社会開発調査部報告書

No. 2

KINGDOM OF NEPAL

DEVELOPMENT STUDY OF CIVIL AVIATION IN NEPAL

SUMMARY

SEPTEMBER 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

KINGDOM OF NEPAL

DEVELOPMENT STUDY OF CIVIL AVIATION IN NEPAL

SUMMARY

SEPTEMBER 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to a request from His Majesty's Government of Nepal, the Japanese Government decided to conduct a Development Study of Civil Aviation in Nepal and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to Nepal a survey team headed by Mr. Makoto Tanaka, and composed of members from Pacific Consultants International Co.,Ltd. and Chiyoda Engineering Consultants Co.,Ltd. from August, 1988 to September, 1989.

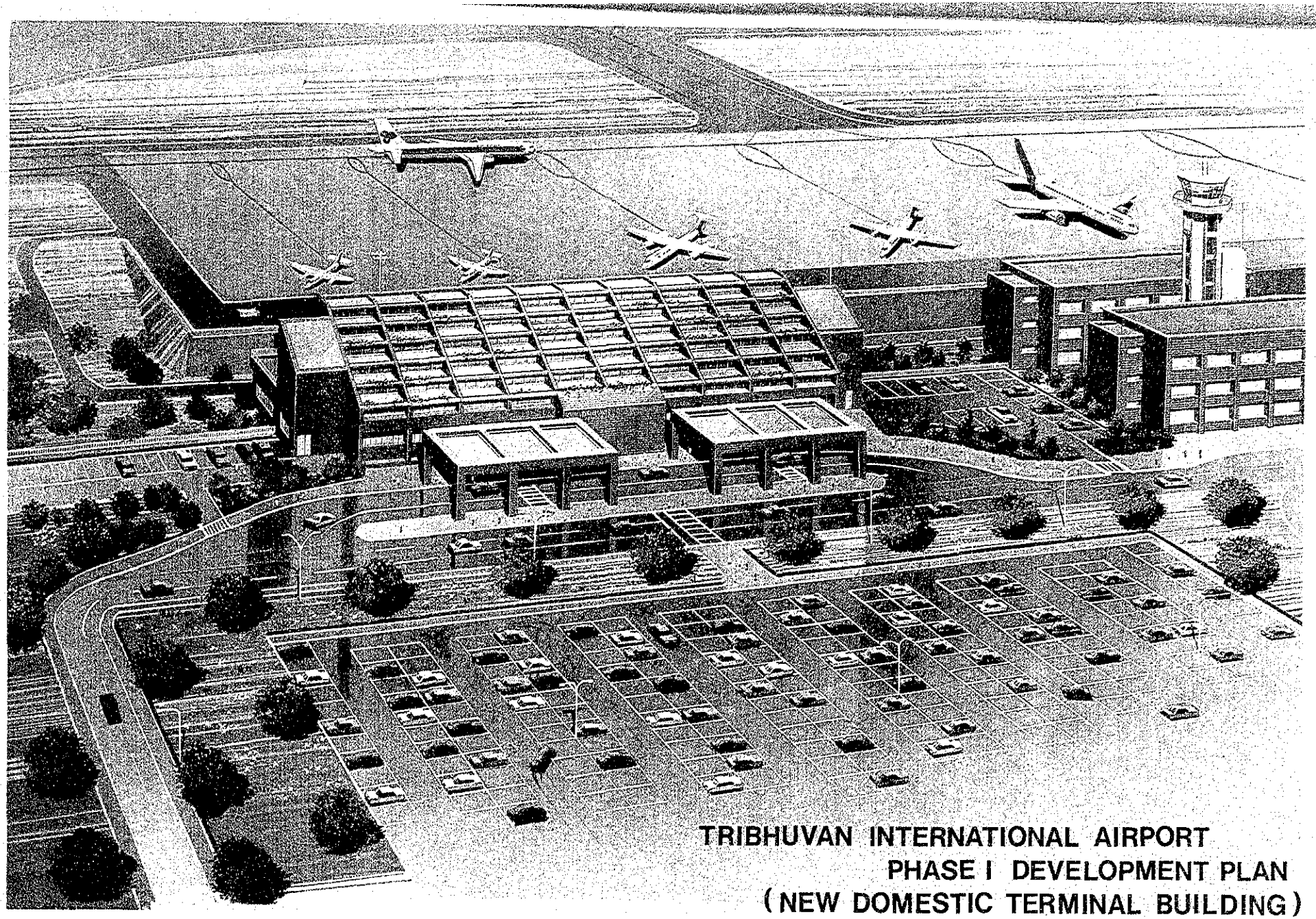
The team held discussions with officials concerned of the Government of Nepal, and conducted field surveys. After the team returned to Japan, further studies were made and the present report was prepared.

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 His Majesty's Government of Nepal for their close cooperation extended to the team.

September, 1989

Kensuke Yanagiya
President
Japan International Cooperation Agency



TRIBHUVAN INTERNATIONAL AIRPORT
PHASE I DEVELOPMENT PLAN
(NEW DOMESTIC TERMINAL BUILDING)

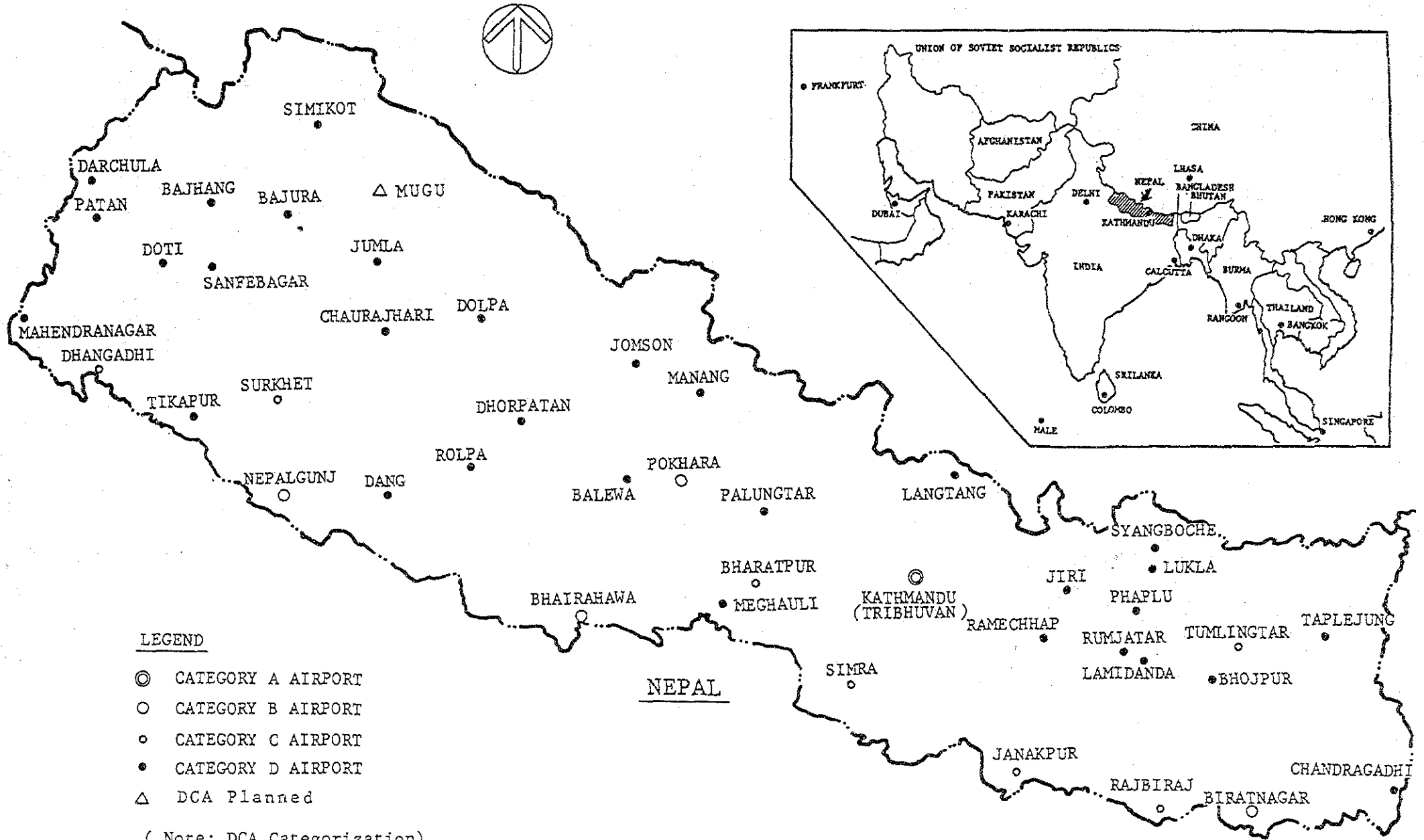

SIMIKOT
DARCHULA
PATAN
BAJHANG
BAJURA
MUGU
DOTI
JUMLA
SANFEBAGAR
MAHENDRANAGAR
DHANGADHI
CHAURAJHARI
DOLPA
JOMSON
MANANG
SURKHET
TIKAPUR
DHORPATAN
ROLPA
POKHARA
NEPALGUNJ
DANG
BALEWA
PALUNGTAR
LANGTANG
SYANGBOCHE
LUKLA
BHARATPUR
JIRI
BHAIRAHAWA
MEGHAULI
KATHMANDU (TRIBHUVAN)
PHAPLU
RAMECHHAP
RUMJATAR
TUMLINGTAR
TAPLEJUNG
SIMRA
LAMIDANDA
BHOJPUR
NEPAL
JANAKPUR
CHANDRAGADHI
RAJBIRAJ
BIRATNAGAR
UNION OF SOVIET SOCIALIST REPUBLICS
FRANKFURT
AFGHANISTAN
CHINA
LHASA
NEPAL
BANGLADESH
BHUTAN
PAKISTAN
DELHI
DUBAI
KARACHI
KATHMANDU
DHAKA
HONG KONG
INDIA
CALCUTTA
BURMA
RANGOON
THAILAND
BANGKOK
SRILANKA
COLOMBO
MALE
SINGAPORE
LEGEND
CATEGORY A AIRPORT
CATEGORY B AIRPORT
CATEGORY C AIRPORT
CATEGORY D AIRPORT
DCA Planned
(Note; DCA Categorization)
PROJECT LOCATION MAP
0 20 50 100 200 Kilometres

TABLE OF CONTENTS

INTRODUCTION

INTRODUCTION

1. General

Nepal is the world's most precipitious staircase to the frozen heights of "the Roof of the World" squeezed between the vastness of China to the north and India to the south, east and west. It has a total area of 147,000 sq. km and a population of 17 million.

Except for the narrow strip of Terai plain along its southern boundary and temperate valleys spread across its middle, the country is entirely mountainous with more than a quarter of its land area above 3,000 m in altitude.

In this mountainous country with deep valleys etched between peaks and ranges, roads are vital for bringing together the various communities. But until the early 1950's, Nepal had nothing except village trails and mountain paths. Since then, there have been major efforts to construct roads, but there is still an insufficient road network.

In the light of the present conditions of land transportation, and the importance of invitation in the overall development of the country, it is considered indispensable to develop the air transport system in Nepal for enhancing public welfare in remote districts, the promotion of tourism sector, and the growth of both international and domestic trade.

His Majesty's Government of Nepal (hereinafter referred to as "HMG/N") has decided to request the Government of Japan to provide a technical assistance necessary for the development of civil aviation in Nepal.

Based on an agreement between the governments, Japan International Cooperation Agency (hereinafter referred to as "JICA"), an official agency responsible for the implementation of technical cooperation programs of the Government of Japan, was entrusted to carry out the Development Study for Civil Aviation in Nepal (hereinafter referred to as "the Study"). JICA organized the study team and commenced the study in August, 1988.

This Final Report explains results of above study finalized in accordance with the mutual understanding between HMG/N and JICA.

2. Objectives and Scope of Work

The objectives of this study are to develop schematically as a master plan, the overall development of Air Transport System in Nepal and finally, to examine the technical, economic, and financial feasibility on the priority plans elaborated in said master plan study.

The study comprises the following three (3) steps and fourteen (14) major items.

I. Review and Field Work

(1) Review of the existing reports and data related to the study

(2) Data collection and supplementary survey

II. Formulation of Master Plan

(3) Analysis and forecast of air transport demand taking into account other modes of transport

(4) Evaluation of existing airports and related facilities with special emphasis on TIA, Pokhara, Nepalgunj, Dolpa, Jomsom, Jumla, Lukla, Phaplu, Sanfebagar, Mugu, Simikot, and Syangboche Airports

(5) Formulation of basic policies for development of airports and related facilities

(6) Identification of the air transport network to be developed

(7) Categorization of airports and determination of necessary related facilities for each category

(8) Preparation of master plan for key airports selected from viewpoints of economic and/or tourism development

(9) Recommendation on operational improvement, institutional requirements and management

(10) Identification of priority plans

III. Feasibility Study on Priority Plans

(11) Preparation of preliminary study

(12) Estimation of cost

(13) Project evaluation

(14) Preparation of implementation program

CHAPTER 1 FORMULATION OF MASTER PLAN

CHAPTER 1 FORMULATION OF MASTER PLAN

1.1 Existing Conditions and Problems of Air Transportation in Nepal

1.1.1 Existing Conditions of Air Transportation

There are 43 airports under the control of the Department of Civil Aviation in Nepal as shown in Fig. 1.1.1. The existing conditions of the facility and operation of each airport are summarized in Table 1.1.1.

Fig. 1.1.2 shows the location of existing navaids and availability of ATS. Existing air routes are shown in Fig. 1.1.3.

1.1.2 Problems of Air Transportation

Major problems with regard to airport facilities and operation of the airports, air traffic control, navigation aids, and airspace use are summarized as follows:

(1) Runway Length

The only runway of length sufficient for jet aircraft operation is available at Kathmandu in Nepal.

Operational performance of aircraft is limited by short runways less than 500 m long at some STOL airports. Accelerate stop distance is not available at most of the STOL airports

(2) Runway Pavement

The runways of all except five airports are not paved. The non-paved runways shorten the life span of the aircrafts' engines. Nine airports with non-paved runways are closed during the rainy season due to the runway surface condition.

(3) Runway Profile

At many airports in the Hill and High Himalaya regions, the longitudinal slopes of the runways exceed ICAO recommendations, and the aircraft departure/approach pattern is limited to one direction because of geographical features and steep sloped runways.

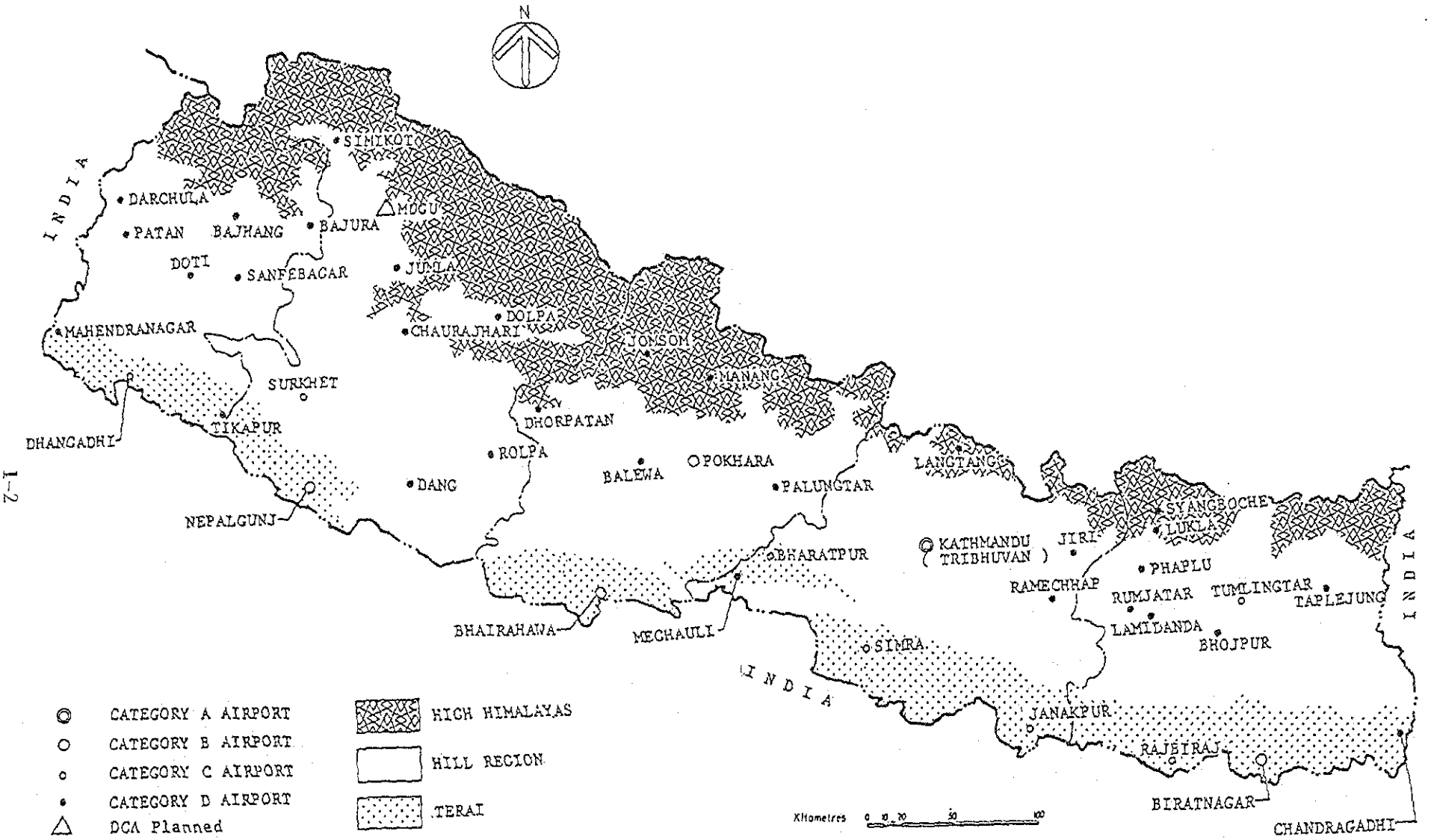


Fig. 1.1.1 Airports in Nepal (Source: DCA)

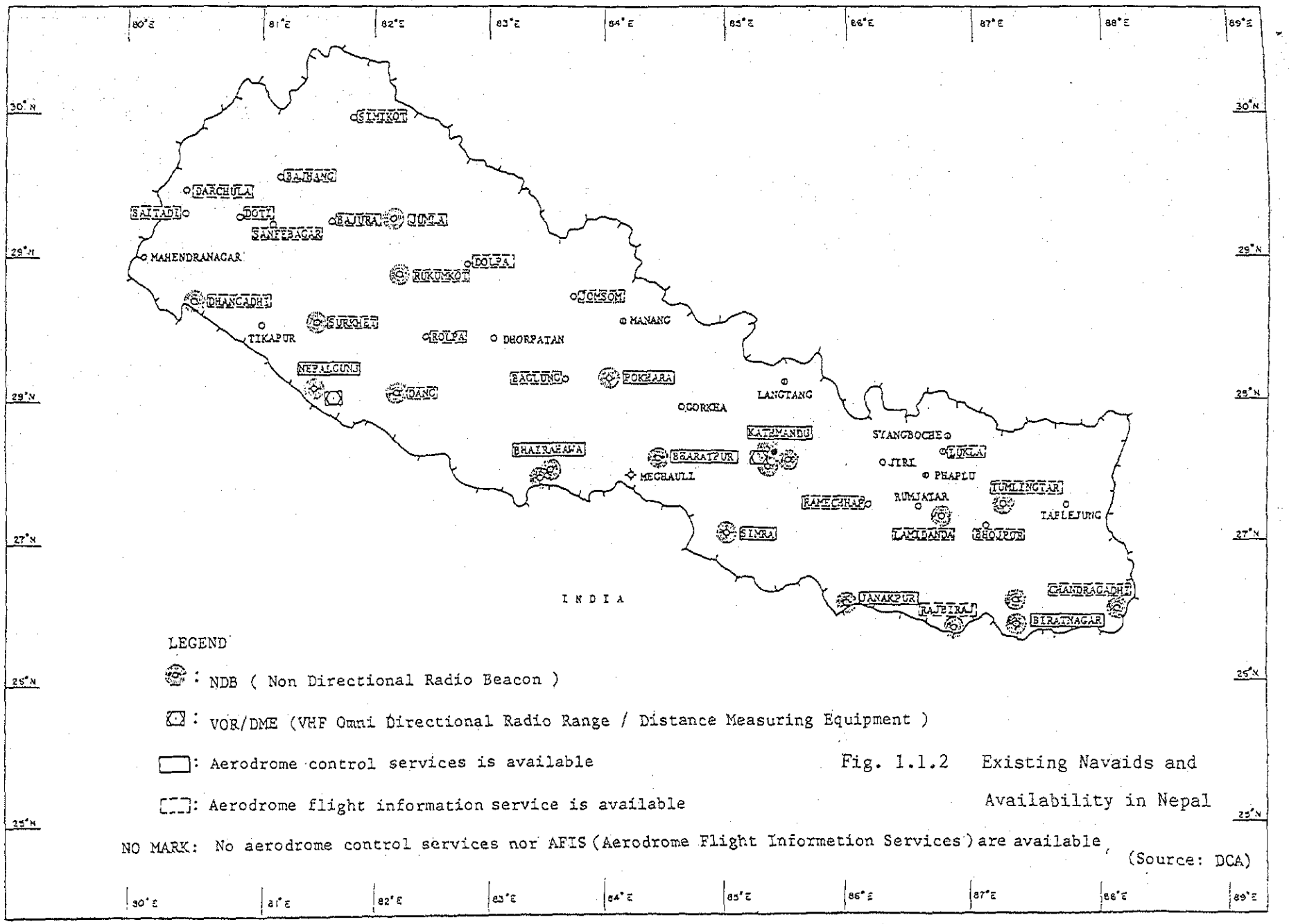
Table 1.1.1 Existing Condition of Airports in Nepal

NO.	CATEGORY DCA	AIRPORT	CODE	INT	DOM	LOCATION					RUNWAY						EXISTING CONDITION							
								ARP		ELEV.	DESIG-	DIMENSION	SUR-	LDG	TKOF	CONDITION	MAX.	OPERATION			ANNUAL PASSENGERS (THOUSAND)					
						REG.	ZONE	LATITUDE	LONGITUDE	(M)	NATION	(M)	FACE	RWY	RWY	AS FW CDM	ACFT	YR SN	ACFT	CHTR	1981/82	82/83	83/84	84/85	85/86	86/87
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)					
1	A	KATHMANDU (TRIBHUVAN)	KTM	*		C	BAGMATI	27°41'47"	85°21'42"	1338	02/20	3050 X 45	ASP	02	02/20	*	DC-10	*	DC-10		I+D 556.5 INT 400.9 DOM 155.6	562.7 407.8 154.9	576.8 414.8 162.0	651.8 465.3 186.5	657.6 482.9 174.7	726.4 523.2 203.2
2	B	BHAIRAHAWA	BWA		*	W	LUMBINI	27 30 00	83 25 00	109	10/28	1524 X 30	ASP	10/28	10/28	*	HS748	*	HS748		11.9	9.1	7.1	12.0	11.3	12.9
3	B	BIRATNAGAR	BIR		*	E	KOSHI	26 29 00	87 16 00	72	09/27	1524 X 30	ASP	09/27	09/27	*	HS748	*	HS748		44.9	43.4	40.7	44.4	46.5	52.7
4	B	NEPALGUNJ	KEP		*	M.W	BHERI	28 06 00	81 40 00	165	08/26	1524 X 30	ASP	08/26	08/26	*	HS748	*	HS748		25.5	32.6	38.4	46.1	52.7	58.6
5	B	POKHARA	PKR		*	W	GANDAKI	28 12 00	83 59 00	827	03/21	1433 X 30	GRV	03/21	03/21	*	HS748	*	HS748		23.2	20.0	23.0	34.2	36.4	46.5
6	C	BHARATPUR	BHR		*	C	NARAYANI	27 41 00	84 25 00	183	14/32	1158 X 30	GRS	14/32	14/32	*	HS748	*	DHC-6		1.0	0.0	0.1	0.1	0.1	0.1
7	C	DHANGADHI	DHI		*	F.W	SETI	28 42 00	80 36 30	210	09/27	1524 X 30	GRS	12/30	12/30	*	HS748	*	DHC-6		9.6	7.1	7.3	11.2	11.7	14.1
8	C	JANAKPUR	JKR		*	C	JANAKPUR	26 40 00	85 55 00	78	09/27	1006 X 30	ASP	09/27	09/27		HS748	*	DHC-6		6.4	5.1	6.3	7.7	5.4	6.0
9	C	RAJBIRAJ	RJB		*	E	SAGARMATHA	26 31 00	86 45 00	76	11/29	1280 X 46	GRS	11/29	11/29	*	HS748	*	DHC-6		0.3	0.0	0.0	0.1	0.2	0.4
10	C	SIMRA	SIF		*	C	NARAYANI	27 09 00	84 59 00	137	02/20	1219 X 46	GRS	02/20	02/20	*	HS748	*	DHC-6		10.5	15.5	15.9	15.8	11.5	11.5
11	C	SURKHET	SKH		*	M.W	BHERI	28 35 00	81 36 00	732	02/20	1036 X 30	GRS	02/20	02/20	*	HS748	*	DHC-6		9.2	7.7	10.7	13.6	12.4	15.0
12	C	TUMLINGTAR	TMI		*	E	KOSHI	27 19 00	87 12 00	518	16/34	1219 X 46	GRS	16/34	16/34	*	HS748	*	DHC-6		13.2	12.8	11.3	7.6	11.9	13.1
13	D	BAITADI (PATAN)	BIT		*	F.W	MAHAKALI	29 28 00	80 32 00	1280	03/21	500 X 30	CLY	03	21	*	DHC-6	*	DHC-6		1.0	3.0	3.3	2.8	3.5	4.8
14	D	BAGLUNG (BALEWA)	BGL		*	W	DHAULAGIRI	28 13 00	83 40 00	1012	01/19	610 X 30	GRS	19	01	*	DHC-6	*	DHC-6		3.5	4.3	3.3	7.0	10.0	10.6
15	D	BAJHANG	BJH		*	F.W	SETI	29 33 00	81 12 00	1250	07/25	640 X 30	GRS	07	25	*	DHC-6	*	DHC-6		2.9	2.1	2.1	3.3	4.9	4.9
16	D	BAJURA	BJU		*	F.W	SETI	29 30 00	81 40 00	1311	09/27	573 X 30	GRV	27	09	*	DHC-6	*	DHC-6		0.0	0.0	1.2	2.9	4.2	5.1
17	D	BHOJPUR	BHP		*	E	KOSHI	27 09 00	87 03 00	1219	17/35	533 X 30	CLY	35	17	*	DHC-6	*	DHC-6		5.3	5.4	5.3	7.1	7.9	8.6
18	D	CHANDRAGADI	BDP		*	E	MECHI	26 34 00	88 05 00	91	10/28	1524 X 46	GRS	10/28	10/28	*	HS748	*	DHC-6		0.7	1.0	0.8	0.7	0.5	0.6
19	D	DANG (TULSIPUR)	DNP		*	M.W	RAPTI	28 07 00	82 18 00	640	16/34	832 X 46	GRS	16/34	16/34	*	HS748	*	DHC-6		5.6	3.5	2.9	2.5	1.3	1.4
20	D	DARCHULA	DAP		*	F.W	MAHAKALI	29 40 00	80 32 30	649	07/25	590 X 30	GRS	07	25	*	DHC-6	*	DHC-6		0.0	0.0	0.0	0.0	0.5	1.4
21	D	DHORPATAN			*	W	DHAULAGIRI	28 31 00	83 02 00	2728	09/27	366 X 30	GRS	-	-	*	PC-6			*	0.0	0.0	0.0	0.0	0.0	0.0
22	D	DOLPA	DOP		*	M.W	KARNALI	28 58 30	82 49 00	2500	15/33	457 X 30	GRS	15	33	*	DHC-6	*	DHC-6		1.2	2.5	1.6	2.5	2.6	2.9
23	D	DOTI (DIPAYAL)	SIH		*	F.W	SETI	29 15 30	80 57 00	640	14/32	427 X 30	GRS	32	14	*	DHC-6	*	DHC-6		5.2	7.5	8.7	8.2	8.2	10.6
24	D	GORKHA (PALUNGTAR)	GKH		*	W	GANDAKI	28 03 00	84 29 00	457	02/20	1097 X 46	GRS	02	20	*	HS748			*	0.0	0.0	0.0	0.0	0.0	0.0
25	D	JIRI	JIR		*	C	JANAKPUR	27 38 00	86 14 00	1828	14/32	366 X 18	GRS	32	14	*	DHC-6	*	PC-6		0.8	0.8	0.6	0.4	0.2	0.2
26	D	JOMSOM	JMO		*	W	DHAULAGIRI	28 46 50	83 43 30	2682	06/24	610 X 30	SND/STN	6/24	06/24	*	DHC-6	*	DHC-6		3.3	2.0	3.0	5.3	6.0	7.9
27	D	JUMLA	JUM		*	M.W	KARNALI	29 18 00	82 12 00	2347	09/27	670 X 30	GRS	09	27	*	DHC-6	*	DHC-6		5.3	6.5	5.0	5.6	8.7	9.2
28	D	LAMIDADA	LDN		*	E	SAGARMATHA	27 15 00	86 41 00	1250	08/26	518 X 30	GRS	26	08	*	DHC-6	*	DHC-6		8.7	8.8	6.7	8.5	9.8	11.1
29	D	LANGTANG			*	C	BAGMATI	28 12 00	85 36 00	3658	09/27	421 X 30	GRS	12	30	*	PC-6			*	0.0	0.0	0.0	0.0	0.0	0.0
30	D	LUKLA	LUA		*	E	SAGARMATHA	27 43 30	86 43 30	2774	07/25	488 X 30	GRS	07	25	*	DHC-6	*	DHC-6		8.9	11.0	12.1	12.6	12.6	14.3
31	D	MAHENDRANAGAR	XMG		*	F.W	MAHAKALI	58 57 30	80 09 00	198	17/35	884 X 30	GRS	17/35	17/35	*	HS748	*	DHC-6		3.6	5.7	5.6	4.5	7.3	8.6
32	D	MANANG	MGX		*	W	GANDAKI	28 38 00	84 00 00	3353	11/29	610 X 30	GRS	29	11	*	PC-6	*	PC-6		0.0	0.2	0.3	0.6	0.5	0.6
33	D	MEGHAULI	MEY		*	C	NARAYANI	27 35 00	84 14 00	183	08/26	1067 X 46	GRS	08/26	08/26	*	HS748	*	HS748		9.2	6.0	8.0	8.2	8.1	10.8
34	D	PHAPLU	PPL		*	E	SAGARMATHA	27 31 00	86 36 00	2743	02/20	670 X 30	GRS	02	20	*	PC-6	*	DHC-6		0.2	0.4	0.5	0.7	0.8	0.8
35	D	RAMECHHAP	RHP		*	C	JANAKPUR	27 24 00	86 05 00	474	03/21	518 X 30	GRS	03/21	03/21	*	DHC-6	*	DHC-6		0.2	1.3	2.5	3.0	3.1	3.3
36	D	ROLPA	RPA		*	M.W	RAPTI	28 16 00	82 46 00	1250	06/24	457 X 30	CLY	06	24	*	DHC-6	*	DHC-6		0.0	0.1	0.0	0.1	0.1	0.2
37	D	RUKUMKOT (CHAURAJHARI)	HRJ		*	M.W	RAPTI	28 38 00	82 12 00	762	03/21	488 X 30	GRS	03/21	03/21	*	DHC-6	*	DHC-6		5.1	7.0	7.9	8.9	8.7	10.0
38	D	RUMJATAR	RUM		*	E	SAGARMATHA	27 18 00	86 32 30	1524	01/19	549 X 30	CLY/GRS	01	19	*	DHC-6	*	DHC-6		0.3	0.3	2.0	5.9	5.6	6.8
39	D	SANFEBAGAR	FEB		*	F.W	SETI	29 14 00	81 13 00	695	03/21	427 X 30	GRS	03	21	*	DHC-6	*	DHC-6		4.6	5.7	5.6	7.9	14.2	14.8
40	D	SIMIKOT (HUMLA)	IMK		*	M.W	KARNALI	29 58 00	81 49 00	2818	10/28	549 X 18	GRS	28	10	*	DHC-6	*	DHC-6		0.5	1.1	1.3	1.1	3.4	2.9
41	D	SYANGBOCHE			*	E	SAGARMATHA	27 49 00	86 44 00	3748	13/31	405 X 30	GRS	31	13	*	PC-6			*	0.0	0.0	0.0	0.0	0.0	0.0
42	D	TAPLEJUNG	TPJ		*	E	MECHI	27 21 00	87 42 00	2377	07/25	594 X 30	GRS/GRV	07	25	*	DHC-6	*	DHC-6		0.3	0.4	0.8	1.4	1.7	2.6
43	D	TIKAPUR	TKP		*	F.W	SETI	28 31 00	81 09 00	183	05/23	549 X 30	GRS	05/23	05/23	*	DHC-6	*	DHC-6		0.0	0.0	0.0	0.8	2.5	1.8

(Source:DCA)

NOTE :

ACFT : AIRCRAFT
ARP : AIRPORT REFERENCE POINT
ASP : ASPHALT
AS : ALL SEASONS
CDM : CLOSED DURING MONSOON
CHTR : CHARTER FLIGHT
CLY : CLAY
DOM : DOMESTIC
FW : FAIR WEATHER
GRS : GRASS
GRV : GRAVEL
INT : INTERNATIONAL
LDG : LANDING
SND : SAND
STN : STONE
SN : SEASONAL
TKOF : TAKE OFF
YR : YEARLY
REG : REGION



LEGEND

: NDB (Non Directional Radio Beacon)

: VOR/DME (VHF Omni Directional Radio Range / Distance Measuring Equipment)

: Aerodrome control services is available

: Aerodrome flight information service is available

NO MARK: No aerodrome control services nor AFIS (Aerodrome Flight Information Services) are available

Fig. 1.1.2 Existing Navaids and Availability in Nepal

(Source: DCA)

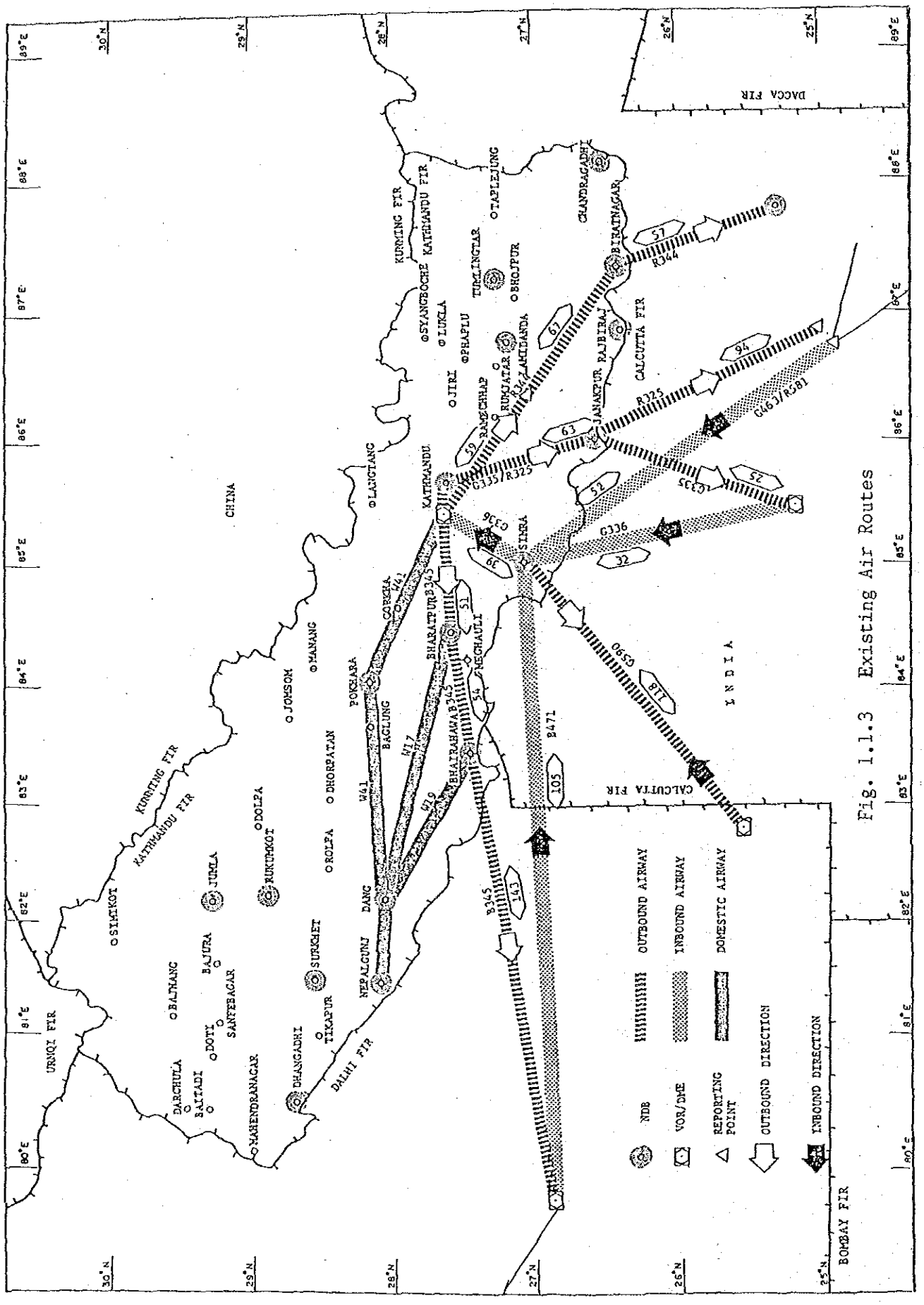


Fig. 1.1.3 Existing Air Routes

(4) Runway Strip and Obstacle Limitation Surfaces

It is difficult to ensure sufficient runway strip and obstacle limitation surfaces because of topographical conditions at most airports in the Hill and High Himalayan Regions.

(5) Terminal Building

Thirty-one airports have terminal buildings.

(6) Rescue and Fire Fighting Services

Rescue and fire fighting vehicles are provided only at Tribhuvan International Airport and two other airports, but the level of protection at these facilities does not meet ICAO recommendations.

(7) Aircraft Fuel Facilities

Aircraft fuel facilities are provided at the five major airports. On flights to the remaining airports it is necessary to load enough fuel for a round trip. This is operationally inefficient and limits the payload.

(8) Power Supply

Many airports in the High Himalayan Region do not have electric power supply, and solar battery power is effectively used. Electric power supply for some airports in the Terai Region are unreliable. Emergency generators in many airports are also not maintained sufficiently.

(9) Airport Usage

Some of the airports are in operation for social welfare reasons, in spite of very low usage.

(10) Aircraft Operations

At Tribhuvan International Airport, the fog limits aircraft operations in the morning of winter season. In the High Himalayan Region, clouds and turbulence limit aircraft operations to the early morning. In the Terai Region some airports have to be closed during the monsoon season because of

flooding of the runway and apron.

(11) Air Traffic Control:

a. Aerodrome Control

Except for the eight airports provided with aerodrome control services, only Aerodrome Flight Information Services (AFIS) are available at the other airports.

b. Approach Control

Approach Control Service is provided only at Tribhuvan International Airport,

c. Area Control

The Kathmandu Area Control Center (ACC) provides area control along the international airways within the Kathmandu Flight Information Region (FIR).

(12) Air Navigation Aid:

a. Radio Facilities

NDB and locators are in place at 22 airports, but several facilities are outdated. VOR/DME is in place at both Tribhuvan International Airport and Nepalgunj Airport. ILS is not in place at any of the airports.

b. Air/ground Facilities

Control consoles with VHF and HF radios are provided as the minimum facilities at many local airports.

c. Fixed Communication Facility

Communications between Kathmandu Communication Center and distant places, especially the Western Region are difficult. It is necessary to install several RCAG (Remote Controlled Air Ground) stations or to divide the Kathmandu FIC (Flight Information Center) into two or three sub-areas.

At Tribhuvan International Airport, there is an aeronautical fixed telecommunications network station with international circuits in connection with Delhi and Calcutta. There is also ATS direct speech circuits between Kathmandu ACC and Calcutta ACC and Delhi ACC which is not in operation for technical reasons.

d. Lighting Facilities

Both Tribhuvan International Airport and Nepalgunj Airport have simple approach lighting systems. Biratnagar and Bhairahawa Airports have runway edge lights and runway threshold lights but they are not in operation. There are PAPIs at nine airports but many airports do not have any lighting facilities.

e. Meteorological Facility

Half hourly weather observations are made at Tribhuvan International Airport and hourly observations are made at four airports. Many airports only have wind direction and speed indicators.

Altimeter settings are done at Tribhuvan International Airport and applied throughout the country. Hence, there are problems with operational safety of aircraft in other airfields.

(13) Airspace Utilization

a. Airways

There are established airways between Nepal and India, but a national airway network is not yet established.

b. Arrival Route

An arrival route for Tribhuvan International Airport needs to be established for air safety and to expedite air traffic flow.

c. Instrument Approach/Departure Procedure

Instrument approach and departure procedures are established at only two airports besides Tribhuvan International Airport. Most airports are operating only by visual flight rules.

d. Control Zone

There are control zones established at eight airports but they should be expanded to other airports with increasing air traffic.

e. Designated Training Area

There is presently no training area.

(14) Air Transport Network

Domestic air routes radiate from Kathmandu and the feeder air routes from Nepalgunj, Biratnagar, Pokhara and Dhangadi Airports. Operation of some domestic routes have not been economical due to the decreased traffic demand shifted from air to the road transportation which is improved by the development of a road network in the Hill Region.

RNAC has to use inefficient, small propeller planes on long range routes that directly connect Kathmandu with all of Nepal.

1.2 Air Traffic Demand Forecast

A traffic demand has been forecast for both international and domestic passengers and cargo from 1990 to 2010 at five year intervals. The results of the forecasts are shown in Table 1.2.1 through Table 1.2.4.

The number of international passengers has been forecast by adjusting two regression analyses: one is with a past trend, and another is with the GDP of Nepal (for Nepalese passengers) or the GDP of the world (for foreign passengers).

Nepalese passengers of domestic routes have been forecast using a sector-wise growth rate calculated from GDP per capita. Influence by road improvement is also considered. Foreign passengers of domestic routes have been forecast using the share of foreigners by route and the growth rate of international foreign passengers. Adjustments for airport closure and the development of a hub and spoke system have been also made.

To forecast of international cargo, the same regression analysis used for international passengers has been adopted.

Domestic cargo has been forecast multiplying the number of passengers by the average cargo volume per passenger.

Table 1.2.1 Forecast of International Passenger Traffic

(1000Pax)

Year	Foreign Pax	Nepalese Pax	Total	
			Pax	Growth Rate (%)
(1987)	(411)	(163)	(574)	5.3
1990	441	228	669	6.7
1995	557	367	924	6.0
2000	695	539	1234	4.9
2005	846	721	1567	4.4
2010	981	965	1946	

Table 1.2.2 Forecast of Domestic Passenger Traffic

	86/87	1990	1995	2000	2005	2010
1 KATHMANDU	203.2	227.0	280.0	332.9	388.9	443.9
2 BHAIRAHWA	12.9	17.0	34.8	41.9	50.0	58.3
3 BIRATNAGAR	52.7	63.2	62.4	72.5	83.4	95.6
4 NEPALGUNJ	58.6	110.8	115.2	135.0	156.5	180.5
5 POKHARA	46.5	55.7	66.9	79.9	94.0	107.6
6 BHARATPUR	0.1	0.0	0.0	0.0	0.0	0.0
7 DHANGADHI	14.1	20.0	20.2	21.2	24.3	27.7
8 JANAKPUR	6.0	6.7	6.0	4.9	3.6	3.3
9 RAJBIRAJ	0.4	0.0	0.0	0.0	0.0	0.0
10 SIMRA	11.5	11.7	12.9	14.0	15.0	16.1
11 SURKHET	15.0	18.9	14.9	17.5	20.1	22.9
12 TUMLINGTAR	13.1	14.9	18.0	21.1	24.5	28.3
13 BAITADI	4.8	6.1	7.6	9.1	10.7	12.6
14 BAGLUNG	10.6	14.1	13.0	12.7	12.8	13.0
15 BAJHANG	4.9	7.1	8.5	9.9	11.5	13.4
16 BAJURA	5.1	8.1	10.2	12.1	14.2	16.5
17 BHOJPUR	8.6	10.5	12.4	14.5	16.7	19.2
18 CHANDRAGADHI	0.6	0.0	0.0	0.0	0.0	0.0
19 DANG	1.4	1.0	1.3	1.5	1.8	2.1
20 DARCHULA	1.4	1.9	2.4	3.0	3.6	4.3
21 DHORPATANG	0.0	0.0	0.0	0.0	0.0	0.0
22 DOLPA	2.9	3.8	4.6	5.7	6.8	8.0
23 DOTI	10.6	13.0	10.6	11.5	13.1	14.7
24 GORKHA	0.0	0.0	0.0	0.0	0.0	0.0
25 JIRI	0.2	0.0	0.0	0.0	0.0	0.0
26 JOMSOM	7.9	9.6	11.4	13.5	15.8	17.9
27 JUMLA	9.2	10.9	12.9	14.9	17.2	19.7
28 LAMIDANDA	11.1	14.7	17.0	19.3	21.9	24.9
29 LANGTANG	0.0	0.0	0.0	0.0	0.0	0.0
30 LUKLA	14.3	15.6	19.6	24.2	29.1	33.6
31 MAHENDRANAGAR	8.6	11.3	13.9	16.5	19.8	23.6
32 MANANG	0.6	0.8	0.9	1.0	1.1	1.2
33 MEGHAULI	10.8	11.8	14.9	18.6	22.5	26.1
34 PHAPLU	0.8	1.1	1.2	1.4	1.6	1.7
35 RAMECHAP	3.3	4.7	5.3	5.4	3.5	2.7
36 ROLPA	0.2	0.4	0.4	0.0	0.0	0.0
37 RUKUMKOT	10.0	12.3	15.5	18.7	22.3	26.2
38 RUMJATAR	6.8	7.8	9.2	10.4	11.9	13.6
39 SANFEBAGAR	14.8	20.2	24.9	27.2	30.6	35.0
40 SIMIKOT	2.9	3.9	4.5	5.1	5.9	6.6
41 SYANGBOCHE	0.0	0.0	6.7	8.3	10.1	11.6
42 TAPLEJUNG	2.6	3.5	4.1	4.7	5.4	6.1
43 TIKAPUR	1.8	1.6	2.0	2.4	1.8	1.4
44 MUGU	0.0	0.0	2.7	3.3	3.9	4.5
45 BARDIYA	0.0	0.0	0.0	0.0	0.0	0.0
46 MOUNTAIN	36.8	40.1	50.8	63.2	76.7	88.8
47 FOREIGN	0.0	0.0	0.0	0.0	0.0	0.0
	591.4	705.2	836.0	977.6	1132.2	1295.7

Table 1.2.3 Forecast of International Cargo Traffic

(ton)

Year	Imported Cargo	Exported Cargo	Total	
			Cargo	Growth Rate(%)
(87/88)	(7002)	(7185)	(14187)	
1990	10368	13845	24213	23.8
95	16698	27847	44545	13.4
2000	24535	44845	69380	8.9
05	34412	65893	100305	7.7
10	46052	92418	138470	6.7

Table 1.2.4 Forecast of Domestic Cargo Traffic

		1987	1990	1995	2000	2005	2010
Passenger (1000 trips)	1)	296	353	418	489	566	648
Average Cargo per Passenger (kg/pax)		9.3	8.3	7.7	7.2	6.8	6.5
Cargo (ton)	2)	2750	2930	3220	3520	3450	4210

Note 1) Estimated in Table 1.2.2
2) Including chartered flight cargo

1.3 Evaluation of Existing Airports

1.3.1 Evluation of All Existing Airports

Table 1.3.1 summarizes the evaluation of all existing airports. Facilities in unsatisfactory condition are marked in this table.

The following sections provide an evaluation of several airports which need to be developed immediately.

1.3.2 Evaluation of Tribhuvan International Airport

The outline of the existing airport are shown in Table 1.3.2. Major problems at the existing airport are summarized hereinafter.

(1) Runway and Runway Strip

a) The width of the runway shoulder is less than the ICAO recommendation.

b) Rubber from aircraft tires has accumulated on the touch down zone of Runway 02.

c) Since 1982, no repair or maintenance work has been done.

d) The width of the runway strip is only 150 m. It should be expanded to 300 m for instrument approach procedures.

e) The runway strip is not extended to the north beyond the end of the runway.

(2) Taxiway

a) The distance between the taxiway center line and the runway center line is less than the ICAO recommendation.

b) Neither end of the parallel taxiway is connected with the runway ends.

c) The width of the taxiway shoulders are too narrow.

d) An aircraft standing on the taxi-holding position of Taxiway No.1 obstructs the VASIS light beam.

Table 1.3.1 Evaluation of All Existing Airports

NO.	CATEGORY DCA	CATEGORY JICA	AIRPORT	CODE	INTDOM	RUNWAY ELEV. (M)	RUNWAY DESIG-NATION	RUNWAY DIMENSION (M)	RUNWAY SUR-FACE	RUNWAY LDG RWY	RUNWAY TKOF RWY	RUNWAY CONDITION AS	RUNWAY CONDITION FW	RUNWAY CONDITION CDM	EXISTING CONDITION MAX. ACFT	OPERATION YR SN	OPERATION ACFT	OPERATION CHTR	EXISTING CONDITION MAJOR PROBLEMS
(1)	(2)		(3)	(4)	(5) (6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)			(14)	(15)	(16)	(17)	(18)
1	A	A	KATHMANDU (TRIBHUVAN)	KTM	*	1338	02/20	3050 X 45	AS	02	02/20	O			DC-10	*	DC-10		See.3.3.1.
2	B	B	BHAIRAHAWA	BWA	*	109	10/28	1524 X 30	ASP	10/28	10/28	O			HS748	*	HS748		
3	B	B	BIRATNAGAR	BIR	*	72	09/27	1524 X 30	ASP	09/27	09/27	O			HS748	*	HS748		
4	B	B	NEPALGUNJ	KEP	*	165	08/26	1524 X 30	ASP	08/26	08/26	O			HS748	*	HS748		Puddling runway,Poor paving condition
5	B	B	POKHARA	PKR	*	827	03/21	1433 X 30	GRV	03/21	03/21	O			HS748	*	HS748		See 3.3.2
6	C	C	BHARATPUR	BHR	*	183	14/32	1158 X 30	GRS	14/32	14/32			●	HS748		* DHC-6		
7	C	C	DHANGADHI	DHI	*	210	09/27	1524 X 30	GRS	12/30	12/30		●		HS748	*	DHC-6		Inadequate strength of runway for Hs748
8	C	C	JANAKPUR	JKR	*	78	09/27	1006 X 30	ASP	09/27	09/27				HS748	*	DHC-6		Flooding of the apron during monsoon
9	C	C	RAJBIRAJ	RJB	*	76	11/29	1280 X 46	GRS	11/29	11/29		●		HS748	*	DHC-6		
10	C	C	SIMRA	SIF	*	137	02/20	1219 X 46	GRS	02/20	02/20		●		HS748	*	DHC-6		
11	C	C	SURKHET	SKH	*	732	02/20	1036 X 30	GRS	02/20	02/20		●		HS748	*	DHC-6		
12	C	C	TUMLINGTAR	TMI	*	518	16/34	1219 X 46	GRS	16/34	16/34		●		HS748	*	DHC-6		Soft during the monsoon
13	D	D	BAITADI (PATAN)	BIT	*	1280	03/21	500 X 30	CLY	03	21			●	DHC-6		* DHC-6		Roughest runway of the STOL airport
14	D	D	BAGLUNG (BALEWA)	BGL	*	1012	01/19	610 X 30	GRS	19	01		●		DHC-6	*	DHC-6		Rough and slippery runway when wet
15	D	D	BAJHANG	BJH	*	1250	07/25	640 X 30	GRS	07	25		●		DHC-6	*	DHC-6		Existence of bamboo trees obsruction and a low hump in the runway
16	D	D	BAJURA	BJU	*	1311	09/27	573 X 30	GRV	27	09		●		DHC-6	*	DHC-6		Stony runway. High ground obstruction for the pilot view
17	D	D	BHOJPUR	BHP	*	1219	17/35	533 X 30	CLY	35	17		●		DHC-6	*	DHC-6		- Difficult operation due to undesirable runway vertical curve - Invisible the whole runway from pilot and controller
18	D	C	CHANDRAGADI	BDP	*	91	10/28	1524 X 46	GRS	10/28	10/28		●		HS748	*	DHC-6		Soft during the monsoon
19	D	C	DANG (TULSIPUR)	DNP	*	640	16/34	832 X 46	GRS	16/34	16/34		●		HS748	*	DHC-6		Existance of peepal tree at both ends of runway
20	D	D	DARCHULA	DAP	*	649	07/25	590 X 30	GRS	07	25			●	DHC-6		* DHC-6		
21	D	D	DHORPATAN		*	2728	09/27	366 X 30	GRS	-	-		●		PC-6			*	Soft when wet because of inadequate drainage
22	D	D	DOLPA	DOP	*	2500	15/33	457 X 30	GRS	15	33		●		DHC-6	*	DHC-6		See.3.3.3
23	D	D	DOTI (DIPAYAL)	SIH	*	640	14/32	427 X 30	GRS	32	14		●		DHC-6	*	DHC-6		
24	D	D	GORKHA (PALUNGTAR)	GKH	*	457	02/20	1097 X 46	GRS	02	20		●		HS748			*	
25	D	D	JIRI	JIR	*	1828	14/32	366 X 18	GRS	32	14			●	DHC-6		* PC-6		
26	D	D	JOMSOM	JMO	*	2682	06/24	610 X 30	SND/STN	6/24	06/24		●		DHC-6	*	DHC-6		See 3.3.3
27	D	D	JUMLA	JUM	*	2347	09/27	670 X 30	GRS	09	27		●		DHC-6	*	DHC-6		See 3.3.3
28	D	D	LAMIDADA	LDN	*	1250	08/26	518 X 30	GRS	26	08		●		DHC-6	*	DHC-6		
29	D	D	LANGTANG		*	3658	09/27	421 X 30	GRS	12	30		●		PC-6			*	
30	D	D	LUKLA	LUA	*	2774	07/25	488 X 30	GRS	07	25		●		DHC-6	*	DHC-6		See 3.3.3
31	D	C	MAHENDRANAGAR	XMG	*	198	17/35	884 X 30	GRS	17/35	17/35			●	HS748		* DHC-6		
32	D	D	MANANG	NGX	*	3353	11/29	610 X 30	GRS	29	11			●	PC-6		* PC-6		
33	D	B	MEGHAULI	MEY	*	183	08/26	1067 X 46	GRS	08/26	08/26			●	HS748		* HS748		
34	D	D	PHAPLU	PPL	*	2743	02/20	670 X 30	GRS	02	20			●	PC-6		* DHC-6		See.3.3.3
35	D	D	RAMECHHAP	RHP	*	474	03/21	518 X 30	GRS	03/21	03/21		●		DHC-6	*	DHC-6		Soft when wet
36	D	D	ROLPA	RPA	*	1250	06/24	457 X 30	CLY	06	24			●	DHC-6		* DHC-6		
37	D	D	RUKUMKOT (CHAURAJHARI)	HRJ	*	762	03/21	488 X 30	GRS	03/21	03/21		●		DHC-6	*	DHC-6		Inadequate drainage
38	D	D	RUMJATAR	RUM	*	1524	01/19	549 X 30	CLY/GRS	01	19		●		DHC-6	*	DHC-6		Slippery and soft when wet
39	D	D	SANFEBAGAR	FEB	*	695	03/21	427 X 30	GRS	03	21		●		DHC-6	*	DHC-6		See 3.3.3
40	D	D	SIMIKOT (HUMLA)	IMK	*	2818	10/28	549 X 18	GRS	28	10		●		DHC-6	*	DHC-6		See 3.3.3
41	D	D	SYANGBOCHE		*	3748	13/31	405 X 30	GRS	31	13		●		PC-6			*	see 3.3.3
42	D	D	TAPLEJUNG	TPJ	*	2377	07/25	594 X 30	GRS/GRV	07	25			●	DHC-6		* DHC-6		Existence of obstruction of hill at the side of the runway
43	D	C	TIKAPUR	TKP	*	183	05/23	549 X 30	GRS	05/23	05/23		●		DHC-6	*	DHC-6		

NOTE:

ACFT : AIRCRAFT
ASP : ASPHALT
AS : ALL SEASONS
CDM : CLOSED DURING MONSOON
CHTR : CHARTER FLIGHT
CLY : CLAY
DOM : DOMESTIC
ELEV : ELEVATION
FW : FAIR WEATHER
GRS : GRASS
GRV : GRAVEL
INT : INTERNATIONAL
LDG : LANDING
SND : SAND
STN : STONE
TKOF : TAKEOFF

O : Satisfactory facilities
● : Unsatisfactory facilities

SN : SEASONAL
YR : YEARLY

(3) Apron

a) The distance between the parallel taxiway center line and parking aircraft is less than the ICAO recommendation.

b) The number of gate positions in the international apron is insufficient for demand.

c) There is no apron service road.

(4) Passenger Terminal Building

a) The existing domestic terminal building is already too small for the present demand.

b) Construction of the new domestic terminal building has not been started yet, although detailed design is complete.

(5) Cargo Terminal Building

a) Existing cargo handling facilities are scattered into three buildings in the airport property area.

b) Building No.1 penetrates the obstacle limitation surface.

c) There is no service road connecting Cargo Building No.3 with the apron or Cargo Building No.1.

(6) Maintenance Hangar

The existing maintenance hangar of RNAC cannot accommodate the largest aircraft B-757.

(7) POL

The underground fuel storage tanks are too close to the parallel taxiway.

(8) Fence

An imperfect boundary fence around the airport allows pedestrians and animals to enter the grounds and cross the runway.

(9) Perimeter Road

There is no perimeter road for maintenance vehicles and security patrols.

(10) Utility

Water supply from WSSC is currently not sufficient, and quality of well water which is taken in the airport to make up for a deficiency of city water, is not so good.

Supply of electricity from the outside of the airport is not reliable.

There is not an incinerator for the garbage dispopsal in the airport.

(11) Use of Runway

A straight-in approach procedure can be made only from the south, while most of aircraft take off to the south. Since the runway is used as such its capacity is lower than normal.

Table 1.3.2 Outline of the Existing Tribhuvan International Airport

Country	Name of Airport	INTL/DOM ICAO CODE	Commencement of Services	Total Area of Airport	Aerodrome Reference Point	Airport Elevation	Runway Bearing	Aerodrome Reference Temperature	Operation Hour	Seasonal Availability	Administrative Authority
NEPAL	TRIBHUVAN	INTL 4D	1950	—	27°41'47"N 85°21'42"E	1338m (4390ft)	02-20	27.8°C	Sunrise to sunset	All Seasons	Department of Civil Aviation

City/Town			Transportation			Wind Coverage	Aerodrome Operationg Minima
Name	Population	Distance to Airport	Railway	Taxi	Bus		
Kathmandu	Kathmandu District 422,000 as of 1981	5.6 km	—	○	○	—	

Name of Approach Procedure	Runway	STA MDA Day	STA MDA Night	STA VIS Day	STA VIS Night	Circling MDA Day	Circling MDA Night	Circling VIS Day	Circling VIS Night
Echo Approach (VOR/DME)	02	—	—	—	—	5186'	—	2500m	—
	20	—	—	—	—	5186'	—	2500m	—
Sierra Approach (VOR/DME)	02	5186'	5186'	1500m	3000m	5186'	—	2500m	—
	20	—	—	—	—	5186'	—	2500m	—

Air Navigation Aids

Radio	NDB	LO	VOR	DME	TACAN	ILS	ASR	PAR	SSR	ARTS	ASDE	HF	VHF	UHF	ITS	VDF	ITV	TTY	AFTN
Existing	Yes	Yes	Yes	Yes	—	—	—	—	—	—	—	Yes	Yes	—	—	Yes	—	Yes	Yes
Plan																			

Lightings	ALS	SFL	SALS	ALB	AGL	CGL	REIL	VASIS	PAPI	RWYL	RWTL
Existing	—	—	Yes	—	—	—	—	Yes	—	Yes	Yes
Plan											

Lightings	RCLL	TDZL	OL	DML	TWYL	TWCL	TGL	ABN	WDIL	AFL
Existing	—	—	—	—	—	—	—	Yes	Yes	Yes
plan										

Meteorological Facilities

Runway Surface Sensors	Yes
Weather Facsimile	Yes
APT Receiver	Yes
Radiosonde	
Weather Radar	—
VOLMET Broadcast	—

Basic Facilities

	Size	Structure	Note
Runway Strip	3140m x 150m		
Runway	3050m x 45m	Asphalt 54F/A/W/T	Rwy
Runway			Old Rwy closed
Taxiway	1945m x 23m	Asphalt 54F/A/W/T	5 connecting 1 Parallel Twy

Apron	Design Aircraft	No. of Stand	Pave-ment	Area (m²)	Parking Configuration
Dom.	HS-748	HS-748 DHC-6	PCC	5,376	Self Manoeuvring
Int'l	DC-10	B-757 etc;6	"	38,072	53/R/B/W/T
Maint	HS-748	—		17,000	61/F/B/W/T

Flight Services

Domestic Flights by RNAC: Flight Route	Type of Aircraft	WAM	International Flights by RNAC: Flight Route	Type of Aircraft	WAM	International Flights by Foreign Airlines: Flight Route	Type of Aircraft	WAM
KTM - KEP	HS-748 DHC-6	6 17	KTM —Bangkok	B727	8	KTM - Bangkok	A300-4	8
-PKR	HS-748 DHC-6	14 28	-Culcutta	B757 B727	2 4	-Culcutta	B737	10
-BIR	HS-748	14	-Colombo	B727	2	-Colombo		
-SIF	DHC-6	28	-Delhi	B757 B727	12 8	-Delhi	B737	14
-LUA	DHC-6	14	-Dhaka	B737	6	-Dhaka	A310 B707 F28	4 6 6
-SKH	DHC-6	8	-Dubai	B757	2	-Dubai		
-DHI	DHC-6	8	-Hongkong	B757	4	-Hongkong		—
-Other		65	**-Other		10	*-Other		24
Total		202			58			72

Note:

WAM: Weekly Aircraft movement

Other Facilities

	Size	Structure	Note
Access Road	250m x 11.0m//	Asphalt	
Autopark	17,000 m² App.	Gravel	temporary use
Pax.T.Building	10,750m² App.	R.C.	Intl
	700 m²	"	Dom.
Cargo.T.Building	3,500 m² App.	R.C.& Quonset	3 buildings
Office Building		R.C.	Part of Pax. Bldg.
Control Tower	390m²##	"	OPS Building
Fire Station	800 m² App.	"	for 6 Vehicles
POL	756 kl x 2 70 kl x 8 15 kl x 2		Nepal Oil Corporation
Hangar	5,800 m² App.		3 Hangars RNAC

Statistics of Air Traffic

No. of Landing &Take-off	19,729	20,731	15,336	17,761	—
Annual Freight Volume(ton)	4661	4254	6811	9418	10993
No. of Annual Passengers	Int'l 415	465	483	523	574
	Dom. 154.9	162.0	186.5	174.7	203.2
Year (Fiscal)	1982/83	1983/84	1984/85	1985/86	1986/87

KEP...Nepalgunj LUA...Lukla *...Including Rangoon, Lhasa, Karachi, etc..
PKR...Pokhara SKH...Surkhet **...Including Lhasa.
BIR...Biratnagar DHI...Dhangadhi
SIF...Simara

//...including shoulders
##...The new Control Tower will be commissioned in the near future.

General Notes:

DCA: Department of Civil Aviation

RNAC: Roval Nepal Airlines Corporation

	◇	
DATE	◇	By
REVISION		
Drawn By		JICA
Date		Sept.'89

1.3.3 Evaluation of Pokhara Airport

The outline of the existing airport is shown in Table 1.3.3. Major problems at the existing airport are summarized hereinafter.

The shortcomings of the existing airport are as follows:

a) Approach from and take-off to the north are operationally limited due to high mountains in that direction.

b) The terminal buildings and a holy tree are located just 55 m from the runway center line.

c) Development of the existing airport including runway extension is impossible due to limited land and environmental problems.

d) The runway orientation is nearly at a right angle to the prevailing wind.

e) Almost all the airports that handle the same traffic volume as Pokhara Airport have a paved runway and apron, while Pokhara Airport has no pavement.

Table 1.3.3 Outline of Existing Pokhara Airport

Country	Name of Airport	INTL/DOM / ICAO CODE	Commencement of Services	Total Area of Airport	Aerodrome Reference Point	Airport Elevation	Runway Orientation	Aerodrome Reference Temperature	Operation Hour	Seasonal Availability	Administrative Authority
Nepal	POKHARA	DOM / 3c	1951	218.000 m²	28°12'N / 83°59'E	827 m (2712')	03-21	27.8 °C	Sunrise to sunset	All Seasons	Department of Civil Aviation

City/Town		Transportation			Wind Coverage	Aerodrome Operating Minima	Runway	Approach Distance	Approach Procedure	Jet		Turbo Prop		Note:
	Population	Distance to Airport	Railway	Taxi	Bus					MDA	Visibility	MDA	Visibility	
POKHARA	KASKI DISTRICT 221000 as of 1981	4 km	—	○	○	—	03		VMC only					IFR procedure not yet established.
							21							

Air Navigation Aids

Radio	NDB	VOR	DME	TACAN	ILS	ASR	PAR	SSR	ARTS	ASDE	HF	VHF	UHF	ITS	VDF	ITV	TTY	AFTN
Existing	Yes	—	—	—	—	—	—	—	—	—	Yes	Yes	—	—	—	—	—	—
Plan																		

Lighting	ALS	SFL	SALS	ALB	AGL	CGL	PAPI	RWYL	RTL	REIL
Existing	—	—	—	—	—	—	—	—	—	—
Plan										

Lighting	RCLL	TDZL	OL	DML	TWYL	TWCL	TGL	ABN	WDIL	AFL
Existing	—	—	—	—	—	—	—	—	—	—
Plan										

Meteorological Facilities	
Runway Surface Sensors	—
Weather Facsimile	—
ART Receiver	—
Radiosonde	—
Weather Radar	—
VOLMET Broadcast	—

Note:

Basic Facilities

	Size	Pavement	Note
Runway Strip	1,570m x 150m		
Runway	1,433m x 30m	Gravel	
Taxiway	—	Grass	

Apron	Design Aircraft	Number of Stand	Pavement	Area	Parking Configuration
	HS-748	HS-748:1 DHC-6 :1	Grass	— m²	Self Manoeuvering

Flight Services

Intl/DOM	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	POKHARA - KATHMANDU	RNAC	HS-748	7	Monsoon schedule 1988
			DHC-6	14	
	- JOMSOM	RNAC	DHC-6	3+11*	*11: charter flights
	-BAGLUNG	RNAC	DHC-6	5	

Note:
RNAC:
Royal Nepal Airlines Corporation

Other Facilities

	Size	Structure	Note
Access Road	W=5.5m	Asphalt	
Autopark	—		
Pax.T.Building		R.C.	
Cargo.T.Building			
Office Building			1F of T/B
Control Tower			
Fire Station			No Fire Vehicle
Electrical & Mechanical Workshop		R.C.	
Power House		R.C.	
Staff Quarter			
POL	—		

Statistics of Air Traffic

Note: Indicating RNAC scheduled traffic only

No. of Landing & Take- off					
Annual Freight Volume (ton)					
No. of Annual Passengers	20,000	23,000	34,200	36,400	46,500
Year (Fiscal)	1982/83	1983/84	1984/85	1985/86	1986/87

	◇	
DATE	◇	By
REVISION		
Drawn By		JICA
Date		Sept.'89

1.3.4 Evaluation of Nepalgunj Airport

The outline of the existing Nepalgunj Airport is listed in Table 1.3.4.

The major problems of the existing facilities are as follows:

(1) The existing runway length is not enough for HS-748 operation without any restriction under the wet surface conditions.

(2) The existing loading apron has already reached its capacity during the peak hour period.

(3) Pavement surface conditions and structure are poor.

(4) No fire fighting vehicles are provided.

The Airport Master Plan has been prepared by DCA and the maintenance base project which is a part of it has already been initiated. The Master plan includes the following items:

- Runway extension and widening of runway strip
- Expansion of loading apron
- Construction of partial parallel taxiway
- Expansion of passenger terminal building

Table 1.3.4 Outline of Existing Nepalgunj Airport

Country	Name of Airport	INTL/DOM ICAO CODE	Commencement of Services	Total Area of Airport	Aerodrome Reference Point	Airport Elevation	Runway Bearing	Aerodrome Reference Temperature	Operation Hour	Seasonal Availability
NEPAL	NEPALGUNJ	DOM 3c	JULY 1983	—	28°06'N 81°40'E	(540ft)	08-26	38°C	Sunrise to sunset	All Seasons

Note: Old airport used 15 Mar. '61 til Jun. '81.

Administrative Authority: DCA

City/Town			Transportation			Wind Coverage	Aerodrome Operating Minima
Name	Population	Distance to Airport	Railway	Taxi	Bus		
NEPALGUNJ	BANKE DISTRICT 205,000 as of 1981	7.5km	—	—	—	—	

Runway	Approach Distance	Approach Procedure	Jet MDA	Jet Visibility	Turbo Prop MDA	Turbo Prop Visibility
08		VFR				
26		VFR				

Note: IFR procedures are under consideration.

Navigation Aids

Radio	NDB	VOR	DME	TACAN	ILS	ASR	PAR	SSR	ARTS	ASDE	HF	VHF	UHF	ITS	VDF	ITV	TTY	AFTN
Existing	Yes	Yes	Yes	—	—	—	—	—	—	—	Yes	Yes	—	—	(Yes)	—	Yes	—

Note: ( ) not in operation
VOR 0.5nm fm RWY 08 THR

Lightings	ALS	SFL	SALS	ALB	AGL	CGL	PAPI	RWYL	RTL	REIL
Existing	—	—	Yes(RWY26)	—	—	—	Yes	Yes	Yes	—

Lightings	RCLL	TDZL	OL	DML	TWYL	TWCL	TGL	ABN	WDIL	AFL
Existing	—	—	—	—	Yes	—	—	Yes	Yes	Yes

Meteorological Facilities	
Runway Surface Sensors	—
Weather Facsimile	—
ART Receiver	—
Radiosonde	—
Weather Radar	—
VOLMET Broadcast	—

Note:

Basic Facilities

	Size	Pavement	Note
Runway Strip	1,625m x 150m		
Runway	1,505m x 35m	Asphalt	
Taxiway	145m x 27m	Asphalt	

Apron	Design Aircraft	Number of Stand	Pavement	Area (m²)	Parking Configuration
	HS-748	HS748:1 DHC-6:3	Asphalt	110m x 66m	Self Manoeuvering

Flight Services

Int'l/DOM	Major Air Route	Name of Airline	Type of Aircraft	No. of Flight/Week	Note
DOM	NEPALGUNJ→KATHMANDU	RNAC	HS-748	7	Monsoon schedule 1987
			DHC-6	1	
	→SANFEBAGAR	"	DHC-6	3	
	→JUMLA	"	"	2	
	→CHAURAJHARI	"	"	5	
	→SURKHET	"	"	13	
	→SILGADI DOTI	"	"	2	
	→Others	"	"	5	
	Total			38 Flts/Week	

General Note

DCA: Department of Civil Aviation

RNAC: Royal Nepal Airline Corporation

Other Facilities

	Size	Structure	Note
Access Road	2km, 5.5m		
Vehicle Parking			
Pax.T.Building	955 m2	R.C.	GF of T/B
Cargo.T.Building	159 m2	R.C.	Not Used
Office Building	440 m2	R.C.	1F of T/B
Control Tower	25 m2	R.C.	VFR Room
Fire Station	114 m2 (for Vehicles)	R.C.	No Fire Vehicle
Electrical & Mechanical Workshop	679 m2	R.C.	
Power House	208 m2	R.C.	
Staff Quarter	10 house		
POL	ATF 70 kl x 4		NOC

Statistics of Air Traffic

Note: Indicating RNAC scheduled traffic only

No. of Landing & Take- off	4,102	4,592	4,301	4,195	4,576
Annual Freight Volume (ton)	121	154	256	211	177
No. of Annual Passengers	33,985	42,331	45,263	46,361	51,335
Year (Fiscal)	1982/83	1983/84	1984/85	1985/86	1986/87

DATE ◇ BY

REVISION

Drawn by JICA Study Team
DATE September 1989

1.3.5 Evaluation of STOL Airports

Problems and shortcomings of selected STOL airports are summarized as listed below:

(1) Dolpa Airport

- Runway gradient is steep. A pilot cannot see the end of the runway while taking-off due to the runway profile.
- Runway surface is soft and slippery when wet.
- Rocks obstruct the approach of aircraft.
- "A High Speed turn off" should be installed because runway extension up to the required length is impossible.

(2) Jomsom Airport

- Runway extension is required.
- Runway surface is soft and slippery when wet.
- The north end of the runway strip is being eroded away by a river.

(3) Jumla Airport

- Snow fall is about 30 cm, and the runway is sometimes closed for 15 to 20 days.

(4) Lukla Airport

- Traffic is the busiest in the STOL airports with five scheduled flights per day.
- The runway has an exceptionally steep slope of 11.5%.
- The runway strip is easily eroded by surface water.
- Additional apron space is necessary.

(5) Phaplu Airport

- Aircraft operation is very difficult because a tight turn is required in a narrow valley and aircraft acceleration is necessary to handle the steep slope of the runway.

(6) Sanfebagar Airport

- Protection works for river erosion are required.

(7) Simikot Airport

- Runway extension is necessary.

- Runway surface is soft and slippery when wet.

- There is no apron.

(8) Syangboche Airport

- This high altitude airport can be served by PC-6. Upgrading of the runway by realignment has been planned by DCA.

- The control tower should be constructed at another place because the level of the tower is the same as the runway level.

1.3.6 Evaluation of Air Traffic Control and Air Navigation Systems

Table 1.3.5 summarizes the existing air navigation systems in Nepal.

The following is the major evaluation of the air navigation systems in Nepal.

a) Kathmandu FIC mainly operates VHF air-ground radio. However, this VHF radio does not cover the western area of Kathmandu FIR. It will be justifiable to establish a VHF remote controlled sub-repeater station and ensure VHF radio coverage within the whole area in Kathmandu FIR.

b) The radio frequency of VHF air-ground for airport flight information services needs to be changed in order to avoid severe interference with the frequencies used for the training area in India.

c) Among the HF radio frequencies for domestic point-point communications, severe interferences occur. The following countermeasures will be required:

   - Subdivide Kathmandu FIR into west and east sectors and assign different frequencies

   - Establish sub-centers, i.e., Nepalgunj in the western area and Biratnagar in the eastern area and de-centralize the functions of Kathmandu.

d) No domestic AFTN (RTT) circuits are operated in Nepal. Domestic AFTN (RTT) circuits and ATS direct speech circuits will be necessary among Kathmandu, Nepalgunj, and Biratnagar Airports.

e) Most air navigation equipment in Nepal is old and staged replacement is desirable.

f) The VHF air-ground radio and HF point-point radio facilities in the mountain airports are in a single unit configuration and provision of stand-by equipment will be mandatory.

Table 1.3.5 Summary of Existing Air Navigation Systems in Nepal

NO.	CATEGORY DCA	CATEGORY JICA	AIRPORT	CODE	AIR TRAFFIC SERVICES ACC	AIR TRAFFIC SERVICES TWR	AIR TRAFFIC SERVICES SMC	AIR TRAFFIC SERVICES AFIS	NAVAIDS VOR/DME	NAVAIDS NDB	NAVAIDS LOC	ATC/COM VHF A/G	ATC/COM HF G/G	ATC/COM VDF	ATC/COM CONSOLE	ATC/COM TAPE REC.	ATC/COM P.A. SIREN	LIGHTS ALS	LIGHTS RWYL RWTL	LIGHTS PAPI VASIS	LIGHTS TWYL	MET MET	POWER CITY POWER	POWER SOLAR POWER	POWER EMGY GEN
(1)	(2)		(3)	(4)	(5)				(6)			(7)						(8)				(9)	(10)		
1	A	A	KATHMANDU (TRIBHUVAN)	KTM	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O *1		O	O	O VDF	O
2	B	B	BHAIRAHAWA	BWA		O				O	O	O	O		O	O		O	O	O	O	O	O		O
3	B	B	BIRATNAGAR	BIR		O				O	O	O	O	O	O	O			O	O		O	O		O
4	B	B	NEPALGUNJ	KEP		O			O	O		O	O	O	O	O		O	O	O	O	O	O		O
5	B	B	POKHARA	PKR		O				O		O	O		O							O	O		O
6	C	C	BHARATPUR	BHR		O				O		O	O		O	O						O	O		O
7	C	C	DHANGADHI	DHI				O		O		O	O		O		O					O	O	O	O
8	C	C	JANAKPUR	JKR		O				O		O	O		O							O	O		O
9	C	C	RAJBIRAJ	RJB				O		O		O	O		O	O									O
10	C	C	SIMRA	SIF		O				O		O	O		O	O						O	O		O
11	C	C	SURKHET	SKH				O		O		O	O		O	O	O					O	O	O	O
12	C	C	TUMLINGTAR	TMI				O		O		O	O		O	O	O			O		O	*4	O	O
13	D	D	BAITADI (PATAN)	BIT				O				O	O		O	O	O					O		O	
14	D	D	BAGLUNG (BALEWA)	BGL				O				O	O		O	O	O					O		O	
15	D	D	BAJHANG	BJH				O				O	O		O	O	O					O		O	
16	D	D	BAJURA	BJU				O				O	O		O	O	O			O		O		O	O
17	D	D	BHOJPUR	BHP				O				O	O		O		O					O		O	
18	D	C	CHANDRAGADI	BDP				O		O		O	O		O	O	O			O		O		O	
19	D	C	DANG (TULSIPUR)	DNP				O		O		O	O		O	O	O					O	O	O	
20	D	D	DARCHULA	DAP				O				O	O		O	O	O					O	*2	O	O
21	D	D	DHORPATAN																			O		O	
22	D	D	DOLPA	DOP				O				O	O		O	O	O					O		O	
23	D	D	DOTI (DIPAYAL)	SIH				O				O	O		O	O	O					O		O	
24	D	D	GORKHA (PALUNGTAR)	GKH																O		O		O	O
25	D	D	JIRI	JIR																					
26	D	D	JOMSOM	JMO				O				O	O		O	O	O			O		O		O	
27	D	D	JUMLA	JUM				O		O		O	O		O	O	O			O		O	O	O	O
28	D	D	LAMIDADA	LDN				O		O		O	O		O	O	O			O		O		O	
29	D	D	LANGTANG																						
30	D	D	LUKLA	LUA				O				O	O		O	O	O					O		O	
31	D	C	MAHENDRANAGAR	XMG																					
32	D	D	MANANG	MGX																					
33	D	B	MEGHAULI	MEY																					
34	D	D	PHAPLU	PPL																			*3		
35	D	D	RAMECHHAP	RHP				O				O	O		O	O	O					O		O	
36	D	D	ROLPA	RPA																					
37	D	D	RUKUMKOT (CHAURAJHARI)	HRJ				O		O		O	O		O	O	O			O		O		O	
38	D	D	RUMJATAR	RUM																					
39	D	D	SANFEBAGAR	FEB				O				O	O		O	O	O					O		O	O
40	D	D	SIMIKOT (HUMLA)	IMK				O				O	O		O	O	O					O		O	
41	D	D	SYANGBOCHE																						
42	D	D	TAPLEJUNG	TPJ																					
43	D	C	TIKAPUR	TKP																					

(Source: DCA)

Abbreviations in this table :

ACC : Area control center
TWR : Aerodrome control tower
SMC : Surface movement control
AFIS : Aerodrome flight information services
ATC : Air traffic control
COM : Communications
VOR : VHF omni-directional radio range
DME : Distance measuring equipment
NDB : Non-directional beacon
LOC : Locator
VHF A/G : Very high frequency air to ground radio (mobil)
HF G/G : High frequency ground to ground radio (fixed)
VDF : VHF direction finder
CONSOLE : Air traffic control console
TAPE REC : Tape recorder for ATC use
P.A. : Public address system
ALS : Approach lighting system
RWYL : Runway edge lights
RWTL : Runway threshold lights including end lights
PAPI : Precision approach path indicator
VASIS : Visual approach slope indicator system
TWYL : Taxiway edge lights
MET : Meteorological observation
CITY POWER: Commercial power supply
EMGY GEN : Emergency generator

Note
*1 : T-VASIS
*2 : Service expected
*3 : Possible
*4 : Services expected in 1989

O : Facility provided

1.4 Basic Policy for Development of Airports

1.4.1 Basic Policy

Basic policies for the development of the airports and air transport are established as mentioned below for a safe and efficient transport system.

a) Development in Mountainous Region

Airports in Nepal are located in the varied topographic conditions from the plains of Terai to the High Himalayan region. Under such circumstances, it is not appropriate to develop all airports on a uniform standard. Lower standards have to be applied to the planning and design of airports in High Himalayas as long as flight safety is ensured. It is also important to consider the difficulties in construction and maintainance in a mountainous region.

b) Financial Circumstances

It is important to allocate resources to priority projects which need to be implemented immediately in order to secure safe operations and to meet increasing demand.

c) Maintenance and Operation

Maintenance of facilities at airports in mountainous regions is costly due to the severe conditions and the remoteness from cities, so it is desirable to plan easily maintained facilities. Equipment should also be standardized for easy maintenance.

d) Operating Aircraft and Categorization of Airport

The capacity of each facility will be decided by the aircraft type to be operated not by aircraft movements because they are so few. Therefore all airports will be categorized according to the aircraft they accommodate and required facilities will be decided in accordance with the category of each airport.

The design aircraft for future are 50-seat aircraft for the trunk routes and 20-seat aircraft for STOL routes. The PC-6 will be retired in the future.

Replacement of Aircraft

Aircraft in Use	Future Aircraft	Serving Route
HS-748	50-seaters	Trunk route
DHC-6	20-seaters	STOL route
PC-6	To be retired	

1.4.2 Working Policy

Based on the above-mentioned basic circumstances, working policies will be set forth as follows:

a) Basic Airport Facilities

The runway shall not be shorter than the length required by the aircraft to be operated. If a runway cannot be extended to the required length due to topographic conditions, runway surfacing should be executed with priority.

The facilities of TIA which are insufficient in function and capacity should be developed before all others.

Air navigation systems of international standard should be installed at Tribhuvan International Airport. They should be also installed at the major airports along the trunk routes as soon as possible.

b) Development of the Airway Network

The air transport network will be strategically improved with the construction of new airports, the closure of some existing airports and introduction of hub and spoke system. Reorganization of the airway network shall be done on the premise of IFR implementation for safe and efficient aircraft operation. Therefore VOR/DME will be installed along the trunk route in the Terai area and new facilities including NDB should be installed based strictly on viable operational requirements. A nationwide air telecommunication system should be developed as soon as possible.

c) Future of Helicopter and General Aviation

After the network for fixed wing aircraft is sufficiently developed and the demand for helicopter service increases, the helicopter may be introduced into the scheduled flight services in limited conditions.

The development of a general aviation is not necessary at present because the demand is not expected to increase rapidly considering the development of the national economy.

1.5 Air Transportation Network to be Developed

1.5.1 General

The future air transport network will be structured considering the following factors:

(1) Aeronautical weather conditions
(2) Improvement of Road Network
(3) Plans of new airport construction
(4) Hub and spoke system
(5) Airway network under IFR operations

1.5.2 Airway Structure

In view of increased air traffic volume in the future, aircraft operations under IFR should be introduced in Nepal along with necessary facilities in order to ensure the punctuality of scheduled flights and to improve the safety of flight operations.

Fig. 1.5.1 shows the result of a study of the airway network which researched the effects in the case that IFR operations are introduced on a national scale in Nepal.

In this study, VOR airways which run east and west in the Terai area have been planned as the trunk line in Nepal, and flights to mountain airports can be made by use of the VOR/DMEs which are to be installed in the Terai area.

The priority of installation of new VOR/DMEs depends on air traffic demand and air traffic volume on each route segment.

1.5.3 The Air Transport Network in the Future

The future air transportation network will be structured as is presented in Fig. 1.5.2. Passenger demand estimated by route is also shown by the number of weekly flights.

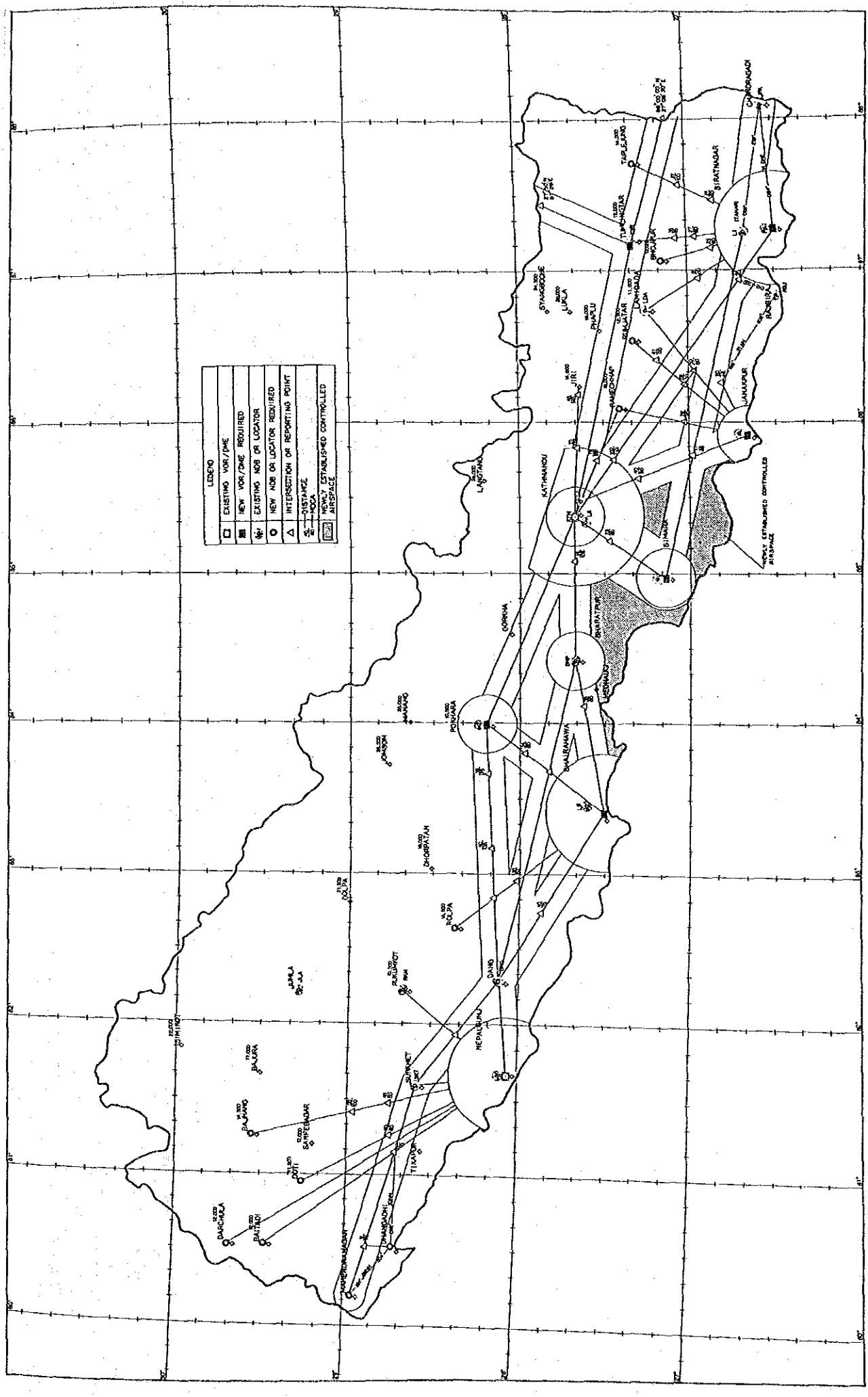


Fig. 1.5.1 Proposed VOR Airway in Nepal

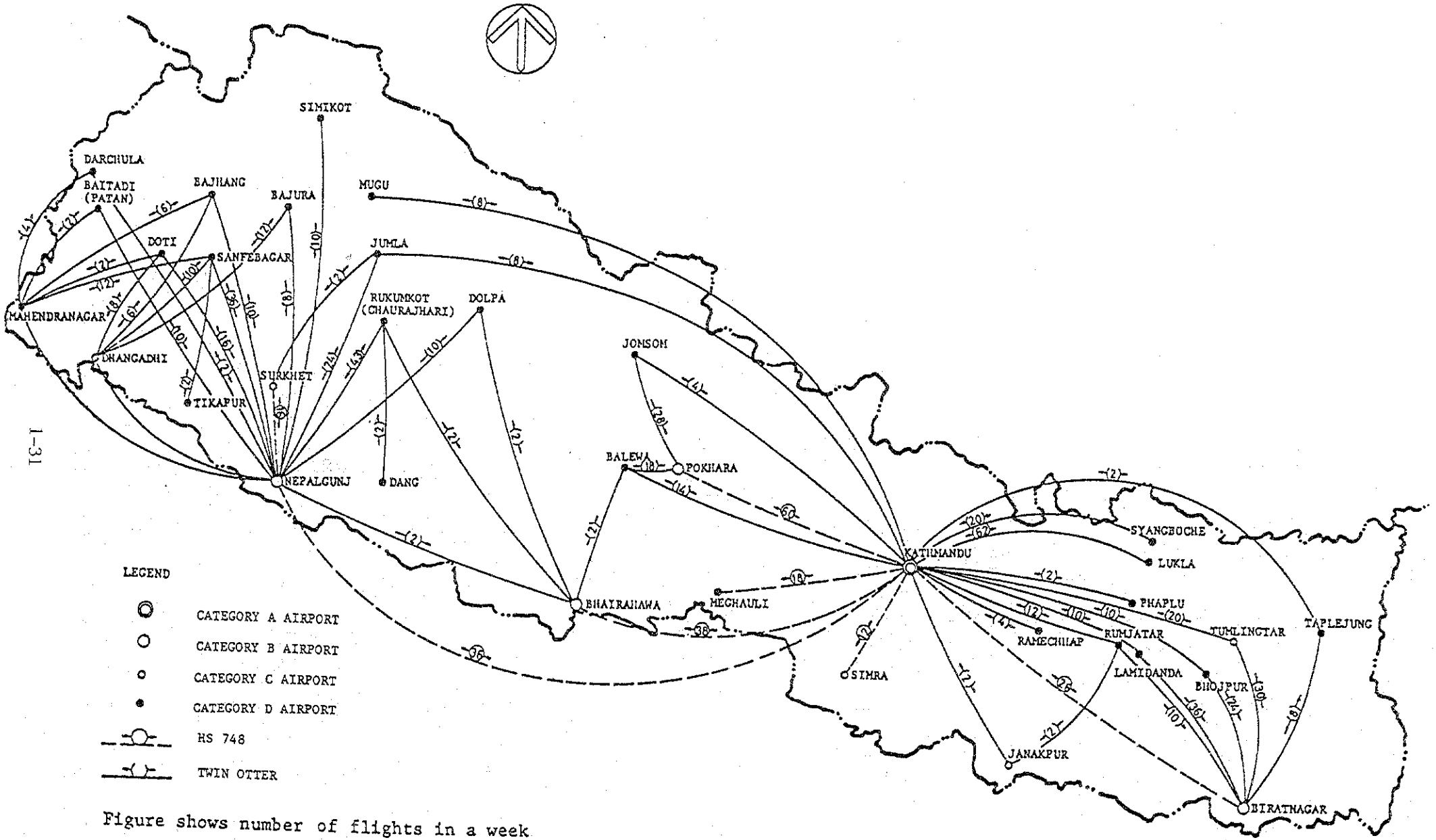


Fig.1.5.2 Future Air Transport Network in 2010

1.6 Classification of Airports and Necessary Facilities

1.6.1 Classification of Airports

The classification applied to airports in this study indicates the target level of facilities to be developed. Because each airport has a unique role to play, operating restrictions and the type of aircraft to be served at each airport have to be decided first. Table 1.6.1 indicates the primary components of each category.

It is recommended that airports be classified into four categories of Cat-A to D as shown below, according to the factors shown in the above table.

Cat-A: International Airport for Large Jet Aircraft
B: Domestic Major Airports for HS-748 class
C: Airports in Terai Region for DHC-6 class
D: STOL Airports in Hill Region and High Himalayas for DHC-6 class (and PC-6 at present)

Table 1.6.1 Classification of Airports

<table>
<tr><th colspan="5">Role of Airport</th><th>Location</th><th>Restriction on Operation</th><th>Operated Aircraft</th><th>Cate -gory</th></tr>
<tr><td>Inter-national</td><td rowspan="2">Center of local administ-ration</td><td rowspan="2">Center of tourism development</td><td rowspan="2">Hub</td><td rowspan="3">Large demand</td><td>Hill</td><td rowspan="3">Nil or Little</td><td>DC-10 class</td><td>A</td></tr>
<tr><td rowspan="3">Domestic</td><td rowspan="2">Terai</td><td>HS-748 class</td><td>B</td></tr>
<tr><td rowspan="2">Tourism spot</td><td rowspan="2">Spoke</td><td rowspan="2">DHC-6 class</td><td>C</td></tr>
<tr><td>Public welfare</td><td>Small demand</td><td>Hill and High Himalaya</td><td>STOL approach</td><td>D</td></tr>
</table>

1.6.2 Determination on Necessary Related Facilities for Each Category

(1) Civil and Architectural Facilities

The basic facilities and other facilities required for each category are summarized as shown in Table 1.6.2.

Table 1.6.2 Necessary Facilities by Classification of Airport

o: necessary facility

Facility	Classification of Airport A	B	C	D
Runway	See Table 1.6.3			
Runway strip	o	o	o	o
Taxiway	o	o	o	o
Apron	o	o	o	o
Passenger Terminal Bldg.	o	o	o	o
Cargo Building	o	o	-	-
Hangar	o	o	-	-
Control Tower	o	o	o	o
Police Quarter	o	o	o	o
Staff Quarter	o	o	o	o
Guard House	o	o	o	o
Fire Station	o	o	o	-
Water Supply System	o	o	o	o
Drainage, Sewerage Disposal, etc.	o	o	o	o

If the runway length is less than the required length and extension is not practical, the following should be provided:

- surfacing of runway,
- take-off runway extension
- high speed turn off

Regarding the design criteria of necessary facilities, the following regulations are recommended:

Cat-A and B . . . ICAO standard, Annex 14
Cat-C . . . . . ICAO Stolport Manual
Cat-D . . . . . Altiport Recommendations

In addition to these regulations, aircraft operational safety should be carefully considered. The runway width for Cat-D airport should be 18 m according to the above regulations, but should be designed to be 30 m where strong cross wind is expected.

Table 1.6.3 Runway Requirement

Category	Cat-B		Cat-C	
Existing Runway	Paved	Un-paved	Paved	Un-paved
Target (Preference)		○ Paving		●
(Future)				○ Paving

Category	Cat-D			
Existing Runway	Sufficient Length		Insufficient Length	
	Paved	Un-paved	Extendable	Un-extendable
Target (Preference)		●	◎ Extension Paving	◎ Paving
(Future)		○ Paving		

● to be paved,when traffic is heavy

◎ to be paved urgently

(2) Air Navigation Systems

The operational requirements for each classified category of airport have been established considering the purpose, utilization, and development level of each category airport.

Cat-A: Precision approach category-I
Cat-B: Instrument, non-precision
Cat-C: Non-instrument or instrurment, non precision
Cat-D: Non-instrument

1.7 Recommendation of Operational Improvement, Institutional Requirements and Management

1.7.1 Recommendations by the JICA Study Team

(1) Reform of Organization Structure of DCA

The JICA Study Team agrees in principle IDS's draft for reform of organization structure of DCA which contains the following:

a) New establishment of DDG

b) New establishment of OPP

c) Intensive management of construction projects and airway engineering function

d) Delegation of Authority

(2) Provision of Rules

DCA should be put the CARs through the proper procedure for the following items:

a) Operations of Aircraft

b) Aerodrome and Air Navigation Aid

c) Aeronautical Light

d) Air Transport Business including scheduled air transport business, non-scheduled air transport business and aircraft using business

e) Foreign Aircraft

(3) Job description should be incorporated into an organization act through the regular procedures.

(4) Compilation of Standard Operating Procedure (SOP)

To maintain and promote the safety of aircraft operations, DCA should compile Standard Operating Procedures (SOP).

(5) Modernization of Office Management

The JICA Study Team advises that by the introduction of computer system in DCA, office management procedures such as filing, documentation, calculation, done smoothly and correctly.

(6) The job description for each section should be cleared, thence DCA should request the additional personnel to accomplish the job described for each section.

1.8 Selection of Key Airports for Master Planning

1.8.1 Selection of Key Airports

As stated in "Evaluation of Existing Airports and Related Facilities" in Section 1.3, Tribhuvan International Airport and New Pokhara Airport should be selected as airports to be developed in the master plan because of their importance and the shortcomings in their existing facilities.

Key STOL airports to be developed are identified through the comparative study as shown in Table 1.8.1 considering the safety factors such as the necessary runway length and condition, the role of the airport, and traffic volume.

The main reasons for selecting each airport are summarized as follows:

Jomsom and Simikot Airports	: Short runways (to be extended)
Dolpa Airport	: Short runway (high speed turn off to be constructed)
Lukla and Sanfebagar Airports	: High traffic volume
Jumla Airport	: Zonal Headquaters
Phaplu, Syangboche and Mugu Airports	: Enhancement of tourism and DCA recommendation

1.8.2 Nationwide Navaids and Telecommunications Network

As for other air navigation systems, a nationwide telecommunications network and en-route (airway) navigational aids network should also be considered.

En-route navigational aids which will commonly be used for terminal navigational aids should be developed in order to compose IFR airways and ensure safety and efficiency of civil air tranport.

A nationwide telecommunications network for international and domestic AFTN and ATS direct speech circuits should be developed in order to solve the problems with current communications and expedite air traffic services.

Table 1.8.1 Selection of Key Airports for Master Planning

Name of Airport	Runway: * Required Ext. length: Paved	Runway: * Required Ext. length: Firm dry sod	Runway: Possibility of extension	Runway: Soft & slippery when wet	One way operation	Operational status	Role of airport: Basic Human Needs	Role of airport: Tourism	Traffic volume: 1986/87	Traffic volume: 2000	Possibility of paving due to frost	Non road connected	ADB Ext./paving recommendation	Airport recommended by DCA for special emphasis	JICA Study Team recommendation	Remarks
	(m)	(m)							(x1000)	(x1000)						
Dolpa	75	130		X soft	one way X	X critical	X		2.9	5.7	X possible	Non-Road X	E ○P		P.O ○	High speed turn off is required
Doti	10	60	X possible	—	X	—	ZH		10.6	11.5	X	—	○E			
Jomsom	110	170	X	X	—	X	X	X	7.9	13.5	△	X	E ○P	○	E.P.O ●	Protection works for river erosion are required
Jumla	0	30	X	—	X	—	ZH X	X	9.2	15.1	△	X	○P	○	P ○	
Lukla	0	0		—	X	X	X	X	14.3	24.2	X	X	○P	○	P.O ○	Additional apron is needed
Phaplu	0	0		—	X	X	X	X	0.8	1.4	X	X	—	○		PC-6 serves
Rolpa	0	40		—	X	—			0.2	0.3	X	—	Close 1992/94			
Rukumkot	0	20	X	—	—	—	X		10.0	18.7	X	X	○E			Drainage works are needed
Sanfebagar	20	60	X	X	X	—	X		14.8	27.1	X	X	Close 1991/93		P.O ○	Protection works for river erosion are required
Simikot	105	160	X	X	X	X	X		2.9	5.4	Diffi-cult	X	E ○P	○	E.P.O ●	Apron should be constructed
Syangboche	—	550**	X		X	—	X	X	0	8.3	X	X	—	○		DCA has a plan to expand for DHC-6
Mugu	460	550	X	Presently under construction	X	—	X	X	0	2.1	△	X	—	○		DCA has a plan to construct for DHC-6

* Length is estimated by take off distance. But this length is less than ASD (Accelerate Stop Distance).

**Refer to F/S Report by DCA, 1986

○ : Key airport to be developed

● : Key airport to be developed immediately

△ : Detailed Survey Required

ZH : Zonal Headquarters

X : Applicable to each item

E : Extension

P : Paving

O : Other work