14.3 Domestic Terminal Building

The domestic terminal building with a total floor area of 3200 sq.m is planned for the Phase I development as shown in Figs. 14.3.1 to 14.3.3.

A linear type concept with one and half floor levels will be employed for the passenger terminal building based on a consideration of the number of aircraft stands and the number of passengers to be served.

The northern side of the building will be used for departing passengers and the southern side for arriving passengers.

The detailed design of the domestic terminal building has been already completed. In this study, the following points in the original layout plan are reviewed taking into consideration the future demand in the target year of Phase I development.

(1) Requirements of each facility, such as the number of check-in counters, floor area of departure lounge, etc., are reviewed based on the result of the demand forecast. As a result, one span will be expanded in the northern part of the building and two check-in counters will be added. In the southern part, layout of the baggage claim area will be modified.

(2) Baggage conveyor system will be introduced at the departing and arriving baggage area instead of manhandling.

(3) The passage and staircase to the observation deck will be separated from the passenger moving area for the smooth passengers flow and from the security aspect.

The building will be a reinforced concrete structure with the same exterior design as the international terminal building.

The floor plan, elevation, and section are shown in Fig. 14.3.1 to 3.

The drawing is made for the purpose of feasibility study and does not bind the final concept of the building.

Note: This drawing does not bind
the final concept of the building

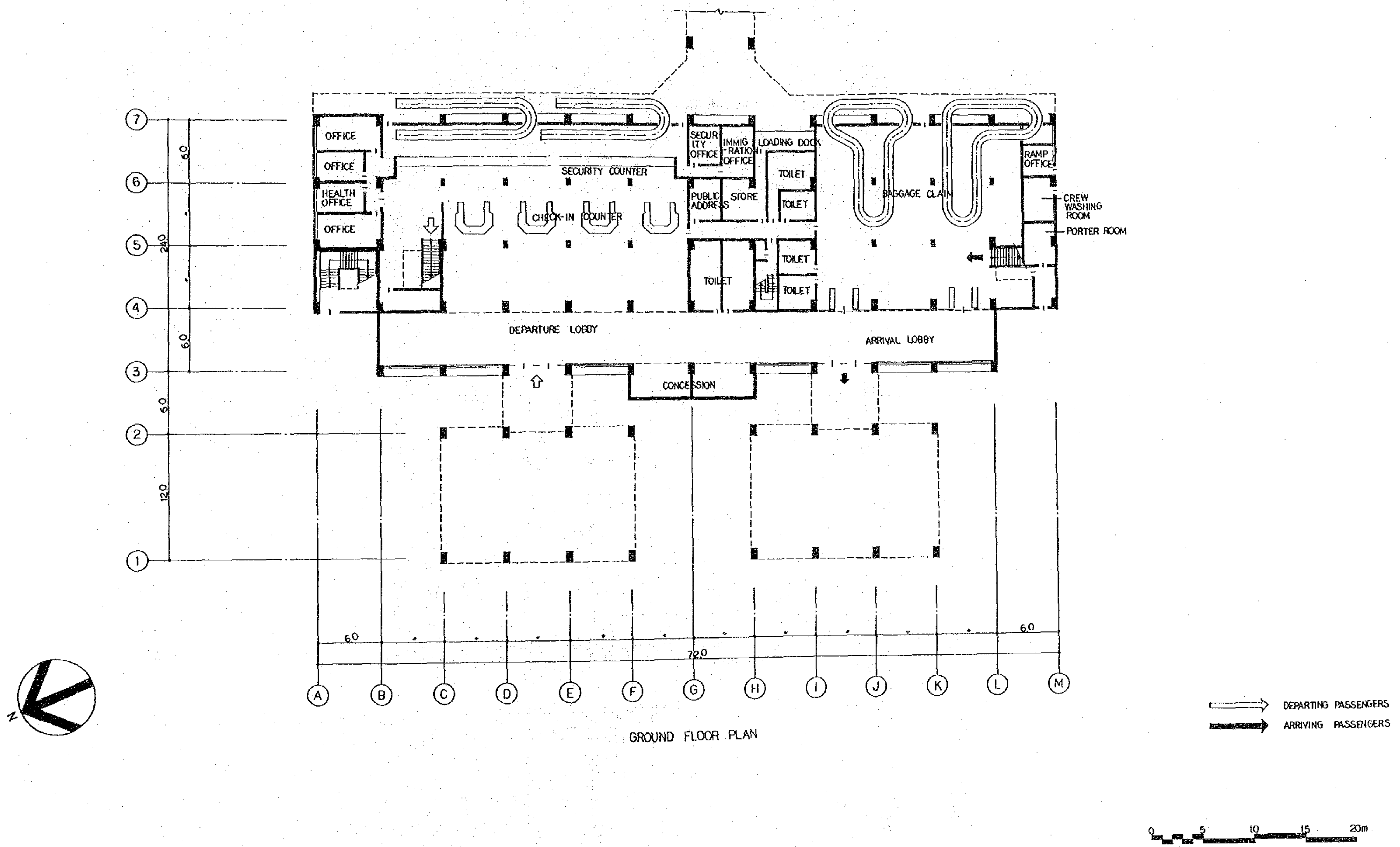


Fig. 14.3.1
Domestic Passengery Terminal Building for T.I.A
(Ground Floor Plan)

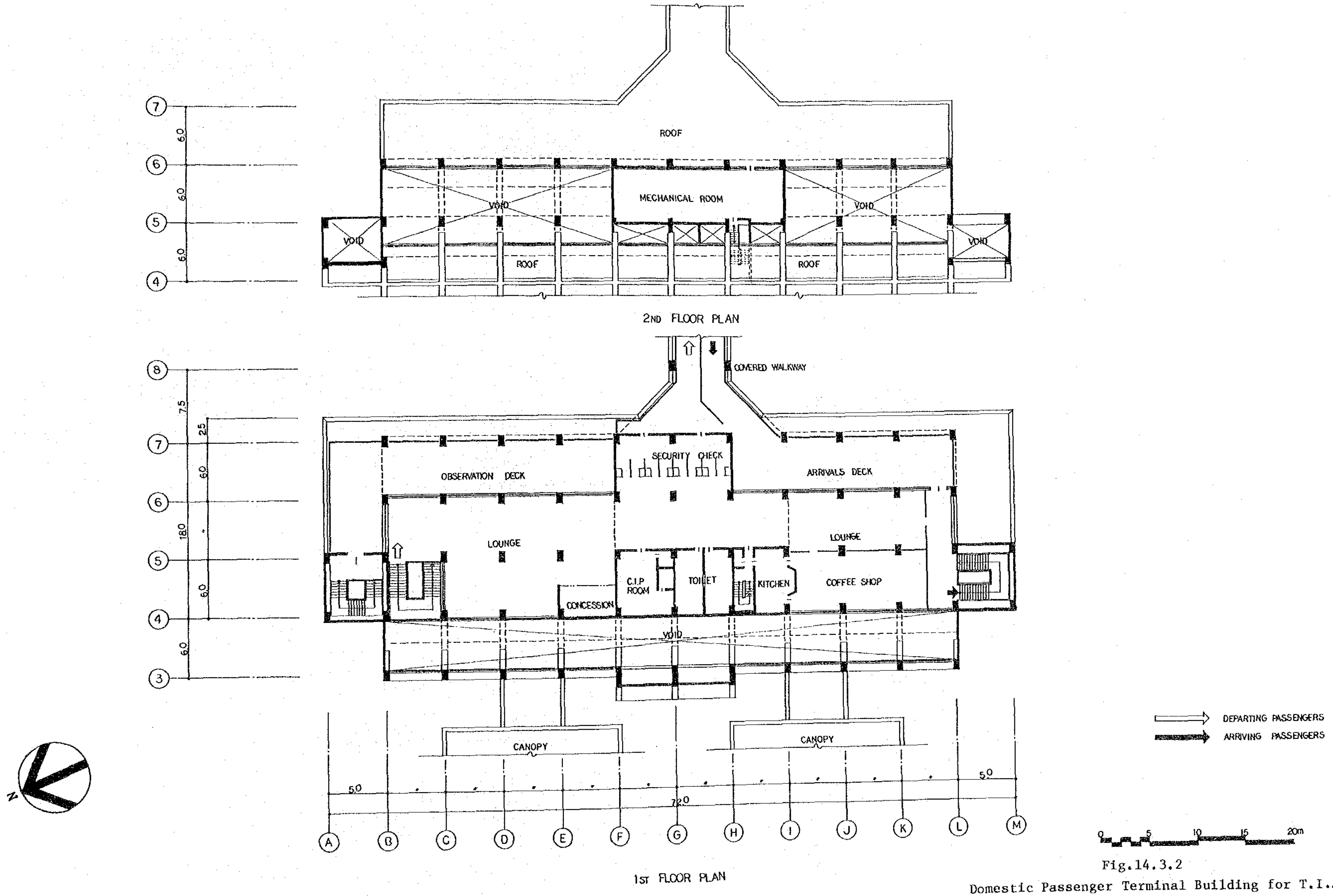
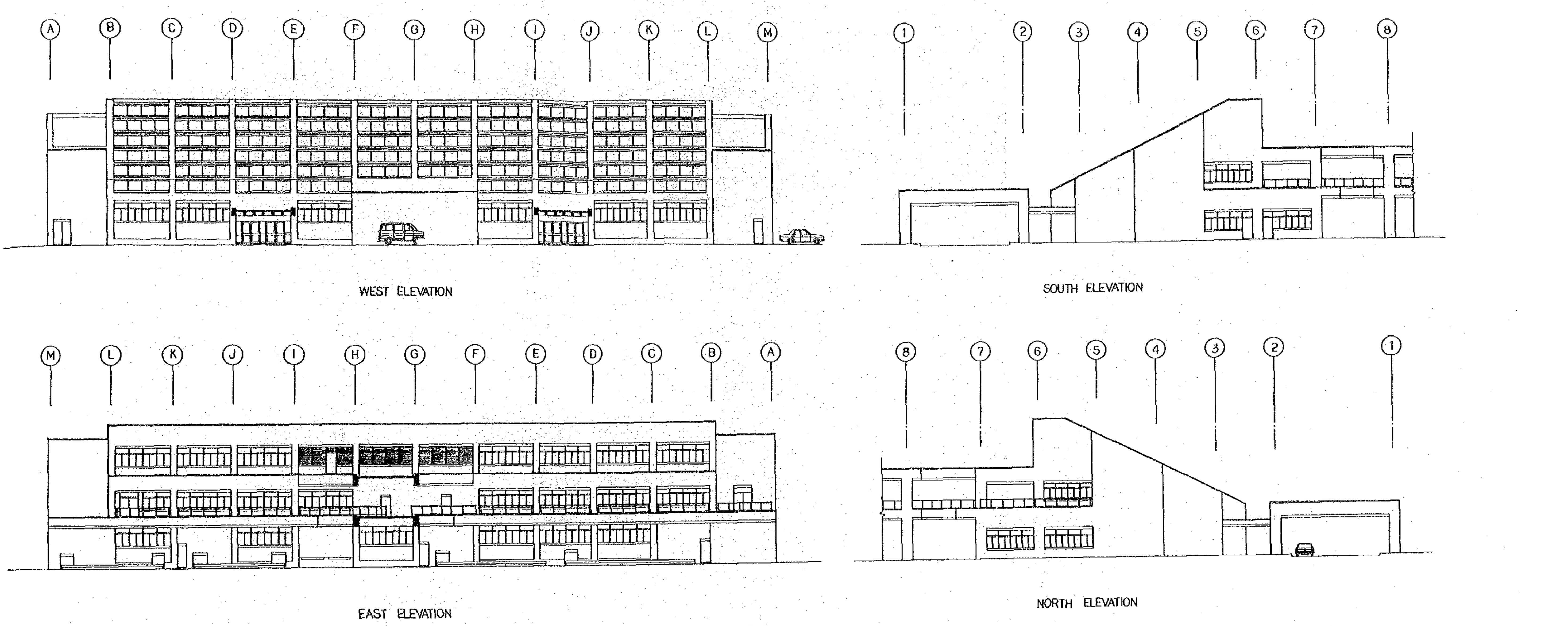
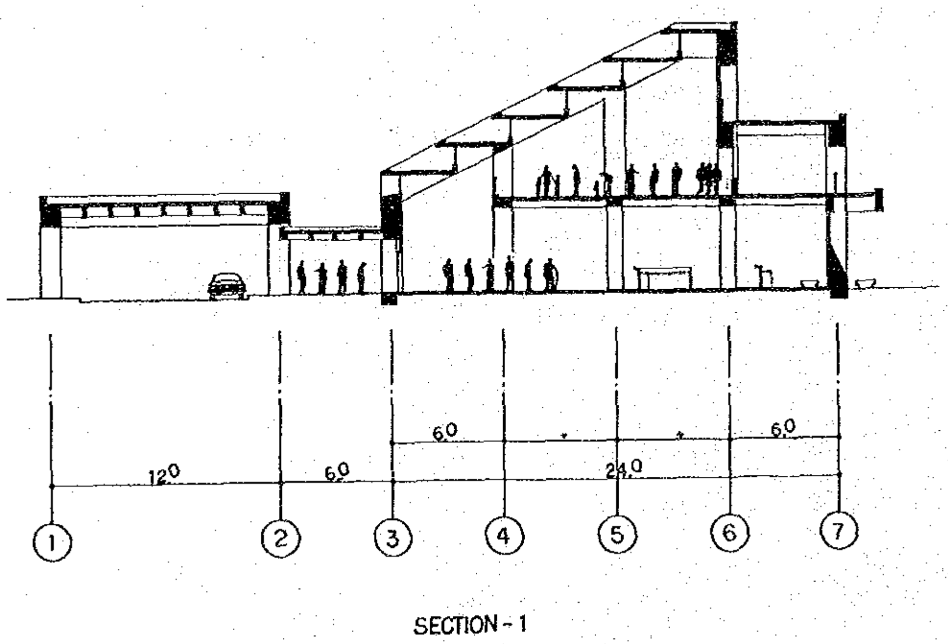


Fig.14.3.2
Domestic Passenger Terminal Building for T.I.A





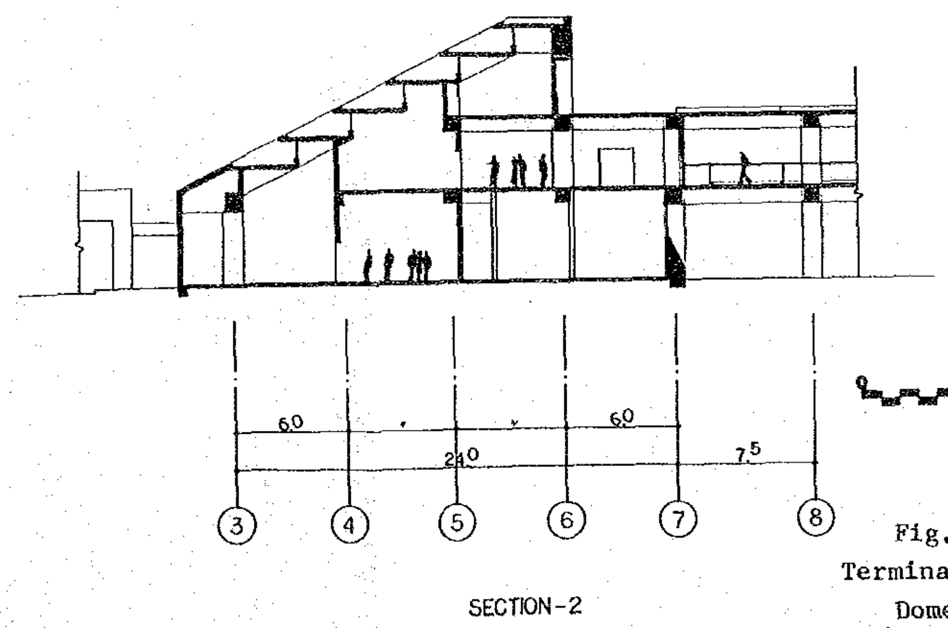


Fig.14.3.3
Terminal Building for T.I.A
Domestic Passenger

14.4 Cargo Terminal Building

A cargo terminal building with a floor area of 13,700 sq.m is required in order to handle the annual cargo volume of 71,400 ton for Phase I.

However, construction of large scale terminal building and the area is very costly and spends long period with high embankment because available area is situated on the narrow terrace.

Besides, city cargo terminal system, where the role of the cargo terminal in the airport is alloted to the cargo terminal in the city, is adopted in some large airports in the world for the efficient and speedy cargo handling.

Therefore, introduction of the system to Kathmandu will be expected in future and will relieve the construction cost and airport property area.

In this study, the cargo terminal building is planned a floor area of 9000 sq.m (65% of above total area 13,700 sq.m) for Phase I, and similarly for Phase II, floor area of 18,000 sq.m (65% of total floor area 27,300 sq.m).

Depth of the building will be set at 30 m so as to handle the cargo efficiently from curb side to air side or vice versa. Airline offices will be located on the first floor so that the ground floor may be exclusively used for cargo handling and airline counter in the limited space of the site. The cargo storage area will be single storey steel frame structure with a high ceiling to permit easy cargo handling, and to be flexible for internal rearrangement and possible future mechanization. Cargo agent offices are planned outside the airport.

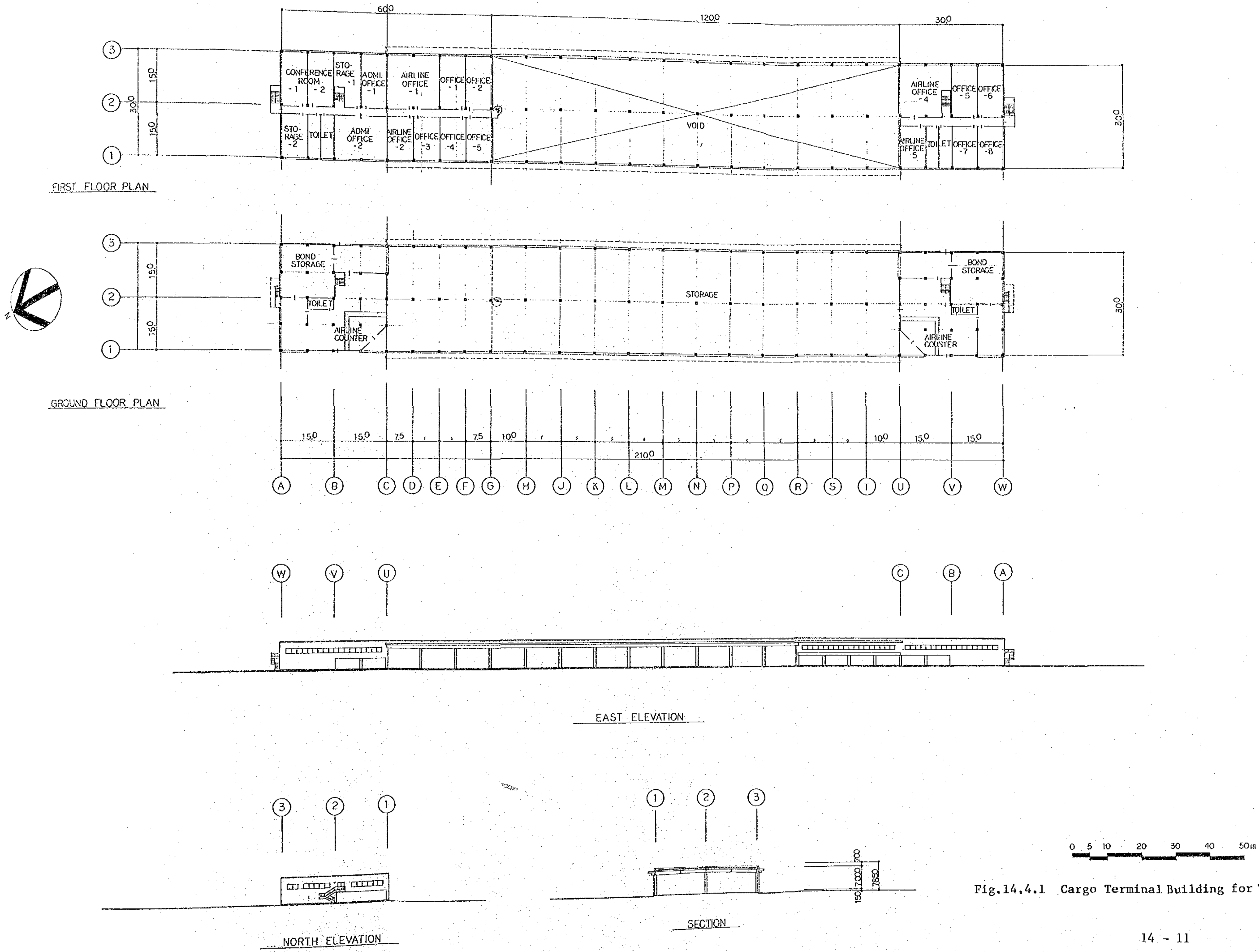
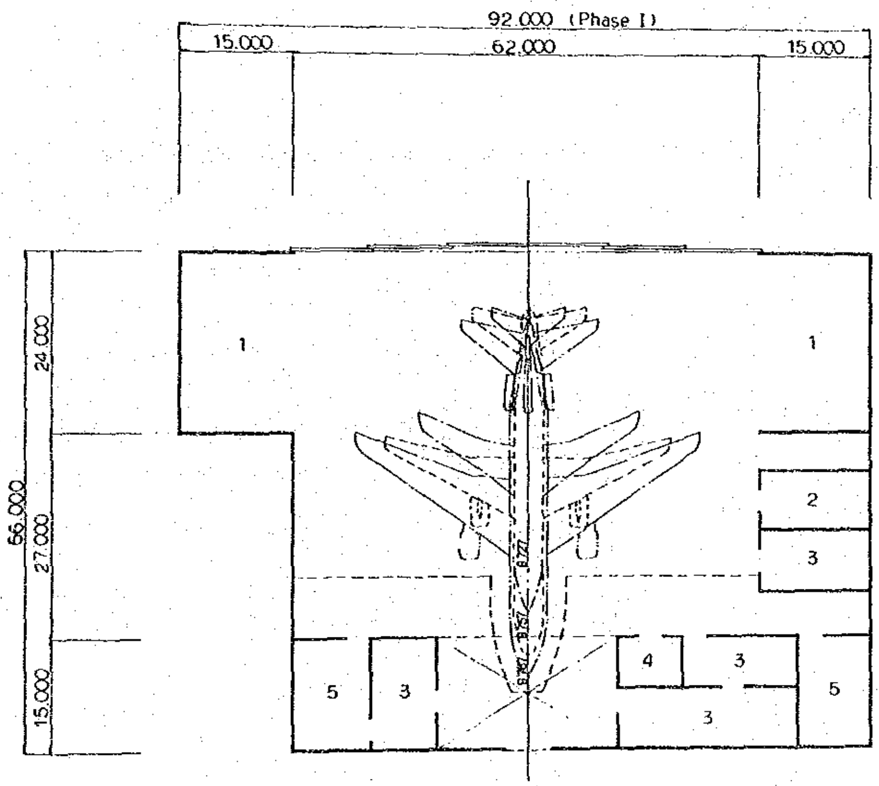


Fig.14.4.1 Cargo Terminal Building for T.I.A

14.5 Maintenance Hangar

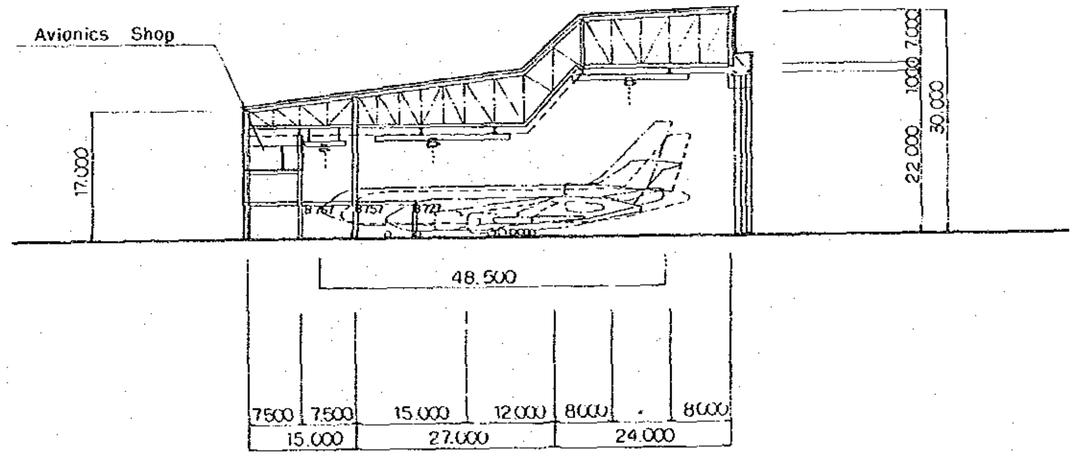
Maintenance hangar is planned to accommodate one B-767 aircraft in Phase I development. Maximum aircraft operated by RNAC is B-757 at present, however, larger aircraft will be introduced according to the increase of the demand. Therefore, B-767 has been adopted for the design aircraft of the maintenance hangar. This hangar will be utilized for the maintenance of jet aircraft of RNAC. The existing hangar will be utilized for HS-748 and DHC-6 in Phase I. Tool shops, stores, office etc. will be located in the hangar.

In Phase II, maintenance hangar will be expanded to accommodate one B-767 and one B-757.



PLAN

1. Workstand Storage
2. Tool Room
3. Support Shop
4. Job Control Room
5. Store



SECTION

0 5 10 20 30 40 50m

Fig.14.5.1
Maintenance Hangar for T.I.A

14.6 Air Navigation Systems

The following are the summary of air navigation system plan in TIA and the background and planning are explained hereunder:

Air Navigation System Plan in Phase I

(NAVAIDS)

(1) Installation of Localizer/DME for RWY 02 Approach

(2) Replacement of KTM DVOR/DME with power supply equipment and an emergency generator

(3) Installation of a new DVOR/DME for Kathmandu terminal control area

(4) Relocation and replacement of the NDB

(AIR TRAFFIC CONTROL AND TELECOMMUNICATIONS SYSTEM)

(1) Relocation and replacement of the HF transmitters for air ground radio, CW (Continuous Wave) circuit and international AFTN circuits

(2) Relocation of the HF transmitters for ATS direct speech circuits

(AERONAUTICAL GROUND LIGHTS)

(1) Replacement or upgrading of the following lights:

- Simple approach lighting system (RWY 02)
- Runway threshold identification lights (RWY 02)
- Runway edge lights (high intensity)
- Runway threshold and end lights
- PAPI
- Taxiway edge lights
- Aerodrome beacon
- Wind direction indicator lights

(2) Extension of apron floodlights

(3) Construction of a substation and power supply system for aeronautical ground lights

(METEOROLOGICAL SYSTEM)

(1) Installation of meteorological observation (airport surface data), data collection, recording and display system.

14.6.1 Radio Navigation Aids (Navaids)

(1) Localizer/DME

At TIA, VOR/DME is the only one reliable navaid at present. Accordingly, another navaid is considered mandatory and an instrument landing system (ILS)/DME is the preferable one. However, the airside facilities are planned to remain "Non-Precision" in Phase I due to the enormous investment cost and the standard glide path (3.0 degree) could not be established due to the mountains south of the airport.

Thus, a localizer facility/DME is planned as a major navaid until the year 2000 when a microwave landing system will replace ILS based on the ICAO transition plan.

Since the standard siting area for the localizer is impossible without reducing the runway length, an offset localizer is planned between the runway and fire station. In this location, the offset angle is less than 3.0 degrees which is the permissible maximum angle. The temporary sheds which were used for apron extension works should be removed in order to secure the localizer critical area.

(2) KTM VOR/DME

Although the existing VOR/DME is well maintained, it was manufactured in 1975 and the replacement is necessary in Phase I. A new doppler VOR/DME should replace the existing one in the same location, but about 50 - 100 m south of the existing one taking into consideration the mutual interferences among the new and existing ones during the construction and flight calibration test of the new one.

(3) NDB

Since the construction of cargo building and maintenance hangar will conflict with the NDB site, the relocation of NDB is required. Although a detailed study and survey by test equipment are required to finalize the NDB location for the reasons mentioned in the item (1) above, the necessary cost for relocation is included in this study.

14.6.2 Air Traffic Control and Aeronautical Telecommunication System

Almost all air traffic control and aeronautical telecommunications systems have been improved and installed in the new Operations and Airline Complex.

Hence, no improvement of these systems for TIA is required, however, the diversion of the Ring road will require relocation and/or replacement of ten sets HF transmitters for the following use:

(1) ATS direct speech circuit
(2) Domestic air-ground HF radio
(3) International air-ground HF radio
(4) International CW circuits
(5) International AFTN circuits

14.6.3 Aeronautical Ground Lights

Since all the existing aeronautical ground lights are obsolete, the replacement or upgrading of the following lights, remote control system and power supply system have been planned.

(1) The existing simple approach lighting system RWY 02 will be replaced by a new one of ICAO standard.

(2) Runway threshold identification lights will be newly installed at RWY 20 threshold.

(3) The existing low intensity runway edge lights will be replaced by high intensity lights and the series power supply circuit should be two circuits in order to maintain high reliability.

(4) The runway threshold and end lights will be replaced by high intensity lights for non-precision approach configuration.

(5) The existing T-VASIS will be replaced by PAPI (RWY 02/20).

(6) The complete taxiway edge lights will be provided for the existing taxiway.

(7) The existing aerodrome beacon should be relocated from the existing control tower and replaced by a new one in order to avoid unnecessary glare to air traffic controller in the new control tower.

(8) New apron floodlights are necessary according to the expansion of the apron.

(9) Since the existing substation which is obsolete will conflict with the domestic passenger apron, a new substation for lights including constant current regulators, control equipment, etc., are required at the north of new domestic passenger terminal building.

14.6.4 Meteorological Observation System

The existing manual-type meteorological sensors are installed on the existing control tower and those do not necessarily indicate the runway surface data for aircraft operations.

The following new meteorological sensors in the runway touch-down area will be installed and all the data will be collected, recorded in the new control tower and displayed in the air traffic control units.

Meteorological data will also be transferred to Weather Forecast Division Building in the west of terminal area through underground telecommunication cable and displayed to video display units (VDU).

(1) Wind sensors (RWY 02/20)
(2) Thermometer/Hygrometer (RWY 02)
(3) Precipitation gauge (RWY 02)
(4) Barometer

CHAPTER 15 AIRSPACE USE OF TIA

CHAPTER 15 AIRSPACE USE OF TIA

15.1 General

This chapter discusses airspace use for Tribhuvan International Airport.

15.2 Present Condition of Airspace Use

15.2.1 Controlled Airspace

The following various controlled airspaces have been designated for Tribhuvan International Airport (TIA) as shown in Fig. 15.2.1. The details of them are shown in Tables 15.2.1 through 3.

Table 15.2.1 Dimensions of Aerodrome Traffic Zone at TIA

Aerodrome	Dimensions of Aerodrome Traffic Zone	
	Lateral Limits	Vertical Limit
VNKT	Area of a circle of 5 NM radius centered at Aerodrome Reference Point	From ground level 2000 ft.

(Source: AIP Nepal)

Table 15.2.2 Dimensions of Controlled Airspace for TIA

Tower	Hours	Controlled Airspaces and Lateral Limits	Upper Limits / Lower Limits	Language	Remarks
Kathmandu Tower	HJ	CTR, a circle with a radius of 10 NM centered at Kathmandu VOR/DME 27°40'29"N 85°21'00"E	8500' AMSL / Ground	English	

(Source: AIP Nepal)

Table 15.2.3 Dimensions of Terminal Control Area for TIA

Approach Control	Hours	Controlled Airspaces and Lateral Limits	Upper Limits / Lower Limits	Language	Remarks
Kathmandu Tower	HJ	An area enclosed by a circle of radius of 25 NM centered on Kathmandu VOR/DME (27°40'29"N 85°21'00"E) except airspace outside the line joining 27°57'45"N 85°00'E to 27°46'00"N 85°48'30"E.	FL 460 / 8500' AMSL	English	

15.2.2 Airways

To expedite air traffic flow and to ensure the safety of aircraft operations, airways established around TIA are designated as "inbound use only" and "outbound use only" respectively as shown in Fig. 15.2.1. Airways designated as "inbound use only" such as B471, G336, G463, G590 and R581 are converged over the Simara NDB which is located near southern border line laying approximately 40 NM south of TIA.

Because the distance between Simara NDB and TIA is short, it is difficult for jet aircraft to descend from high flight level over Simara NDB to initial approach altitude for TIA. To solve this problem DCA recently expanded the controlled airspace over TIA in included additinal area to the south of TIA as shown in Fig. 5.6.1.

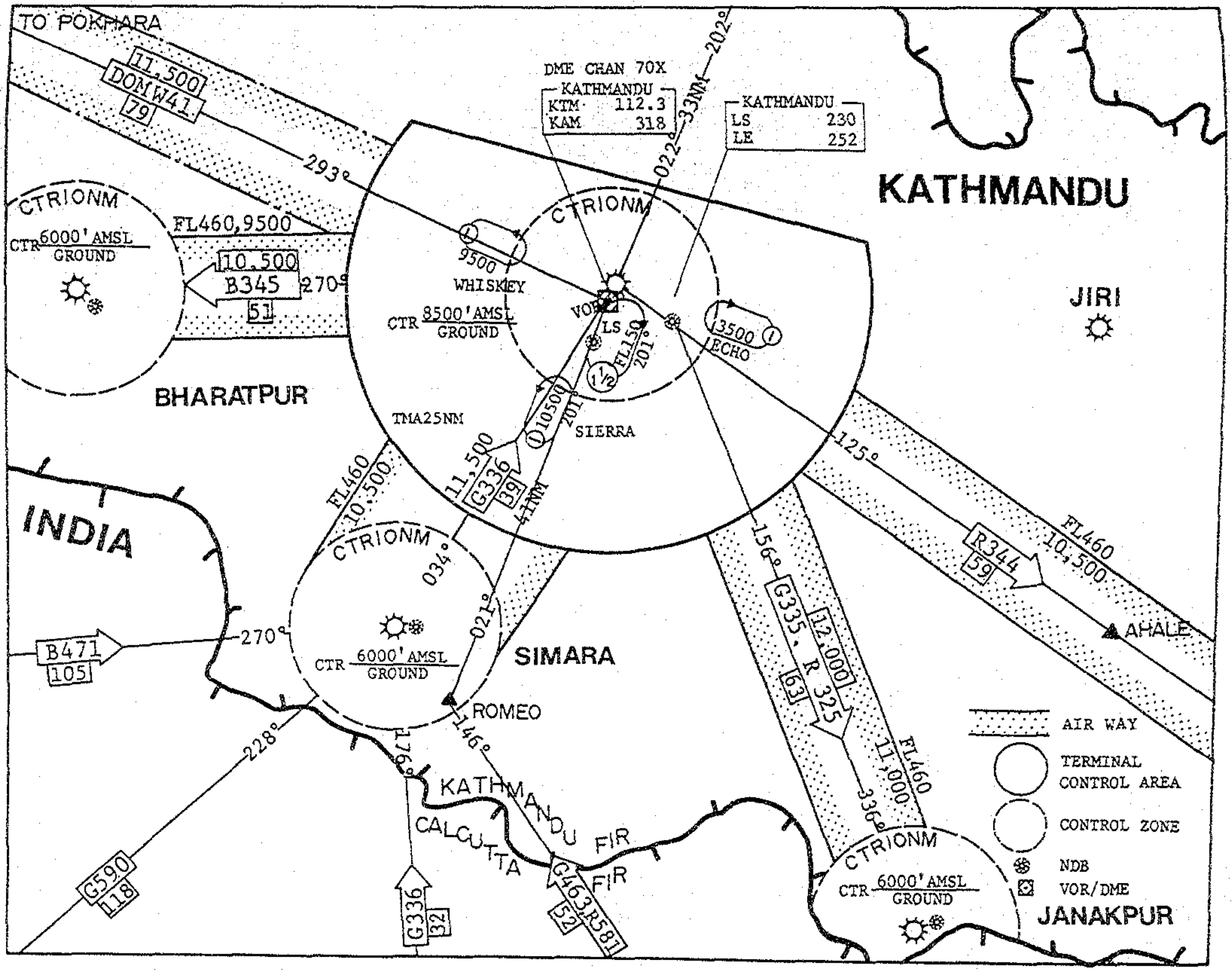


Fig. 15.2.1 Controlled Airspaces designated for TIA (Source: AIP Nepal)

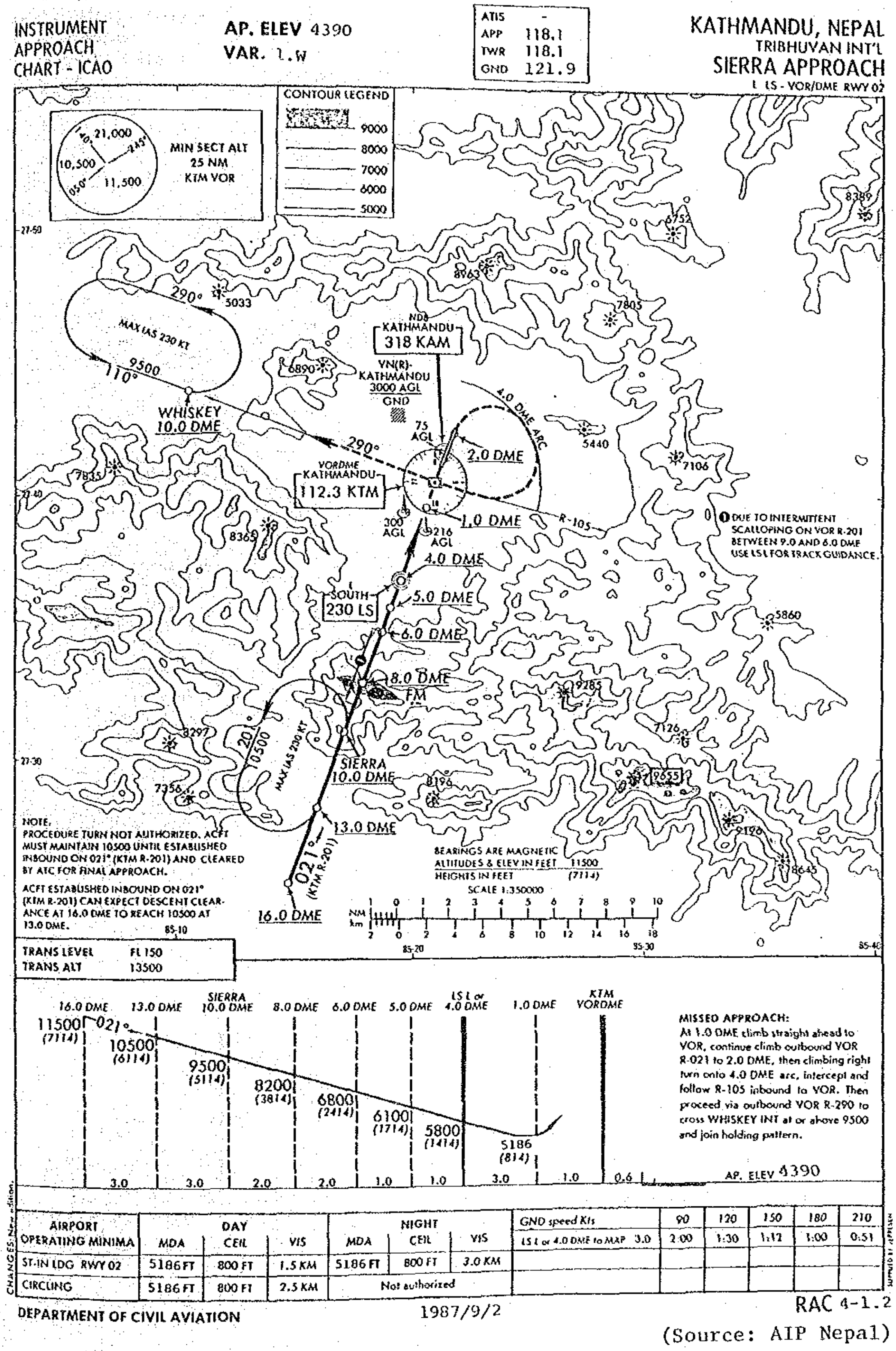
15.3 Instrument Approach and Departure Procedures

Two instrument approach procedures and four standard instrument departures have been established for TIA using KTM VOR/DME as shown in Fig. 15.3.1 through 3. The following holding points have been established within Kathmandu terminal control area as shown in Table 15.3.1 for use for air traffic control purpose.

Table 15.3.1 Holding Points within Kathmandu Terminal Control Area

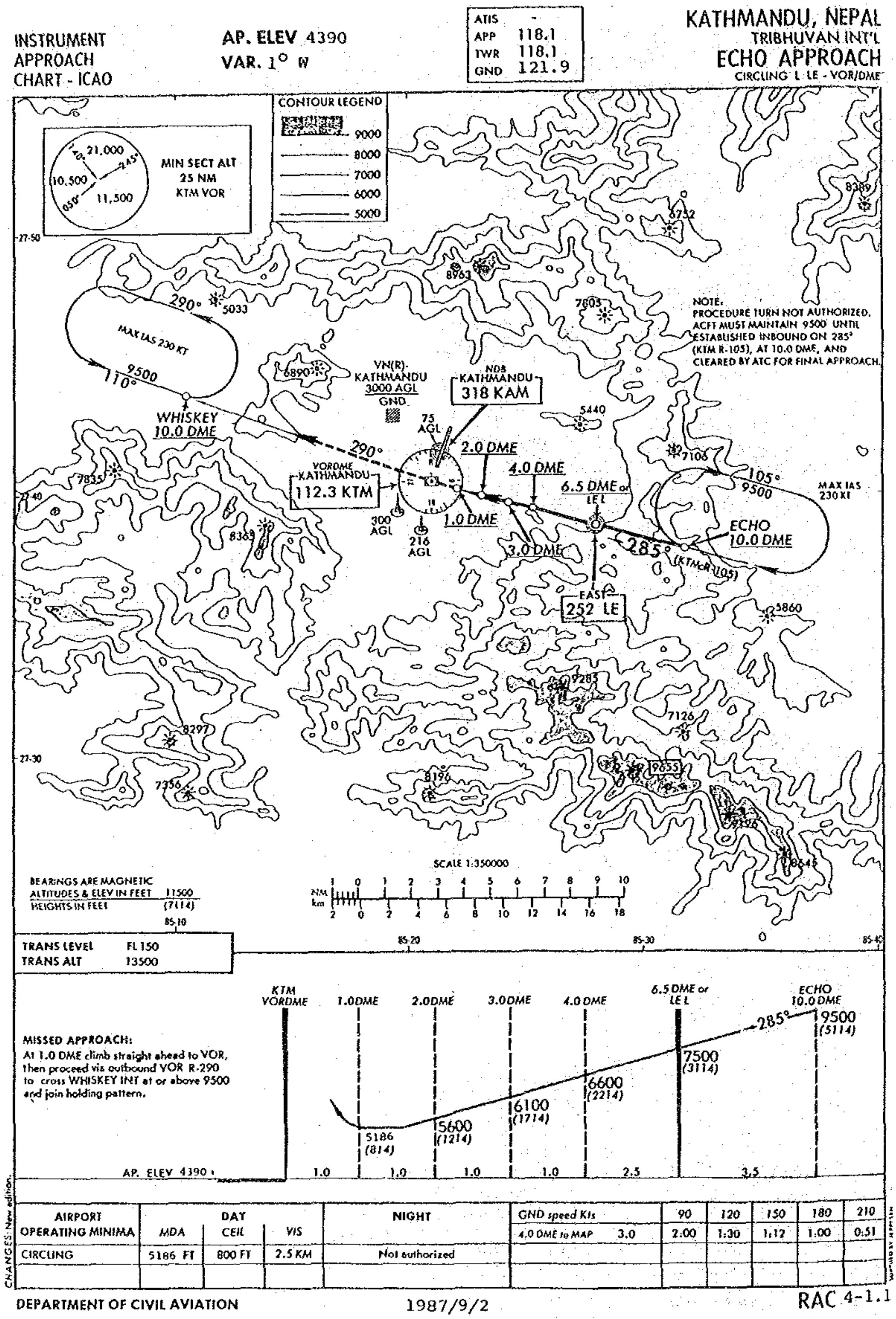
Designation	Upper Limits / Lower Limits	Holding Pattern	Specified inbound track	Remarks
Sierra (D 10 KTM VOR R 201)	13,500' / 10,500'	1 minute race track left turn based on Max IAS 230 Kts	021°	Aircraft will be required to fly 15 DME ARC KTM VOR when deemed necessary for aircraft from one holding point to other.
Echo (D 10 KTM VOR R 105)	13,500' / 9,500'	1 minute race track right turn based on Max IAS 230 Kts	285°	
Whiskey (D 10 KTM VOR R 290)	13,500' / 9,500	1 minute race track left turn based on Max IAS 230 Kts	110°	
KTM VOR	FL 250 / FL 150	1 1/2 minute race track right turn based on Max IAS 230 Kts	021°	

(Source: AIP Nepal)



(Source: AIP Nepal)

Fig. 15.3.1 Instrument Approach Procedure at TIA
SIERRA Approach - L-LS-VOR/DME RWY 02



(Source: AIP Nepal)

Fig. 15.3.2 Instrument Approach Procedure at TIA

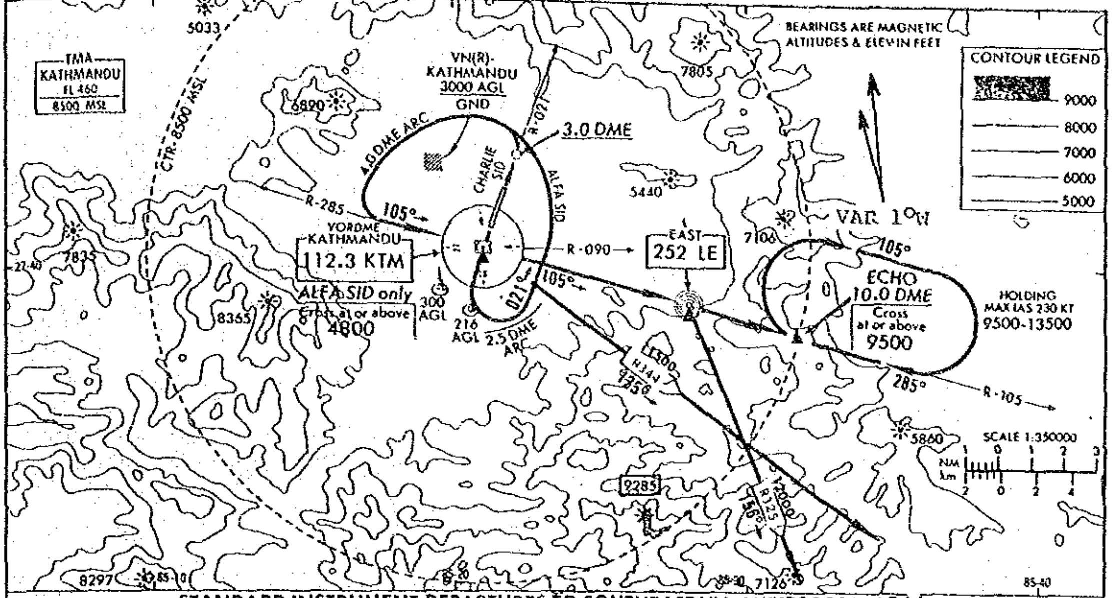
ECHO Approach - CIRCLING L LE-VOR/DME

STANDARD
INSTRUMENT
DEPARTURES

AP. ELEV: 4390
TRANS LEVEL: FL 150
TRANS ALT: 13500

ATIS	-
APP	118.1
TWR	118.1
GND	121.9

KATHMANDU, NEPAL
TRIBHUVAN INT'L



TAKE-OFF

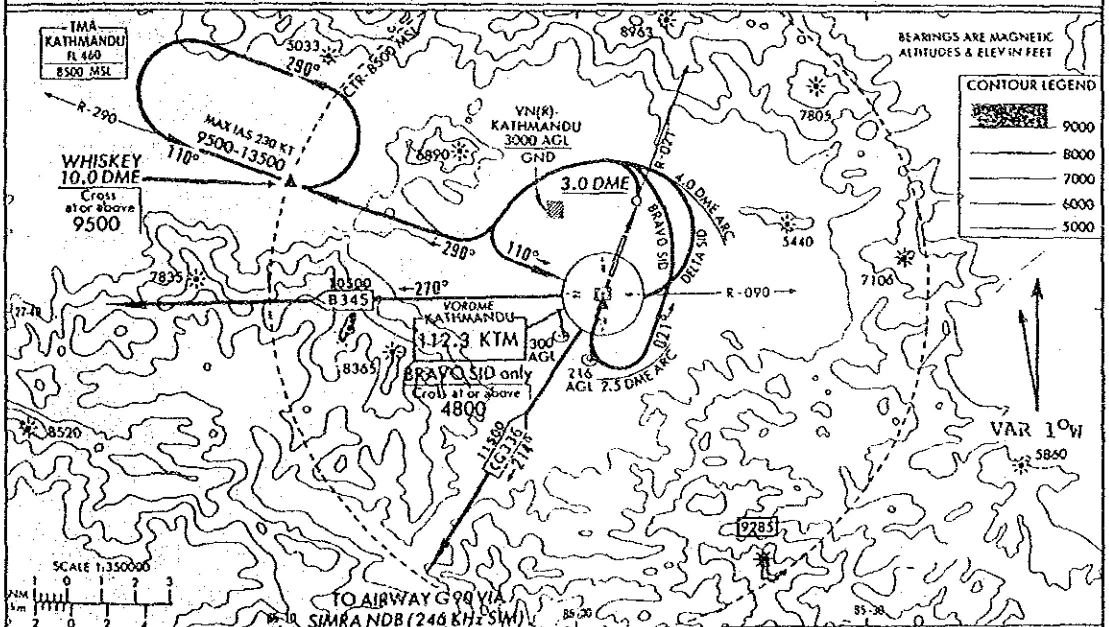
STANDARD INSTRUMENT DEPARTURES TO SOUTHEAST VIA AWYR325OR R344

ALFA SID (RWY 20): Climb STRAIGHT AHEAD inbound on KTM R-021 to cross KTM VORDME at or above 4800, then turn LEFT within KTM 2.5 DME, continue climbing on track 021°. When crossing KTM R-090 turn LEFT onto KTM 4.0 DME arc, then intercept KTM R-285 inbound to KTM VORDME. Thence ....

CHARLIE SID (RWY 02): Climb STRAIGHT AHEAD outbound on KTM R-021 to KTM 3.0 DME, turn LEFT onto KTM 4.0 DME arc, continue climbing, then intercept KTM R-285 inbound to KTM VORDME. Thence ....

DEPARTURE

.... Proceed outbound on KTM R-105 via LE Locator to ECHO INT/10.0 KTM DME, cross ECHO INT at or above 9500, join holding pattern climbing to airway MEA, then intercept airway R325or R 344.



STANDARD INSTRUMENT DEPARTURES TO WEST VIA AWYB345AND TO VARANASI VIA SIMRA AND AWY G590

BRAVO SID (RWY 20): Climb STRAIGHT AHEAD inbound on KTM R-021 to cross KTM VORDME at or above 4800, then turn LEFT within KTM 2.5 DME, continue climbing on track 021°. When crossing KTM R-090 turn LEFT onto KTM 4.0 DME arc, then intercept and follow outbound KTM R-290 to WHISKEY INT/10.0 KTM DME, cross WHISKEY INT at or above 9500, join holding pattern climbing to airway MEA, then intercept airway B345 or G590 via Simra.

DELTA SID (RWY 02): Climb STRAIGHT AHEAD outbound on KTM R-021 to KTM 3.0 DME, turn LEFT onto KTM 4.0 DME arc, continue climbing, then intercept inbound KTM R-290 to KTM VORDME. Turn LEFT, rejoin KTM 4.0 DME arc, then intercept and follow outbound KTM R-290 to WHISKEY INT/10.0 KTM DME, cross WHISKEY INT at or above 9500, join holding pattern climbing to airway MEA, then intercept airway B345or G590 via Simra.

CHANGES: New edition.

DEPARTMENT OF CIVIL AVIATION 1987/9/2 RAC 4-1.3

(Source: AIP Nepal)

Fig. 15.3.3 Standard Instrument Departures at TIA

15.4 Issues on Aircraft Operations

(1) At present, almost international flights to TIA come from south via Delhi and Calcutta FIRs. These arrival aircraft are often encountered around Simara NDB with same flight level due to convergence of international airways over Simara NDB.

To avoid confusion near Simara NDB, Kathmandu ACC tries to contact with ACCs concerned and request them the changing their flight level before their reaching over Simara NDB. But communication between ACCs is not easily.

(2) International flights coming from south are maintained high flight level until Simara NDB. Thus, it is very difficult to descend to initial approach altitude for TIA.

15.5 Navaids to be used for Air Traffic Control

Kathmandu VOR/DME (KTM 112.3 MHZ CH 70 x 27°40'29"N/85°21'00"E) is located at 0.6 nm south of TIA as a main Navaid at TIA.

Kathmandu NDB (KAM 318 KHZ 27°41'37"N/85°21'21"E) is operated in the vicinity of airport.

To overcome the topographical condition surrounding TIA, locators have been installed to the east and south of TIA, and an additional locator which has been installed to the west of TIA is now operating on trial basis.

15.6 Evaluation of Existing Airspace Use

15.6.1 Expansion of Controlled Airspace and Installation of Radar Control System

To solve the confusion over Simara NDB, and to facilitate arrivals at TIA, the following actions have been taken by DCA:

(1) Establishment of additional controlled airspace to the south of TIA as shown in Fig. 5.6.1

(2) Alteration of the airway system from one way traffic to two way traffic on the main airway

(3) Increase the number of arrival routes to TIA from Bhairahawa, Biratnagar and Simara

The countermeasures mentioned above will become more effective if the close coordination with neighbouring ACCs, cooperation with airlines, consolidation of air navigation aids and efficient use of terminal control airspace for TIA have been made. Furthermore, introduction of a Radar Control System which is planned to be installed will help to expedite flow in and around Kathmandu due to airspace constraints within Kathmandu Valley especially the short distance between Kathmandu and the FIR boundary.

15.6.2 Installation of an Additional Navaid

At present, the main navaid facility at TIA is only KTM VOR/DME. This facility is well maintained, but it has been operated since 1975. In case KTM VOR/DME is off the air suddenly by some troubles, there is no way to establish the instrument approach and departure procedures. Therefore, alternative navaid should be installed to ensure a straight-in approach to runway 02 even if main navaid at TIA, KTM VOR/DME is out of order.

Installation of ILS facility, one of newly proposed navaid for TIA, has been studied, but there exist many issues for installation such as glide path angle, width of runway strip and flight calibration, etc., to maintain precision category I.

Accordingly, it is recommended that LLZ/DME facility is suitable as an alternative navaid at TIA.

15.6.3 Preparation of Aerial Survey

It is necessary to make aerial survey on the vast area to provide reliable information for efficient utilization of airspace.

CHAPTER 16 SUPPLEMENTARY CONSIDERATIONS OF TIA

CHAPTER 16 SUPPLEMENTARY CONSIDERATIONS OF TIA

16.1 General

This chapter presents the results of the study on aircraft noise influence and land use of the area surrounding the airport.

16.2 Aircraft Noise

Development of aircraft noise contours measured in Weighted Equivalent Continuous Perceived Noise Level (WECPNL) is shown in Figs. 16.2.1 and 16.2.2 based on the conditions as tabulated in Table 16.2.1. (For details of WECPNL, refer to Attachment F, Annex 16 Environmental Protection, Vol. 1 Aircraft Noise, ICAO).

In the year 2000, the noise contour of WECPNL 70 will extend to approximately 6.0 km south of the runway 02 threshold and approximately 3.0 km north of the runway 20 threshold. The total area covered by WECPNL more than 70 will be about 18.6 sq.km and will increase by 10% to 20.4 sq.km in 2010. In the both of year 2000 and 2010, a densely populated area of Kathmandu City is out of the noise level of WECPNL 70.

Table 16.2.1 Assumption on the Calculation of Aircraft Noise Contour

Target year	Phase I:	Year 2000	
	Phase II:	Year 2010	
Traffic pattern	As stated in Chapter 15		
Ratio of runway use	Take off	R/W 02	10%
		R/W 20	40%
	Landing	R/W 02	40%
		R/W 20	10%
	Total		100%
Runway length	3,050 m		

Table 16.2.1 Continued

Glide slope angle 3.0 degree

Number of daily flights

Year 2000

Aircraft	Day (7:00-19:00)	Evening (19:00-22:00)	Total
DC-10 class	3	1	4
B-767 class	3	1	4
B-757 class	7	1	8
B-727 class	16	2	18
HS-748 class	20	-	20
Total	49	5	54

Year 2010

Aircraft	Day (7:00-19:00)	Evening (19:00-22:00)	Total
B-747 class	4	-	4
DC-10 class	5	1	6
B-767 class	5	1	6
B-757 class	10	2	12
B-727 class	14	2	16
HS-748 class	28	-	28
Total	66	6	72

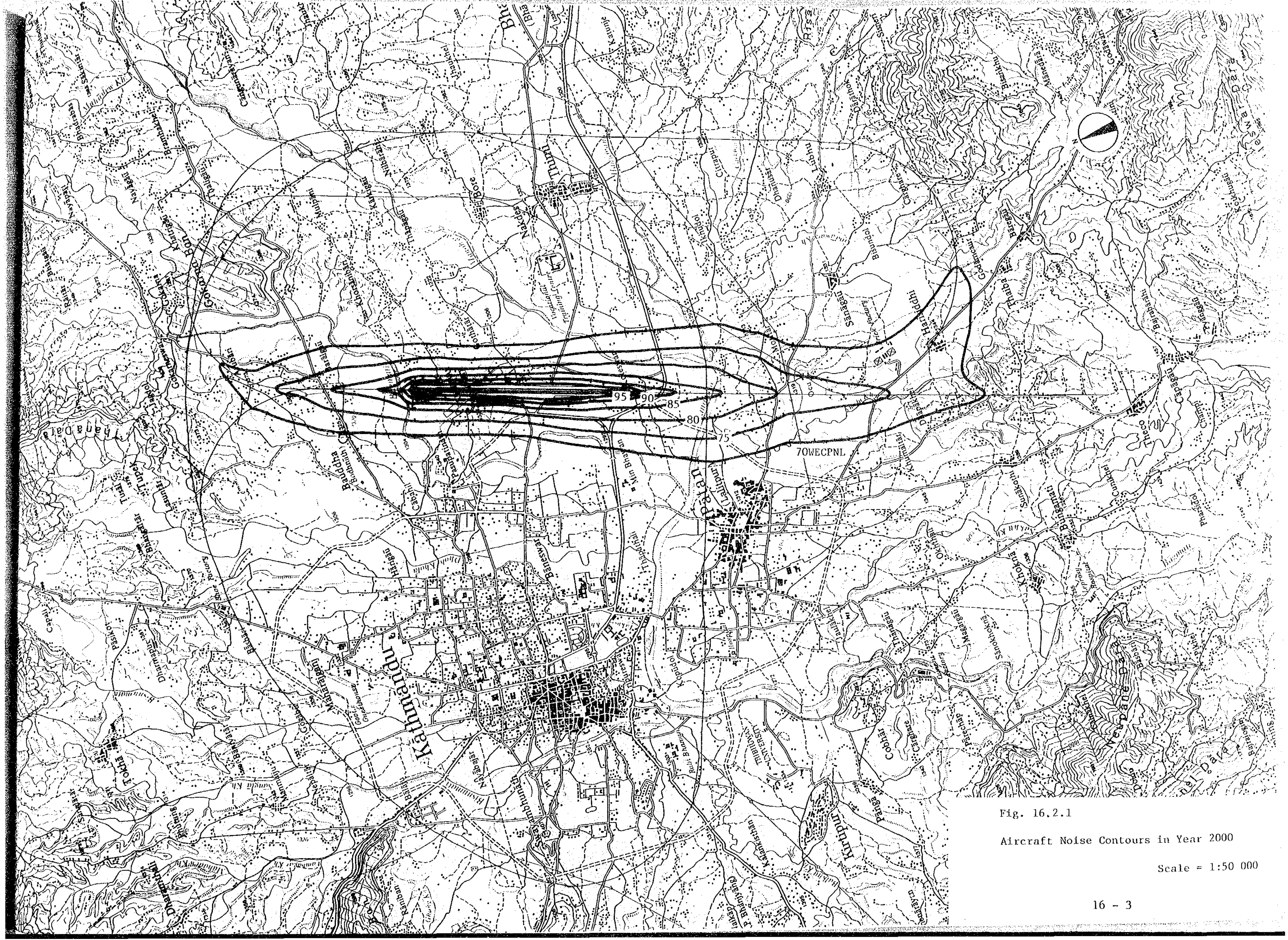


Fig. 16.2.1

Aircraft Noise Contours in Year 2000

Scale = 1:50 000

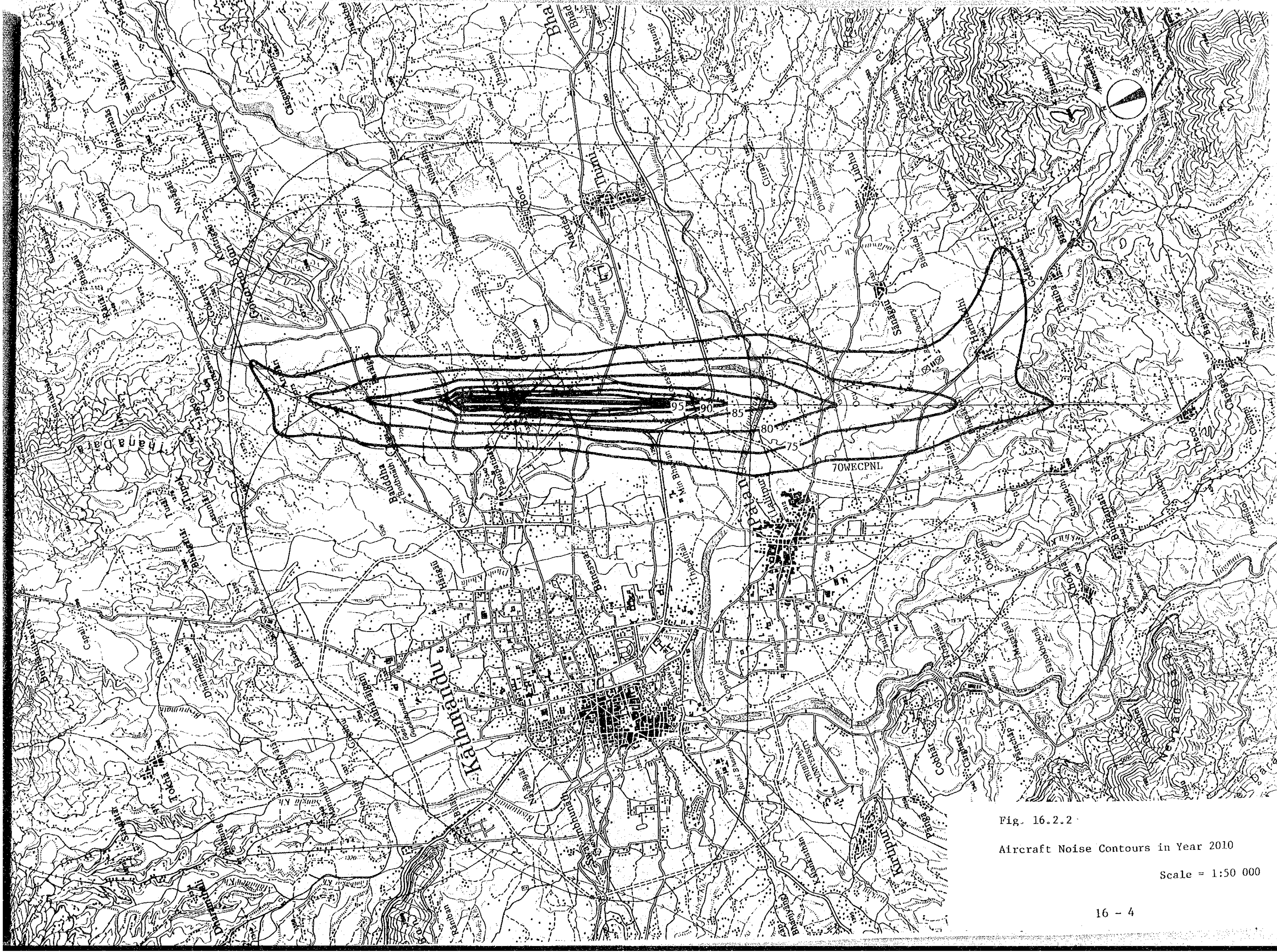


Fig. 16.2.2

Aircraft Noise Contours in Year 2010

Scale = 1:50 000

16.3 Land Use Planning of the Area Surrounding the Airport

Land use controls are broadly classified into the land use zoning regulations (especially based on aircraft noise), height limitation to control to ensure the safe operation of aircraft, etc.. Each requirement for protection of environment and required height limitations are explained in detail below. The land use plan is proposed for the area surrounding the airport as shown in Fig. 16.3.1.

(1) Land Use Planning Concerning Aircraft Noise

A comprehensive land use plan which incorporates the future population growth in this area and increase of aircraft noise is, therefore, necessary to be established based on an evaluation of existing conditions.

For this purpose, a criteria for land use controls for aircraft noise is proposed based on experience in Japan.

- Proposed Criteria -

WECPNL	$\geq$ 70:	Not suitable for public facilities such as schools, hospitals, churches, etc.
	$\geq$ 75:	No new residences are recommended
	$\geq$ 90:	Not suitable for residence

It is noted, however, that the method of estimating noise contours includes an approximation of the calculation. Further study may, therefore, be required for the detailed land use planning.

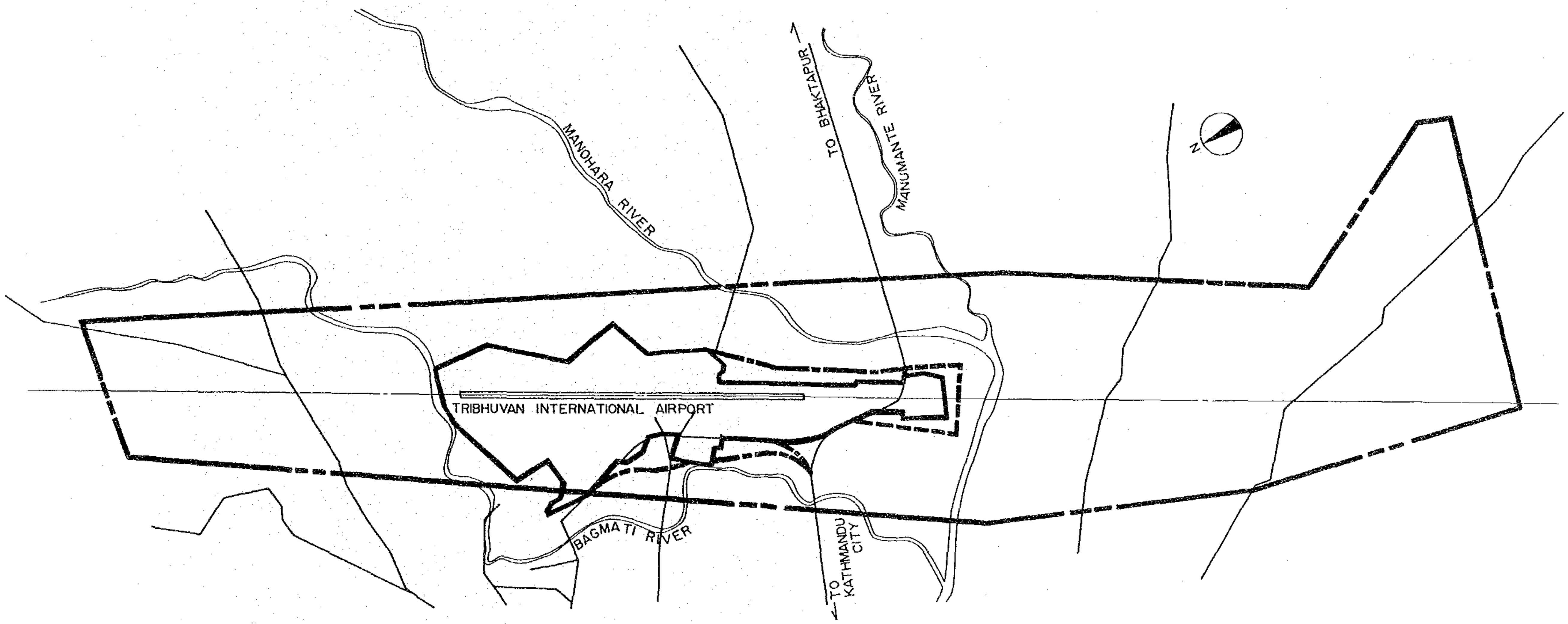
(2) Land Use Planning for the Future Expansion of the Airport Facilities

The land use plan surrounding the airport should be made to meet the development of the airport facilities. It is desirable to restrict the constructiion of new buildings including houses within the areas for the Phase II development as early as possible.

(3) Land Use Planning for Obstacle Control

All the structures and trees surrounding the airport property area must be strictly restricted from the viewpoint of height limitation so as not to infringe upon the approach surfaces.

Above requirements are proposed from the viewpoint of the land use so as to harmonize the airport with its surrounding area. Land use planning will be executed in conformity with these requirements. For example, a positive regional development plan, such as a free trade zone, should be studied.



LEGEND

(solid line)	AIRPORT PROPERTY AREA
(long dash line)	FUTURE AIRPORT PROPERTY AREA
(dash line)	AREA WHERE NEW CONSTRUCTION OF BUILDINGS ETC. ARE RESTRICTED BASED ON THE AIRCRAFT NOISE LEVELS
(short dash line)	AREA WHERE OBSTRUCTIONS PENETRATING THE OBSTACLE LIMITATION SURFACES ARE RESTRICTED

Fig. 16.3.1 Proposed Land Use Plan

CHAPTER 17 PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES OF TIA

CHAPTER 17 PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES OF TIA

17.1 General

This chapter explains the project implementation schedule and cost estimates for TIA based on the preliminary study for the Phase I development as described in Chapter 14.

The project cost necessary for the Phase I development is estimated to be 174 million US dollars at 1988 base price.

17.2 Project Implementation Schedule

The construction schedule for the project is indicated in Table 17.2.1.

17.3 Project Cost Estimates

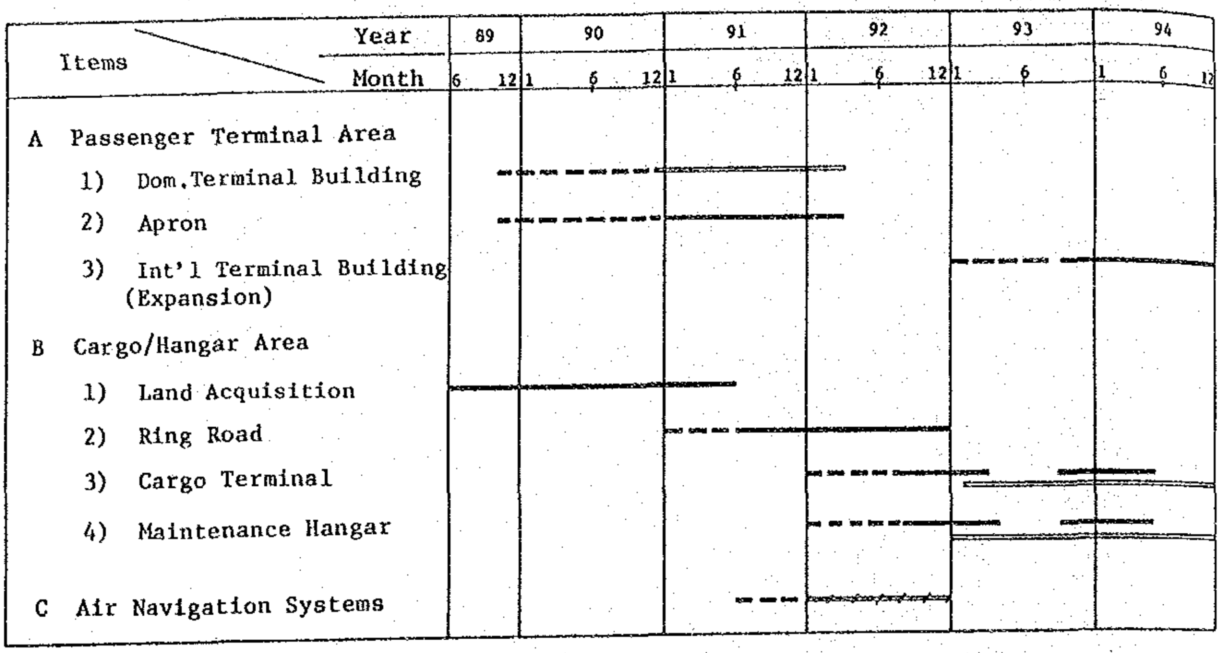
The project cost required for the Phase I development is estimated to be 174 million US dollars based on 1988 prices as shown in Table 17.3.1. This cost has been estimated primarily for the economic analysis which will be evaluated considering the national economy.

This cost includes soil investigation and topographical survey, construction supervision, engineering services and physical contingencies.

The exchange rate used has been established at US$1.00 = NRs.25.0 = Yen125. The contingency is estimated at about 10% of the sum of the total cost of construction works, soil investigation and topographical survey, engineering services cost and construction supervision.

It is assumed that borrowed soil will be available about 10 to 15 km from TIA. It should be reviwed based on the investigation before the implementation of the project.

Table 17.2.1 Construction Schedule of TIA



Legend,
- Basic Design,Detailed Engineering Services and Tendering
- Civil Work
- Architectural Work
- Navigation Work

Table 17.3.1 Project Cost for Phase I Development of TIA

(Unit=US$1,000)

Item		Construction Cost		
		Local	Foreign	Total
1. Domestic Terminal Building	Civil Works	392	2,053	2,445
	Arch. Works	1,304	8,531	9,835
	Engineering	121	1,659	1,780
	Total	1,817	12,243	14,060
2. Cargo Terminal	Civil Works	3,336	10,544	13,880
	Arch. Works	1,526	11,681	13,207
	Engineering	268	3,660	3,928
	Total	5,130	25,885	31,015
3. Maintenance Hangar	Civil Works	4,825	16,576	21,401
	Arch. Works	4,705	39,361	44,066
	Engineering	648	8,845	9,493
	Total	10,178	64,782	74,960
4. Expansion of Apron (1) (Dom. & Int'l Apron)	Civil Works	1,717	4,134	5,851
	Supporting Equipment	-	745	745
	Engineering	65	891	956
	Total	1,782	5,770	7,552
5. Expansion of Apron (2) (Dom. Apron)	Civil Works	149	282	431
	Engineering	4	58	62
	Total	153	340	493
6. Diversion of Ring Road	Civil Works	3,636	10,398	14,034
	Engineering	139	1,896	2,035
	Total	3,775	12,294	16,069
7. Expansion of Int'l Terminal Building	Arch. Works	615	3,002	3,617
	Engineering	36	489	525
	Total	651	3,491	4,142

Table 17.3.1 Continued

Item		Construction Cost		
		Local	Foreign	Total
8. Air Navigation System	NAV	508	5,838	6,346
	ATC/COM	45	1,176	1,221
	Lights	670	3,707	4,377
	MET	88	617	705
	Others	-	344	344
	Civil Works	211	1,478	1,689
	Engineering	146	1,983	2,129
	Total	1,668	15,143	16,811
9. Rescue/Fire Fighting Vehicles	Equipment	-	1,562	1,562
	Engineering	15	211	226
	Total	15	1,773	1,788
10. Utilities	Civil Works	319	943	1,262
	Engineering	12	171	183
	Total	331	1,114	1,445
11. Land Acquisition		5,859	-	5,859
Total		31,359	142,835	174,194

Note : Engineering = Engineering Service Cost
Exchange rate US$1.00 = NRs25.00
Cost estimates based on 1988 price