社会開発協力部報告書

No. 7

REPUBLIC OF INDONESIA

# THE STUDY
# ON
# THE AIRPORT DEVELOPMENT PROJECT
# IN
# CENTRAL JAVA AND YOGYAKARTA

PART II VOL. 1

FEASIBILITY STUDY FOR NEW YOGYAKARTA AIRPORT DEVELOPMENT PROJECT

NOVEMBER 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF INDONESIA

# THE STUDY
# ON
# THE AIRPORT DEVELOPMENT PROJECT
# IN
# CENTRAL JAVA AND YOGYAKARTA

PART II VOL. 1

## FEASIBILITY STUDY FOR NEW YOGYAKARTA AIRPORT DEVELOPMENT PROJECT

NOVEMBER 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

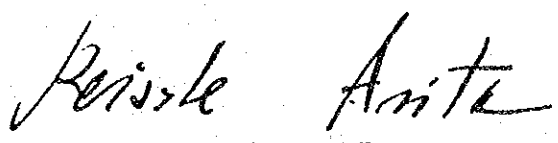
In response to the request of the Government of the Republic of Indonesia, the Japanese Government has decided to conduct feasibility studies on the Development of Airports in Central Java and Yogyakarta, and entrusted the studies to the Japan International Cooperation Agency. J.I.C.A. sent to Indonesia a study team headed by Mr. Makoto TANAKA of Pacific Consultants International between August 1985 and September 1986.

The team had discussions with the officials concerned of the Government of Indonesia and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

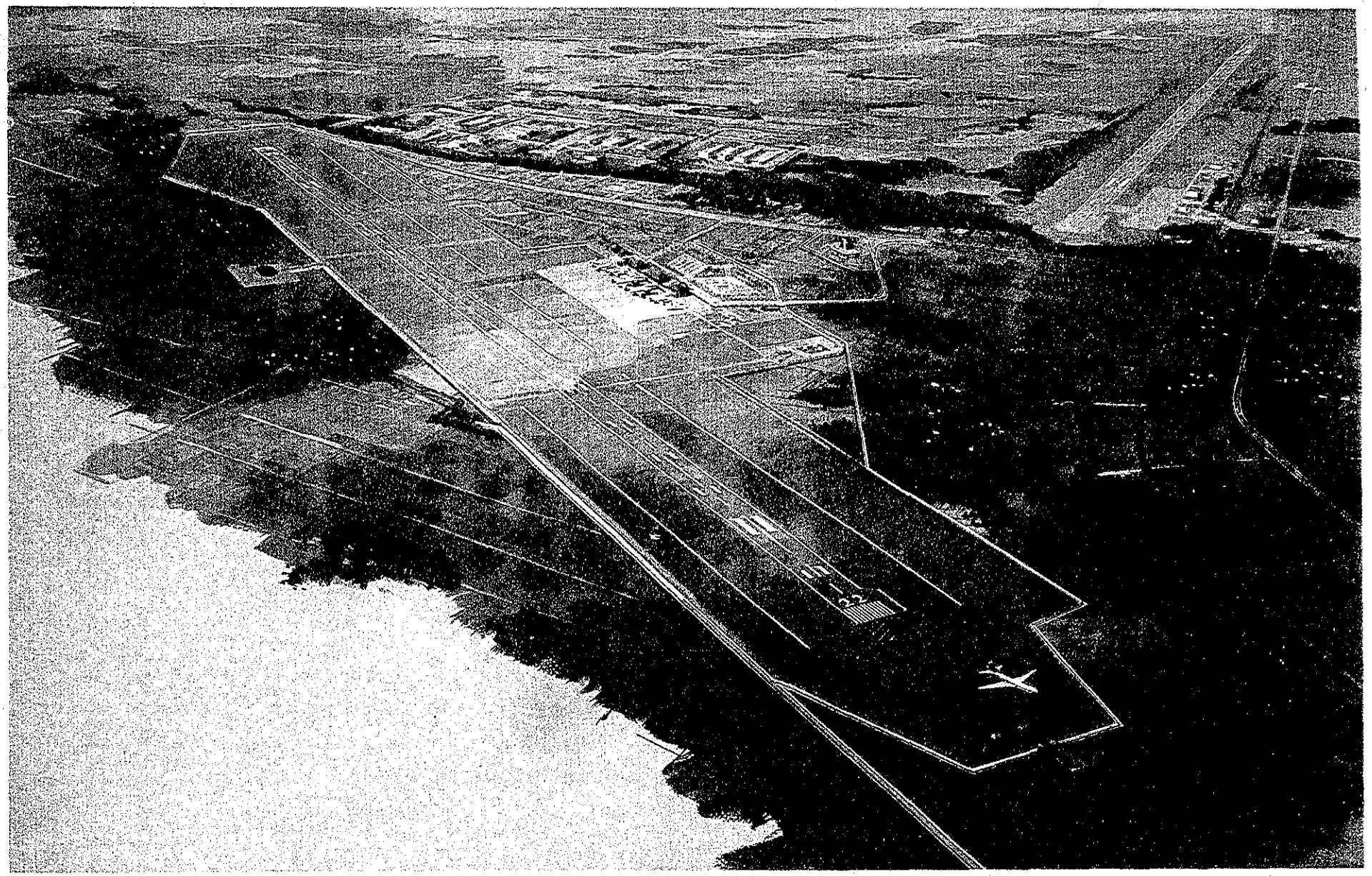
I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

November, 1986

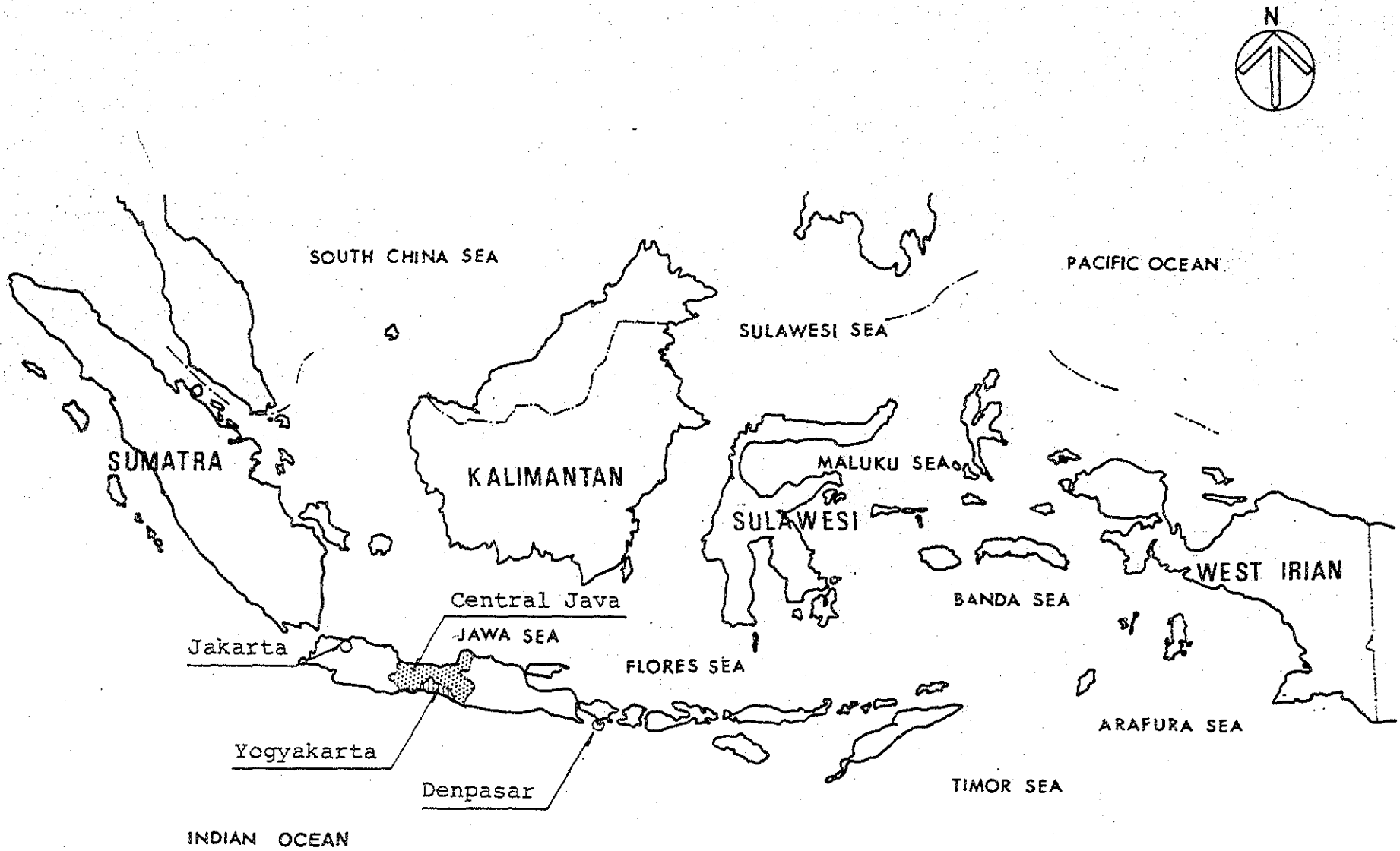


Keisuke Arita
President

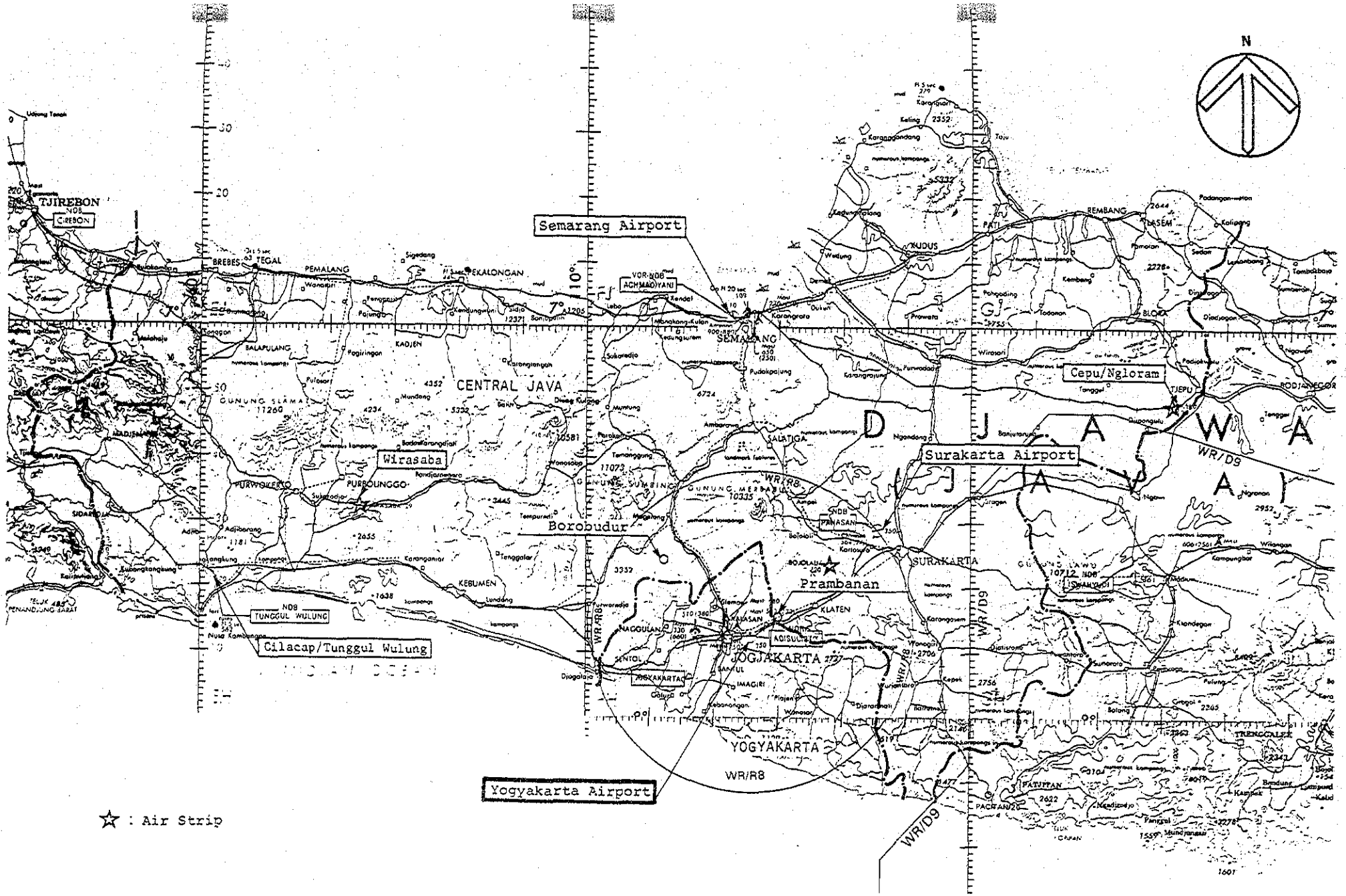
Japan International Cooperation Agency



NEW YOGYAKARTA AIRPORT DEVELOPMENT PLAN




PROJECT LOCATION MAP - 1




PROJECT LOCATION MAP - 2

TABLE OF CONTENTS

PART II VOL. 1 FEASIBILITY STUDY FOR
NEW YOGYAKARTA AIRPORT DEVELOPMENT PROJECT

## Chapter 3 Airport Master Plan



## Chapter 4 Airspace Use



## Chapter 5 Subsidiary Considerations

# CHAPTER 1 GENERAL

# CHAPTER 1 GENERAL

## 1.1 General

In this Part II, the results of the Feasibility Study for New Yogyakarta Airport Development Project are described.

The long-term development plan of Yogyakarta airport, which will be executed by construction of a new airport at a distance of 2 Km east of the existing airport, has been established on the basis of the conclusions of Part I, "Formation of the Airports Development Concept." The process of studies and discussions concerning airport development concept has been stated in Part I.

The Airport Master Plan is based on the following demand forecasts, which are explained in detail in Part I.

Table 1.1.1 Summary of Demand Forecast

| | Actual Record as of 1984 | 2,000 | 2,010 |
|---|---|---|---|
| Passengers (x 1,000) | 290 | 908 | 1,610 |
| Cargo (tons) | 831 | 2,210 | 3,820 |

The maximum aircraft anticipated in 2000 and 2010 is a wide-body jet of the DC-10/A300 class. Therefore, the runway is planned as 2,500m long of precision approach Category-I.
The selected location of the new Yogyakarta airport is shown in Fig. 1.1.1.

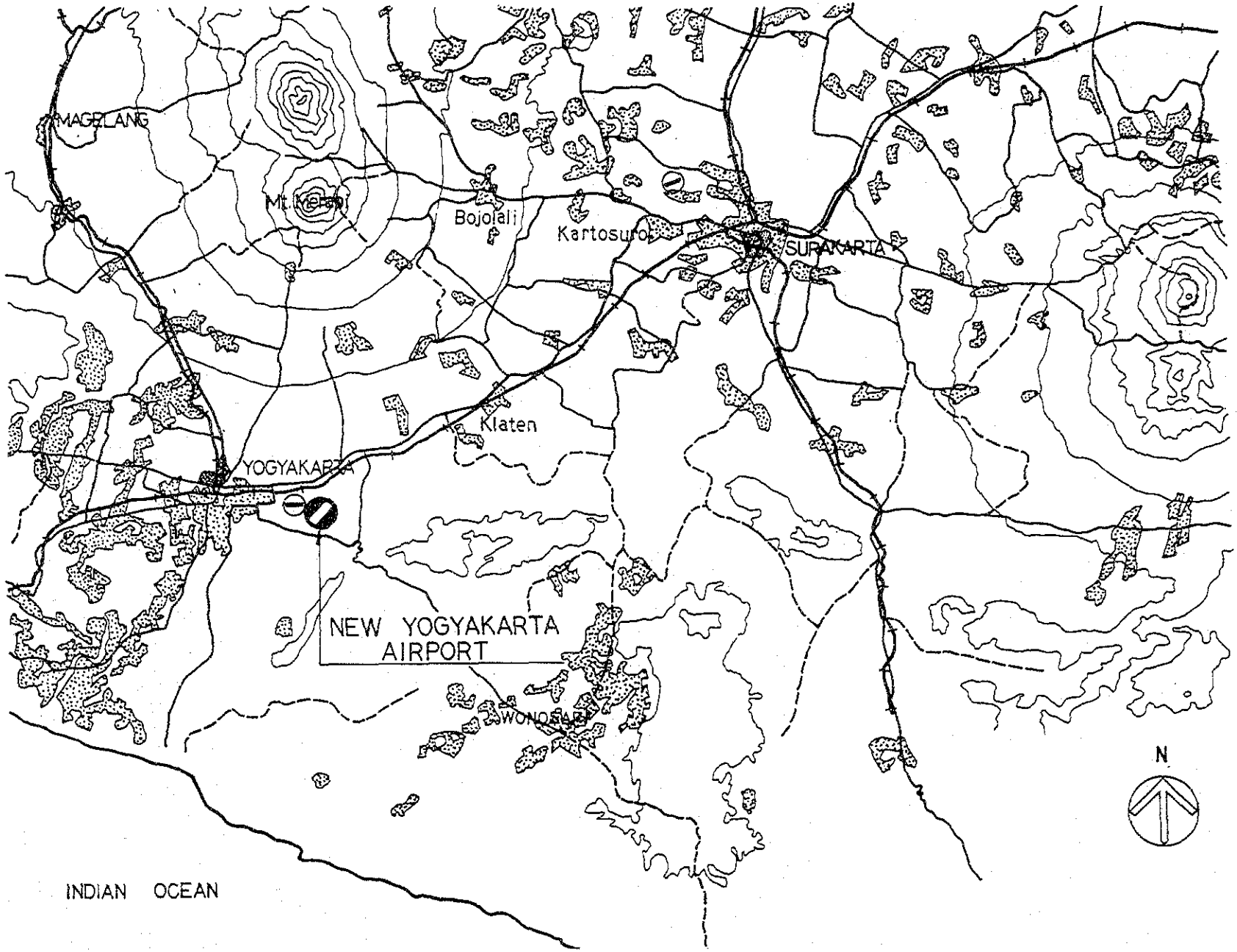



Fig. 1.1.1 Location of New Yogyakarta Airport

## 1.2 Phases of Airport Development

The final target year of this project is to be the year 2010. The New Airport Development will be implemented in two phases taking into consideration the general situation of project implementation and need for successive improvement in Indonesia.

a) Phase I Project

Expansion of the passenger terminal building in Yogyakarta airport was completed at the end of 1985. Accordingly it is desirable to utilize existing facilities as long as possible. Since it has been decided to remove civil aviation facilities to the new airport in the long-term development plan, it is not desirable to improve and expand existing facilities. In such a case, it is estimated that existing facilities will be saturated around 1994, as described in Part I. Therefore, the completion of the Phase I project is fixed to be the end of 1994, using the existing facilities for ten years until that year.

The target year of the Phase I project is the year 2000, six years after the completion of the new airport. This is in order to reduce the initial investment for the development of the new airport.

b) Phase II Project

The Phase II Project is scheduled to start in 2001. The capacities of the relevant facilities correspond to the air traffic demand in 2010, ten years after completion of the Phase II project. The construction cost for the Phase II project is about 30% of that of Phase I based on a service period of 10 years.

The plan of Phase II is roughly described in this report for the purpose of clarifying the final target of this project.

# CHAPTER 2 FACILITY REQUIREMENTS ANALYSIS

# CHAPTER 2 FACILITY REQUIREMENTS ANALYSIS

## 2.1 Summary

This chapter discusses the airport facility requirements which were estimated based on the air traffic demand forecast in Part I in compliance with the relevant standards, recommended practices, and/or regulations of International Civil Aviation Organization (ICAO), Civil Aviation Bureau of Japan (JCAB) and Federal Aviation Administration of the United States (FAA).

The facility requirements were established for Phases I and II, respectively 2000 and 2010, and the results are summarized in Table 2.1.1.

Table 2.1.1 Air Traffic Demand and Facility Requirements

| | Item \ Year | | Present Conditions as of 1984 | 2000 | 2010 |
|---|---|---|---|---|---|
| Air Traffic Demand | 1. Annual Passengers | | 290,279 | 908,000 | 1,610,000 |
| | 2. Annual Cargo (ton) | | 831 | 2,210 | 3,820 |
| | 3. Annual Aircraft Movements | | 6,336 | 9,600 | 11,000 |
| | 4. Peak Hour Passengers | | 300* | 800 | 1,310 |
| | 5. Peak Hour Aircraft Movements | | 4 | 4.5 | 4.7 |
| | 6. Largest Aircraft in Service | | DC-9-32 | A300, DC-10 | |
| Facility Requirements | 7. Runway (m x m) | | 1,850 x 40 | 2,500 x 45 | |
| | 8. Runway Strip (m x m) | | 1,970 x 150 | 2,620 x 300 | |
| | 9. Taxiway | | - | Parallel Taxiway Justified | |
| | 10. Passenger Terminal Apron | | DC-9 : 6 | WB : 2<br>MJ : 3<br>SP : 1<br>STOL: 1 | WB, NMJ : 5<br>SJ : 1<br>SP : 1<br>STOL: 1 |
| | 11. Passenger Terminal Building (sq.m) | | 2,850 | 12,000 | 19,700 |
| | 12. Cargo Terminal Building (sq.m) | | - | 700 | 1,100 |
| | 13. Administration Building (sq.m) | | 200 | 1,700 | 2,200 |
| | 14. Vehicle Parking (cars) | | 50 | 300 | 500 |
| | 15. Access Road (lane) | | 2 | 2 | |
| | 16. Air Navigation Systems | | Instrument, Non-Precision | Precision Approach Category-I | |
| | 17. Utilities Works | Electricity (KVA) | 317 | 1,800 | 2,700 |
| | | Water (ton/day) | | 300 | 500 |
| | | Sewage (ton/day) | | 200 | 300 |
| | | Waste (kg/day) | | 1,000 | 1,600 |
| | 18. Rescue and Fire-Fighting Services | | | Cat-7 | Cat-8 |
| | 19. Aviation Fuel Storage (kℓ) | | | 1,070 | 1,210 |

* Estimated Figure

## 2.2 Airside Facilities

### 2.2.1 General

Airside facility requirements are summarized below. The methods for determination of facility size, dimension etc., are the same as those used in Chapter 4, Part I, however further studies were carried out.

### 2.2.2 Runway and Runway Strip

#### (1) Aerodrome Reference Code

An aerodrome reference code - code number and code letter - was established in accordance with the runway length and the maximum aircraft operated based on Annex-14, Aerodromes, ICAO, as shown in Table 2.2.1.

Table 2.2.1 Aerodrome Reference Code

| Phase | I (Year 2000) | II (Year 2010) |
|---|---|---|
| Code Number | 4 | 4 |
| Code Letter | D | D |

#### (2) Runway Length and Width

The runway length was calculated for the longest route between Yogyakarta and Denpasar and for the maximum payloads of A300. The results of the calculation are summarized in Table 2.2.2.

Table 2.2.2 Runway Length and Width

| Phase | I | II |
|---|---|---|
| Runway Length (m) | 2,500 | 2,500 |
| Runway Width (m) | 45 | 45 |
| Shoulder Width (m) | 7.5 | 7.5 |

(3) Runway Strip

The runway strip should be 2,620 m x 300 m in both Phases I and II to be in compliance with the ICAO standards based on the runway length of 2,500m and precision approach Category-I.

(4) Obstacle Limitation Requirements

The operational category for the runway was established to be a precision approach Category-I. The dimensions and slopes for the obstacle limitation surfaces are same as the study in Part I as shown in Figs. 2.2.1 and 2.2.2.

2.2.3 Taxiway

A complete parallel taxiway with perpendicular exits is justified in light of ICAO Airport Planning Manual on the basis that the number of instrument approaches exceeds four during the peak hour and the operation of wide body jet aircraft will be frequent. The detailed study will be stated in Chapter 3.

2.2.4 Apron

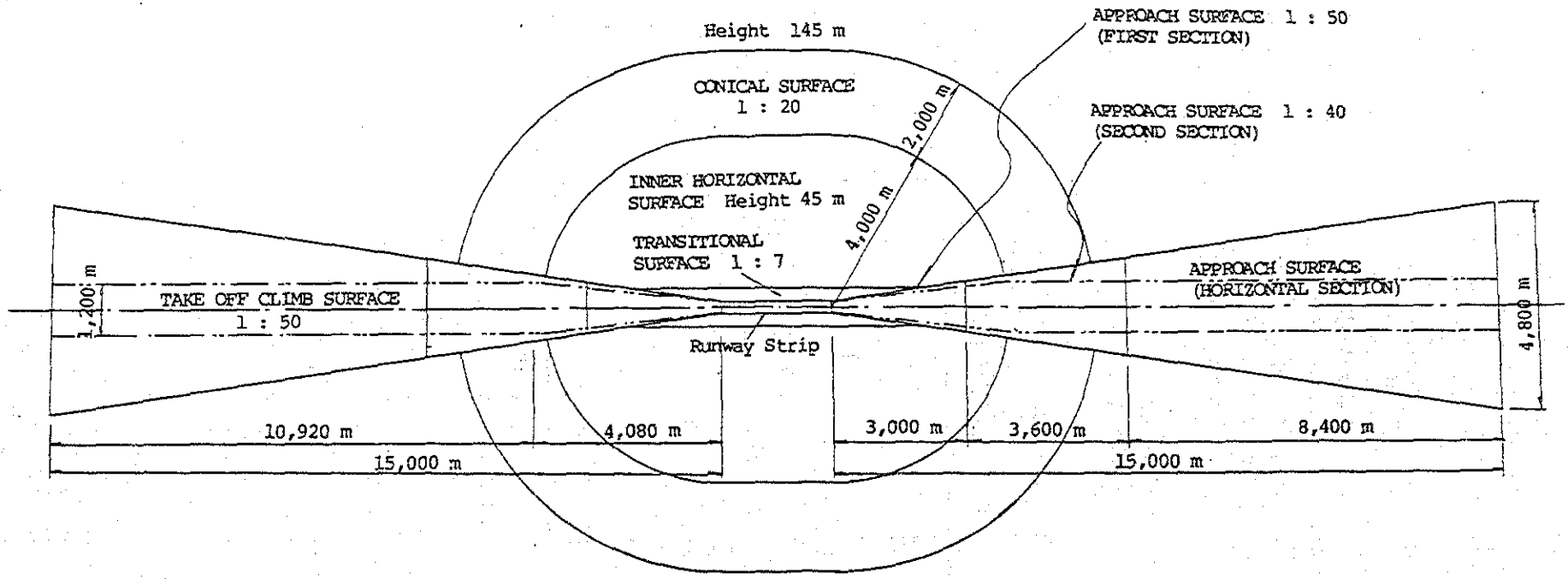
The number of required aircraft stands for Phases I and II is summarized in Table 2.2.3. Calculation was based on the following formula although the detailed calculation is shown in Part I.

$$S = \Sigma \left( \frac{Ti}{60} \times Ni \right) + a$$

Where, S : Required number of aircraft stands
Ti: Gate occupancy time of aircraft of Category (i) in minutes
Ni: Number of arriving aircraft of Category (i) during peak hour
a : One extra stand for the largest aircraft of the planning year for unexpected peak occasions. (1 extra for each 10 stands)

Table 2.2.3 Required Number of Aircraft Stands

| Aircraft Category \ Phase | I | II |
|---|---|---|
| WB | 2 | 3 |
| NMJ | - | 2 |
| MJ | 3 | - |
| SJ | - | 1 |
| SP | 1 | 1 |
| STOL | 1 | 1 |
| Total | 7 | 8 |




Note : Height above aerodrome elevation

Fig. 2.2.1 Obstacle limitation Surfaces (1)

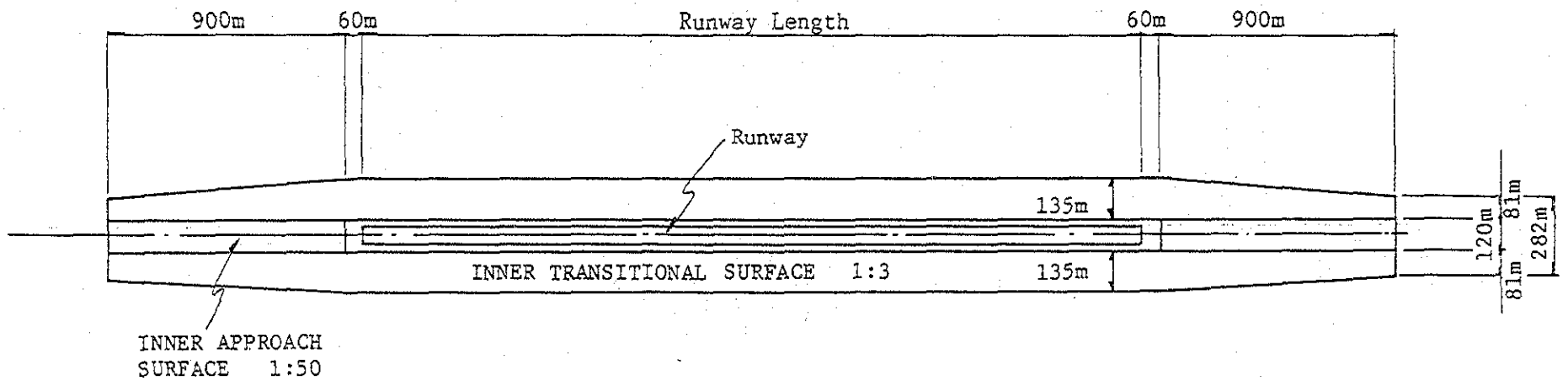



Fig. 2.2.2 Obstacle limitation Surfaces (2)

## 2.3 Landside Facilities

### 2.3.1 Passenger Terminal Building

The floor area required for the passenger terminal building is determined by multiplying the number of hourly peak passengers by the unit floor area per peak hour passenger.

A unit floor area of 15 sq.m per peak hour passenger is assumed. Table 2.3.1 shows the required floor area for Phases I and II.

Table 2.3.1 Floor Area Requirements for the Passenger Terminal Building

| Items \ Phase | I | II |
|---|---|---|
| Peak Hour Passengers | 800 | 1,310 |
| Required Floor Area ($m^2$) | 12,000 | 19,700 |

### 2.3.2 Cargo Terminal Building

The floor area required for the cargo terminal building is calculated based on the annual cargo volume forecast in Part I.

The annual cargo handling volume per unit floor area of 5 ton/sq.m is used for the calculation of cargo handling area. The floor area of the cargo terminal building is usually required to be 1.5 times that of the cargo handling area for the accommodation of airline offices , cargo agents, etc.

Table 2.3.2 Floor Area Requirements for the Cargo Terminal Building

| Items \ Phase | I | II |
|---|---|---|
| Annual Cargo Volume (tons/year) | 2,212 | 3,820 |
| Cargo Handling Area ($m^2$) | 440 | 760 |
| Cargo Terminal Building ($m^2$) | 700 | 1,100 |

2.3.3 Administration Building and Control Tower

An administration building with a control tower is required for airport administration, operation and maintenance, which is planned as an independent building in order to enhance security.

The required floor area is calculated by multiplying the number of staff by the unit floor area required for each staff. A unit floor area of 6 sq.m per staff is assumed on the basis of the Japanese standards. The requirements for Phases I and II are shown in Table 2.3.3.

Table 2.3.3 Floor Area Requirements for the Administration Building

| Phase | I | II |
|---|---|---|
| Floor Area ($m^2$) | 1,700 | 2,200 |

The height of the control tower is established at 30 m based on the FAA standards.

### 2.3.4 Vehicle Parking

The required number of vehicle parking spaces is determined by using the following formula.

$$V = P \times C$$

Where; V : Required number of parking spaces
P : Number of peak hour passengers
C : Number of vehicles per peak hour passenger

The number of parking spaces per peak hour passenger was estimated to be 0.3 vehicles based on the results of the site survey at the existing airport. 60 % of the vehicles requiring parking will be private cars, 30 % taxis, and 10 % buses.

Table 2.3.4 shows the requirements for car parking spaces.

Table 2.3.4 Parking Space Requirements

| Items \ Phase | | I | II |
|---|---|---|---|
| Number of Parking Spaces | Private Car | 180 | 300 |
| | Bus | 30 | 50 |
| | Taxi | 90 | 150 |
| | Total | 300 | 500 |

### 2.3.5 Access Road

The required number of lanes for the access road is determined by evaluating the incoming and outgoing traffic from/to the terminal area.

The traffic during the peak hour was 0.29 car per passenger on the basis of the traffic survey executed at Bali airport. Since it is anticipated that the traffic per passenger will increase in the future, the car traffic generated is established to be 0.5 car/peak hour passenger.

The maximum capacity of an access road is usually considered to be approx. 1,000 cars/hour for 1 lane (each direction).

Table 2.3.5 shows the required number of lanes for the access road.

Table 2.3.5 Required Number of Lanes

| Items \ Phase | I | II |
|---|---|---|
| Peak Hour Passengers | 800 | 1,310 |
| Number of Cars Generated | 400 | 655 |
| Number of Lanes (each direction) | 1 | 1 |

Note : This generated traffic volume is only the traffic related to the airport, and through traffic is not included.

## 2.4 Air Navigation Systems

Air navigation systems include radio navigation aids, aeronautical telecommunications, air traffic control systems, aeronautical ground lights and meteorological system.

Air navigation systems should be designed to meet the operational requirements for Instrument, precision approach Category-I, and should be adequate to handle the forecast aircraft movements in a safe and effective manner. The detailed study on each system and required equipment will be stated in Section of 3.3.6. Air Navigation Systems.

## 2.5 Airport Utilities

The airport utilities requirements are determined based on the unit demand established here as shown in Table 2.5.1. Table 2.5.2. shows the demand for public utilities.

Table 2.5.1 Unit Demand

| Utilities / Building | Electricity ($VA/m^2$) | Water ($t/m^2/day$) | Sewage ($t/m^2/day$) | Waste ($kg/m^2/day$) |
|---|---|---|---|---|
| Passenger Terminal Building | 80 | 0.023 | 0.017 | 0.072 |
| Cargo Terminal Building | 60 | 0.003 | 0.002 | 0.144 |
| Administration Building and Others | 100 | 0.010 | 0.007 | 0.024 |

Table 2.5.2 Airport Utilities Demand

| Items \ Phase | I | II |
|---|---|---|
| Electricity (kVA) | 1,800 | 2,700 |
| Water (t/day) | 300 | 500 |
| Sewage (t/day) | 200 | 300 |
| Waste (kg/day) | 1,000 | 1,600 |

## 2.6 General Services

### 2.6.1 Rescue and Fire-Fighting Services

The facility requirements for rescue and fire-fighting services are estimated in compliance with the ICAO Airport Service Manual, Part-1.

The requirements are tabulated in Table 2.6.1. The Airport Category is determined based on the largest aircraft movements for the busiest consecutive three months of the year.

Table 2.6.1 Requirements for Rescue and Fire-Fighting Services

| Items \ Phase | I | II |
|---|---|---|
| Airport Category | 7 | 8 |
| Extinguishing Agents | | |
| - Water for Aqueous Film Forming Foam Production (L) | 12,000 | 18,200 |
| - Dry Chemical Powders (kg) | 225 | 450 |
| or | | |
| - $CO_2$ (kg) | 450 | 900 |
| Vehicles | | |
| - Rapid Intervention Vehicle | 1 | 1 |
| - Major Vehicle | 2 | 3 |
| - Ambulance | 1 | 1 |
| - Command Car | 1 | 1 |

## 2.6.2 Aviation Fuel

The daily fuel consumption is calculated by multiplying the trip fuel including that for an alternate airport by the number of departing aircraft. The required fuel storage capacity is estimated as shown below based on the condition that the airport is provided with a one week storage capacity.

Table 2.6.2 Aviation Fuel Storage Requirements

| Items \ Phase | I | II |
|---|---|---|
| Daily Fuel Consumption (KL) | 123 | 138 |
| 7 days Storage Capacity (KL) | 1,070 | 1,210 |
| Fuel Tank Requirement | 300 KL x 4 | 300 KL x 4 |