water when the tide is in, which causes the pavement to deteriorate and cause the land to be saline and to kill plant life. Extending the runway by an additional 250m to a total length of 1,650m will eliminate the payload restriction. The pavement of taxiway and apron does not have enough strength and requires an overlay.

4.9.3 Maintenance and Rehabilitation Plans

It is planned to construct a perimeter dyke around the runway strip on its west side and western extended portion to keep out the tide.

Average thickness of the overlay for the taxiway and apron are estimated as 14cm and 22cm respectively.

Construction period and cost estimates are summarized in Table 4.9.3.

4.9.4 Project Appraisal

The provision of a perimeter dyke will maintain the function of airport facilities, and contribute to safer aircraft operations. Therefore this work is placed in the top priority.

The economic effect of runway extension is low with an EIRR of only 2%. This is because the benefits obtained from the elimination of payload restriction are not enough to cover the construction cost due to low traffic volume. In consideration of the low economic effect, runway extension is given a low order of implementation.

On the other hand, high priority of implementation is given to the apron extension because of its high economic effect exceeding 15% EIRR and urgency.

4.9.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.9.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.9.1 Outline of the Existing Bima Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
West Nusa Tenggara	Salaludin	III	DOM 3C		51.89 Ha	S : 08.30 E : 118.42	1 m	13 - 31	27 - 34 C	0.00 - 07.00 GMT	All Season	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	1,500 x 150	Grass	Kolakan
Runway	1,400 x 30	Flexible	Kolakan
Taxiway	100 x 20	Flexible	Kolakan

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
120 x 69	F27	3	Flexible	8,280m²	Self Maneuvering
	CN212	1			

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	500 m²	Brick & Wood	
Operation Building	96 m²	Brick & Wood	
Administration Building	200 m²	Brick & Wood	
Control Tower	104 m²	R.C.	4 Stories

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	0	-
Walk Through Metal Detector		-	0	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	-	0	-
	Departure Lounge	-	0	-
Mower		Disk type	1	-
Tractor		Diesel	2	-
Handy Mower		-	0	-
Sweeper		-	0	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Bima	60,074	21 km

Transportation

Taxi	Bus	Others
Yes	Yes	-

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	BMU-DPS	MNA	F27	5	
	BMU-ANI	MNA	F27	7	
				12/Week	

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	2,538	2,694	2,682	2,695	3,640
No. of Annual Passengers	43,120	38,266	36,809	39,582	48,850
Annual Freight Volume (kg)	84,830	142,694	146,909	171,497	119,304

Note :

Note :

Note :

Table 4.9.2 Air Traffic Demand and Airport Facility Requirement for Bima Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	72,000	90,000	130,000	
2. Annual Aircraft Movements	3,640	3,800	5,100	
3. Peak Hour Passengers	100	256	256	
4. Peak Hour Aircraft Movements (2 ways)	4	9	9	
5. Largest Aircraft	F27	F27	F27	
6. Longest Route	Denpasar	Denpasar	Denpasar	
7. Reference Code	3C	3C	3C	
8. Runway				
- Length	1,400 m	1,650 m	N	
- Width	30 m	30 m	N	
9. Runway Strip				
- Length	1,500 m	1,770 m	N	
- Width	75 m	150 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	20 m	15 m	15 m	
11. Apron				
- Number of Aircraft Stands	F27: 3 CS2: 1	F27: 3 CS2: 2	F27: 3 CS2: 2	
12. Passenger Terminal Building	500 m^2	1,044 m^2	1,044 m^2	
13. Administration and Operation Building	200 m^2	221 m^2	286 m^2	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Unit	0	1	N	
- Walk Through Metal Detector	0	1	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	0	Control Tower: 39,700BTU Dep. Lounge : 89,300BTU	N	
15. Airport Maintenance Equipment				
- Mower	1	2	N	
- Tractor	2	2	N	
- Hand Mower	0	1	N	
- Sweeper	0	0	N	
- Dump Truck	1	1	N	

Note) N: Not estimated

Table 4.9.3 Description of Works and Order of Implementation (Bima)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Provision of Perimeter Dyke	638
	2	Taxiway and Apron Overlay Apron Expansion	2,363
	3	X-Ray Baggage Screen Unit Walk-Through Metal Detector	684
	4	Runway Extension	1,816
	5	Air Conditioning in Passenger Terminal Building	16
Provision of Maintenance Equipment	1	Mower, Tractor and Handy Mower	124
Construction Cost Total			5,641
Construction Period - 6 Months			
Effect of Implementation	(1) Prevent submergence of airport surface by sea water (2) Ensure safer and regular air transportation		
Remarks	Administrative responsibility and management on the following should be co-ordinated with local government - Diversion of existing river due to runway extension - Water level control due to the perimeter dyke		

4.10 Merauke Airport

4.10.1 Background of Merauke Airport

Merauke Airport is class III in DGAC classification and the Border Airport in Irian Jaya Province for PNG and the base airport of 9 pioneer airports. Due to underdeveloped land transportation, this airport is indispensable for daily life of local population. Merauke Airport is handling 28 thousand passengers annually, and the largest aircraft is F28.

Outline of the existing Merauke Airport is summarized in Table 4.10.1.

4.10.2 Evaluation of Existing Facilities

Air traffic demand in 1995 and 2004 and their facility requirements are shown in Table 4.10.2.

A 300m long and 20m wide area in the middle of runway is in a weathered condition with raveling in many places. With 30mm deep depression, it is dangerous for aircraft operations. Apron and taxiway pavement are also deteriorated. Pavement overlays are necessary for safe aircraft operations.

The existing passenger terminal building is overcrowded with peak hour passengers. The available floor area is about half of the standard requirement.

The main structure of passenger terminal building were proved to be stable by the building survey. The roofing is however superannuated and is causing serious leaks.

4.10.3 Maintenance and Rehabilitation Plans

The maintenance and rehabilitation plans are prepared using the above considerations. The result of the plan is shown in Figure 4.10.1.

The thickness of pavement overlays for the runway, taxiway and apron average 8cm, 4cm and 9cm respectively. It is planned to widen the runway strip to 300m in accordance with ICAO recommendations because of its easy implementation. The graded area is widened to 75m from 45.5m in order to reduce the risk of damage to aircraft running off the runway. An open ditch, trees and bush are cleared to cope with this requirement.

Construction period and cost estimates are summarized in Table 4.10.3.

4.10.4 Project Appraisal

From the view point of the importance of securing aviation safety, high priority of implementation are given to the overlay works of runway,

taxiway and apron.

The X-ray screening unit and walk-through metal detector are ranked priority I, but the order of implementation is changed to agree with expansion of the passenger terminal building and is accordingly ranked down.

4.10.5 Conclusion and Recommendation

It is concluded that the airport maintenance and rehabilitation works should be urgently implemented for airport. Description of works and order of implementation are summarized in Table 4.10.3.

Preparations for the implementation of the project is recommended to be urgently undertaken by DGAC.

Table 4.10.1 Outline of the Existing Merauke Airport

Province	Name of Airport	Class	INT'L/DOM ICAO Code	Commencement of Services	Total Area of Airport	Airport Reference Point	Airport Elevation	Runway Bearing	Airport Reference Temperature	Operation Hours	Seasonal Availability	Note : Control Agency :
Irian Jaya	Mopah	IV	DOM 3C	1983	276 Ha	S : 08.37 E : 140.28	2.85 m	16 - 34	26 C	To meet ops. requirement	All Seasons	DGAC

Basic Facilities

Name of Facilities	Size	Pavement	Note
Runway Strip	2,250 x 150	Grass	-
Runway	1,850 x 30	Flexible	-
Taxiway	A=239m, B=100m B 100 x 150	Flexible	-

Apron	Aircraft Type	No. of Stand	Pavement	Area	Parking Configuration
160 x 45	F28	2	Flexible	7,200m²	Self Maneuvering

Building Facilities

Name of Facilities	Size	Structure	Note
Passenger Terminal Building	910 m²	R.C. and Wood	Incl. Adm .& Opr.
Operation Building	-	-	
Administration Building	-	-	
Control Tower	48 m²	R.C. and Wood	
Cargo Terminal Building	18 m²	-	
Airport Maintenance Workshop	262 m²	-	
Fire Station	200 m²	-	

Equipment

Name of Equipment		Type or Capacity	Number	Note
X-ray Baggage Screening Unit		-	1	-
Walk Through Metal Detector		-	1	-
Baggage Claim Device		-	0	-
Air Conditioning	Control Tower	16,000BTU	1	-
	Departure Lounge	-	0	-
Mower		Disk type	1	-
Tractor		Diesel	5	-
Handy Mower		-	0	-
Sweeper		-	0	-
Dump Truck		-	1	-

City/Town

Name	Population	Distance to A/P
Merauke	35,900	4.3 km

Transportation

Taxi	Bus	Others
Yes	-	-

Note :

Flight Services

Int'l/Dom	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	MKQ-DJJ	MNA	F28	4	
DOM	MKQ-BXD	MNA	DHC-6	9	
	MKQ-KEA				
	MKQ-KEI				
	MKQ-KMP				
	MKQ-MDP				
	MKQ-MUP				
	MKQ-OKQ				
	MKQ-XKG				
	MKQ-TMH				
				13/Week	

Note :

Air Traffic Statistic

Years	1985	1986	1987	1988	1989
No. of Landing & Take-offs	1,527	1,703	1,541	1,481	1,286
No. of Annual Passengers	36,941	39,458	31,851	29,639	27,682
Annual Freight Volume (kg)	1,322,051	1,384,440	1,218,391	716,107	709,293

Note :

Table 4.10.2 Air Traffic Demand and Airport Facility Requirement for Merauke Airport

Items	Present Conditions (as of 1989)	Year 1995	Year 2004	Remarks
1. Annual Passengers	28,000	37,000	54,000	
2. Annual Aircraft Movements	1,300	1,800	2,400	
3. Peak Hour Passengers	69	168	168	
4. Peak Hour Aircraft Movement s(2 ways)	2	6	6	
5. Largest Aircraft	F28	F28	F28	
6. Longest Route	Jayapura	Jayapura	Jayapura	
7. Reference Code	3C	3C	3C	
8. Runway				
- Length	1,850 m	M	N	
- Width	30 m	30 m	N	
9. Runway Strip				
- Length	2,250 m	M	N	
- Width	75 m	150 m	N	Mimimum distance from runway centerline
10. Taxiway				
- System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	
- Width	23 m	M	15 m	
11. Apron				
- Number of Aircraft Stands	F28: 2	F28: 2 CS2: 2	F28: 2 CS2: 2	
12. Passenger Terminal Building	518 m^2	1,008 m^2	1,008 m^2	
13. Administration and Operation Building	392 m^2	M	M	
14. Ancillary Equipment in Building				
- X-Ray Baggage Screen Nnit	1	1	N	
- Walk Through Metal Detector	1	1	N	
- Baggage Claim Device	0	0	N	
- Air Conditioning	Control Tower: 16000BTU	Control Tower: 13,000BTU Dep. Lounge: 65,000BTU	N	
15. Airport Maintenance Equipment				
- Mower	1	3	N	
- Tractor	5	3	N	
- Hand Mower	0	2	N	
- Sweeper	0	1	N	
- Dump Truck	1	1	N	

Note) N: Not estimated
M: Meet minimum requirement

Table 4.10.3 Description of Works and Order of Implementation (Merauke)

Classification	Order of Implementation	Description of Works	Construction Cost (Million Rupiah)
Rehabilitation Works	1	Runway Overlay	3,152
	2	Apron Overlay	1,874
	3	Taxiway Overlay	672
	4	Widening of Graded Area	244
	5	Apron Expansion	27
	6	Expansion of Passenger Terminal Building X-Ray Baggage Screening Unit Walk-Through Metal Detector	1,071
	7	Rehabilitation of Finishing in Passenger Terminal Building, and Administration and Operation Building	12
	8	Widening of Runway Strip	126
	9	Air Conditioning in Passenger Terminal Building	16
Provision of Maintenance Equipment	1	Mower, Handy Mower, Sweeper	841
	2	Dump Truck	93
Construction Cost Total			8,128
Construction Period - 9 Months			
Effect of Implementation	(1) Assure safer aircraft operations and improved service level of air transportation (2) Merauke will be assigned to the provincial capital in South Irian Jaya. The rehabilitation of existing Merauke airport would be an important policy in order to contribute to regional economy and to reduce the regional disparity of eastern Indonesia		
Remarks	Training of maintenance staff, strengthening of airport maintenance organization and provision of workshop and equipment garage should be considered for the operation, maintenance and repair of new equipment.		

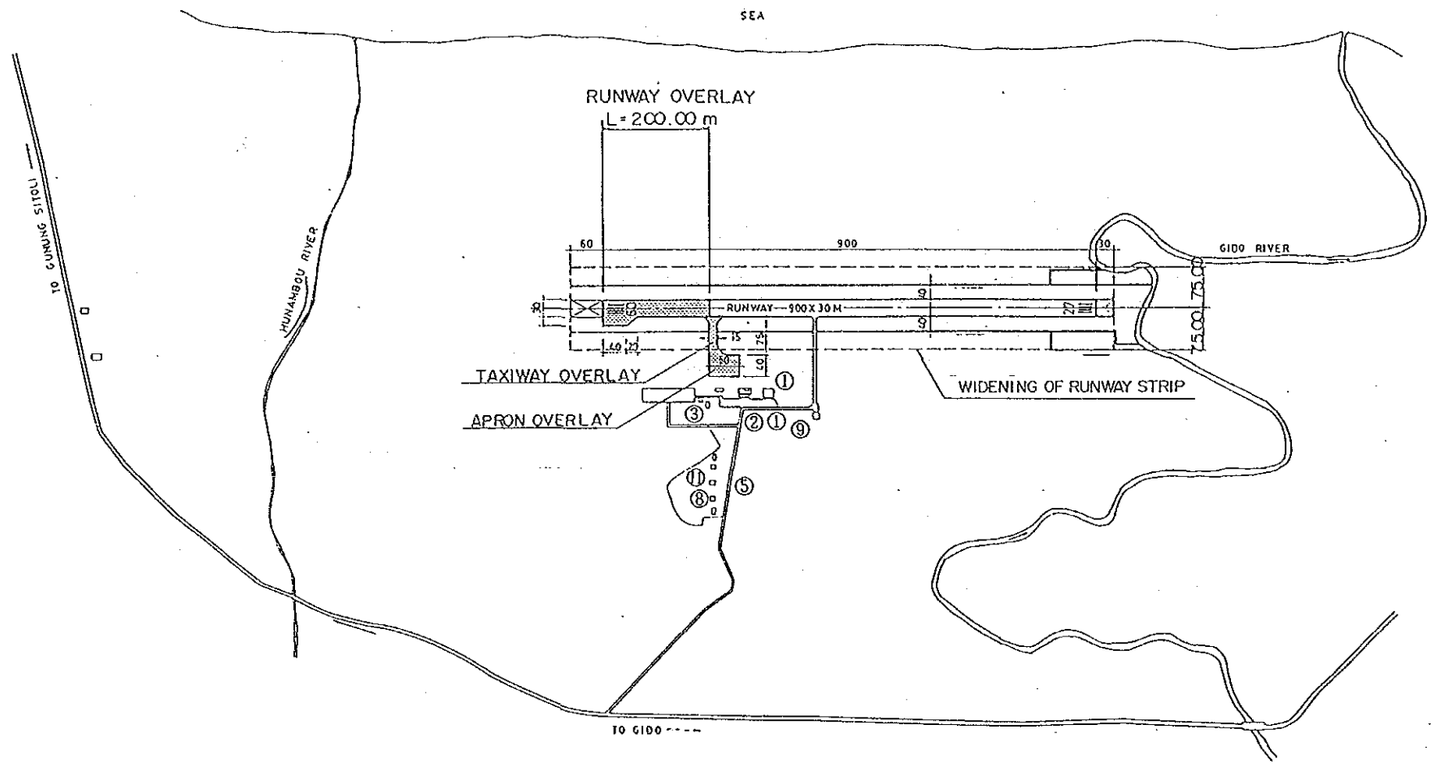


Figure 4.1.1 Master Plan of Gunung Sitoli Airport

SCALE 0 100 200 500M

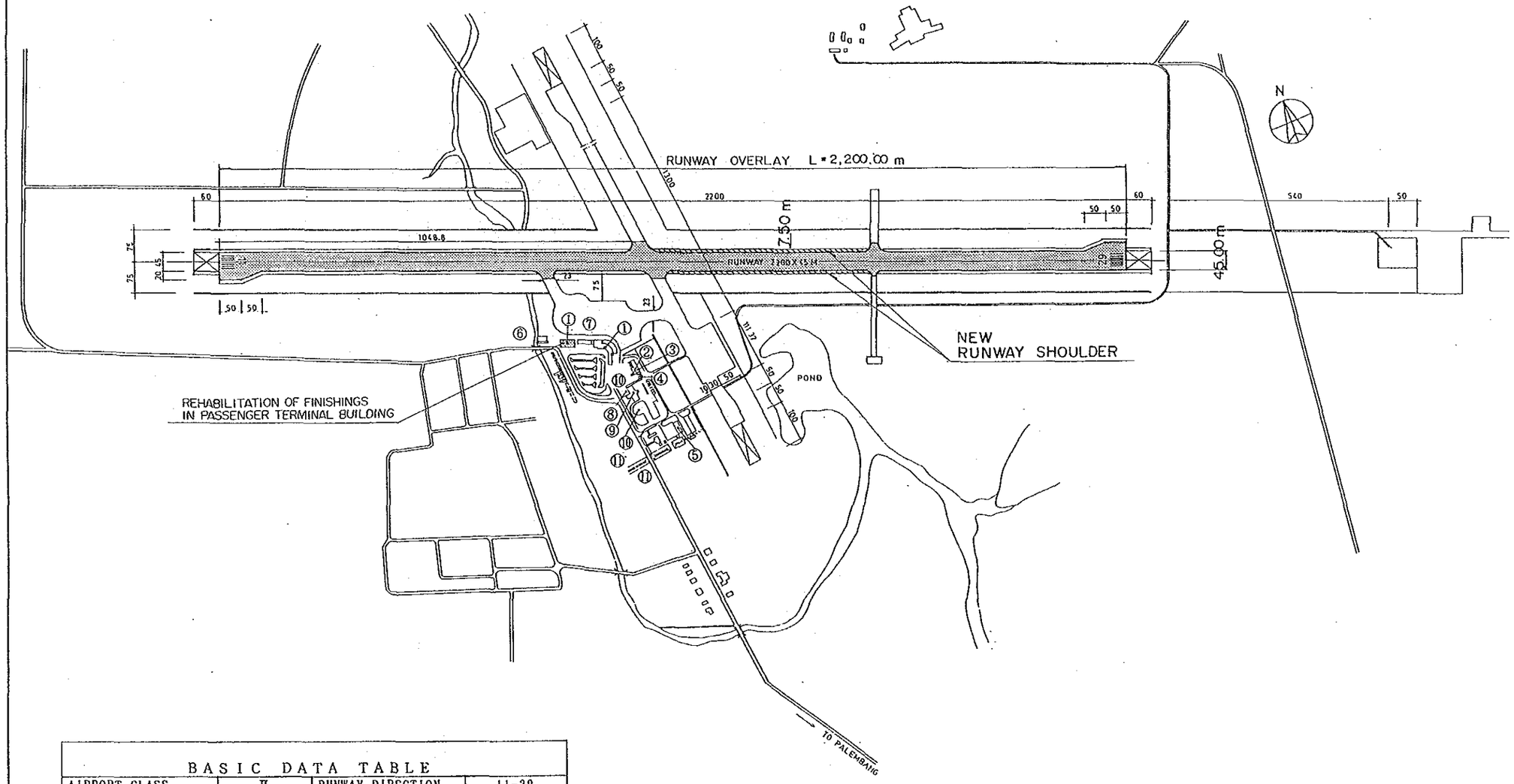
BASIC DATA TABLE			
AIRPORT CLASS	IV	RUNWAY DIRECTION	09-27
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	3M	PAVEMENT STRENGTH	
AIRPORT REF. POINT	01° 16′ N	NAVIGATIONAL AIDS	
(ARP) COORDINATES	97° 37′ E	DISTANCE FROM CITY	18KM
AIRPORT REF. TEMP			

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower		10	Fuel Farm	
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION

NAME OF AIRPORT :	SCALE :
BINAKA/GUNUNG SITOLI	
NAME OF DRAWING :	DWG NO :
Layout Plan	GNS-1



BASIC DATA TABLE			
AIRPORT CLASS	II	RUNWAY DIRECTION	11-29
AIRPORT STATUS	INT'L/DOM	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	11.3M	PAVEMENT STRENGTH	PCN 35 FCXU
AIRPORT REF. POINT (ARP) COORDINATES	02° 54′ S 104° 42′ E	NAVIGATIONAL AIDS	
		DISTANCE FROM CITY	11KM
AIRPORT REF. TEMP	32.9℃		

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	✓
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	✓
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building	✓			

LEGEND	
—×—×—	Fence
═══	Ditch

Figure 4.2.1 Master Plan of Palembang Airport

SCALE 0 100 200 500M

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : ST. MAHMUD BADARUDDIN/PALEMBANG	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : PLM-1

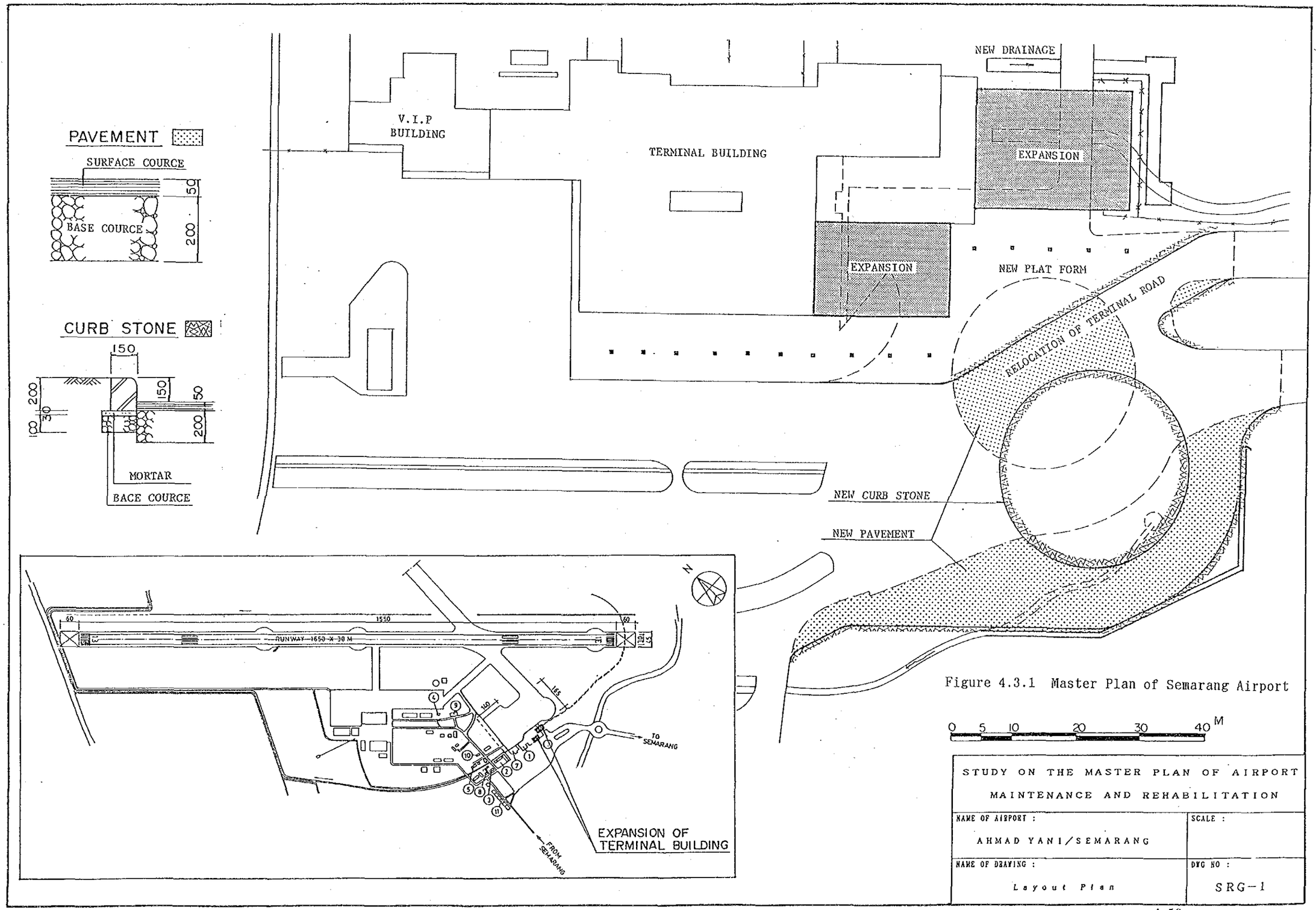
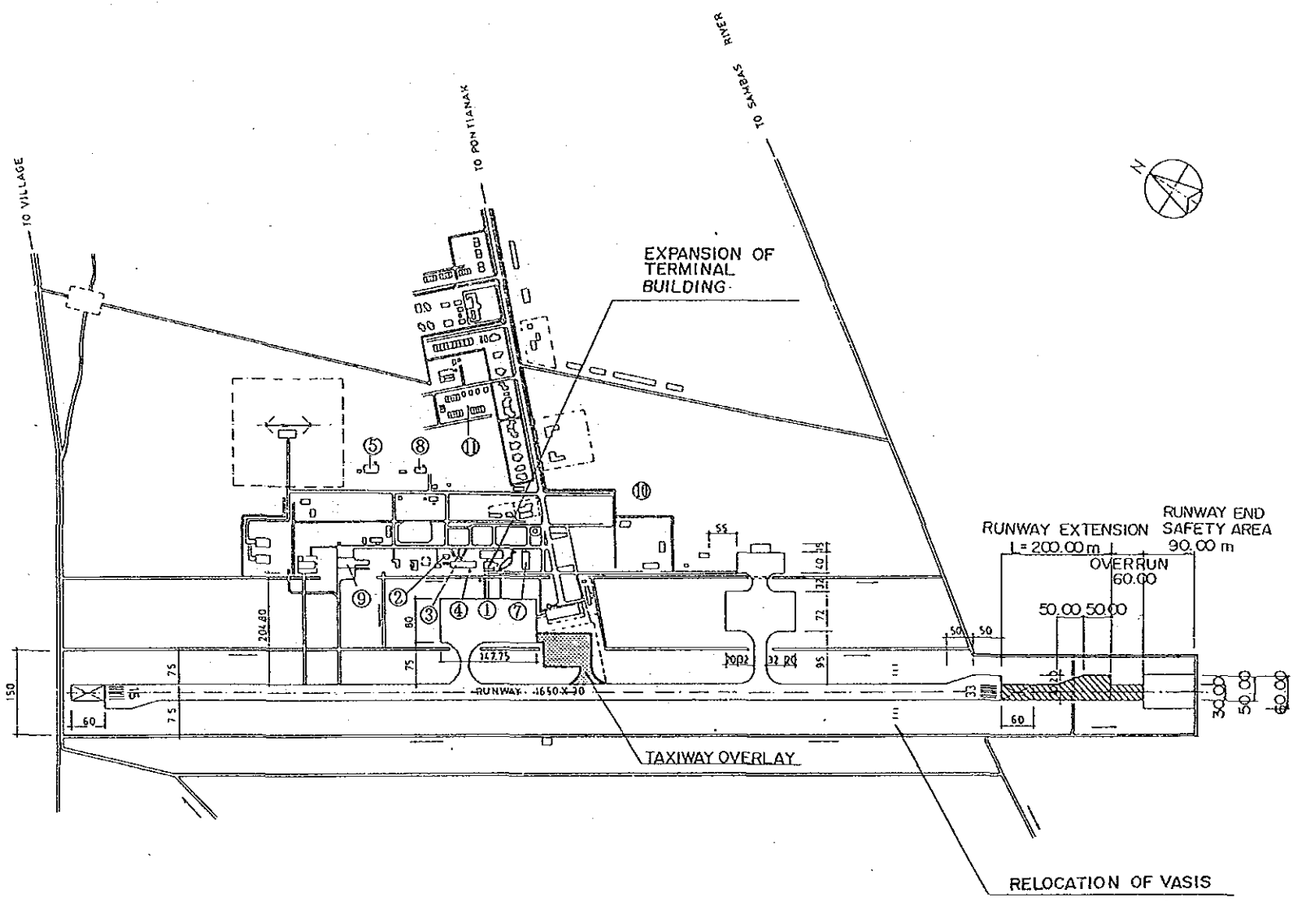


Figure 4.3.1 Master Plan of Semarang Airport

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : AHMAD YANI/SEMARANG	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : SRG-1



BASIC DATA TABLE			
AIRPORT CLASS	I	RUNWAY DIRECTION	15-33
AIRPORT STATUS	INT'L/DOM	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	3M	PAVEMENT STRENGTH	PCN 20 FDYU
AIRPORT REF. POINT (ARP) COORDINATES	00° 09′ S 109° 24′ E	NAVIGATIONAL AIDS	NDB, VOR, ILS
		DISTANCE FROM CITY	17KM
AIRPORT REF. TEMP	24-31°C		

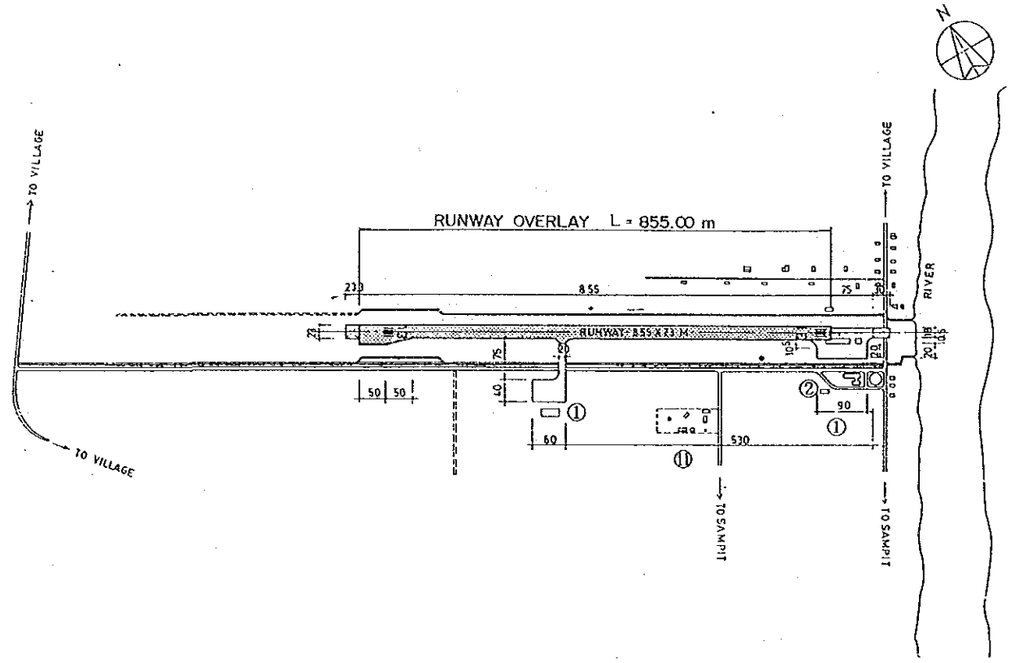
Figure 4.4.1 Master Plan of Pontianak Airport

SCALE 0 100 200 500M

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	✓
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	✓
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : SUPADIO/PONTIANAK	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : PNK-1



BASIC DATA TABLE			
AIRPORT CLASS	V	RUNWAY DIRECTION	13-31
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	4.5M	PAVEMENT STRENGTH	
AIRPORT REF. POINT	02° 33′ S	NAVIGATIONAL AIDS	NDB
(ARP) COORDINATES	112° 58′ E	DISTANCE FROM CITY	5KM
AIRPORT REF. TEMP	30°C		

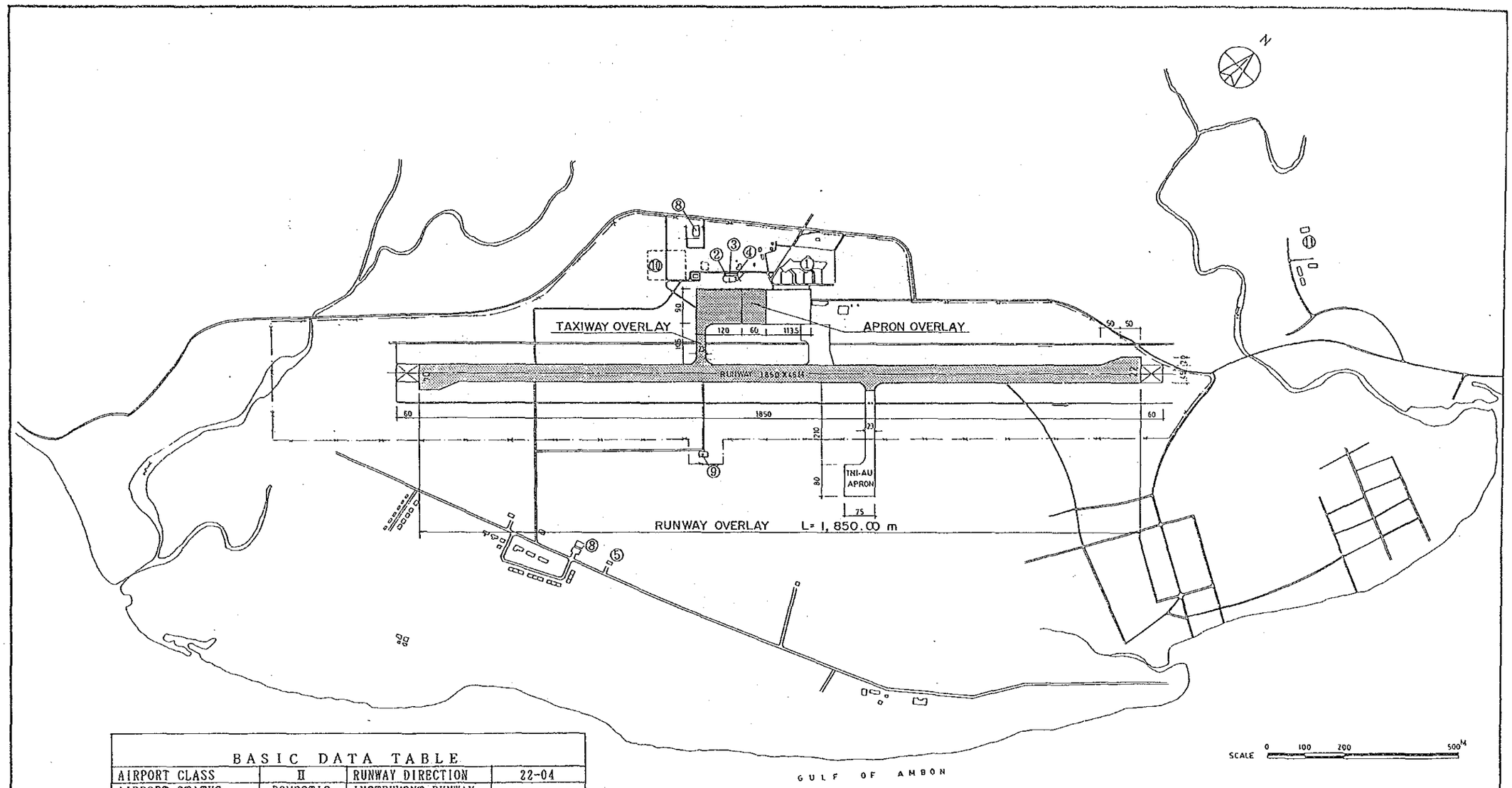
MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	
2	Administration Building	✓	8	Main Power House	
3	Operations Building		9	Fire Station	
4	Control Tower		10	Fuel Farm	
5	Workshop		11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

Figure 4.5.1 Master Plan of Sampit Airport

SCALE 0 100 200 500M

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : HASAN/SAMPIT	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : SMQ-1



BASIC DATA TABLE			
AIRPORT CLASS	II	RUNWAY DIRECTION	22-04
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	10M	PAVEMENT STRENGTH	PCN 31 FCZU
AIRPORT REF. POINT (ARP) COORDINATES	128° 05′ E 03° 42′ S	NAVIGATIONAL AIDS	NDB, VOR/DME ILS
AIRPORT REF. TEMP	28℃	DISTANCE FROM CITY	37KM

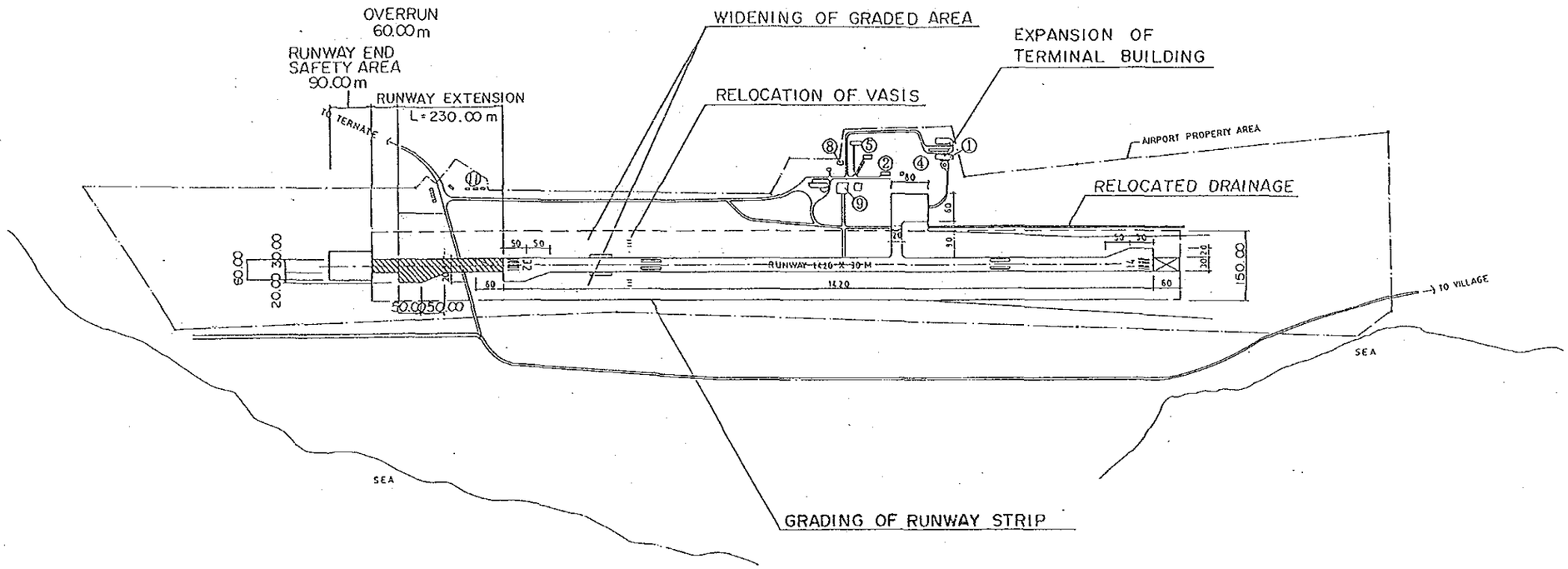
Figure 4.6.1 Master Plan of Ambon Airport

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	✓
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION

NAME OF AIRPORT :	SCALE :
PATIMURA/AMBON	
NAME OF DRAWING :	DWG NO :
Layout Plan	AMQ-1



BASIC DATA TABLE			
AIRPORT CLASS	III	RUNWAY DIRECTION	14-32
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	15M	PAVEMENT STRENGTH	PCN 12 FCZU
AIRPORT REF. POINT (ARP) COORDINATES	00° 50′ S 127° 23′ E	NAVIGATIONAL AIDS	NDB, VOR
		DISTANCE FROM CITY	4KM
AIRPORT REF. TEMP	30℃		

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building		9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

Figure 4.7.1 Master Plan of Ternate Airport

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : BABULLAH/TERNATE	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : TTE-1

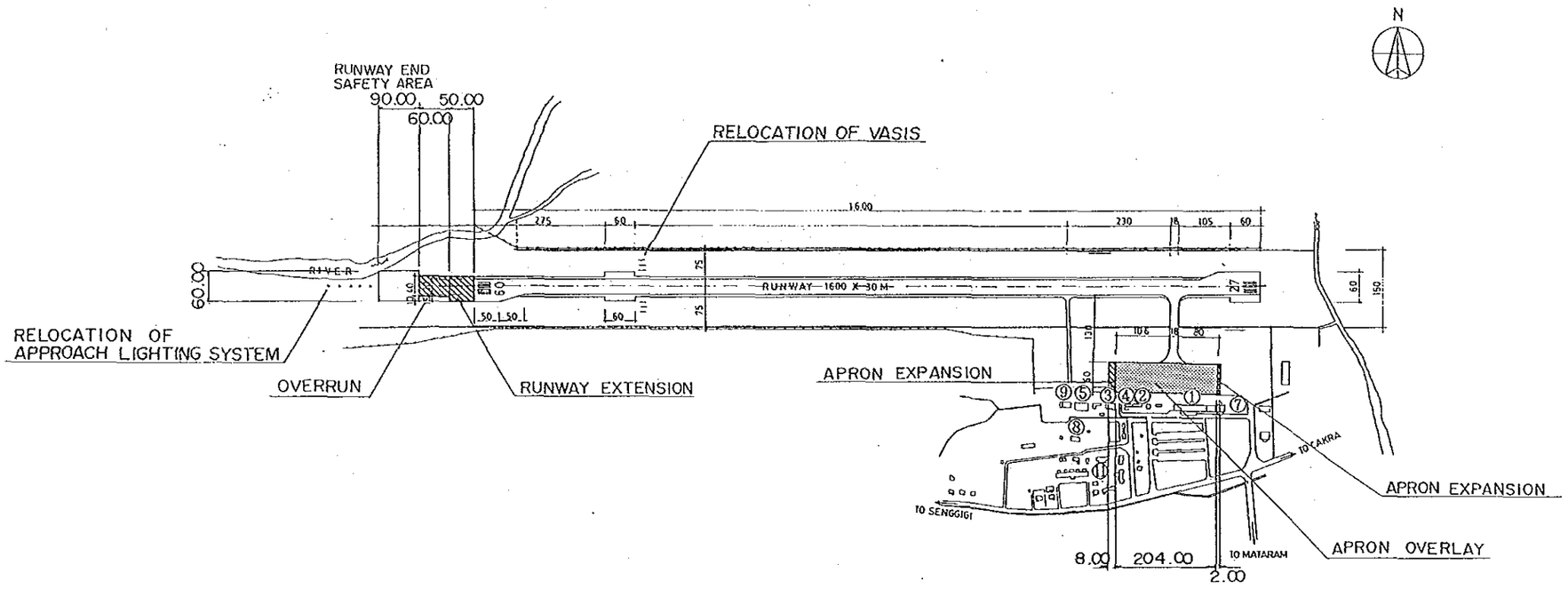


Figure 4.8.1 Master Plan of Mataram Airport

SCALE 0 100 200 500M

BASIC DATA TABLE			
AIRPORT CLASS	III	RUNWAY DIRECTION	09-27
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	15.40M	PAVEMENT STRENGTH	PCN 20 FCYU
AIRPORT REF. POINT (ARP) COORDINATES	08° 32′ S 116° 04′ E	NAVIGATIONAL AIDS	NDB, VOR
		DISTANCE FROM CITY	1KM
AIRPORT REF. TEMP	26.9℃		

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	✓
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	
5	Workshop	✓	11	Staff Housing	
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : SELAPARANG/MATARAM	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : AMI-1

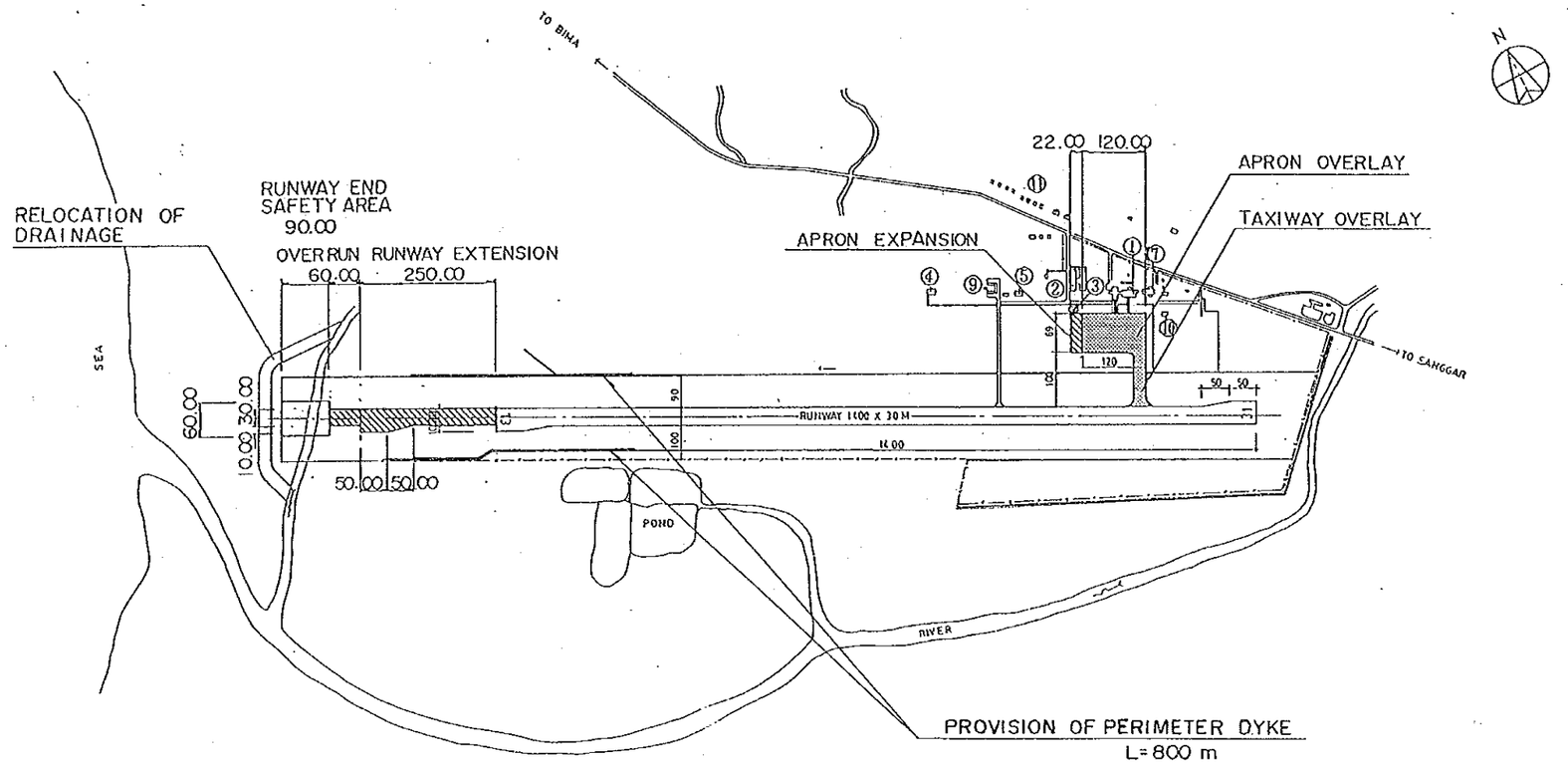


Figure 4.9.1 Master Plan of Bima Airport

BASIC DATA TABLE			
AIRPORT CLASS	III	RUNWAY DIRECTION	13-31
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	1M	PAVEMENT STRENGTH	PCN 11 FDZU
AIRPORT REF. POINT (ARP) COORDINATES	08° 30′ S 118° 42′ E	NAVIGATIONAL AIDS	NDB, VOR
		DISTANCE FROM CITY	21KM
AIRPORT REF. TEMP	27℃-34℃		

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	✓
2	Administration Building	✓	8	Main Power House	
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	✓
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : ST, SALAHUDIN/BIMA	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : BMU-1

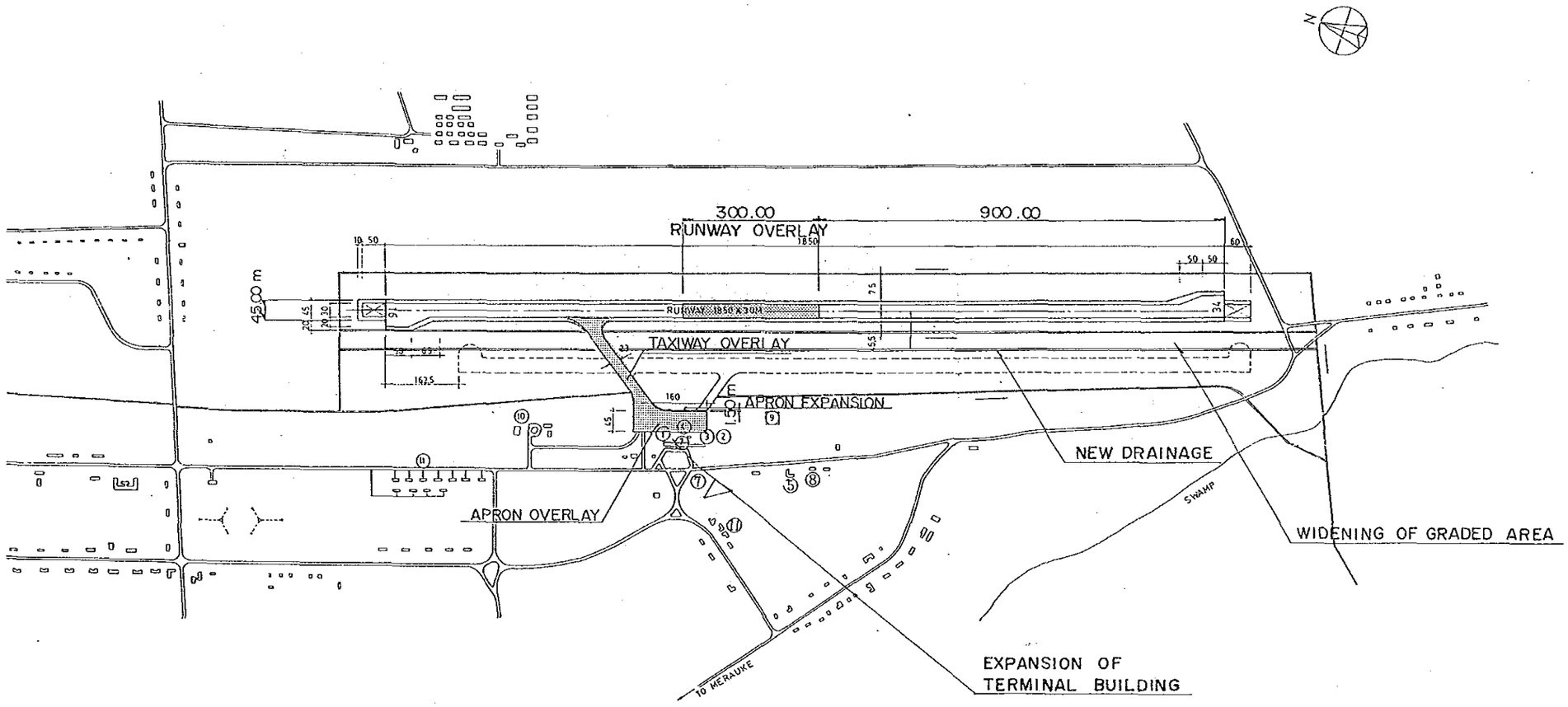


Figure 4.10.1 Master Plan of Merauke Airport

SCALE 0 100 200 500M

BASIC DATA TABLE			
AIRPORT CLASS	III	RUNWAY DIRECTION	16-34
AIRPORT STATUS	DOMESTIC	INSTRUMENT RUNWAY	
AIRPORT ELEVATION	2.85M	PAVEMENT STRENGTH	PCN 18 FBXU
AIRPORT REF. POINT (ARP) COORDINATES	0° 38′ S 140° 28′ E	NAVIGATIONAL AIDS	NDB, VOR/DME
		DISTANCE FROM CITY	4.3KM
AIRPORT REF. TEMP	26℃		

MAJOR BUILDINGS					
No.	Name of Building	tick if available	No.	Name of Building	tick if available
1	Passenger Terminal	✓	7	VIP Building	✓
2	Administration Building	✓	8	Main Power House	✓
3	Operations Building	✓	9	Fire Station	✓
4	Control Tower	✓	10	Fuel Farm	✓
5	Workshop	✓	11	Staff Housing	✓
6	Cargo Terminal Building				

LEGEND	
—x—x—	Fence
═══	Ditch

STUDY ON THE MASTER PLAN OF AIRPORT MAINTENANCE AND REHABILITATION	
NAME OF AIRPORT : MOPAH/MERAUKE	SCALE :
NAME OF DRAWING : Layout Plan	DWG NO : MKQ-1