

**THE STUDY ON THE DEVELOPMENT
OF
CHITTAGONG AIRPORT
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH**

FINAL REPORT

SUMMARY

SEPTEMBER 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

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FINAL REPORT SUMMARY
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PREFACE

In response to a request from the Government of the People's Republic of Bangladesh, the Japanese Government decided to conduct a study on the Development of Chittagong Airport and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to Bangladesh a survey team headed by Mr. Shota MORITA of Pacific Consultants International from December 1988 to February 1989 and in July 1989.

The team held discussions with concerned officials of the Government of Bangladesh 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 sincerest appreciation to the officials concerned of the Government of the People's Republic of Bangladesh for their close cooperation extended to the team.

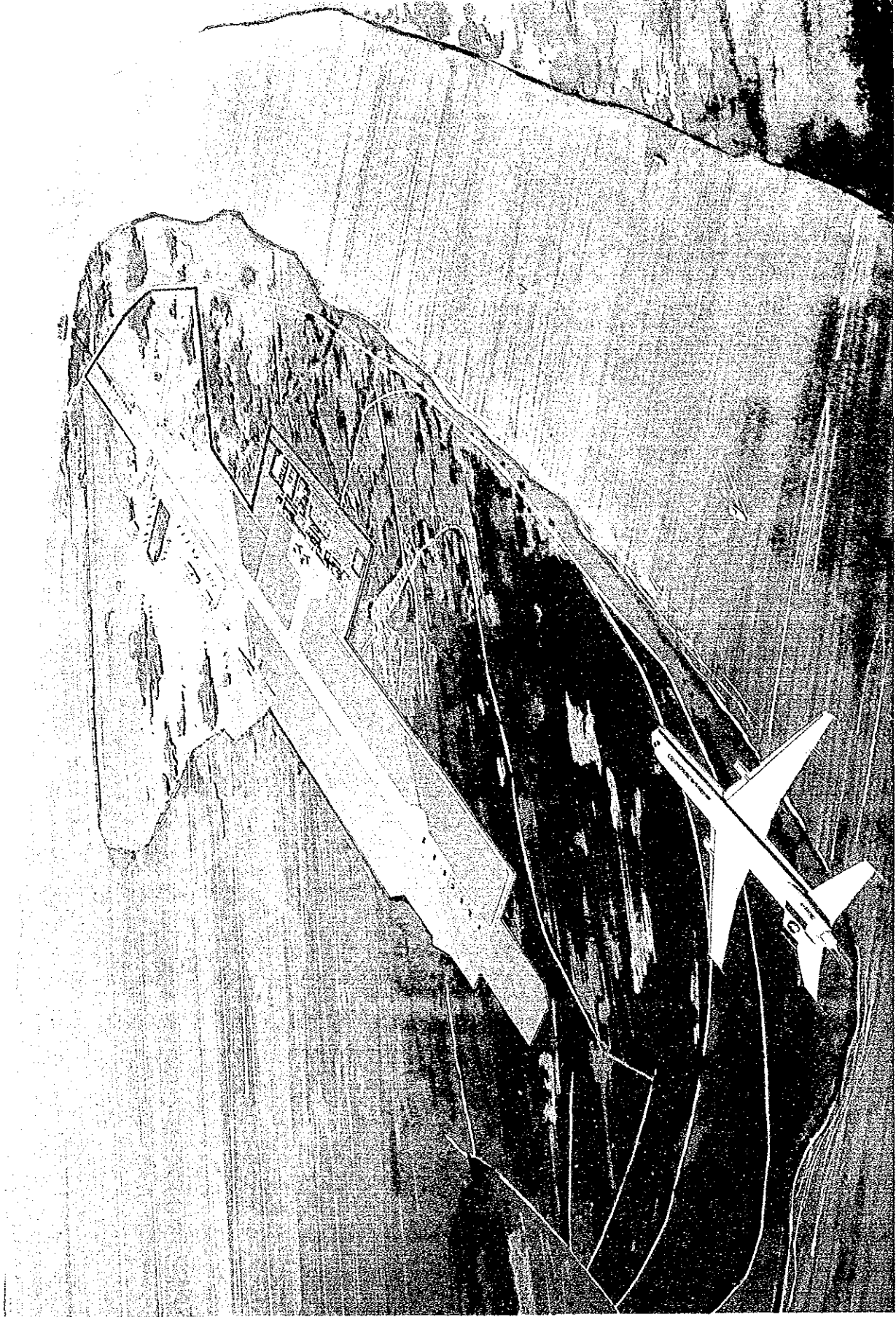
September 1989



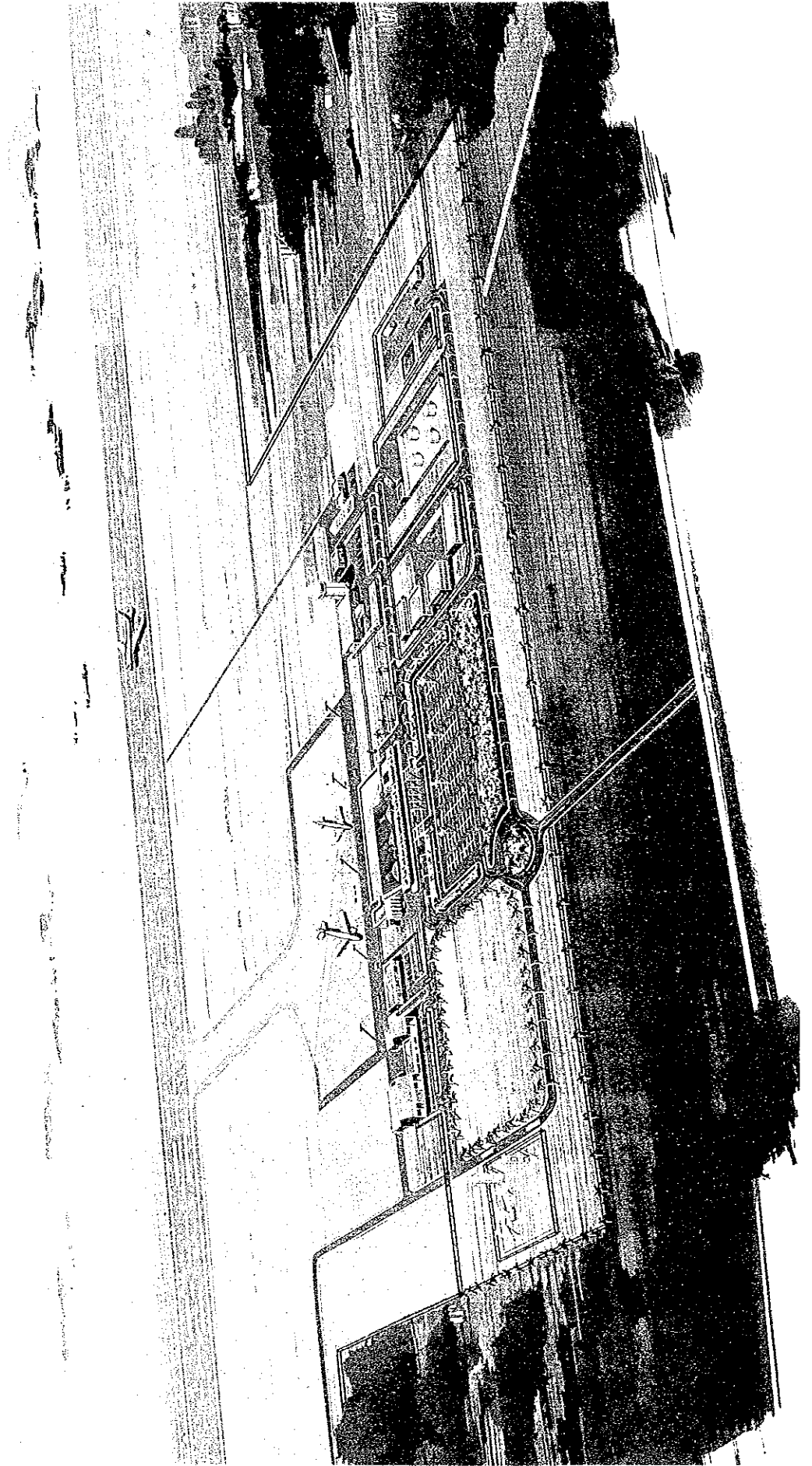
Kensuke Yanagiya

President

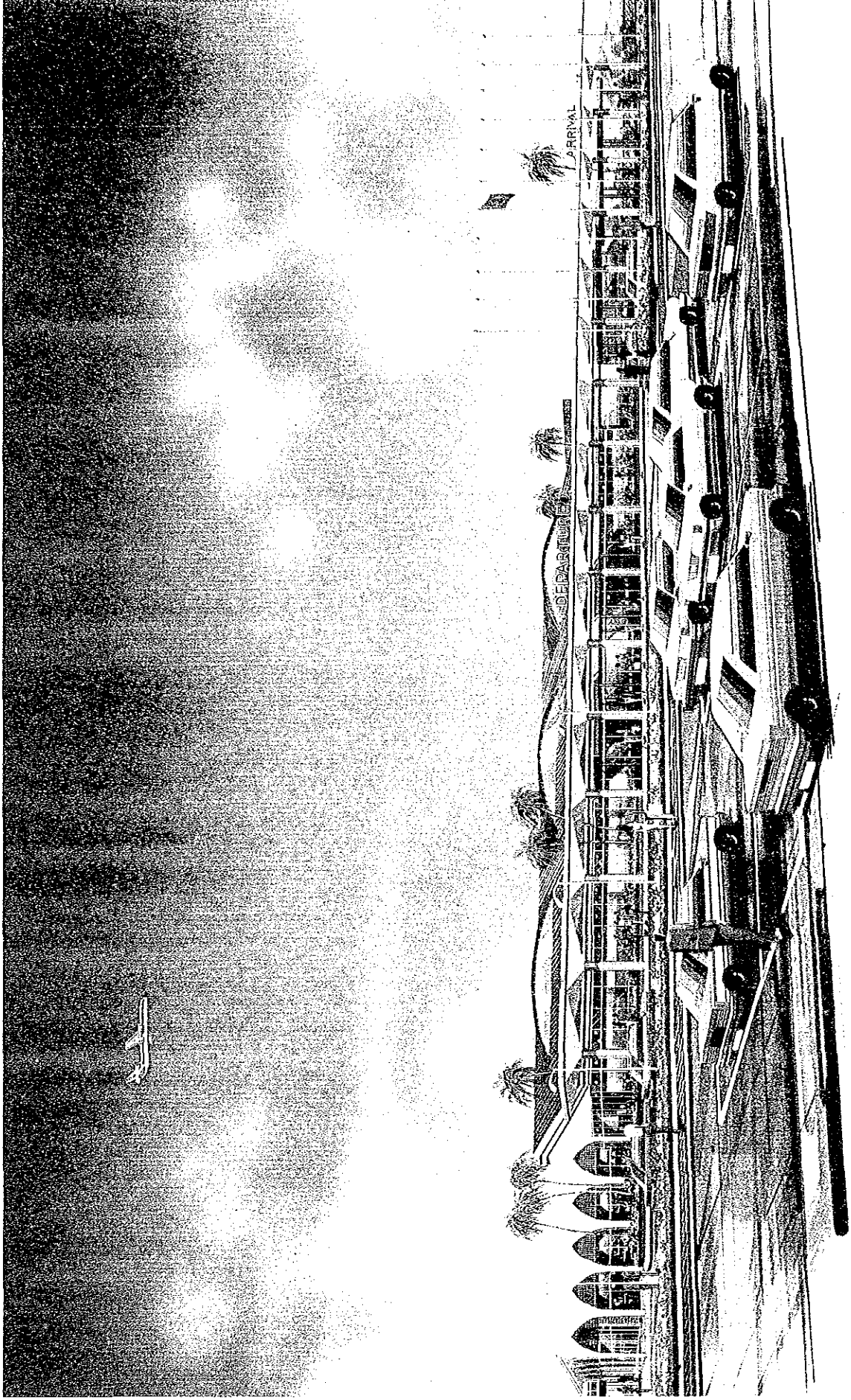
Japan International Cooperation Agency



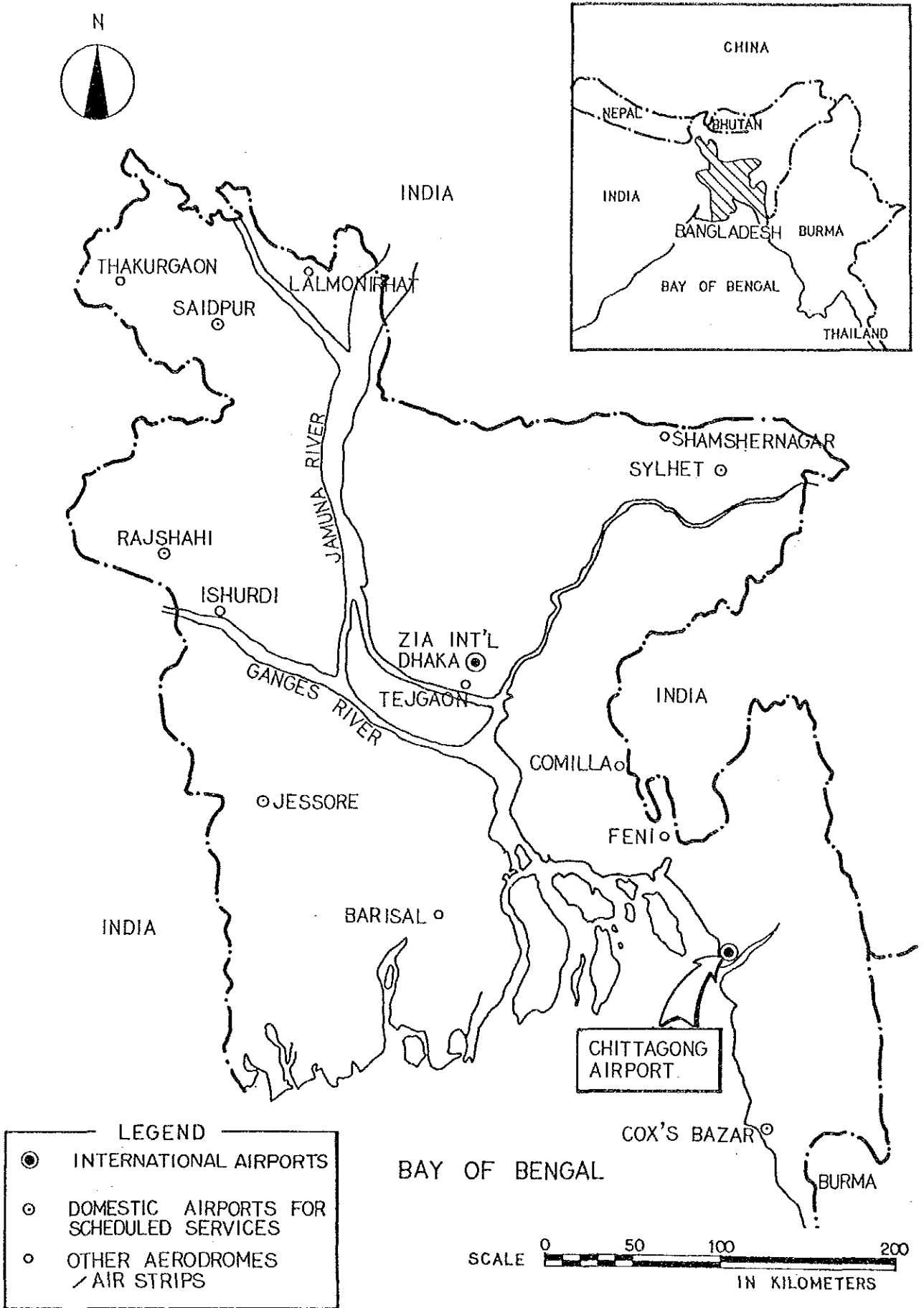
**CHITTAGONG AIRPORT PHASE I DEVELOPMENT PLAN
TARGET YEAR 2000**



NEW TERMINAL AREA



NEW PASSENGER TERMINAL BUILDING



PROJECT LOCATION MAP

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CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 General

Bangladesh is situated on the north of the Bay of Bengal, and stretches over 640km north to south and about 490km east to west, roughly between India and Burma. It contains the Ganges Delta and has a total area of about 144,000 sq.km with an estimated population of 106 million in 1988.

Due to a lack of sufficient surface transport, air transport plays an important role in smoothing socio-economic activities and in promoting structural change of the economy towards industrialization.

Chittagong Airport is located 8km south of Chittagong City which is close to Chittagong Port at the mouth of Karnafuli River to the Bay of Bengal. Chittagong City has a population of about 2 million, the second largest in Bangladesh, and has grown to be a major industrial area with an advantage of marine communications.

The airport is supposed to stimulate the Chittagong area by serving both air passenger and cargo traffic generated from social and economic activities at industries, sea port, etc. This airport is also urgently required for national stability and calamity preparedness to practically function as an alternate airport for Dhaka Zia International Airport (ZIA) and a center of relief activities without having to rely on neighboring countries because Chittagong area is free from floods and can meteorologically relieve the northern part of Bangladesh including Dhaka. However, the existing facilities are insufficient even for the present traffic and in obsolescent conditions. Terminal facilities are too small to handle peak hour traffic and have no room to expand in the existing area.

The existing runway strength is not sufficient to accommodate large aircraft such as DC-10's which will land there in case of closure of ZIA due to meteorological and calamity reasons. Air safety is threatened by ship traffic on Karnafuli River which constitutes an obstacle to approaching aircraft.

At present these problems restrict socio-economic activities in Bangladesh. Therefore it is increasingly recognized by the Government of Bangladesh to remove the present barriers in order to provide required services.

In response to the request of the Government of Bangladesh, the Government of Japan has agreed to undertake the Study on the Development of Chittagong Airport (hereinafter referred to as "the Study"). Based on this decision, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), an official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, has been entrusted to carry out the Study.

1.2 Objective of the Study

The objectives of the Study are to prepare a long-term master plan for the orderly development of Chittagong Airport and to plan a Phase I development project (hereinafter referred to as "the Project") which will be implemented to solve the present facility problems. Phase I development project is to be examined in terms of technical and economic feasibility.

CHAPTER 2 BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE AIRPORT

2.1 Existing Chittagong Airport

Chittagong Airport is located about 8km south of the center of Chittagong City. The airport now includes a 3,048m long runway, connecting taxiway, apron, international and domestic terminal buildings and other supporting facilities. The existing layout and outline of the airport are shown in Figure 2.1 and Table 2.1 respectively.

Chittagong Airport is administrated by Civil Aviation Authority of Bangladesh (CAAB) and jointly used by civil aviation and Bangladesh Air Force (BAF). Airport property areas of CAAB and BAF are divided by the centerline of the runway, and occupy the southern part and the northern part respectively. The existing terminal area is located to the north of the runway in BAF area.

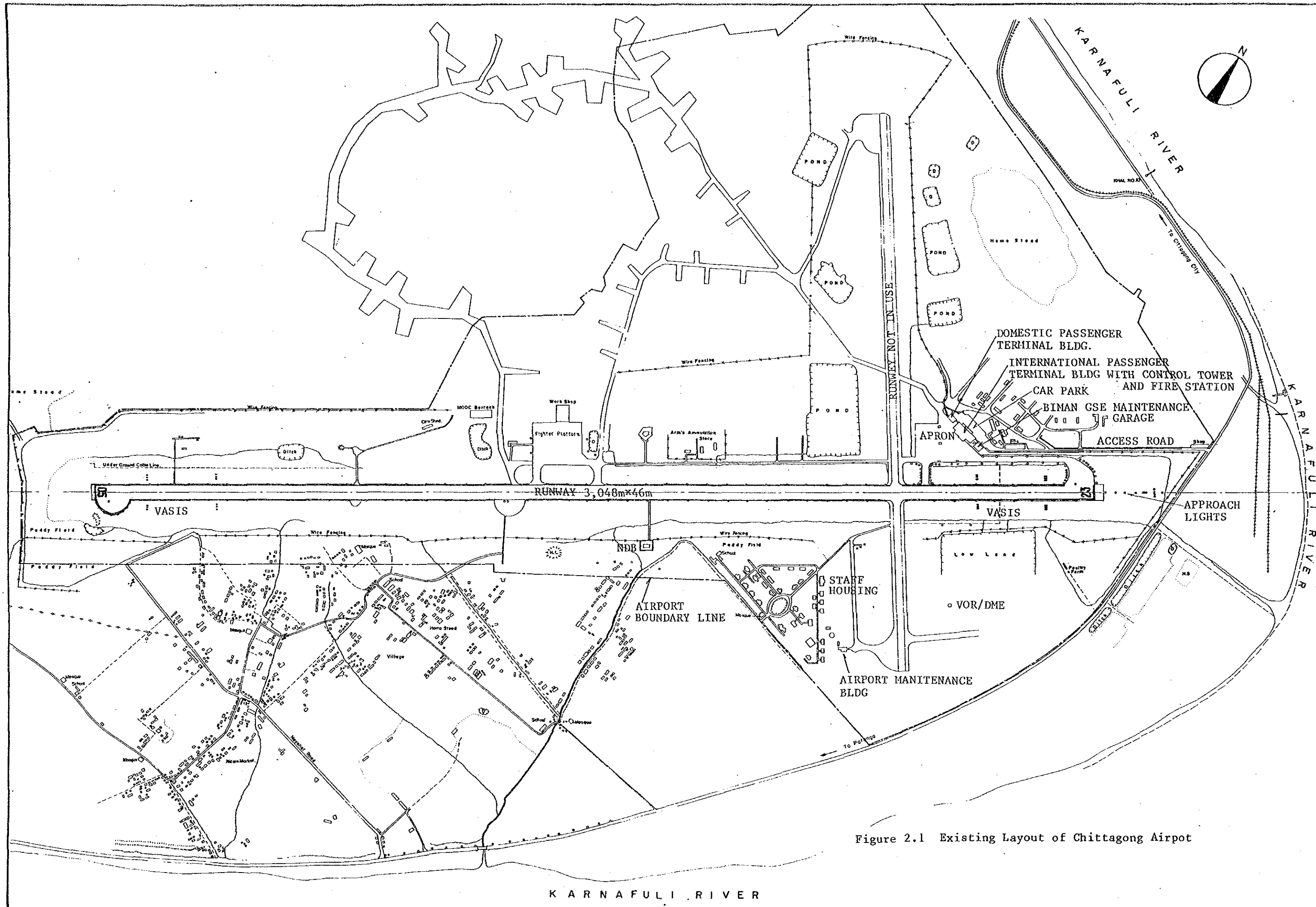


Figure 2.1 Existing Layout of Chittagong Airport

Table 2.1 Outline of the Existing Chittagong Airport

Note, "x" indicates available.
 "-" indicates not available.

Country	Name of Airport	Int'l/Dom. ICAO Code	Commencement of Services	Total Airport Area	Aerodrome Ref. Point	Ref. Point Elevation	Runway Orientation	Aerodrome Ref. Temp.	Operational Hours	Seasonal Availability	Administrative Agency:											
Bangladesh	Chittagong	Int'l/Dom. 4D	Early 1940s	320 ha	N22°15'22" E90°49'30"	3.66m (12ft)	N49°E (True North)	32.0°C (April)	To meet ops. requirement	All Seasons	Civil Aviation Authority of Bangladesh (CAAB)											
City/Town		Transportation		Runway Usability Factor		Operational Minima					Approach Category: Instrument Non-precision Approach											
Name	Population	Distance to Airport	Railway	Bus	Taxi		Straight-in	Circling CAT-A & B	Circling CAT-C & D													
Chittagong	2 million	15km by Road	-	x	x	86.8%(13kt) 92.9%(20kt)	OCA Visibility	520ft 2,800m	650ft 3km	750ft 4km(C),5km(D)												
Air Navigation Systems	Nav aids		NDB	VOR	DME	TACAN	ILS	MM	OM	VHF DF												
	ATC/COM		ASR	SSR	PAR	ASDE	ARTS	VHF A/G	AFS	TTY	Micro Wave	ATIS										
	Lights		ALS	SFL	SALS	ALB	CGL	RWL	RWCL	RWIL	ORL	TDZL	REIL	DML	VASI	TWL	TWCL	TGS	ABN	IWDI	AFL	OL
	MET		RWY Surface Sensors			Transmissiometer			Ceilmeter	WX-FAX	APT-RX	Radio Sonde	WX Radar	WX-TTY								
			x (Not in the Airfield)							x		x		x								
Basic Facilities	Facility		Size		Pavement		Note		Int'l/Dom.	Route		Airline	Aircraft	Frequency								
	Runway		3,048m x 46m		Asphalt		7 ton/sq.m		Int'l	Chittagong-Calcutta		BG IC	F-28 F-27	4/week 6/week								
	Runway Strip		3,170m x 150m						Dom.	Chittagong-Dhaka Chittagong-Cox's Bazar		BG BG BG	F-28 F-27 F-27	52/week 10/week 4/week								
	Taxiway		65m x 13m		Asphalt		7 ton/sq.m			BG: Biman Bangladesh IC: Indian Airlines												
	Apron		Design No. of Aircraft Stands	Size		Pavement		Note		F-28: 85 Seats F-27: 44 Seats												
		B-707	1	16,200 sq.m		Asphalt and Cement		7 ton/sq.m														
		F-28	2																			
		3 F-28s can be parked simultaneously.			Self-maneuvering																	
Other Facilities	Facility		Size		Structure		Note		Year		1984	1985	1986	1987								
	International Passenger Bldg.		1,660 sq.m		RC		Terminal Use 880 sq.m															
	Domestic Passenger Bldg.		320 sq.m		RC																	
	Cargo Bldg.		Nil																			
	Administration Bldg.		670 sq.m		RC		Part of Int'l Pax. Bldg.															
	Control Tower		VFR Room 40 sq.m		RC		Part of Int'l Pax. Bldg.															
	Fire Station		300 sq.m		RC		Part of Int'l Pax. Bldg.															
	Fire Fighting Services		Category-5		Major Vehicle: 3 Fire Jeep : 1 Ambulance : 2																	
Car Park		1,600 sq.m		Asphalt		96 Cars																
Fuel System		55 kl		by Hydrant		Burmah Eastern																
								Int'l Passengers		49,486	53,222	57,334	66,599									
								Dom. Passengers		117,390	129,920	109,608	109,153									
								Total Passengers		168,876	183,142	166,942	175,752									
								Cargo (ton)		422	438	446	550									
								Aircraft Movements		8,448	8,412	9,590	9,151									

Drawn by JICA
As of 1989

CHAPTER 3 AIR TRAFFIC ANALYSIS AND DEMAND FORECASTS

CHAPTER 3 AIR TRAFFIC ANALYSIS AND DEMAND FORECAST

3.1 Phases of the Airport Development

The development of Chittagong Airport is planned to be implemented in two phases in order to achieve cost-effective development with a minimum initial investment.

(1) Phase I Development

Phase I development will handle air traffic demands anticipated in 2000 so that no major improvement work will be required for about 5 years from the likely completion of construction.

(2) Phase II Development

Design target year of Phase II development is set at 2010 in order to visualize the airport development in the foreseeable future.

3.2 Air Traffic Analysis and Demand Forecasts

Air traffic demands at Chittagong Airport are forecast up to 2010 at five year intervals in order to provide basic conditions for airport master planning. The forecasts are prepared in accordance with the following steps:

- Analysis of past trend of air traffic and economic factors in Bangladesh
- Projection of population and gross domestic products (GDP) of Bangladesh
- Forecast of air traffic demands in Bangladesh using regression analyses between air traffic and economic factors
- Distribution of air traffic demand for Chittagong Airport
- Break-down of annual traffic demands into peak hour traffic

The forecasts of annual international and domestic passengers and cargo at Chittagong Airport are shown in Figure 3.1. Higher

growth is forecast for international passenger demand reflecting the industrial and commercial potential of the Chittagong area which is not reflected in the present traffic, while stable growth in accordance with increase in GDP is forecast for domestic passenger demand. Direct international services by DC-10 class aircraft from/to Middle East and Bangkok will be initiated around 1995. Cargo demand will increase remarkably with the introduction of large aircraft which have big cargo loading capacity.

Flight services at Chittagong Airport in 2000 and 2010 are shown in Table 3.1

Table 3.1 Flight Services at Chittagong Airport

Route	Year	1989 (Present)	2000 (Phase I)	2010 (Phase II)
International				
Chittagong-Calcutta		F-28: 4/week F-27: 6/week	F-28/F-27 : 10/week B-737 class: 8/week	B-737 class: 24/week
Chittagong-Middle East			DC-10 class: 12/week	DC-10 class: 16/week
Chittagong-Bangkok			DC-10 class: 6/week	DC-10 class: 10/week
Domestic				
Chittagong-Dhaka		F-28: 52/week F-27: 10/week	F-28/F-27 : 16/day	F-28/F-27 : 8/day B-737 class: 8/day
Chittagong-Cox's Bazur		F-27: 4/week	F-28/F-27 : 4/week	F-28/F-27 : 6/week
Total		76/week	152/week	168/week

Note: Total of arrivals and departures

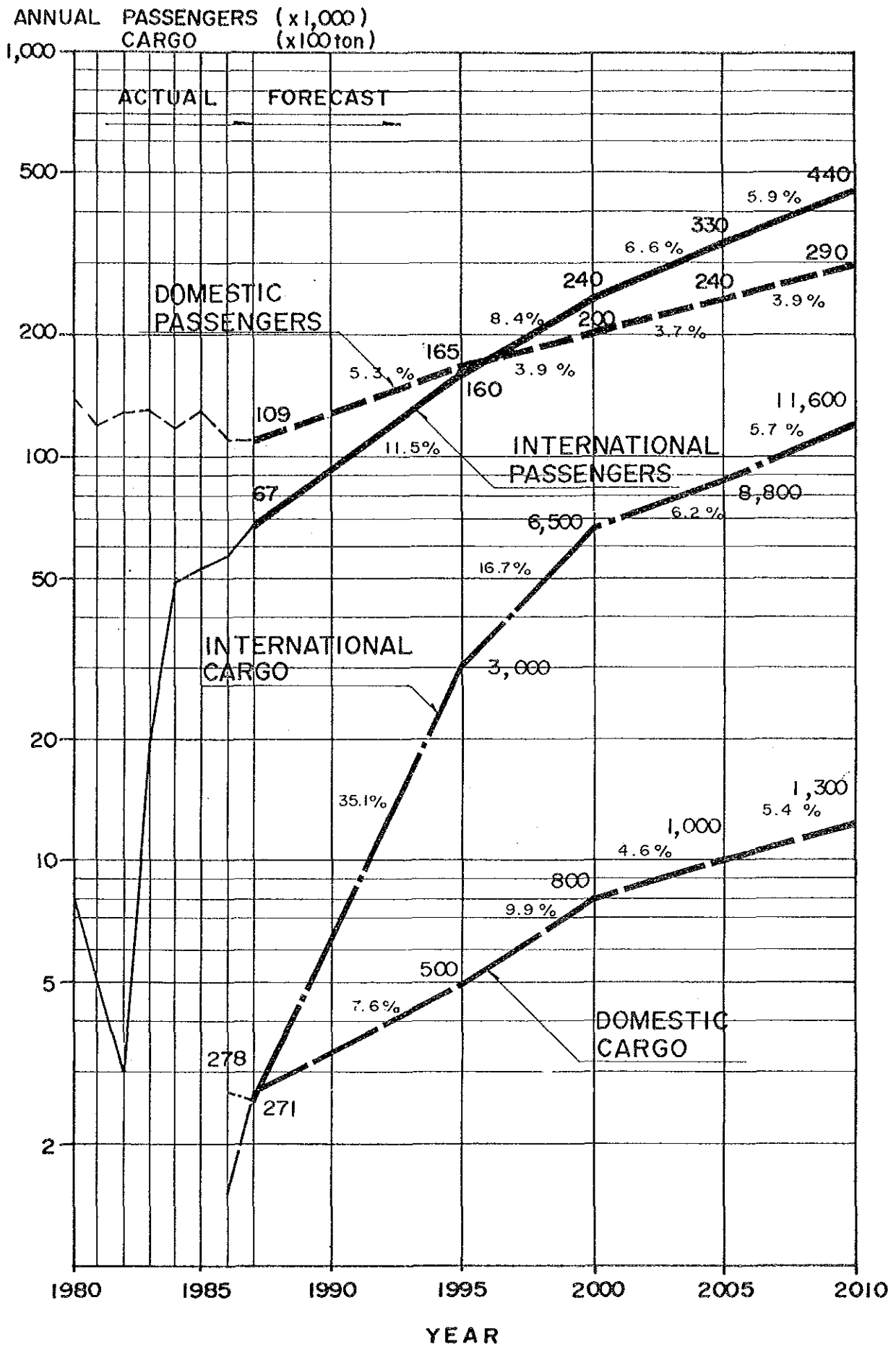


Figure 3.1 Projection of Passenger and Cargo Demand at Chittagong Airport

CHAPTER 4 AIRPORT FACILITY REQUIREMENTS

CHAPTER 4 AIRPORT FACILITY REQUIREMENTS

Airport facility requirements are established based on the air traffic demand forecasts and taking account of the possible diversions from Zia International Airport. They are shown in Table 4.1 together with target air traffic demands.

Table 4.1 Facility Requirements

ITEMS	Present Conditions (as of 1989)	Year 1995	YEAR 2000 (Phase I Development)	YEAR 2005	Year 2010 (Phase II Development)
1. Annual Passengers					
Domestic	109,153 (1987)	165,000	200,000	240,000	290,000
International	66,599 (1987)	160,000	240,000	330,000	440,000
Total	175,752 (1987)	325,000	440,000	570,000	730,000
2. Annual Cargo					
Domestic	278 ton (1987)	500 ton	800 ton	1,000 ton	1,300 ton
International	270 ton (1987)	3,000 ton	6,500 ton	8,800 ton	11,600 ton
Total	548 ton (1987)	3,500 ton	7,300 ton	9,800 ton	12,900 ton
3. Annual Aircraft Movements					
Domestic	2,359 (1988)	4,400	5,800	5,900	5,900
International	496 (1988)	1,400	1,670	1,770	2,310
Others	5,726 (1988)	5,700	5,700	5,700	5,700
Total	8,581 (1988)	11,500	13,170	13,370	13,910
4. Peak Hour Passengers (2 ways)					
Domestic	130	168	224	288	352
International	150	328	456	504	504
Overall	160	440	568	616	680
5. Peak Hour Aircraft Movements (2 ways)					
Domestic	2	3	4	4	4
International	2	3	3	3	3
Others	0	2	2	2	2
Overall	2	7	7	7	7
6. Largest Aircraft Schedule Diversion	F-28 B-707	DC-10 B-747	DC-10 B-747	DC-10 B-747	DC-10 B-747
7. Longest Route	Calcutta	Jeddah	Jeddah	Jeddah	Jeddah
8. Reference Code	4D	4E	4E	4E	4E
9. Runway					
Take-off Length	3,048 m	2,750 m	2,750 m	2,750 m	2,750 m
Landing Length	3,048 m	2,450 m	2,450 m	2,450 m	2,450 m
Width	46 m	45 m	45 m	45 m	45 m
10. Runway Strip					
Length	3,170 m	2,870 m	2,870 m	2,870 m	2,870 m
Width	150 m	300 m	300 m	300 m	300 m
11. Taxiway System	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway	1 Exit Taxiway
Width	15 m	23 m	23 m	23 m	23 m
12. Apron Commercial Aircraft Stands					
B-707 : 1	B-747 : 1	B-747 : 1	B-747 : 1	B-747 : 1	B-747 : 1
F-28 : 2	DC-10 : 1	DC-10 : 1	DC-10 : 1	DC-10 : 1	DC-10 : 1
Total : 3	F-28 : 2	B-737 : 2	B-737 : 2	B-737 : 2	B-737 : 2
	Total : 4	Total : 4	Total : 4	Total : 4	Total : 4

ITEMS	Present Conditions (as of 1989)	Year 1995	YEAR 2000 (Phase I Development)	YEAR 2005	Year 2010 (Phase II Development)
13. Passenger Terminal Building					
Domestic	320 sq.m	1,000 sq.m	1,300 sq.m	1,700 sq.m	2,100 sq.m
International	880 sq.m	3,000 sq.m	4,100 sq.m	4,500 sq.m	4,500 sq.m
Total	1,200 sq.m	4,000 sq.m	5,400 sq.m	6,200 sq.m	6,600 sq.m
14. Cargo Terminal Building	NIL	900 sq.m	2,000 sq.m	2,700 sq.m	3,500 sq.m
15. Administration Building	670 sq.m	1,800 sq.m	1,800 sq.m	1,800 sq.m	1,800 sq.m
16. Car Park Parking Lots Area	96 1,600 sq.m	220 6,600 sq.m	284 8,500 sq.m	308 9,200 sq.m	340 10,200 sq.m
17. Access Road Traffic Lanes	1 lane per direction 5.5 m	1 lane per direction 7.0 m	1 lane per direction 7.0 m	1 lane per direction 7.0 m	1 lane per direction 7.0 m
18. Air Navigation Systems	Non-Precision (VOR/DME, NDB)	Precision Category-I	Precision Category-I	Precision Category-I	Precision Category-I
19. Public Utilities					
Power Supply	400 KVA	900 KVA	1,100 KVA	1,200 KVA	1,300 KVA
Water Supply	-	3,600 t/month	4,700 t/month	5,300 t/month	5,600 t/month
Sewage Disposal	-	3,600 t/month	4,700 t/month	5,300 t/month	5,600 t/month
Solid Waste Disposal	-	15 t/month	20 t/month	25 t/month	30 t/month
20. Rescue and Fire Fighting					
Category	Category-6	Category-6	Category-6	Category-6	Category-6
Fire Vehicles	4	4	4	4	4
Fire Station	300 sq.m	450 sq.m	450 sq.m	450 sq.m	450 sq.m
21. Airport Maintenance Building	280 sq.m	300 sq.m	300 sq.m	300 sq.m	300 sq.m
22. Fuel Supply Facility					
Tank Capacity	54.5 kl	1,500 kl	2,000 kl	2,000 kl	2,500 kl
Fuel Farm	920 sq.m	6,300 sq.m	6,300 sq.m	6,300 sq.m	7,700 sq.m

CHAPTER 5 EVALUATION OF EXISTING AIRPORT

CHAPTER 5 EVALUATION OF EXISTING AIRPORT

The existing Chittagong Airport is evaluated by comparing the present conditions with the future requirements estimated based on the air traffic demand forecasts.

The anticipated time of saturation of the existing facilities is estimated as shown in Table 5.1. Major problems of the existing Chittagong Airport are summarized below:

(1) Evaluation in Safe Aircraft Operation

- a) Ships on Karnafuli River under the approach surface of runway 23 constitute mobile obstacles to aircraft operation. Therefore, the measures such as the replacement of the 23 runway threshold and the control of ships and aircraft shall be taken in order to avoid a collision.
- b) Port Road which runs along Karnafuli River is a fixed obstacle to runway 23 approach surface. The relocation of this road or replacement of the 23 runway threshold will be necessary.
- c) There are many obstacles on the runway strip or protruding upon the transitional surfaces. These obstacles shall be removed as far as practicable.
- d) Standing water appears at many places of the runway due to existing depressions and may cause hydro-plane to aircraft. The improvement of runway pavement is necessary.
- e) Most of the air navigation systems including VOR/DME, aeronautical telecommunications equipment, aeronautical ground lights and meteorological observation equipment are antiquated. These facilities should be replaced in order to ensure safe aircraft operations and to maintain reliability.

Table 5.1 Anticipated Time of Saturation of Existing Facilities

Sl. No.	FACILITIES	YEAR												REMARKS
		DC-10 DIRECT FLIGHT TO MIDDLE EAST												
		89	90	91	92	93	94	95	96	97	98	99	2000	
1.	Runway <input checked="" type="checkbox"/> Length													- Existing runway length permits DC-10-30 to fly directly to Jeddah.
	<input checked="" type="checkbox"/> Pavement													- Existing pavement may need overlay to accommodate DC-10 class aircraft.
2.	Runway Strip	X												- Only 150 m wide strip is secured at present.
3.	Approach Surface	X												- Sailing vessels with more than 14.6m high mast are obstacles to runway 23 approach surface.
4.	Exist <input checked="" type="checkbox"/> System													- One existing taxiway is sufficient for non-peak hour aircraft movements.
	<input checked="" type="checkbox"/> Pavement	X												
5.	Apron <input checked="" type="checkbox"/> Aircraft Stands													- Expansion of existing apron to accommodate DC-10 class aircraft is difficult due to the limited area.
	<input checked="" type="checkbox"/> Pavement	X												
6.	Passenger Terminal Buildings <input checked="" type="checkbox"/> International	X												- Passenger terminals buildings are too small to handle even the present traffic.
	<input checked="" type="checkbox"/> Domestic	X												
7.	Cargo Terminal Building	X												- No cargo terminal building is available.
8.	Car Park	X												- Existing car park reached its capacity. Absence of vehicular circulation is also a problem.
9.	Access Road	X												- Pavement width is below standard. There are many depressions.
10.	Air Navigation Systems <input checked="" type="checkbox"/> VOR/DME													- The life span will be reached soon.
	<input checked="" type="checkbox"/> NDB													- No renewal required because of the new installation
	<input checked="" type="checkbox"/> ATC & COM													- Most equipment will reach their life span soon.
	<input checked="" type="checkbox"/> AGL													- Most equipment will reach their life span soon.
	<input checked="" type="checkbox"/> MET	X												- Total system performances is in an obsolescent condition.
11.	Airport Utilities <input checked="" type="checkbox"/> Power													- The capacity will reach its maximum soon.
	<input checked="" type="checkbox"/> Water													- The capacity will reach its maximum soon.
	<input checked="" type="checkbox"/> Sewerage	X												- Nil.
	<input checked="" type="checkbox"/> Solid Waste	X												- Nil.
	<input checked="" type="checkbox"/> Telephone	X												- System is in an obsolescent condition.
12.	Rescue and Fire Fighting													- No additional equipment is required because of the existing Cat-6.
13.	Aviation Fuel Supply													- Introduction of DC-10 class aircraft will require bigger capacity for fuel supply system.

Note : "x" indicates that facility reached its capacity or is not available.

(2) Evaluation in Capacity of the Facilities

- a) Strength of the existing pavement of runway, taxiway and apron is not sufficient to accommodate DC-10 class aircraft. Hence the pavement of these facilities shall be improved.
- b) The existing apron has not enough space for the parking of DC-10 class due to the limited space.
- c) Existing international and domestic passenger terminal buildings are too small to handle even the present traffic volume and have already reached their capacities, but are difficult to expand due to limited availability of land area.
- d) No cargo terminal building is available.
- e) Existing car park has already reached its capacity, but expansion is difficult due to limited availability of land area.

(3) Evaluation in Service Level for Passengers

- a) The existing passenger terminal building has the following problems in service level for passengers:
 - Passenger flow in the international terminal building is complicated.
 - Queuing spaces and holding areas are too small and very crowded.
 - No baggage claim, fire system, restaurant or snack bar is available.
 - Security system is not sufficient.
 - Building curb front is always crowded due to absence of public space to accommodate a local characteristic of high greeter ratio.

The construction of new passenger terminal building will be necessary in order to solve the above problems.

- b) Terminal road is a cul-de-sac and makes a vehicle circulation difficult.

CHAPTER 6 AIRPORT MASTER PLAN

CHAPTER 6 AIRPORT MASTER PLAN

3.1 Airport Master Plan

The airport master plan for Chittagong Airport is produced based on the facility requirements and the evaluation of the existing facilities. An airport layout plan indicating the phased developments up to 2010 and an outline of Phase I development project are presented in Figure 6.1 and Table 6.1 respectively. The airport master plan is prepared through the following studies:

(1) Runway Layout Planning

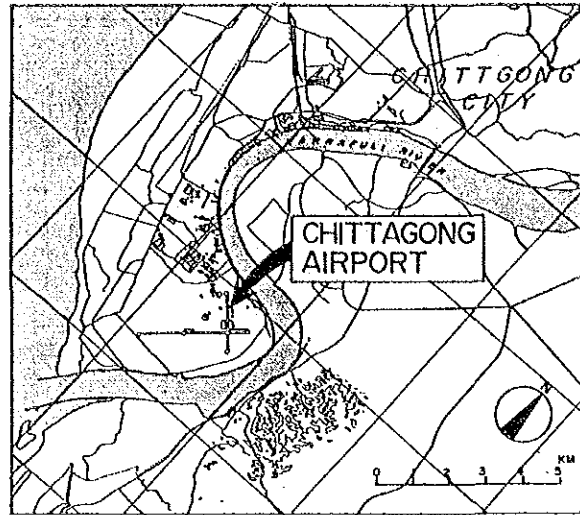
Runway layout is studied in relation to aircraft operation over Karnafuli River on which ships constitute mobile obstacles to the approach surface of runway 23.

As the result of Study, runway 23 threshold is determined to be displaced by 298m, so that vehicles on Port Road close to the runway 23 threshold will not infringe the approach surface, and no runway extension will be required. Approach surface will be free from ships by restricting ship traffic from approach surface area during the use of aircraft landing.

(2) Location of New Terminal Area

Location of the new terminal area is studied and selected for the following reasons:

- a) Taxing distance is the shortest.
- b) Location of the terminal area is the most convenient in airport operational and administrative aspects.
- c) Large space for expansion can be reserved.



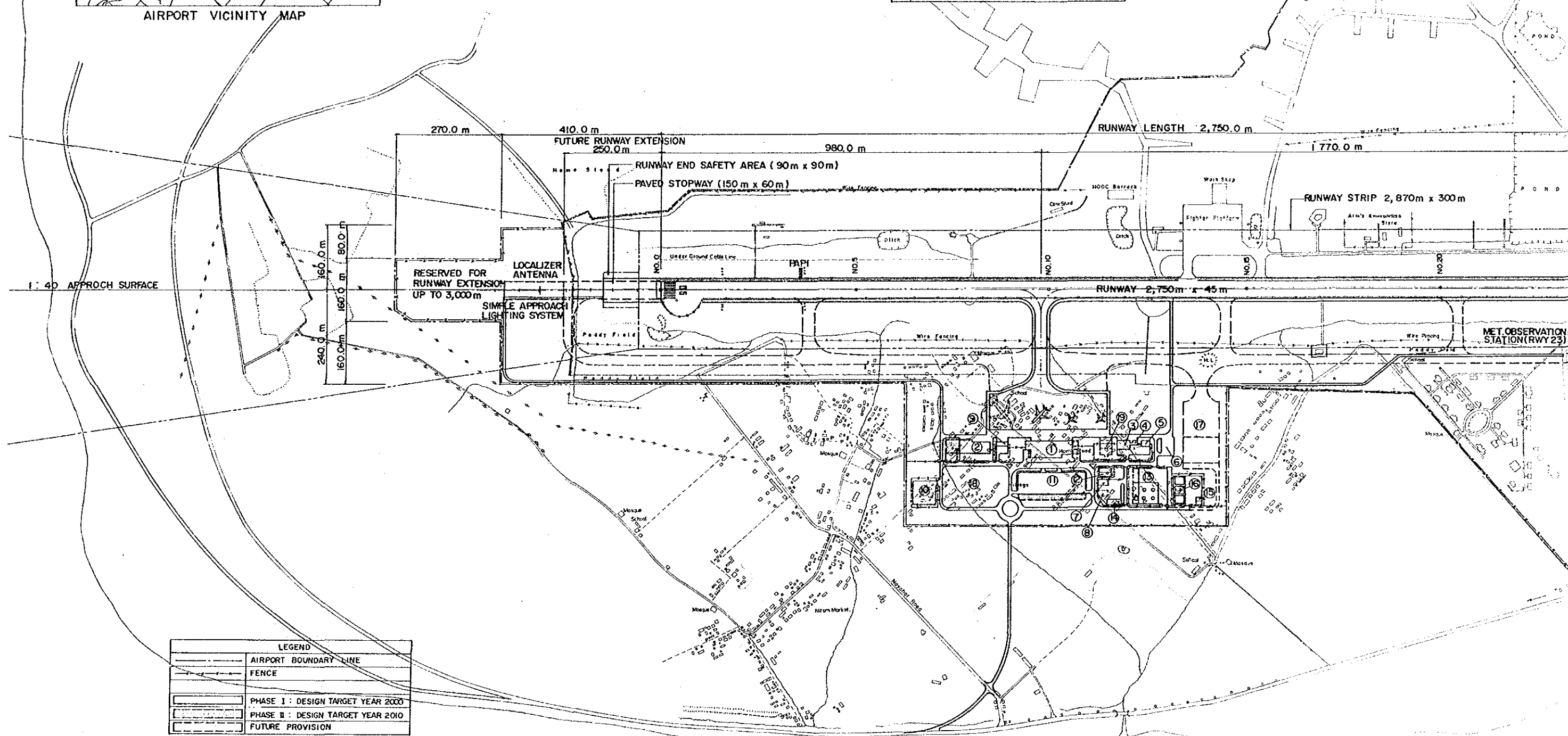
AIRPORT VICINITY MAP

RUNWAY DATA	
RUNWAY ORIENTATION 049/239 (TRUE NORTH)	
EFFECTIVE GRADIENT	0.0 %
WIND COVERAGE	91.6 % (13KT)
	96.4 % (20KT)
INSTRUMENT RUNWAY	
PAVEMENT STRENGTH	PCN 75 / FCXT
APPROACH SURFACE RWY 23	1: 50
	RWY 05 1: 40
RUNWAY LIGHTING	HIRL
LANDING AIDS RWY 23	ILS CAT-1,
	ALS, PAPI
	RWY 05 SALS, PAPI

AERODROME DATA	
ELEVATION	3.96 m
REFERENCE POINT LAT.	N 22° 15' 22"
	LONG. E 90° 49' 30"
REFERENCE TEMPERATURE	32.0 °C
MAGNETIC VARIATION	00° 55' (1985)
	02° W/YEAR
AERODROME NAVAIDS	D-VOR/DME,NDB
FIRE PROTECTION	CATEGORY-6

BUILDINGS	
①	PASSENGER TERMINAL BUILDING
②	CARGO TERMINAL BUILDING
③	ADMINISTRATION BUILDING
④	CONTROL TOWER
⑤	POWER HOUSE
⑥	FIRE STATION
⑦	OPERATION CENTER
⑧	OTHER GOVERNMENT OFFICE BUILDING
⑨	GSE MAINTENANCE GARAGE
⑩	NDB AND TRANSMITTING STATION
⑪	CAR PARK
⑫	AIRPORT MAINTENANCE BUILDING AND GARAGE
⑬	FUEL FARM
⑭	WATER SUPPLY STATION
⑮	INCINERATOR
⑯	CENTRAL SEWERAGE TREATMENT PLANT
⑰	MAINTENANCE APRON
⑱	PUBLIC AND COMMERCIAL FACILITIES' AREA
⑲	VVIP BUILDING

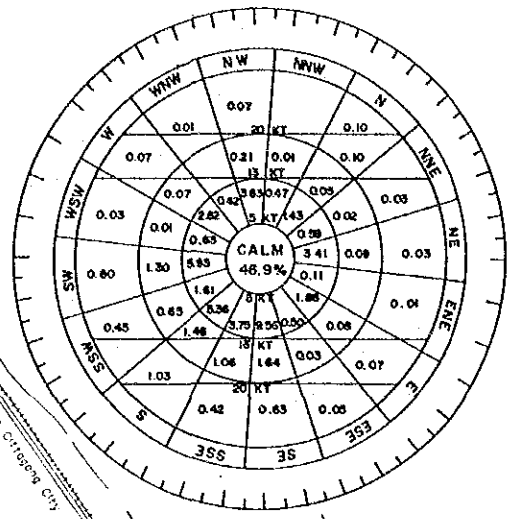
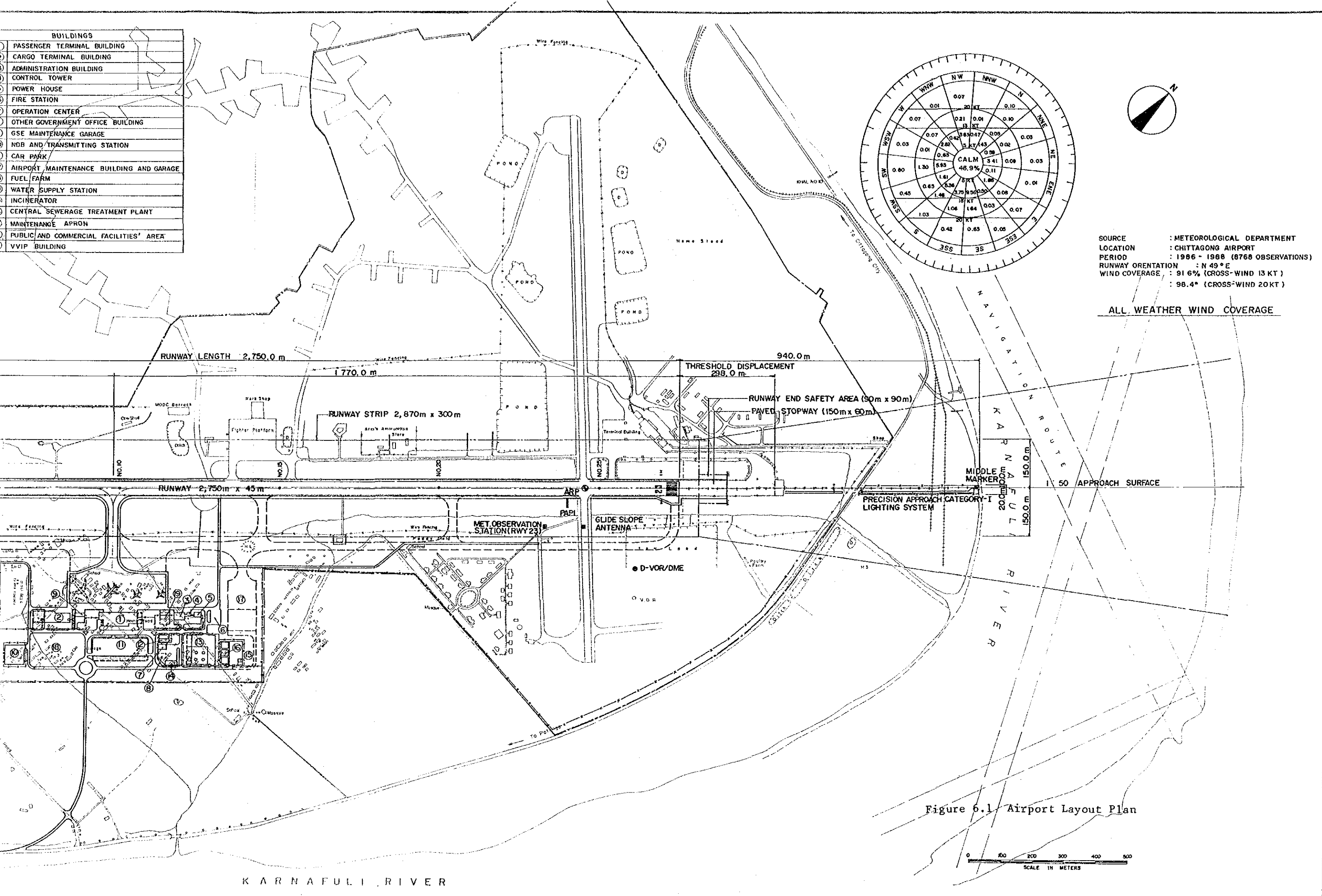
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LEGEND	
	AIRPORT BOUNDARY LINE
	FENCE
	PHASE I : DESIGN TARGET YEAR 2000
	PHASE II : DESIGN TARGET YEAR 2010
	FUTURE PROVISION

KARNAFULI RIVER

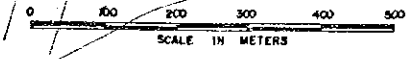
BUILDINGS	
1	PASSENGER TERMINAL BUILDING
2	CARGO TERMINAL BUILDING
3	ADMINISTRATION BUILDING
4	CONTROL TOWER
5	POWER HOUSE
6	FIRE STATION
7	OPERATION CENTER
8	OTHER GOVERNMENT OFFICE BUILDING
9	GSE MAINTENANCE GARAGE
10	NDB AND TRANSMITTING STATION
11	CAR PARK
12	AIRPORT MAINTENANCE BUILDING AND GARAGE
13	FUEL FARM
14	WATER SUPPLY STATION
15	INCINERATOR
16	CENTRAL SEWERAGE TREATMENT PLANT
17	MAINTENANCE APRON
18	PUBLIC AND COMMERCIAL FACILITIES' AREA
19	VVIP BUILDING



SOURCE : METEOROLOGICAL DEPARTMENT
 LOCATION : CHITTAGONG AIRPORT
 PERIOD : 1986 - 1988 (8768 OBSERVATIONS)
 RUNWAY ORIENTATION : N 49° E
 WIND COVERAGE : 91.6% (CROSS-WIND 13 KT)
 : 98.4% (CROSS-WIND 20 KT)

ALL WEATHER WIND COVERAGE

Figure 6.1 Airport Layout Plan



KARNAFULI RIVER

Table 6.1 Outline of Phase I Development Project

Note, "x" indicates available.
 "-" indicates not available.

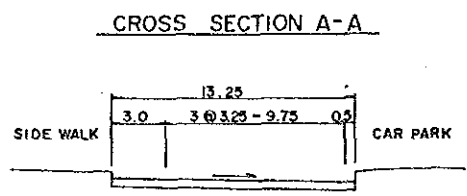
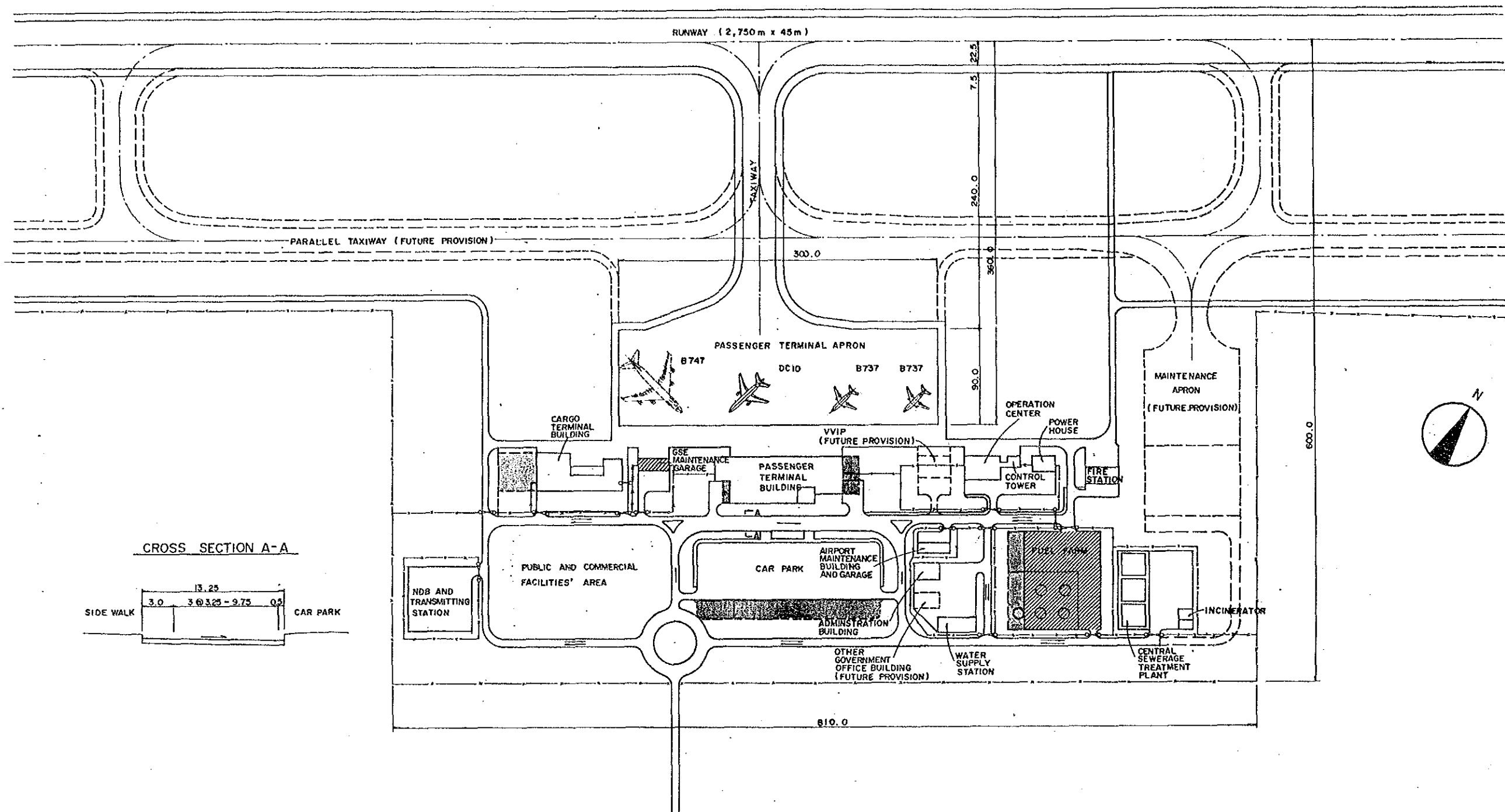
Country	Name of Airport	Int'l/Dom. ICAO Code	Commencement of Services	Total Airport Area	Aerodrome Ref. Point	Ref. Point Elevation	Runway Orientation	Aerodrome Ref. Temp.	Operational Hours	Seasonal Availability	Administrative Agency: Civil Aviation Authority of Bangladesh (CAAB)											
Bangladesh	Chittagong	Int'l/Dom. 4E	Early 1940s	320 ha	N22°15'22" E90°49'30"	3.96m (13ft)	N49°E (True North)	32.0°C (April)	To meet ops. requirement	All Seasons												
City/Town		Transportation		Operational Minima		Approach Category: Instrument Precision Approach Category-I																
Name	Population	Distance to Airport	Railway	Bus	Taxi	Runway Usability Factor	Straight-in 23 (Vis. 1,200m)		Circling 05	Visibility												
Chittagong	2 million	19km by Road	-	x	x	90.1% (13kt) 96.8% (20kt)	CAT-A	209ft	480ft	2km												
							CAT-B	221ft	520ft	3km												
							CAT-C	229ft	700ft	4km												
							CAT-D	240ft	760ft	5km												
Air Navigation Systems	Nav aids		NDB	VOR	DME	TACAN	ILS	MM	OM	VHF DF												
	ATC/COM		ASR	SSR	PAR	ASDE	ARTS	VHF A/G	AFS	TTY	Micro Wave	ATIS										
	Lights		ALS	SFL	SALS	ALB	CGL	RWL	RWCL	RWTL	ORL	TDZL	REIL	DML	PAPI	TWL	TWCL	TGS	ABN	IWDI	AFL	OL
	MET		RWY Surface Sensors				Transmissiometer				Ceilometer	WX-FAX	APT-RX	Radio Sonde	WX Radar	WX-TTY						
			x (RWY 23/05)				x (RWY 23)				x (RWY 23)	x	-	x	-	x						
Basic Facilities	Facility		Size		Pavement		Note		Int'l/Dom.	Route		Aircraft/	Frequency	Note	Completion of Phase I Development: End of 1994							
	Runway		2,750m x 45m		Asphalt		PCN75FCXT		Int'l	Chittagong-Middle East Chittagong-Calcutta		DC-10 class B-737 class	12/week 8/week	270 Seats 150 Seats								
	Runway Strip		2,870m x 300m							Chittagong-Bangkok		F-28/F-27 DC-10 class	10/week 6/week	70 Seats 270 Seats								
	Taxiway		248m x 30m		Cement		PCN75RCXT		Dom.	Chittagong-Dhaka Chittagong-Cox's Bazar		F-28/F-27 F-28/F-27	16/day 4/week	70 Seats 70 Seats								
	Apron		Design Aircraft	No. of Stands	Size	Pavement	Note															
		B-747	1	2,700 sq.m (300m x 90m)	Cement	PCN75RCXT																
		DC-10	1	45° Parking	Self-maneuvering																	
		B-737	2																			
Other Facilities	Facility		Size		Structure		Note		Year		1995	2000	2005	2010	Drawn by JICA As of 1989							
	Passenger Terminal Building		5,400 sq.m		RC				Int'l Passengers		160,000	240,000	330,000	440,000								
	Cargo Terminal Building		2,000 sq.m		RC				Dom. Passengers		165,000	200,000	240,000	290,000								
	Administration Building		1,800 sq.m		RC				Total Passengers		325,000	440,000	570,000	730,000								
	Control Tower		VHF Room 60 sq.m		RC		Eye Level 23m		Int'l Cargo (ton)		3,000	6,500	8,800	11,600								
	Fire Station		450 sq.m		RC				Dom. Cargo (ton)		500	800	1,000	1,300								
	Fire Fighting Services		Category-6		Major Vehicle :2 Rapid Intervention Vehicle :1 Ambulance :2				Total Cargo (ton)		3,500	7,300	9,800	12,900								
	Car Park		8,500 sq.m		Asphalt		280 Cars		Int'l Aircraft Mvts.		1,400	1,670	1,770	2,310								
	Access Road		2 Lanes		Asphalt				Dom. Aircraft Mvts.		4,400	5,800	5,900	5,900								
	Fuel System		JET-AI 2,000 kl		By Refueler		Burmah Eastern		Total Aircraft Mvts.		11,500	13,170	13,370	13,910								

- d) Access distance to the terminal area is relatively short among the alternatives.
- e) No difficulty is anticipated for land acquisition, compensation construction works.

(3) Terminal Area Layout Planning

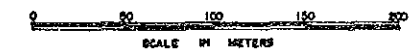
Terminal area layout is studied from various viewpoints, and as a result of comprehensive evaluation, a layout in Figure 6.4 is produced as an adequate alternative for the following reasons:

- a) Large expansibility for future development of the terminal area can be secured.
- b) Sufficient separation of functional areas, i.e. passenger, cargo, administration and maintenance areas achieve operational and administrative ease of facilities and regulated movements of passengers and vehicles.
- c) Administration area closer to the mid way of the runway is convenient in airport operational and administrative aspects.
- d) Regulated vehicle circulation will be achieved by segregating the circulation for passenger vehicles, cargo trucks and fuel trucks.



LEGEND	
SECURITY AND BOUNDARY FENCES	—x—x—
PHASE I DEVELOPMENT (DESIGN TARGET YEAR 2000)	
[Solid Box]	FACILITIES TO BE CONSTRUCTED BY CAAB
[Hatched Box]	FACILITIES TO BE CONSTRUCTED BY OTHER ORGANIZATIONS
PHASE II DEVELOPMENT (DESIGN TARGET YEAR 2010)	
[Dotted Box]	FUTURE PROVISION

Figure 6.2 Terminal Area Layout Plan



CHAPTER 7 SCOPE OF THE PHASE I DEVELOPMENT PROJECT AND
PRELIMINARY DESIGN FOR AIRPORT FACILITIES

**CHAPTER 7 SCOPE OF PHASE I DEVELOPMENT PROJECT
AND PRELIMINARY DESIGN FOR AIRPORT FACILITIES**

Construction work items of Phase I development project is established within a framework of the long-term master plan as follows:

The outline of the facilities requested from the preliminary design are supplemented in the respective construction work item.

(1) Civil Works

- a) Displacement of runway 23 threshold to the west by 298m
- b) Pavement overlay of the existing runway with asphalt concrete to accommodate DC-10 class aircraft
- c) Widening of existing 2m wide runway shoulders to 7.5m
- d) Provision of 150m by 60m stopways at each end of the runway
- e) Provision of 90m by 90m runway end safety areas at each end of the runway
- f) Construction of turnaround pads for large aircraft at each end of the runway
- g) Construction of a 247.5m long and 30m wide exit taxiway
- h) Construction of an aircraft parking apron to accommodate one B-747, one DC-10 aircraft and two B-737 class aircraft (300m by 90m)
- i) Construction of 650m long access road 7m wide for two lanes, terminal roads (20,000 sq.m) and a car park for 280 parking lots (8,500 sq.m) with lighting system
- j) Construction of airport service roads
- k) Improvement of existing storm water drainage system and additional drainage system for the new terminal area
- l) Installation of boundary and security fences

(2) Architectural Works

Construction of the following new buildings:

- a) A one story passenger terminal building of reinforced concrete (5,400 sq.m) for international and domestic services.
- b) A one story cargo terminal building of reinforced concrete and steel frame (2,000 sq.m)
- c) Two story administration building, operation center and a 22m high control tower of reinforced concrete (1,800 sq.m)
- d) A one story power house of reinforced concrete (500 sq.m)
- e) A one story fire station of reinforced concrete (450 sq.m)
- f) A one story airport maintenance building of reinforced concrete (300 sq.m) and a vehicle garage (170 sq.m)

(3) Air Navigation Systems

a) Radio Navigation Aids

- Installation of a category I ILS (RWY23) including localizer/DME, glide path and middle marker
- Replacement of the existing C-VOR/DME by a D-VOR/DME
- Relocation of the existing NDB to the new terminal area
- Construction of external power supply cables and airside substations for nav aids

b) Air Traffic Control and Aeronautical Telecommunications

Installation of the following new equipment:

- VHF air-ground radio facilities for aerodrome control, surface movement control and emergency use
- VHF multi-channel transceiver for back-up of the above radios
- HF SSB transmitters and receivers for ATS direct speech circuits
- HF CW transmitters and receivers for AFTN circuits
- AFTN teletypewriters
- Aerodrome control console and communications control unit
- Automatic terminal information services (ATIS) equipment
- VHF link between Chittagong Airport and Chittagong Port Authority for direct speech telephone and facsimile
- Magnetic tape-recorder for ATC use
- Air traffic light guns
- DC power supply equipment

c) Aeronautical Ground Lights

Installation of the following new lights:

- Precision approach category I lighting system (RWY23)
- Simple approach lighting system (RWY05)
- High intensity runway edge lights and turnaround pad lights
- Wing bar, runway threshold and end lights
- Precision approach path indicators (RWY05/23)
- Stopway lights
- Taxiway edge lights
- Illuminated wind direction indicator lights
- Aerodrome beacon
- Apron floodlights
- Power distribution and control system for aeronautical ground lights
- HT switch gear and generator stations and emergency generators

d) Meteorological Observation System

Installation of the following new equipment:

- Field weather observation, collecting, recording and display equipment
- HF transmitter and receiver for meteorological services
- HF facsimile receiver and printer
- Radio teletypewriters

(4) Public Utilities

Provision of the following systems and facility:

- a) Power supply system
- b) Water supply system
- c) Sewage treatment system
- d) Incinerator
- e) Public telecommunications system

CHAPTER 8 AIRSPACE USE AND SUPPLEMENTARY CONSIDERATIONS

CHAPTER 8 AIRSPACE USE AND SUPPLEMENTARY CONSIDERATION

8.1 Airspace Use

A precision approach procedure for runway 23 needs to be developed by the installation of ILS as the main approach procedure. Runway 05, however, will remain basically unchanged. The instrument approach procedure of NDB/ILS/DME and VOR/ILS/DME for runway 23 and standard instrument departure are studied.

8.2 Supplementary Consideration

Assessment on aircraft noise contours indicate that aircraft noise control is necessary in the land use plan in order to harmonize the airport with the surrounding area.

CHAPTER 9 PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES

CHAPTER 9 IMPLEMENTATION SCHEDULE AND COST ESTIMATES

An implementation schedule of Phase I development project is planned as indicated in Table 9.1. Construction works will begin in mid 1991 and be completed in three and a half years. Last six months of the years will be spent for such preparations as flight checks, information dissemination to IATA, ICAO, etc., training for air navigation systems, test operation of airport facilities, airlines' orientation flights, issue of NOTAM, etc. The completion of the construction works will be at the end of 1994.

Within two years before the start of the construction, financial arrangement, land acquisition, topographic survey, soil investigation, engineering services, etc. should be completed.

The project cost for Phase I development is estimated to be 378.3 million TK for Bangladesh currency portion and 1,315.4 million TK for foreign currency portion, or a total of 1,693.7 million TK based on 1989 prices. A break-down of the total project cost is shown in Table 9.2.

Table 9.1 Implementation Schedule for Phase I Development Project

Items	Year	1989	90	91	92	93	94	95	96	97	98	99	2000
1. Service Period								PHASE-I					
2. Feasibility Study		█											
3. Financial Arrangement		█											
4. Topographic Survey and Soil Investigation			█										
5. Basic Design and Detailed Design			█										
6. Land Acquisition			█										
7. Construction Works				█									
7-1 Airside Facilities													
(Runway Overlay, Taxiway and Apron)				█									
7-2 Landside Facilities													
(Terminal Road, Car Park, Access Road and Other Civil Work)				█									
7-3 Buildings													
7-4 Airport Utilities													
7-5 Air Navigation Systems													
8. Test Operation and Flight Check etc.													

Table 9.2 Project Cost for Phase I Development Project

Exchange Rate : US\$ 1.0 = TK.32.2 = YEN 140 (As of May 1989)
 Cost estimated based on 1989 price (Unit : 1,000 TK)

Item	Bangladesh Portion	Foreign Portion	Total
Civil			
Runway Overlay and Turnaround	39,900	199,200	239,100
Taxiway	6,200	25,700	31,900
Apron	18,200	73,700	91,900
Terminal Road and Car Park	15,000	61,600	76,600
Access Road	5,200	9,200	14,400
Earth Work	54,500	8,100	62,600
Drainage	4,000	4,400	8,400
Miscellaneous	3,900	4,400	8,300
Sub-Total	146,900	386,300	533,200
Architectual Works			
Passenger Terminal Building	58,600	136,000	194,600
Cargo Terminal Building	18,500	35,900	54,400
Administration Building and Control Tower	21,500	41,100	62,600
Power House	2,600	4,800	7,400
Fire Station	2,300	4,300	6,600
Airport Maintenance Building	1,300	3,200	4,500
Sub-Total	104,800	225,300	330,100
Air Navigation Systems			
Radio Navigation Aids	2,800	137,500	140,300
ATC and Communication	1,600	80,000	81,600
Aeronautical Ground Lights	13,300	156,100	169,400
Meteorological System	1,000	42,600	43,600
Sub-Total	18,700	416,200	434,900
Airport Utilities			
Power Supply System	1,700	57,500	59,200
Water Supply System	700	4,800	5,500
Sewage Treatment System and Incinerator	4,600	13,800	18,400
Public Telecommunication	200	4,300	4,500
Sub-Total	7,200	80,400	87,600
Total of Construction Cost	277,600	1,108,200	1,385,800
Engineering Services	35,100	87,600	122,700
Land Acquisition and Compensation	31,200	0	31,200
Contingency	34,390	119,580	153,970
Total of Project Cost	378,290	1,315,380	1,693,670

CHAPTER 10 ECONOMIC AND FINANCIAL ANALYSES

CHAPTER 10 ECONOMIC AND FINANCIAL ANALYSES

Economic and financial analyses are carried out on the development of Chittagong Airport. Since the airport development is planned in two phases in order to minimize initial investment, succeeding Phase II development should be considered as a premise to evaluate this Project. Therefore economic and financial feasibility is analyzed regarding Phase I and Phase II developments as an aggregated investment to produce economic benefits and financial revenues for the project life of 25 years, and a case with only Phase I development is evaluated in a sensitivity analysis.

As a result, the Project is proven to be economically viable and indispensable in the light of expected economic return along with other indirect and/or intangible benefits including its essential role in case of a flood disaster.

(1) Economic Analysis

The economic feasibility was assessed in terms of Economic Internal Rate of Return (EIRR), Benefit Cost Ratio (B/C) and Net Present Value (NPV) as shown in Table 10.1.

Table 10.1 Evaluation Indicators

EIRR (%)	B/C Ratio*	NPV* (1,000TK)
15.0	1.00	1,186

Note * : Discounted at 15% opportunity cost of capital based on the evaluation criterion for infrastructure projects by Planning Commission in Bangladesh.

Economic analysis proves that this Project is feasible because the EIRR of 15.0% is just equal to the opportunity cost of capital which is adopted by the Planning Commission as a criterion for selecting economically viable projects.

Sensitivity analyses are also carried out to provide probabilistic judgement on the feasibility of the Project and the results are summarized in Table 10.2.

Table 10.2 Results of Sensitivity Analyses

Projections		EIRR (%)
Original Case		15.0
Case 1	Costs down by 10% and Traffic Demands up by 10%	17.5
Case 2	Costs up by 10%	13.9
Case 3	Traffic Demands down by 10%	13.8
Case 4	Costs up by 10% and Traffic Demands down by 10%	12.7
Case 5	Costs up by 20% and Traffic Demands down by 20%	10.4
Case 6	Phase I development without further investment	12.3
Case 7	Phase I and Phase II facilities in the first phase	14.7

The above sensitivity analyses show that even if the project costs go up by 20% and traffic demands go down by 20% simultaneously, the project maintains the EIRR more than 10%, which the World Bank generally adopts as a lower limit of opportunity cost of capital for selecting projects.

The above economic analysis is based on the following direct/tangible benefits which will be expected by the implementation of the Project.

a) Accommodation of Overflowing Traffic

The Project will benefit the national economy by accommodating air traffic demands without restriction while the existing airport is already saturated by the present

traffic. This benefit is quantified in terms of willingness of Bangladeshi passengers and cargo shippers to pay and the increase in foreign exchange earnings from foreigners. This benefit accounts for the major part of the total benefits.

b) Time Saving

The development of Chittagong Airport will bring convenient international flight services directly from/to Chittagong, alleviate congestion, and increase runway usability as compared with the existing airport. Although the terminal area will require slightly longer access time from/to the city, reduction of connecting time and processing time, and a decrease of flight delay and cancelation will make economic activities more efficient and enable additional activities. These benefits are quantified in terms of time value.

c) Airline Benefit

With the Project, Biman Bangladesh Airlines will utilize Chittagong Airport as an alternate airport of ZIA and can introduce larger aircraft at Chittagong Airport. These opportunities will reduce the average operating cost per passenger and benefit the national economy from the viewpoint of saving in national resources.

(2) Indirect/Intangible Benefits

In addition to the direct and tangible benefits, the following indirect/intangible benefits stress the urgent need for the development of Chittagong Airport.

a) Social Welfare from the Viewpoint of Calamity Preparedness

Bangladesh is located in the low land and frequently suffers from floods in the upper stream of Ganges River and cyclones.

The Chittagong area is free from floods and the second largest commercial and industrial center of Bangladesh favoured by a large harbour. The development of Chittagong Airport will enable it to practically function as an alternate airport for Zia International Airport and will assure Bangladesh at all times of not only reliable international air communications without interruption, but also a linkage to air, sea, land and inlandwater transport.

Chittagong Airport will act not only as a nation's main gateway in case ZIA has to be closed for any reasons including a flood, but also as the center of relief activities including distribution of rescue aid, food and commodities which may be transhipped at Chittagong Airport from large aircarft and ships from foreign countries to smaller aircraft and helicopters.

In Bangladesh, both prevention and preparedness must be implemented at the same time for countermeasures to flood calamities. However, prevention will take a long time to be implemented due to its required cost and the difficulty to effect immediately due to geographical characteristics of Bangladesh. Therefore, the preparedness for floods is considered very important from the viewpoint of the human basic needs, and the implementation of this Project is essential in this respect.

b) Promotion of Foreign Investment

Promotion of foreign investment is one of the national policies for economic development of Bangladesh, and Chittagong Export Processing Zone (EPZ) was established in line with this policy in 1983.

In order to promote foreign investment and to sustain the development of EPZ, Chittagong Airport is required to ensure unrestricted air transport services with convenient international flights from/to major international hubs

airports such as Bangkok. The promotion of foreign investment, as a result, will contribute to the national economy by increasing foreign exchange earnings, employment opportunities and opportunities to advance Bangladeshi industries through technology transfer from the operation of foreign factories.

Therefore, this Project is considered as a prerequisite not only for the development of the EPZ but also for seizing opportunities to activate the regional and national economy.

c) Enhancement of Foreign Trade

There are two landlocked countries to the north of Bangladesh, i.e. Nepal and Bhutan. Due to the landlocked geography, air transport is essential for economic and social development of such countries.

Chittagong Airport will be able to play a role as a trans-shipment station of sea cargo to air cargo, and vice versa for such countries. The development of Chittagong Airport is therefore expected to create new trade demands and enhance foreign trade in Bangladesh as a whole.

It will also provide these countries with an alternative lifeline and thereby contribute to international regional stability.

d) Improvement of Air Safety

The approach surface of the existing Chittagong Airport is infringed by the ships on Karunafuli River and air safety is one of the major problems at Chittagong Airport. The measure proposed in this Study will prevent a collision of an aircraft and a ship and ensure the safety of air transport which is the most essential requirement for socio-economic activities.

e) Contribution to Tourist Attraction

Chittagong City is the second largest city and the most historical city in Bangladesh, which has a sea port and is favored by its natural beauty and green hills. The development of Chittagong Airport will increase the accessibility of such tourist resources and increase the number of foreign tourists. It will also attract foreign tourists to Cox's Bazar which is a famous beach resort in Bangladesh. The introduction of direct flight to Chittagong Airport will not only induce such foreign tourists, but also make the average length of stay longer than the present situation in which most foreign tourists arrive via Dhaka.

An increase in foreign tourists and longer average length of stay will contribute to the national economy and social stability in the form of foreign exchange earnings and employment opportunities.

(3) Financial Analysis

Results of the financial analysis show that the expected revenues will not cover the total expenditure including investment cost and operation and maintenance costs. Generally speaking, it will be difficult for an airport project to be balanced financially.

However, this project is appreciated since the operation and maintenance costs will be sufficiently covered by the airport revenue. This indicates that if the construction cost is provided, the airport can sustain its operation with the revenue from the airport services.

CHAPTER 11 CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 11 CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

As a result of the comprehensive study presented in this report including airport master planning and the feasibility study on Phase I development project (the Project), it is concluded that the existing airport be rehabilitated and developed in order to solve the present capacity problems, to cope with the traffic requirements anticipated up to 2000, and to assure in consequence Bangladesh of a reliable nation's gateway, which can cooperatively be linked with the nation's major seaport, the relief center or the lifeline in case of flood calamity.

The Project will consist of construction of a new terminal area, improvement of existing runway pavement and improvement of air navigation systems. The construction works of the Project will be commenced in 1991 and complete at the end of 1994.

These conclusions have been reached for the following major reasons:

- a) The project cost is estimated to be 1,693.7 million Taka and 105.5 million Taka in Phase I and II developments respectively and the economic internal rate of return (EIRR) is 15.0 percent. Hence, the Project is feasible from the viewpoint of the optimum allocation of resources in the national economy.
- b) The implementation of the Project will have impacts on:
 - Contribution to calamity preparedness as a major relief base which is serviceable at all times without interruption and can be effectively linked by air, water and land transport,

- Contribution to increase opportunities of trade and business as a basic infrastructure through the promotion and implementation of various regional development projects such as Export Processing Zone (EPZ) development, Chittagong Port development and other industrial projects,
- Stimulation of foreign investment,
- Contribution to increase employment opportunities,
- Stimulation of international tourism development,
- Assurance of air transport safety,
- Flexibility in an adverse weather, an emergency, maintenance work, etc., which require closure of Zia International Airport,
- Alleviation of congestion at Zia International Airport especially for international services, and
- Provision of an alternate to Zia International Airport.

2. Recommendations

- (1) It is recommended to implement the Project as soon as possible and the preparatory work should be initiated at an earliest possible date.
- (2) The agreement should be concluded and signed between CAAB and CPA (Chittagong Port Authority) in order to control the ship traffic from/to Chittagong Port and to ensure the safety of the approach aircraft to runway 23 as planned in Chapter 6.

- (3) In order to maintain and operate the facilities at the original levels of performance and services after the completion of the Project, a regular maintenance work should be carried out especially on air navigation systems, electrical and mechanical facilities, pavement, etc.
- (4) The existing objects in the runway strip of 300 meter wide and the existing obstacles to ICAO obstacle limitation surfaces should as far as practicable be removed.
- (5) In order to harmonize the airport with the area surrounding the airport, height restriction should be enforced in order not to permit any new obstacle and to ensure the required obstacle limitation surfaces. A land use plan in the airport vicinity where aircraft noise influences will exceed an allowable level is desirable to be implemented.

JICA