CHAPTER 6 CONSTRUCTION SCHEDULE AND COST ESTIMATES

CHAPTER 6 CONSTRUCTION SCHEDULE AND COST ESTIMATES

6.1 General

This chapter explains the construction schedule and cost estimates based on the Airport Master Plan.

The construction cost necessary for expansion of the Surakarta airport is estimated to total about 52 billion Rupiah in Phase I, and about 15 billion Rupiah in Phase II.

6.2 Construction Conditions

(1) Site Conditions

The airport site lies on flat terrain with an average elevation of approx. 120 meters above the mean sea level at the center of the runway.

The runway extension area is located in rice fields with an elevation of approx. 116 meters above the mean sea level.

In the extension area, a large number of houses with trees for protection against the sun, a trunk road and the Wungu River lie in the way of the extension. They will have to be removed, relocated and diverted.

The subsoils at the site mainly consist of sandy soils in a somewhat dense condition, and the ground water lever seems to be high.

The rainfall - annual precipitation is about 1,400 mm with most of the rainfall occurring during the rainy season from December to April.

(2) Construction Materials and Equipment

The ordinary materials and equipment for the construction work can be easily procured in Yogyakarta and Surakarta. The materials and equipment to be imported will be unloaded at Semarany harbor.

Aggregate materials for pavement, namely the gravel and cobble, will be taken from the river deposit near the airport.

6.3 Civil Work

(1) Temporary Works and Preliminary Works

The temporary works including a site office and construction plants shall start as soon as possible after commencement of the construction work and should be completed within two months.

The works precedent to the main works are as follows:

- Access road
- Diversion of trunk roads
- Diversion of the Wungu River
- Temporary drainages

However, the terminal area will be started first; then the runway extension works can be started.

Therefore, the airport access road and trunk roads will be constructed and diverted as soon as possible to be used for the construction road and to keep road traffic which are also required for transportation of construction materials and equipment before the runway extension works will start.

The Wungu River which flows in the extension area shall be diverted so that it runs outside the airport property area. Temporary drainage shall be excavated to connect with the diverted river in order that rainwater can be drained to the outside the area.

Prior to commencement of these works, coordinations with the related land owners and organizations who maintain the irrigation system, the Wungu River and trunk roads shall be made.

(2) Site Preparation

Site preparation should start immediately after completion of the temporary and preliminary works. That for the terminal area will take 12 months and for the extension works, the total earth work volume is estimated to be about 200,000 cu.m of cut and fill volume so that site preparation will take approx. 18 months.

(3) Pavement Work

The pavement work should start immediately after completion of the site preparation. Most of pavement work must be performed at night because of the overlay on the existing pavement so as not to interrupt aircraft operation. The pavement work is intended to be divided into two periods as well as site preparation such as the terminal area and airside, and the periods needed will be approx. 12 and 18 months, respectively. The work for Phase II will take approx. 8 months.

6.4 Building Works

The building works including the passenger terminal building, cargo terminal building, etc., should start immediately after completion of site preperation of the terminal area and it will take 24 months for the passenger terminal building and 12 months for the cargo terminal building in Phase I and 12 months for the passenger terminal building and 4 months for the cargo terminal building in Phase II.

6.5 Other Works

Installation of the equipment for navaids and airport utilities will start after the site preparation and it will take 30 and 18 months, respectively, in Phase I, and 12 months respectively in Phase II.

For air navigation systems, the MLS will be substituted for the existing ILS taking 18 months in 1996 and 1997.

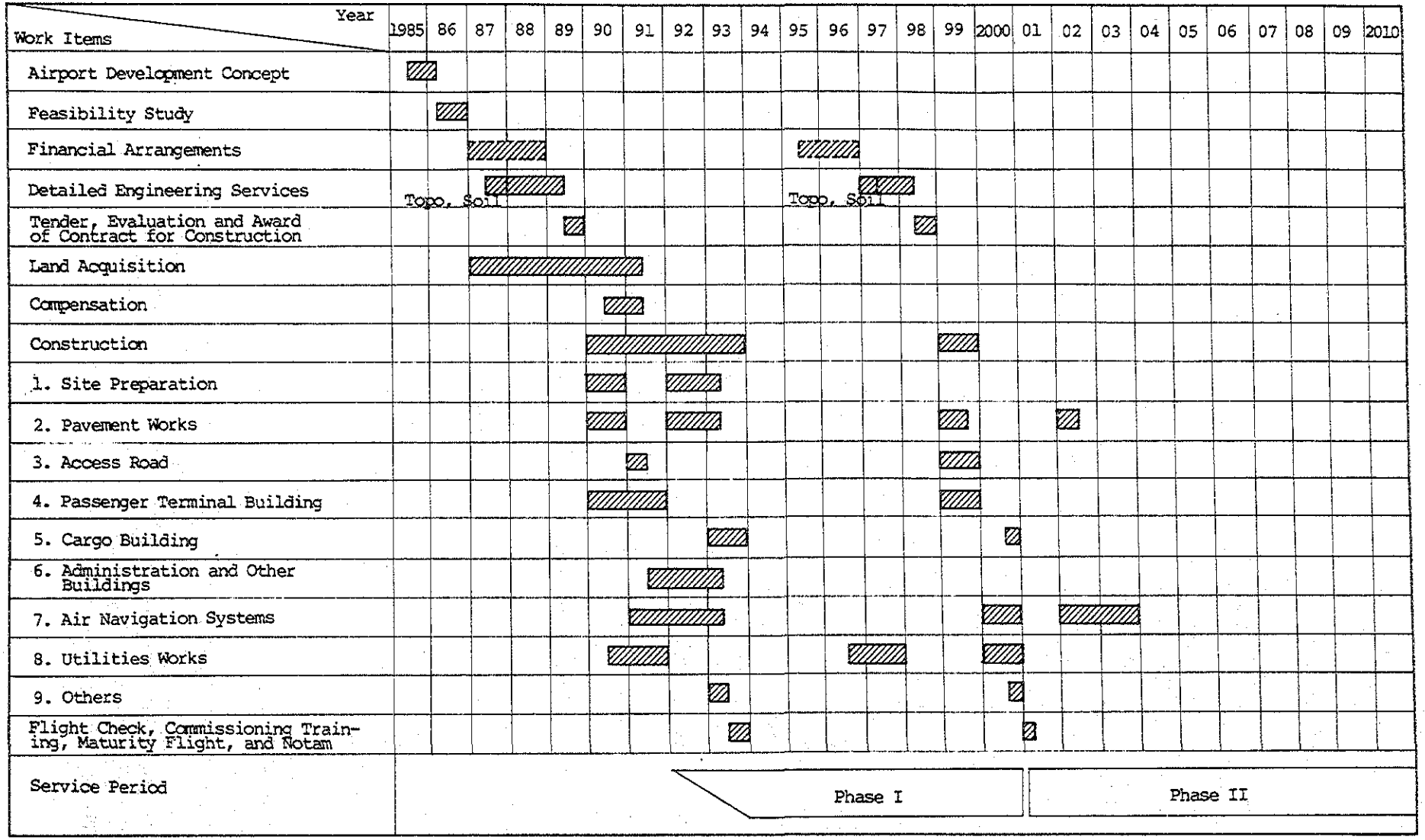
The time schedule for the airport utilities such as power and telecommunications should be adjusted with the related organizations prior to commencement of the construction work.

6.6 Construction Schedule

The construction schedule is summarized in Table 6.6.1.

It is noted that approx. six months for flight check, test operation for various navaids, maturity flight, etc., are required after completion of the construction work.

Table 6.6.1 Construction Schedule



6.7 Construction Cost Estimates

The construction cost is estimated based on the Airport Master Plan for Phases I and II, and is tabulated in Table 6.7.1. The total construction cost is estimated to be about 52 billion Rp. for Phase I and 15 billion Rp. for Phase II as shown in Table 6.7.1.

The cost estimates are based on the following assumptions:

a) The cost is estimated based on the unit prices as of April 1986.

b) The exchange rates are assumed to be US$ 1.00 = Rp. 1,125 = Yen 200.

c) Foreign currency portion of the construction cost includes the following items.

- Purchase cost of construction equipment (CIF cost)
- Cost of imported materials such as construction materials (steel bars, steel conduit, etc.) special equipment, etc.
- Salvage cost of construction equipment
- 50 % of construction materials procured in Indonesia such as asphalt, cement, fuel and lubricants
- Foreign remittance portion of the overhead and profit for foreign contractors and engineering firms
- Wages of expatriate staff and labor

d) Local currency portion of the cost includes the following items:

- Construction materials procured in Indonesia such as aggregate, timber materials, etc.
- 50 % of construction materials procured in Indonesia such as asphalt, cement, fuel and lubricants
- Handling and clearance cost of land transportation
- Overhead cost and profit of local contractors

- Wages of Indonesian staff and labor

- Land acquisition cost

e) Contingencies are estimated to be about 10 % of the total construction cost.

f) Price escalation is not considered in this estimation.

Table 6.7.1 Estimated Construction Cost

(Unit: million Rp.)

	Work Item \ Phase of Construction	Phase I			Phase II			Total		
		Local Portion	Foreign Portion	Sub Total	Local Portion	Foreign Portion	Sub Total	Local Portion	Foreign Portion	Total
Land Acquisition	Land Acquisition	1,560	0	1,560	0	0	0	1,560	0	1,560
	Compensation	35	0	35	0	0	0	35	0	35
	Land Acquisition * (Ultimate Expansion Area)	(1,654)	(0)	(1,654)	(0)	(0)	(0)	(1,654)	(0)	(1,654)
	Sub Total	1,595	0	1,595	0	0	0	1,595	0	1,595
Civil Works	Earth Work	966	502	1,468	10	39	49	976	541	1,517
	Drainage Works	529	730	1,259	0	0	0	529	730	1,259
	Pavement Works	2,777	5,581	8,358	955	1,771	2,726	3,732	7,352	11,084
	Access Road	235	122	357	470	250	720	705	372	1,077
	River Diversion	34	47	81	0	0	0	34	47	81
	Sub Total	4,541	6,982	11,523	1,435	2,060	3,495	5,976	9,042	15,018
Architectural Works	Passenger Terminal Building	2,106	2,473	4,579	1,366	1,604	2,970	3,472	4,077	7,549
	Cargo Terminal Building	262	233	495	230	204	434	492	437	929
	Administration Building	334	408	742	111	136	247	445	544	989
	Other Buildings	306	270	576	0	0	0	306	270	576
	Special Equipment	0	2,661	2,661	0	95	95	0	2,756	2,756
	Sub Total	3,008	6,045	9,053	1,707	2,039	3,746	4,715	8,084	12,799
Air Navigation Systems	Radio Navigation Aids	235	5,674	5,909	68	1,702	1,770	303	7,376	7,679
	Air Traffic Control and Aeronautical Telecommunications	87	2,555	2,642	37	1,021	1,058	124	3,576	3,700
	ATC Radar System	0	0	0	0	0	0	0	0	0
	Aeronautical Ground Lights	1,238	3,403	4,641	247	681	928	1,485	4,084	5,569
	Meteorological System	62	1,906	1,968	19	569	588	81	2,475	2,556
	Sub Total	1,622	13,538	15,160	371	3,973	4,344	1,993	17,511	19,504
Utilities Works	Power Supply System	479	2,518	2,997	23	947	970	502	3,465	3,967
	Water Supply System	44	90	134	0	4	4	44	94	138
	Sewarage System	257	397	654	12	3	15	269	400	669
	Solid Waste Disposal System	29	130	159	0	0	0	29	130	159
	Telecommunication System	260	619	879	0	0	0	260	619	879
	Sub Total	1,069	3,754	4,823	35	954	989	1,104	4,708	5,812
Other Equipment	Vehicles for Fire Fighting Services	0	1,086	1,086	0	0	0	0	1,086	1,086
	Sub Total	0	1,086	1,086	0	0	0	0	1,086	1,086
Total of Construction Works		11,835	31,405	43,240	3,548	9,026	12,574	15,383	40,431	55,814
Engineering Services Cost		1,184	3,141	4,325	355	903	1,258	1,539	4,044	5,583
Sub Total		13,019	34,546	47,565	3,903	9,929	13,832	16,922	44,475	61,397
Contingency		1,302	3,455	4,757	390	993	1,383	1,692	4,448	6,140
Grand Total		14,321	38,001	52,322	4,293	10,922	15,215	18,614	48,923	67,537

* Land Acquisition Cost for Ultimate Expansion Area is not included in Total Cost.

Exchange Rate: US$ 1.00 = Rp. 1,125, ¥ 1 = Rp 5.625

CHAPTER 7 ECONOMIC AND FINANCIAL ANALYSES

CHAPTER 7 ECONOMIC AND FINANCIAL ANALYSES

7.1 General

Economic and financial analyses on the airport master plan were carried out for the facilities of the Phase II development assuming that the project life is 25 years.

Results of the analyses show that this project is feasible from the viewpoint of the national economy. According to the sensitivity analysis, in case where either the construction cost will increase or the air traffic demand will reduce, it is proven that this project yields a sufficient economic return on investment, and from this point, the project is, also, feasible.

On the other hand, results of the financial analysis show that only revenues based on the current airport charges system cannot cover the construction and maintenance costs. However, this conclusion is not attributable to project characteristics. Rather, it is common in airport development projects that it is difficult to establish financial self-sufficiency.

Therefore, introduction of soft loan or government subsides will be necessary in order to implement the project as a social infrastructure. It is also recommended that the airport charges should be increased step by step in order to cover the airport maintenance costs.

7.2 Economic Analysis

7.2.1 Objectives

The objectives of the economic analysis are to identify and estimate costs and benefits of a project from the national economic viewpoint in order to assess the exact contribution to national economy.

7.2.2 Methodolody

The methods and procedures used in this chapter are basically same as those described in the section, 10.5, "Economic Analysis for the Selection of Alternatives", Part I.

The economic analysis is made through a comparison of the costs and benefits of two cases, i.e., "with project" case and "without project" case ("WOP").

This is because the additional benefits to the national economy, which are firstly realized by investing or utilizing the additional capital are measured through the comparison with "WOP" case.

"WOP" case of this project has been established for the air traffic demand in 1993 as shown in the Chapter 5, Part I.

(1) Conversion Factor of Financial and Economic Value

The economic costs and benefits should be valued at economic prices. In this study, conversion factors from financial value to economic value are assumed as 1.00 for the following reasons.

a) No excise tax is levied on Yen-Credit import

b) According to BAPPENAS, the conversion factors for the transportation sector are just 1.00 in Indonesia.

(2) Project Life and Depreciation Period

The project life is set at 25 years and the depreciation period of the airport facilities is assumed as 40 years. Residual values of the facilities after the project life are calculated as those at the end of the project life.

(3) Cost

The costs are composed of the following:

- Construction Costs in Phases I and II (Investment)

- Renewal Cost (Investment)

- Operation and Maintenance Costs

a) The construction costs and renewal cost are shown in Table 6.7.1.

b) The operation cost is composed of personnel cost and, material and utility costs. The personnel cost is calculated by multiplying the number of DGAC staff estimated in the chapter 6 by the average annual personnel cost.

The annual growth rate of personnel cost is assumed to be the same rate as that of GNP in Indonesia forecast in Part I.

The average annual personnel cost of the DGAC staff in the beginning year of the project is assumed to be 1,400,000 Rp./Year and the average annual growth rate is anticipated to be 4.5%.

Material and utility costs are estimated to be 70% as the personnel cost.

c) The maintenance costs are estimated as the following:

- Civil and architectural facilities: 0.5% of the construction cost

- Instrument and Equipment : 1% of purchase prices

(4) Benefit

The composition of benefit item have been described in Chapter 10, Part I. Only direct tangible benefits are measured in the economic analysis, as follows:

- Benefit due to reduction of the operation and maintenance costs of the existing Surakarta airport

  120 million Rp./Year in 1995

- Benefit to airlines due to reduction of the operation cost of aircraft caused by introduction of larger aircraft (Refer to APPENDIX II-2-7)

- Benefit due to accommodation of overflowing passengers

  Benefit due to reduction of trip time will create when overflowing passengers using bus as alternative transportation will utilize air traffic (Refer to APPENDIX II-2-7)

- Benefit due to utilization of the existing terminal facilities for other purposes

  400 million Rp. corresponding to the construction cost of the existing terminal facilities subtracted from the project cost.

By implementation of this project, the following benefits are expected besides above direct tangible benefit.

i) Direct Intangible Benefit

- Increase in air safety

- Compatibility with environs

ii) Indirect Tangible Benefit

- Expansion of regional income

iii) Indirect Intangible Benefit

- Reduction of road traffic due to conversion of road traffic to air traffic

- Development of regional economy

- Increase of employment opportunities

(5) Calculation

The economic benefit is composed of three types of savings as shown in equation (7.2.1).

$$TEBt = MAEt + SCt + DIBt \quad \text{----------} \quad (7.2.1)$$

Where,

TEBt : Total economic benefit

MAEt : Maintenance cost of the existing airport or maintenance cost in "WOP" case

SCt : Saving in transportation cost of an airline company due to introduction of larger aircraft

DIBt : Total benefit of passengers who will divert from bus to air due to larger capacity of the air transportation

The suffixes in equations mean as follows:

t : Year

p : Zonal pair

ℓ : Route

All monetary figures are expressed in 1986 price.

As seen in the equation (7.2.5), the maintenance cost of the existing airport is recognized as the project cost, therefore it is regarded as a saving in its full amount.

$$SCt = \sum_{\ell} (WOPCt\ell - WPCt\ell) \qquad \text{----------} \qquad (7.2.2)$$

Where,

SCt : See the equation 7.2.1.

WOPCtℓ : Total passenger transportation cost of airline companies in "WOP" case (or the cost by smaller aircraft).

WPCtℓ : Total passenger transportation cost of airline companies in "With Project" case (or the cost by larger aircraft).

$$DIBt = \sum_{p} OUIPtp \cdot USBtp \qquad \text{----------} \qquad (7.2.3)$$

Where,

DIBt : See the equation (7.2.1)

OVIPtp : Passengers who will exceed the present capacity of the air transportation and inevitabely use highway buses,

USBtp : User benefit of passengers who will divert from bus to air due to larger capacity of the air transportation

$$USBtp = (BSTp \cdot VTt + BSFp) - (ALTp \cdot VTt + ALFp) \quad \text{----} \quad (7.2.4)$$

Where,

USBtp : See the equation (7.2.3)

BSTp : Trip time by bus (or "WOP" case)

VTt : Time value

BSFp : Passenger fare by bus (or "WOP" case)

ALTp : Trip time by air (or "With Project" case)

ALFp : Passenger fare by air (or "With Project" case)

$$ECt = EKt + MAINTt \quad \text{----------} \quad (7.2.5)$$

Where,

ECt : Cost of the project

EKt : Project investment

MAINTt : Maintenance cost of the airport

7.2.3 Economic Cash Flow

The costs and benefits over the entire project period are shown in Table 7.2.1.

Table 7.2.1 Economic Cash Flow

Unit:Million Rp.

Year	Costs			Benefits				Net Benefit
	Const. Cost	O & M Cost	Total Cost	Saving O & M Cost	Saving Transp. Cost	Over Flow Pax.	Total Benefit	
1987	1230.	0.	1230.	0.	0.	0.	0.	-1230.
1988	2305.	0.	2305.	0.	0.	0.	0.	-2305.
1989	1540.	0.	1540.	0.	0.	0.	0.	-1540.
1990	11895.	0.	11895.	0.	0.	0.	0.	-11895.
1991	13609.	0.	13609.	0.	0.	0.	0.	-13609.
1992	10541.	660.	11201.	100.	198.	524.	822.	-10379.
1993	7993.	706.	8699.	100.	397.	1048.	1545.	-7154.
1994	0.	988.	988.	100.	595.	1571.	2266.	1278.
1995	0.	1010.	1010.	100.	793.	2095.	2988.	1978.
1996	874.	1063.	1937.	100.	851.	2619.	3570.	1633.
1997	2858.	1119.	3977.	100.	910.	3144.	4154.	177.
1998	417.	1209.	1626.	100.	968.	3668.	4736.	3110.
1999	6979.	1274.	8253.	100.	1027.	4190.	5317.	-2936.
2000	2577.	1375.	3952.	100.	1085.	4715.	5900.	1948.
2001	0.	1422.	1422.	100.	1317.	8423.	9840.	8418.
2002	1698.	1539.	3237.	100.	1549.	12131.	13780.	10543.
2003	1698.	1619.	3317.	100.	1782.	15838.	17720.	14403.
2004	0.	1713.	1713.	100.	2014.	19546.	21660.	19947.
2005	0.	1806.	1806.	100.	2246.	23254.	25600.	23794.
2006	0.	1910.	1910.	100.	2416.	28442.	30958.	29048.
2007	0.	2014.	2014.	100.	2586.	33631.	36317.	34303.
2008	923.	2132.	3055.	100.	2757.	38820.	41677.	38622.
2009	0.	2289.	2289.	100.	2927.	44008.	47035.	44746.
2010	0.	2424.	2424.	100.	3097.	49197.	52394.	49970.
2011	0.	2424.	2424.	100.	3097.	49197.	130662.	128238.

Discount Rate = 9. % B/C Ratio = 1.715 NPV = 35439.
Discount Rate = 12. % B/C Ratio = 1.234 NPV = 9800.
Discount Rate = 15. % B/C Ratio = 0.899 NPV = -3638.

EIRR = 13.977 %

7.2.4 Evaluation of the Project

The economic internal rate of return (EIRR), benefit cost ratio (B/C Ratio) and net present value (NPV) are shown in Table 7.2.2.

Table 7.2.2 Economic Assessment

EIRR (%)	B/C Ratio *	NPV (million Rp. 1985)
14.0	1.23	9,800

Note * : at discount rate of 12%

The results of the economic analysis show that the project is feasible because the EIRR of 14.0% is higher than 12% of the opportunity cost of capital in Indonesia.

Therefore, it is proven that the Surakarta airport development project is a national project to be invested and implemented urgently.

7.2.5 Sensitivity Analysis

The sensitivity analysis is also made to provide a basis for profitability judgement on the feasibility of the project. The EIRRs are calculated on Zthe several projections and summarized in Table 7.2.3.

Table 7.2.3 Summary of Sensitivity Analysis

Projections		EIRR (%)
Base Case		14.0
Case I	Construction Cost Up by 10%	13.1
Case II	Traffic Demand Down by 10%	13.1
Case III	Construction Cost Up by 10% Traffic Demand Down by 10% (Simultaneously)	12.2

The results of the sensitivity analysis show that even in the worst projection (case III), the EIRR is a little bit more than 12%, and satisfies the opportunity cost of capital in Indonesia, and suggests that the project will yield a sufficient economic return on investment even in case of a substantial increase of the construction cost or reduction of air traffic demand.

7.3 Financial Analysis

7.3.1 Objectives

The financial analysis is to study financial viability of the project, assuming the airport management and maintenance are an independent business. The analysis is generally carried out by investigating financial cost benefit analysis.

The financial benefits are composed of various airport charges and the financial costs are also composed of construction and maintenance costs.

7.3.2 Methodology

The financial benefits and costs to be measured and calculation methods are stated below.

(1) Financial Benefit (Revenue)

The revenues of an airport management organization are as follows:

a) Landing Charge

The Surakarta airport is classified class-III. The landing charge of the class-III airports is stipulated in Table 7.3.1.

Table 7.3.1 Landing Charge of the Class-III Airports

Aircraft Weight	Tariff
a) Up to 40,000 Kg	Rp. 550.- for each 1,000 Kg or its part.
b) Above 40,000 Kg	Rp. 22,000.- + Rp. 730.- for each 1,000 Kg above 40,000 Kg or its part.
c) Tariff of facility use for runway lamp;	
1) Domestic Flight	Rp. 9,000.-
2) Round Flight	Rp. 4,500.-
3) Training & Trial Flight	Rp. 2,000.-

Source: DGAC

b) Air Passenger Service Charge

The air passenger service charge of domestic flights is stipulated for each airport class in Table 7.3.2.

Table 7.3.2 Air Passenger Service Charge

Airport Class	Air Passenger Service Charge (Rp./Pax.)
I	1,800
II	1,400
III	1,200
IV	800
V	500

According to Table 7.3.2, the charge at Surakarta airport is to be 1,200 Rp./Pax.

c) Rental Charge of Terminal Building Space

Airlines, restaurants, etc., which do business in the passenger terminal building pay the charge on concessions to the airport management organization.

According to data of airlines which use the check-in counters at the existing Yogyakarta airport, the annual rental charge including utility charges is 90,000 Rp./sq.m.

Based on this data, the rental charge for the new terminal building is assumed to be 100,000 Rp./sq.m and 40 % area of the terminal building is assumed to be rented.

d) Vehicle Parking Fee

The existing vehicle parking makes no parking charge. However, after completion of the project, more revenue from the airport will be required in order to operate and maintain the larger new facilities.

Accordingly, the vehicle parking will be charged for. The fee is supposed to be 500 Rp./time·vehicle the same as that of Soekarno-Hatta airport.

(2) Financial Cost (Expenditure)

The expenditures of the airport management organization are composed of the following items:

a) Construction Cost

The construction cost has been shown in Table 6.7.1. including the renewal cost.

b) Operation and Maintenance Costs

The operation and maintenance costs are the same as those described in the section of "7.2 Economic Analysis".

7.3.3 Financial Cash Flow

The financial cash flow over the entire project period is shown in Table 7.3.3.

Table 7.3.3 Financial Cash Flow

Unit:Million Rp.

Year	Costs			Incomes				Net Income
	Const. Cost	O & M Cost	Total Cost	Landing Charge	Service Charge	Rental Fee	Total Income	
1987	1230.	0.	1230.	0.	0.	0.	0.	-1230.
1988	2305.	0.	2305.	0.	0.	0.	0.	-2305.
1989	1540.	0.	1540.	0.	0.	0.	0.	-1540.
1990	11895.	0.	11895.	0.	0.	0.	0.	-11895.
1991	13609.	0.	13609.	0.	0.	0.	0.	-13609.
1992	10541.	660.	11201.	50.	127.	339.	516.	-10685.
1993	7993.	706.	8699.	53.	144.	342.	539.	-8160.
1994	0.	988.	988.	57.	162.	344.	563.	-425.
1995	0.	1010.	1010.	62.	179.	347.	588.	-422.
1996	874.	1063.	1937.	64.	192.	350.	606.	-1331.
1997	2858.	1119.	3977.	66.	205.	353.	624.	-3353.
1998	417.	1209.	1626.	69.	219.	355.	643.	-983.
1999	6979.	1274.	8253.	71.	232.	358.	661.	-7592.
2000	2577.	1375.	3952.	73.	245.	361.	679.	-3273.
2001	0.	1422.	1422.	86.	267.	366.	719.	-703.
2002	1698.	1539.	3237.	99.	289.	370.	758.	-2479.
2003	1698.	1619.	3317.	113.	311.	375.	799.	-2518.
2004	0.	1713.	1713.	126.	333.	379.	838.	-875.
2005	0.	1806.	1806.	139.	355.	384.	878.	-928.
2006	0.	1910.	1910.	152.	377.	388.	917.	-993.
2007	0.	2014.	2014.	165.	399.	393.	957.	-1057.
2008	923.	2132.	3055.	179.	422.	398.	999.	-2056.
2009	0.	2289.	2289.	192.	444.	402.	1038.	-1251.
2010	0.	2424.	2424.	205.	466.	407.	1078.	-1346.
2011	0.	2424.	2424.	205.	466.	407.	1078.	-1346.

7.3.4 Evaluation of the Project

The financial cash flow shows that the expected revenue will not cover the total expenditures and will not be able to cover even the operation and maintenance costs, which is estimated to reach 2.3 times the revenue around of the year 2010.

Generally speaking, it will be very difficult for the airport project to be balanced financially; however, it is desirable that the operation and maintenance cost be at least covered by the airport revenues.

As a result, it is recommended that the total airport revenue based on the current airport charge system should be raised by at least 30% at the start of the new terminal. Furthermore, it is suggested that in the future, some countermeasures such as subsidies of the government, etc., will be required.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS AND RECOMMENDATIONS

Part I "Formation of the airports development concept" concluded that the long-term development of the major airports in Central Java province and D.I. Yogyakarta should be implemented by the following development policies:

- Development of the new Yogyakarta airport
- Redevelopment of the existing Surakarta airport
- Redevelopment of the existing Semarang airport after review of the master plan already prepared

The feasibility study on the redevelopment of the existing Surakarta airport was executed in Part II based on the above conclusion.

Based on the comprehensive study presented in Vol 2, Part II, the redevelopment project of the existing Surakarta airport is judged feasible both in terms of engineering and national economy of Indonesia.

The cost of the project is estimated to be approximately 52 and 15 billion Rp. in Phases I and II, respectively and the economic internal rate of return (EIRR) is estimated to be 14.0 %, and net present value (NPV) to be approx. 10 billion Rp.

By the implementation of this project, the following beneficial impacts can be expected on the air transportation and the socio-economic situation;

- Unrestricted and flexible air transport services can be ensured to the increasing air traffic demand in the future.
- Safe and efficient operation of aircraft can be promoted, especially of training aircraft and civil flights in the military training area.
- Implementation of this project will contribute to the airlines' profitability by means of introduction of larger aircraft.

- Tourism development can be promoted by the provision of unrestricted air transport services.

- Implementation of this project will also contribute to the expansion of economic activities in the Surakarta region.

- Employment opportunity can be enlarged.

It is recommended that the following actions should be undertaken for the project implementation.

- Airspace above Surakarta airport should not be re-arranged solely in terms of Surakarta airport, but in relation with the development project of the new Yogyakarta airport. To do so, DGAC should constitute a committee to closely coordinate with the Indonesian Air Force.

- Land acquisition, compensation, topographic survey, soil investigation and detailed engineering services should be completed by the end of 1989 so that the construction work for the Phase I project can be started in 1990 and completed in 1993. Since the existing passenger terminal building has been saturated even for the present passengers, a new terminal building should be constructed prior to the other works by 1992.

- By the time of completion of the Phase I project, DGAC and BAPPEDA in Surakarta should prepare the land use plan, which will require the consensus of the regional society, in the vicinity of the airport.

- Phase I facilities are to be designed to cope with the air traffic demand in 2000. The construction work for the Phase II project should be completed by 2000 to cope with the air traffic demand in 2010.