Civil Aviation Authority of Nepal
Federal Democratic Republic of Nepal

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF
AVIATION SAFETY FACILITIES IN
MAJOR AIRPORTS
IN
THE FEDERAL DEMOCRATIC REPUBLIC OF NEPAL

May 2016

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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AVIATION SYSTEMS CONSULTANTS CO., LTD.
ORIENTAL CONSULTANTS GLOBAL CO., LTD.

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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to a joint venture consist of ADAMIS Ltd., Aviation Systems Consultants Co., Ltd. and Oriental Consultants Global Co., Ltd..

The survey team held a series of discussions with the officials concerned of the Government of Nepal, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Nepal for their close cooperation extended to the survey team.

May, 2016

Akira Nakamura
Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Summary

1. General Information of Nepal

Federal Democratic Republic of Nepal (hereinafter referred to as "Nepal") is a landlocked country of about 147,000km^2, surrounded by India on the east, south and west and Tibet Autonomous Region of China on the north, and has a population of more than 26 million. Development of land transport network is difficult due to the rugged mountains and numbers of rivers flow from these mountains, and air transport plays important roles in transportation of goods, stability of the nation and foreign currency earnings through tourism development. Nominal Gross Domestic Products (GDP) in Fiscal Year 2014/2015 was US$ 21.35 billion, and GDP per capita was US$ 762. The GDP growth rate was 3.4%, i.e. at a low level among the Southwest Asian countries, and Nepal is categorized as the Least Developed Country.

2. Background, History and Summary of the Project

Tribhuvan International Airport (TIA), the sole international airport of the nation, does not have precision approach procedures using an Instrument Landing System, (ILS) which is quite common for the international airports, due to the high mountains around the airport. Among the 30 domestic airports, only four airports are equipped with VHF Omnidirectional Range/Distance Measuring Equipment (VOR/DME), and three airports are equipped with Non- Directional Beacon (NDB). Other 23 airports have no radio navigational equipment, and aircraft are operated under the Visual Flight Rules (VFR). Therefore, operations are hindered under bad weather conditions.

Aeronautical lighting systems are installed at 12 airports including TIA, but six of these airports have Precision Approach Path Indicators (PAPI) only and another airport has PAPI and Visual Alignment Guidance System (VAGS) only. Since visual recognition of the runway is one of the prerequisites for aircraft operations at the airports in mountainous areas, needs of lighting system, which facilitates recognition of the runway in case of sudden weather change, are very high.

Under such circumstances, the Government of Nepal requested procuring and installing ILS at TIA, VOR/DME at Chandragadhi, Tumlingtar, Janakpur and Dhangadhi Airports, Runway Lighting System and Solar Power Supply System at Lukla, Jomsom, Jumla, Rara and Simikot Airports, Radar Controller Training Simulator, Radar Maintenance Training Equipment and ILS Maintenance Training Equipment at Civil Aviation Academy at Sanothimi, VHF Remote Control Air to Ground Communication System at 3 locations and Flight Procedure Design System at CAAN Head Office.

3. Outline of the Study and Contents of the Project

In response to a request from the Government of Nepal, Japan International Cooperation Agency (JICA) dispatched a Preparatory Survey Team (hereinafter referred to as "JICA Survey Team") from 04 April to 08 May and from 27 September to 10 October 2015. The JICA Survey Team held a series of discussions with CAAN, confirmed contents of the request, conducted site surveys, confirmed operation and maintenance systems, and studied obligations of Nepalese side. The JICA Survey Team produced an outline designs in Japan, explained major changes to CAAN from 06 to 11 December 2015, and prepared a Draft Preparatory Survey Report. JICA dispatched the JICA Survey Team from 27 February to 5 March 2016, and explained a Draft Preparatory Survey Report to CAAN. After the explanation, CAAN agreed in principle to contents of the report. There were changes of the Project components from the original request from the Government of Nepal on 14 July 2014 as listed below.

- Instrument Landing System (ILS) was changed to Localizer (LOC) because ILS would be less cost effective than LOC only, and introduction of ILS would require high-level technical capacity for safety assessment, etc.

- Four sets of VOR/DMEs were increased to two sets because CAAN withdrew the request for Tumlingtar and Janakpur.
- TOR/DME Test Rack was added because it would be needed for maintaining VOR/ DME for a longer period.
- Four sets of Abbreviated Precision Approach Path Indicators were excluded from the Project because CAAN withdrew the request.
- One set of Runway Threshold/End Lights were increased to five sets because they were necessary for improving visibility of threshold and end of the runway at Jomsom and Jumla Airports.
- For sets of Runway Threshold Identification Lights were added because they were necessary for providing additional threshold conspicuity at Jomsom and Jumla Airports.
- Three sets of VHF Remote Control Air-to- Ground Communication Systems were excluded from the Project because CAAN withdrew the request.
- Five sets of Solar Power Supply Systems were increased to six sets because one set each would be required for Tower and Terminal Building at Lukla Airport.

List of Equipment

Equipment Name	Location and Purpose	Q'ty
Localizer/Terminal Distance Measuring Equipment	Trhibuvan International Airport To be used for more precise approach of the aircraft landing on the runway from the south	1 set
Localizer Maintenance Training Equipment	Sanothimi Civil Aviation Academy To be used for training of Localizer maintenance staff	1 set
VHF Omnidirectional Range/Distance Measuring Equipment	Chandragadhi and Dhangadhi Airports To be used for establishing air routes, Standard Terminal Approach, Instrument Approach Procedures and Standard Instrument Departure	2 sets
VOR/DME Test Rack	Office of Com. & Nav Aid Department, Navigation Aid Maintenance Section at Sinamangal To be used for testing spare parts of the VOR/DME	1 set
Radar Maintenance Training equipment	Sanothimi Civil Aviation Academy To be used for training of radar maintenance staff	1 set
Radar Controller Training Simulator	Sanothimi Civil Aviation Academy To be used for training of air traffic controller of approach and area control operations	1 set
Runway Lighting System	Lukla, Jomsom and Jumla Airports To be used for increasing conspicuity of outline, threshold and end of the runway	3 set
Flight Procedure Design System	CAAN Head Office To be used for design of various flight procedures based on conventional procedures and RNAV procedures/satellite-based procedures	1 set
Solar Power Supply System	Lukla, Jomsom, Jumla Rara and Simikot Airports To be used for providing electric power required for stable airport operations by using solar energy	6 sets

4. Implementation Schedule and Cost of the Project

Duration of the Project implementation is to be 4.5 months for the detailed design and 18 months for the equipment procurement. The Nepalese portion of the Project cost is estimated to be 67 million Japanese Yen.

5. Project Evaluation

(1) Relevance

The relevance of implementation of the Project as one of the Japan's Grant Aid projects is judged high for the following reasons:

1) Compatibility with Nepalese National Development Policy

The Government of Nepal identified development of physical infrastructure as one of the strategies to bring down the population living below the poverty line to 18 percent in "Thirteenth Plan (FY 2013/14-2015/16) Approach Paper". The Project can be placed in the priority areas of (i) development of roads and other physical infrastructure and (ii) development of tourism, industries and trade sector.

2) Compatibility with Japanese ODA Policy

The Japanese "Country Assistance Policy for Nepal" (April 2012) sets "Building social infrastructure and institutions for balanced and sustainable economic growth" as one of the priority areas, and states "In order to directly improve the living standard of people, Japan supports the building of social infrastructure and institutions relating to transportation, with due attention to the environment and disaster prevention." The Project is in line with this policy. Furthermore, it includes radar maintenance training equipment and radar controller training simulator as the project components, which supplements ongoing "Tribhuvan International Airport Modernization Project (Surveillance System)" and "The Project for the Development of a Spare Parts Management Center and En-route Radar Control Services"

(2) Effectiveness

The following Outputs are expected to be achieved by the Project, and the effectiveness of implementation of the Project as one of the Japan's Grant Aid is expected to be high for achievement of the Project Purpose.

1) Quantitative Effect

Indicator	Baseline (Year 2014)	Target (Year 2021)
Number of flights that can land with precise approach by using LOC at Tribhuvan International Airport (Number/Year)	0	27,000
Percentage of domestic flights that can fly to destination airports by using VOR/DME	48.5%	51.2%
Runway Usability Factor for jet aircraft at Tribhuvan International Airport	89%	95.5%

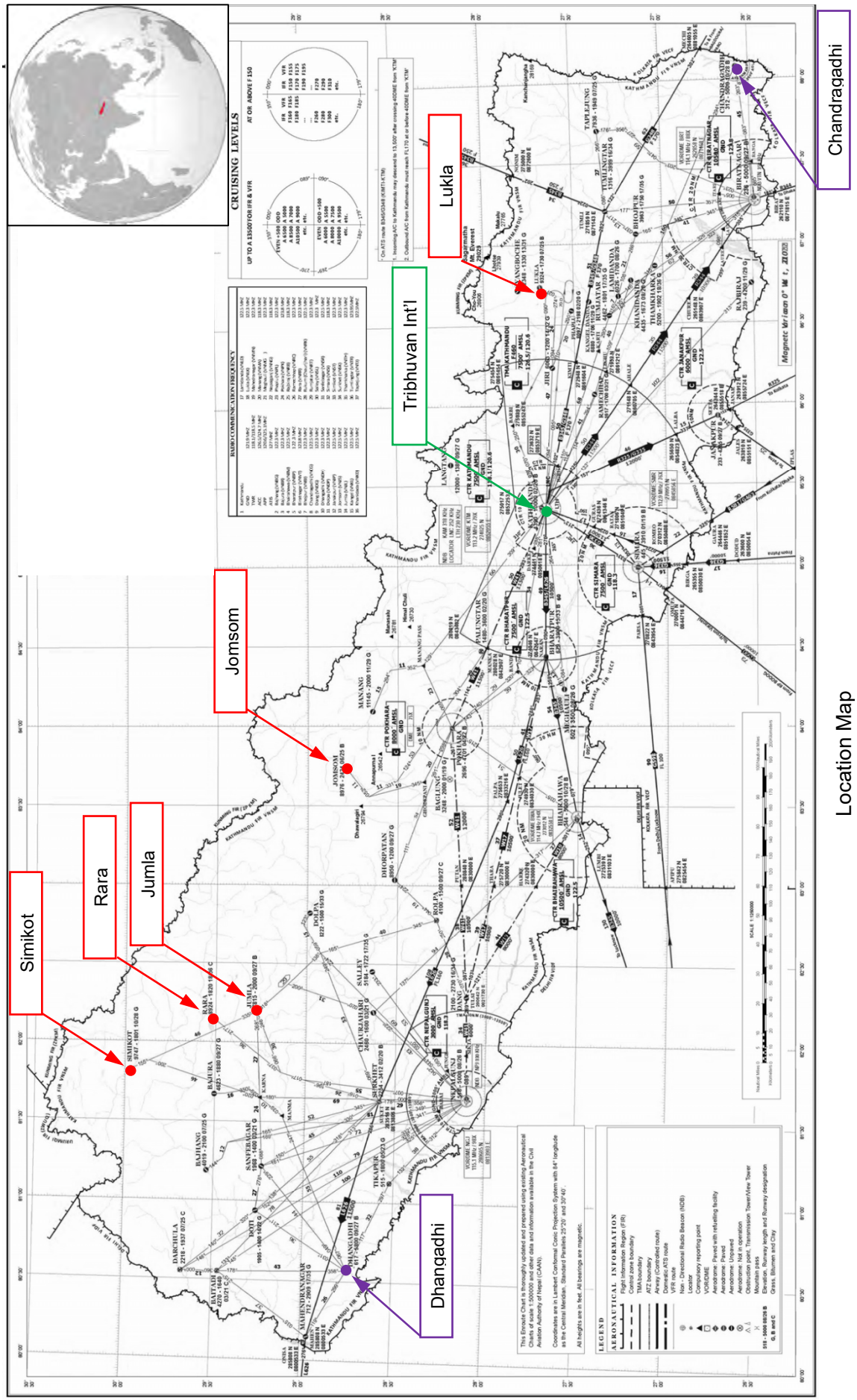
2) Qualitative Effect

- Enhancing safety of aircraft operations at eight target airports through improvement of aviation safety facilities, equipment and power supply system
- Enabling sustainable operation and maintenance of Monopulse Secondary Surveillance Radar

(MSSR)

- Enabling sustainable training for new radar air traffic controllers of CAAN
- Creating an environment to improve efficiency and advancement of flight procedure design services by CAAN

Contents



Location Map

List of Figures and Tables

Abbreviations

ACC	Area Control Center
ADB	Asian Development Bank
AP	Affected Person
APP	Approach / Approach Control
ATM	Air Traffic Management
CAA	Civil Aviation Academy
CAAN	Civil Aviation Authority of Nepal
CAT	Category
CDC	Compensation Determination Committee
CDO	Chief District Officer
CMV	Converted Meteorological Visibility
COTS	Commercial Off-The-Shelf
DAC	Development Assistance Committee
DME	Distance Measuring Equipment
DVOR	Doppler VHF Omnidirectional Range
EIA	Environmental Impact Assessment
FAF	Final Approach Fix
GP	Glide Path
GRC	Grievance Redress Committee
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICAO	International Civil Aviation Organization
IEE	Initial Environmental Evaluation
IF	Intermediate Approach Fix
ILS	Instrument Landing System
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
KIAS	Knot Indicated Air Speed
LAN	Local Area Network
LED	Light Emitting Diode
LOC	Localizer
MAPt	Missed Approach Point
MDA/H	Minimum Descending Altitude/Height
MOC	Minimum Obstacle Clearance
MSSR	Mono-pulls Secondary Surveillance System
NGO	Non-Governmental Organization
NPR	Nepal Rupee
OECD	Organization for Economic Co-operation and Development
PANS-OPS	Procedures for Air Navigation Services-Aircraft Operations
PBN	Performance Based Navigation
PD	Project Director
PMU	Project Management Unit
PV	Photovoltaic
RVR	Runway Visual Range

RWY	Runway
SDS	Social Development Specialist
S.L.C.	School Leaving Certification
SS	Suspended Solids
T-DME	Terminal - Distance Measuring Equipment
TIA	Tribhuvan International Airport
TSP	Total Suspended Particle
VAGS	Visual Alignment Guidance System
VHF	Very High Frequency
VIS	Visibility
VOR	VHF Omnidirectional Range

CHAPTER 1 BACKGROUND OF THE PROJECT

1) Background of the Project

Civil Aviation Authority of Nepal (CAAN) operates Tribhuvan International Airport (TIA), the sole international airport of the nation, and 30 domestic airports in the Federal Democratic Republic of Nepal (hereinafter referred to as "Nepal"). Number of air passengers at TIA has been increasing rapidly. However, TIA does not have precision approach procedures using an Instrument Landing System (ILS), which is quite common for the international airports, due to the high mountains around the airport. Among the 30 domestic airports, only four airports are equipped with VHF Omnidirectional Range/Distance Measuring Equipment (VOR/DME), and three airports are equipped with Non- Directional Beacon (NDB). Other 23 airports have no radio navigational equipment, and aircraft are operated under the Visual Flight Rules (VFR). Therefore, operations are hindered under bad weather conditions.

Aeronautical lighting systems are installed at 12 airports including TIA, but six of these airports have Precision Approach Path Indicators (PAPI) only and another airport has PAPI and Visual Alignment Guidance System (VAGS) only. Since visual recognition of the runway is one of the prerequisites for aircraft operations at the airports in mountainous areas, needs of lighting system, which facilitates recognition of the runway in case of sudden weather change, are very high.

Under such circumstances, the Project for Improvement of Aviation Safety Facilities in Major Airports (the Project) aimed at procuring and installing Localizer (LOC)/Terminal Distance Measuring Equipment (T-DME) at TIA, VOR/DME at Chandragadhi and Dhangadhi Airports, Runway Lighting System at Lukla, Jomsom and Jumla Airports, Solar Power Supply System at Lukla, Jomsom, Jumla, Rara and Simikot Airports, Radar Controller Training Simulator, Radar Maintenance Training Equipment and ILS Maintenance Training Equipment at Civil Aviation Academy at Sanothimi, VOR/DME Test Rack at Office of Com. & Nav Aid Department, Navigation Aid Maintenance Section at Sinamangal and Flight Procedure Design System at CAAN Head Office.

The Project is expected (i) to increase number of flights that can land with precise approach by using LOC at TIA, (ii) increase percentage of flights that can fly to destination airports by using VOR/DME, and (iii) to improve runway usability factor for jet aircraft at TIA. Furthermore, it is expected, to improve safety of aircraft operations through enhancement of aviation safety facilities and (v) to carry out continuously the operation and maintenance of aviation safety equipment.

2) Environmental and Social Considerations

(1) Environmental Impact Assessment

Land acquisition for installation of VOR/DME equipment is required near Chandragadhi Airport and Dhangadhi Airport. Initial Environmental Evaluation (IEE) and Environmental Impact Assessment (EIA) are not required for installation of air navigation facilities outside of the existing airports under the Environment Protection Rules (EPR) 1997. However, the Project is categorized into environment category B as per the "Japan International Corporation Agency (JICA) Guidelines for Environmental and Social Considerations (Translation of Japanese Version) April 2010" (hereinafter referred to as JICA Guidelines), and requires an IEE to determine the nature and extent of impact from implementation of the Project. Therefore, an IEE was carried out in this preparatory survey in accordance with JICA Guidelines. The result of IEE is shown in Table 1-1, and "Environmental Checklist: 9. Airport" of the JICA Guidelines is shown in Appendix 1.

Table 1-1 IEE Result

No.	Impacts	Rating of IEE		Description of the Rating
		Cnst. *1	Ops. *2	
1. Pollution				
1.1	Air pollution	B-	D	**Construction Phase:** Negative impacts were foreseen on air pollution and dust due to work of the construction equipment. However, the impacts will be limited locally and temporarily since large-scale construction works are not included. **Operation Phase:** Negative impacts are not foreseen
1.2	Water pollution	B-	D	**Construction Phase:** Negative impacts were foreseen on water pollution due to temporary water pollution by concrete works, civil works. However, the impacts will be limited locally and temporarily since large-scale construction works are not included. **Operation Phase:** Negative impacts are not foreseen.
1.3	Waste	B-	D	**Construction Phase:** Negative impacts were foreseen on waste due to building waste materials by concrete works, civil works. The activities on construction stage potentially will decrease environment sanitation quality and it will secondarily have negative impact to public health. However, the impacts are limited locally and temporarily since large-scale construction works are not included. **Operation Phase:** Negative impacts are not foreseen.
1.4	Soil Contamination	B-	D	**Construction Phase:** Negative impacts were foreseen on soil contamination by fuel outflow from construction equipment. However, the impacts are limited locally and temporarily since large-scale construction works are not included. **Operation Phase:** Negative impacts are not foreseen.
1.5	Noise and vibration	B-	D	**Construction Phase:** Negative impacts were foreseen on noise pollution due to work of construction equipment. However, the impacts are limited locally and temporarily since large-scale construction works are not included. **Operation Phase:** Negative impacts are not foreseen.
1.6	Ground subsidence	D	D	Negative impacts were not foreseen.
1.7	Odor	B-	D	**Construction Phase:** Negative impacts were foreseen on odor due to water pollution by concrete works and civil works. However, the impacts are limited locally and temporarily since large-scale construction works are not included. **Operation Phase:** Negative impacts are not foreseen.
1.8	Sediment quality	D	D	Negative impacts were not foreseen.
2. Natural environment				
2.1	Protected area	D	D	The project site and the surrounding area were not designated as national park and protected area.
2.2	Ecosystem	D	D	Negative impacts were not foreseen.
2.3	Hydrology	D	D	Negative impacts were not foreseen.
2.4	Topography and geology	D	D	Negative impacts were not foreseen.
3. Social environment				
3.1	Involuntary resettlement	B-	D	Involuntary resettlement was not foreseen. However, land acquisition will be required.
3.2	The poor	D	D	Negative impacts were not foreseen. Although there was a possibility of impact on this matter accompanied by land acquisition, Socio-Economic Survey proved that vulnerable groups were not included in the affected persons at the proposed sites.
3.3	Indigenous and ethnic people	D	D	Negative impacts were not foreseen.

3.4	Local economy such as employment and livelihood	B+	D	**Construction Phase:** Positive impacts specified for local employment creation were expected. **Operation Phase:** Negative impacts were not foreseen.
3.5	Land use and utilization of local resources	D	D	Negative impacts were not foreseen.
3.6	Water usage	D	D	Negative impacts were not foreseen.
3.7	Existing social infrastructures and services	D	D	**Construction Phase:** Negative impacts were not foreseen. Although increase of traffic volume during the construction work was foreseen, traffic congestion was not foreseen in consideration of the current traffic condition. **Operation Phase:** Negative impacts are not foreseen.
3.8	Social institutions such as social infrastructure and local decision making institutions	D	D	Negative impacts were not foreseen.
3.9	Misdistribution of benefit and damage	D	D	Negative impacts were not foreseen.
3.10	Local conflict of interests	D	D	Negative impacts were not foreseen.
3.11	Cultural heritage	D	D	There was no cultural heritage in the project site and the surrounding area.
3.12	Landscape	D	D	Negative impacts were not foreseen.
3.13	Gender	D	D	Negative impacts were not foreseen.
3.14	Right of children	D	D	Negative impacts were not foreseen.
3.15	Infectious diseases such as HIV/AIDS	B-	D	**Construction Phase:** Increase of risk of spreading infectious diseases was foreseen due to inflow of construction workers into the local community. **Operation Phase:** Negative impacts were not foreseen since any permanent officer at site is not required for the operation.
3.16	Labor environment (including work safety)	B-	D	**Construction Phase:** There would be possibilities to increase risk of accidents, diseases, etc. if construction work environment was inappropriate. **Operation Phase:** Negative impacts were not foreseen since any permanent officer at site is not required for the operation.
4. Others				
4.1	Accidents	B-	D	**Construction Phase:** There would be possibilities of traffic accidents by construction vehicles in the surrounding area. **Operation Phase:** Negative impacts were not foreseen since any permanent officer at site is not required for the operation.
4.2	Cross boundary impacts and climate change	D	D	**Construction Phase:** Cross boundary impacts and climate change were not foreseen since the construction works are limited within the small area. **Operation Phase:** Negative impacts were not foreseen.

*1 Construction Phase, *2 Operation Phase

Rating A+/-: Significant positive/negative impact is foreseen.
B+/-: Positive/negative impact is foreseen to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is foreseen.

Source: JICA Survey Team

(2) Land Acquisition

a) Necessity of Land Acquisition

Land acquisition for installation of VOR/DME equipment is required near Chandragadhi Airport and

Dhangadhi Airport although resettlement is not required by devising the selection of the proposed site.

b) Legal Framework for Land Acquisition and Resettlement

The key national policies and legal framework on land acquisition and compensation are shown as follows.

i) Applicable Legal and Policy Framework of the Government of Nepal

Legal provisions on land acquisition and resettlement in Nepal are shown in the following table.
Nepal lacks a comprehensive policy on Involuntary Resettlement (IR). However, there are many acts, rules and regulations governing land acquisition.

Table 1-2 Legal Provisions on Land Acquisition and Resettlement

SN	Titles
1	Interim Constitution of Nepal, 2007
2	Land Reform Act,1964
3	Land Revenue Act,1977
4	Land Administration and Revenue Act, 1977
6	Guthi Corporation Act, 1976
7	Land Acquisition Act, 1977 and its subsequent amendment in 1993

* Based on Resettlement Planning Document of upgrading Gautam Buddha Airport (GBA)

Source: JICA Survey Team

Land Administration and Revenue Act, 1977 is the main Act to carry out land administration including maintenance and updating records, collecting land revenue and settling disputes after completion of survey and handing over of the records to Land Revenue Office (LRO) by Survey Parties. It authorizes the LRO to take responsibility for registration, ownership transfer and deed transfer of land. This Act also authorizes LRO to transfer ownership/deeds of individual land, if any person applies for ownership transfer of his/her land.

Land Acquisition Act, 1977 Specifies procedures of land acquisition and compensation. The Act empowers the Government to acquire any land, on the payment of compensation, for public purposes or for the operation of any development project initiated by government institutions. There is a provision of Compensation Determination Committee chaired by Chief District Officer to determine compensation rates for affected properties. The Act also includes a provision for acquisition of land through negotiations. It states in Clause 27 "not-withstanding anything contained elsewhere in this Act, the Government may acquire any land for any purpose through negotiations with the concerned land owner. It shall not be necessary to comply with the procedure laid down in this act when acquiring land through negotiations."

ii) JICA's Involuntary Resettlement Policy

The principles of JICA policies on involuntary resettlement are summarized below.

I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
II. When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.
III. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.

IV. Compensation must be based on the full replacement cost[1] as much as possible.
V. Compensation and other kinds of assistance must be provided prior to displacement.
VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.
VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principles are complemented by World Bank Operational Manual OP 4.12, since it is stated in JICA Guideline that "JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies". Additional key principle based on World Bank OP 4.12 is as follows.

X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.
XI. Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.
XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
XIII. Provide support for the transition period (between displacement and livelihood restoration.
XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.
XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.

[1] Description of "replacement cost" is as follows.

Type	Application	Description
Land	Agricultural Land	The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
	Land in Urban Areas	The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Structure	Houses and Other Structures	The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes.

Source: JICA Guidelines

iii) Comparison of Compensation Policy between and GON and JICA

The following table compares gaps between national legal framework and JICA's requirements and delineates the measures to fill the gaps.

Table 1-3 Gaps between GON and JICA Compensation Policy

Key Issue	JICA Guideline (World Bank O.P.4.12)	Government Laws	Gap between JICA and GON	Recommended Policy on the Project
Compensation Principle	All the compensation is based on the principle of replacement cost.	Compensation rate will be determined by CDC. The Land Acquisition Act 1977, also mention the need of considering periodic circulations issued by the GON while fixing compensation for the affected assets.	Compensation rate is determined by CDC regardless of the principle of replacement cost.	Compensation rate shall be determined by CDC based on the government laws in consideration of the principle of replacement cost based on JICA guideline.
Compensation for Non-titleholders	Squatters/ vulnerable encroachers/non- title holders are entitled to the payment for affected structures/ houses/ business/ crops, trees, and other assistance.	Do not consider squatters/ encroachers/ non-titled land users for compensation.	Compensation for non-titleholders is not considered in the government law.	Not necessary. (Since non-titleholders are not included in the APs.)
Relocation Assistance	All the eligible APs including tenants, employees are entitled to receive financial assistance to cover physical and economical displacement.	Land Acquisition Act provisions to consider extent of losses caused due to relocation/ shifting of Displaced people, while fixing the compensation rate.	No difference significantly	Not necessary. (Since resettlement is not required.)
Income Restoration	Income restoration program such as training and other measures to restore and improve the standard of living of the displaced households of those having more than 10 % of the total landholdings and income.	Land Acquisition Act 1977, do not consider for income restoration.	Income restoration program such as training and other measures to restore and improve the standard of living of the displaced households is not considered in the government law.	Not necessary. (Since resettlement is not required.)
Grievance Procedures	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	Provisions of the CDC.	No difference significantly	To be carried out based on the government laws and JICA guideline.
Compensation payment timing	Compensation and other kinds of assistance must be provided prior to displacement.	Provisions that compensation for land is paid after determination of rates and verification of the list of entitled applicants by the CFC.	No difference significantly	To be carried out based on the government laws and JICA guideline.

* CDC: Compensation Determination Committee, CFC: Compensation Fixation Committee,

Source: JICA Survey Team

c) Scale and Range of Land Acquisition and Resettlement

The results of Census, Inventory of Loss Survey and Social Economic Survey at the proposed site for installation of VOR/DME are shown as below. Vulnerable Groups are not found in every proposed

area.

Table 1-4 Number of Project Affected Units and Affected Persons

Type of loss	No of Project Affected Units			No of Affected Persons		
	legal	Illegal	Total	legal	Illegal	Total
Required for displacement						
1 HH (Structure owner on Gov. land)	0	0	0	0	0	0
2 HH (Structure on Private land)	0	0	0	0	0	0
3 HH (Tenants)	0	0	0	0	0	0
4 CBEs (Structure owner on Gov. land)	0	0	0	0	0	0
5 CBEs (Structure on Private land)	0	0	0	0	0	0
6 CBEs (Tenants)	0	0	0	0	0	0
7 Community owned structures including physical cultural resources	0	0	0	0	0	0
Not Required for displacement						
8 Land owners	3		3	31		31
Chandragadhi *1	2		2	26		26
Dhangadhi *2	1		1	5		5
9 Wage earners	3		3	0		0
Chandragadhi *1	2		2	0		0
Dhangadhi *2	1		1	0		0
Grand Total (1-9)	6		6	31		31

HH: House Hold, CBEs: Commercial and Business Enterprises
*1: As of 30th Apr 2015, *2: As of 6th May 2015

Source: JICA Survey Team

Table 1-5 Land Expected to Be Affected

No.	Location (Village/Sub District)	Land Type	Affected (m2)	Total
1	Chandragadhi	Farm land	5,000	5,000
2	Dhangadhi	Farm land	5,000	5,000
Total				**10,000**

Source: JICA Survey Team

Table 1-6 Affected Households - Chandragadhi

No.	Family Member	Sex	Age	Education	Jobs	Ethnicity	Religion	Income	Remarks
1	Raj Kumar Rai (Land Owner)	M	48	Master	Teacher		Kirat		F1
2	Madan Kumar Rai	M	42	Bachelor	Teacher		Kirat		F1
3	Asha Kumari Rai	F	39	Master			Kirat		F1
4	Ganesh Kumar Rai	M	36	S.L.C.			Kirat		F1
5	Tara Devi Rai	F	42	S.L.C.			Kirat		F1
6	Sabina Rai	F	23	Bachelor			Kirat		F1
7	Santosh Rai	M	17	10th grade	Student		Kirat		F1
8	Sornima Rai	F	14	9th grade	Student		Kirat		F1
9	Adarsha Rai	M	9	2nd grade	Student		Kirat		F1
10	Rimix Rai	M	10	3rd grade	Student		Kirat		F1
11	Rithem Rai	M	3				Kirat		F1
12	Rameshowr Ojha (Land Owner)	M	78				Hindu	NPR100,000	F2
13	Uma Ojha	F	70				Hindu		F2
14	Prakash Ojha	M	52	S.L.C.			Hindu	USD 12,000	F2
15	Peayaj Raj Ojha	M	46	Bachelor			Hindu	NPR200,000	F2
16	Mukti Raj Ojha	M	43	Bachelor			Hindu	USD 12,000	F2
17	Kamela Ojha	F	38	10th grade			Hindu		F2
18	Sobita Ojha	F	38	Master			Hindu	NPR200,000	F2
19	Abdilasha Ojha	F	34	Bachelor			Hindu	USD 12,000	F2
20	Pratik Ojha	M	22	Bachelor	Student		Hindu		F2
21	Pratistha Ojha	F	18	12th grade	Student		Hindu		F2
22	Praraya Ojha	F	16	S.L.C.	Student		Hindu		F2
23	Anuska Ojha	F	16	S.L.C.	Student		Hindu		F2
24	Manaslu Ojha	F	16	S.L.C.	Student		Hindu		F2
25	Sanskriti Ojha	F	14	8th grade	Student		Hindu		F2
26	Siddhanta Ojha	M	11	4th grade	Student		Hindu		F2

Note: S.L.C.: School Leaving Certification

Source: JICA Survey Team

Table 1-7 Affected Households - Dhangadhi

No.	Family Member	Sex	Age	Education	Jobs	Ethnicity	Religion	Income	Remarks
1	Bibek Karki (Land Owner)	M	23	Bachelor	Student		Hindu		F1
2	Chitra Bahadur Karki (Father)	M	53	Bachelor	Business		Hindu	NPR3 mil.	F1
3	Bhirkuti Karki (Mother)	F	42				Hindu		F1
4	Archan Karki (Sister)	F	26		Student		Hindu		F1
5	Chetan Karki (Brother)	M	16	11th grade	Student		Hindu		F1

Source: JICA Survey Team

d) Measures of Compensation and Support

The recommended entitlement matrix by type of loss is show in the following table.

Table 1-8 Recommended Entitlement Matrix

No.	Type of Loss	Application	Entitled Person	Compensation Policy	Implementation Issues	Responsible Agency
1	Loss of land	Agricultural land, or vacant plot	Owner(s) with legal title	• Land-for-land arrangements of equal productive capacity satisfactory to AP • AP option for cash compensation equivalent to replacement cost • Provision of stamp duty, land registration fee, capital gains tax, and value added tax incurred for replacement land • Option to be compensated if remaining land is no longer viable • Provision of access to equivalent common property resources previously accessed	• If land-for-land is offered, title will be to both husband and wife	• Verification of APs by PMU • Government to provide replacement land • Replacement cost at Community Consensus Valuation by Committee headed by CDO • Implementing NGO to consult APs on compensation • EA to provide budget and release cash compensation payments • PMU to determine viability of remaining land
2	Loss of crops and trees	Standing crops and trees	Owner(s) With legal title	• 60 days advance notice to harvest standing seasonal crops, if harvest is not possible, cash compensation for crops (or share of crops) equivalent to prevailing market price • Cash compensation for perennial crops and fruit bearing trees based on annual net market value multiplied by remaining productive years • Cash compensation equivalent to prevailing market price of timber for non-fruit trees	• Work schedule to allow harvesting prior to acquisition and avoid harvest season • Market value to be determined	• Verification of APs by PMU • Replacement cost at Community Consensus Valuation by Committee headed by CDO with assistance from agriculture/horticulture expert

*1: AP: Affected Person, RP: Resettlement Plan, PMU: Project Management Unit, CDO: Chief District Officer, NGO: Non-Governmental Organization, EA: Executing Agency

*2: The entitlement matrix is summarized through landholder meetings by referring to Resettlement Planning Document for upgrading Gautam Buddha Airport (GBA)

Source: JICA Survey Team

e) Grievance Redress Mechanism

It is recommended that a Grievance Redress Committee (GRC) shall be formed to register and hear grievances of the people regarding technical, social and environmental concerns. The GCR shall consist of a representative body of Affected Persons (APs) representatives from the local government, representatives from CAAN in the rank of Airport Manager, etc.

Grievances of APs will first be brought to the attention of field level Social Development Specialist (SDS) of CAAN. Grievances not redressed will be brought to GRC. The Committee will meet every month (if grievances are brought to the Committee), determine merit of each grievance, and resolve grievances within fifteen (15) days of receiving the complaint. Further, grievances not addressed will be referred by APs to the appropriate courts of law. CAAN will keep records of all grievances received including: contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions, dates they got affected and final outcome. APs can call for SDS assistance in presenting their grievances or queries to the GRC.

If the GRC cannot find amicable solution to the grievances, the APs reserve the right to use formal channels as described in Land Acquisition Act, 1977. The Act assigns the Chief District Officer (CDO) as the sole responsibility to chair land acquisition activities and to address grievances related to the Resettlement Plan implementation. Some of the major steps that are supposed to be taken for addressing the grievances are stipulated in the Act. In keeping with the legal provision mentioned in the Act, the basic process of grievances redress undertaken under the subproject will be as follows.

- Decisions should be given within fifteen (15) days after receiving grievances.
- Further processing of grievances or any decision should be taken only after consultation with CDO and also the Project Officer, if deemed necessary; and
- The Ministry of Home Affairs can exercise legal authority as of District Court while investigating such grievances.

f) Institutional Framework

The recommended implementation framework, and role and responsibilities of organizations involved in implementation of the project is shown as fallows.

CAAN, as the Executing Agency, will establish Project Management Unit (PMU) within its organization. The PMU will be responsible for implementation of the overall project under the control of Project Director (PD). PMU designates a full-time officer in-charge of the land acquisition and resettlement operation, who will oversees and manages social considerations. The PMU also will work in close coordination with respective government line agencies and carry out the implementation of Resettlement Plan (RP) such as the compensation policy based on this site survey. The PD will be responsible for coordinating with the Chief District Officer of the subproject district with regard to formation and implementation of Compensation Determination Committee by providing necessary documents and assisting valuation of assets to be compensated.

The Project shall be disclosed entitlement information to the Affected Persons (APs) through social media, mobile public loudspeaker, pamphlets, and consultation meetings in the project area. Executive summary of the RP and entitlement matrix shall be translated into Nepali language and made available to APs. The translated section of RP in Nepali language is available at: (i) CAAN Head Office in Kathmandu, (ii) Office of the Airport Manager where VOR/DME will be installed (iii) Village Development Committee office; (iv) District Administration Office; and (v) PMU. Any person seeking information can obtain a hard copy of the complete RP document at the cost of photocopy from PMU, on a written request and payment for the same to the Project Director. Electronic version of the RP will be placed in the official website of CAAN and the official website of JICA after endorsement of the documents by the Government.

The PMU will conduct information dissemination sessions and focus group discussions with APs and vulnerable groups during project implementation. PMU will organize public meetings to inform the community about compensation payment arrangements. Participation of APs will be further enhanced through their active involvement in the Grievance Redress Committee (GRC). In addition, PMU will maintain continuous interaction with APs to identify problems and undertake appropriate remedial measures.

g) Implementation Schedule

CAAN, following the government requirements, shall initiate the land acquisition process in accordance with the Land Acquisition Act, 1977. The Compensation Determination Committee (CDC) chaired by Chief District Officer shall fix the compensation rates and issue public notice to apply for the compensation claim. The CDC supported by CAAN shall verify the eligibility of Affected Persons (APs) and paying compensation to be verified APs. Proper compensation and agreement with the APs shall be settled prior to the commencement of the construction.

h) Budget and Financing

All land acquisition will be considered as an integral component of project costs. The Executing Agency, i.e. CAAN, will earmark in advance in its annual plan, the provisional budget for the cost of land acquisition. While calculating land value, the compensation rates mentioned by the APs and the local rates quoted by the District Land Revenue Office was taken as basis. The following table provides land acquisition cost estimated for the subproject.

Table 1-9 Land Acquisition Cost

Item	Quantity (sqm)	Rate (NPR/sqm)	Cost (NPR)
1. Chandragadhi	5,000	3,000	15,000,000
2. Dhangadhi	5,000	1,479	7,396,450
Total	**10,000**	**-**	**22,396,450**

* Compensation rate for private land has been estimated while administrative costs as well as incidental expenses have not been estimated.

Source: JICA Survey Team

i) Landholder Meeting

The following table summarizes the proceedings and key issues raised during the landholder meetings. There were no opposing views for the project on the meetings.

Table 1-10 Summary of Landholder Meetings

Date	Location	Participants	Major Views, Concerns and Suggestions
30th Apr, 2015	Chandragadhi, Proposed site	CAAN (1) JICA Survey Team (2) Land Owner (1)	Explanation of the project outline and the compensation policy, and the agreement Intension to approve for the Project, Interest for the land price
6th May, 2015	Dhangadhi, Proposed site	CAAN (1) JICA Survey Team (1) Land Owner: (1)	Explanation of the project outline and the compensation policy, and the agreement Intension to approve for the Project, Interest for the land price

Source: JICA Survey Team

(3) Mitigation Measures and Environmental Monitoring Plan

The environmental mitigation measures and the environmental monitoring plan during pre-construction phase and construction phase are shown in Table 1-11 and Table 1-12 respectively.

Table 1-11 Mitigation Measures (Pre-Construction Phase, Construction Phase)

No.	Impacts	Possible Effects	Mitigation Measures	Implementation Organization	Supervising Organization
Pre-Construction Phase					
3. Social Environment					
3.1	Involuntary Resettlement	Land Acquisition	Proper compensation, Agreement with the affected people	CDC*[1] CAAN	CAAN
Construction Phase					
1. Pollution					
1.1	Air Pollution	Air pollution due to construction works	Sprinkling water to control dust, Inspection and maintenance of construction equipment	Contractors*[2]	CAAN
1.3	Waste	Waste due to construction works	Waste at designated final disposal site	Contractors	CAAN
1.4	Soil Contamination	Soil contamination due to construction works	Inspection and maintenance of construction equipment	Contractors	CAAN
1.5	Noise and Vibration	Noise and vibration due to operation of construction equipment	Inspection and maintenance of construction equipment	Contractors	CAAN
2. Natural Environment					
3. Social Environment					
3.15	Infectious Diseases such as HIV/AIDS	Increase of infectious diseases due to inflow of construction workers into local community	Training on infectious diseases for construction workers	Contractors	CAAN
3.16	Labor Environment (including work safety)	Increase of accidents and diseases due to inappropriate labor environment management	Industrial health management	Contractors	CAAN
4. Others					
4.1	Accidents	Increase of accidents due to inappropriate construction management	Safety apparatus for construction workers, Compliance with traffic regulations	Contractors	CAAN

*[1] CDC: Compensation Determination Committee, *[2] Contractors for Site Preparation and Equipment Installation

Source: JICA Survey Team

Table 1-12 Environmental Monitoring Plan (Pre-Construction Phase, Construction Phase)

No.	Impacts	Parameters to be monitored	Location	Frequency	Implementing Organization	Supervising Organization
Pre-Construction Phase						
3. Social Environment						
3.1	Involuntary Resettlement (Land Acquisition)	Proper compensation, Agreement with the affected people	—	Not later than the commencement of the construction	CDC*[1] CAAN	CAAN
Construction Phase						
1. Pollution						
1.1	Air Pollution	Baseline survey and periodic visual inspection of air quality (TSP*[2])	Construction Site	Monthly	Contractors*[3]	CAAN
		Sprinkling water to control dust	Construction Site	Daily in dry season	Contractors	CAAN
		Inspection and maintenance of construction equipment	Construction Site	Monthly	Contractors	CAAN
1.3	Waste	Waste at designated final disposal site	Construction Site	Monthly	Contractors	CAAN
1.4	Soil Contamination	Inspection and maintenance of construction equipment	Construction Site	Monthly	Contractors	CAAN
1.5	Noise and Vibration	Baseline survey and periodic inspection of noise	Construction Site	Monthly	Contractors	CAAN
		Inspection and maintenance of construction equipment	Construction Site	Monthly	Contractors	CAAN
2. Natural Environment						
3. Social Environment						
3.15	Infectious diseases such as HIV/AID	Training on infectious diseases for construction workers	Construction Site	Beginning of construction period	Contractors	CAAN
3.16	Labor Environment (including work safety)	Industrial health management	Construction Site	Monthly	Contractors	CAAN
4. Others						
4.1	Accidents	Safety apparatus for construction workers, Compliance with traffic regulations	Construction Site	Monthly	Contractors	CAAN

[1] CDC: Compensation Determination Committee,[2] TSP: Total Suspended Particle, *[3] Contractors for Site Preparation and Equipment Installation, *[4] SS: Suspended Solid

Source: JICA Survey Team

The baseline survey shall be conducted prior to the construction works by the contractor for site preparation since there are no existing survey results.

It is recommended that implementation of resettlement (land acquisition) will be monitored internally and externally. The internal monitoring will be conducted by Project Management Unit (PMU) and external monitoring by specialist such as a consulting agency. The outline of the recommended internal and external monitoring is shown as follows.

a) Internal Monitoring

PMU will maintain records of all transactions in their resettlement database, such as entitlement records signed by Affected Persons (APs) and survey-based monitoring of land acquisition progress on a monthly basis. PMU will provide necessary technical assistance, monitor implementation of land acquisition and prepare semiannual reports on the progress achieved.

b) External Monitoring

An external monitoring agency, i.e. a consulting agency, university, Non-Governmental Organization (NGO),etc., will be engaged by PMU, and carry out independent review of land acquisition implementation as well as post project evaluation throughout the project cycle. The external monitoring will be focused on:

- Evaluating social and economic impact of land acquisition and rehabilitation of APs;
- Verifying the objective of enhancement or at least restoration of income levels and standard of living of the APs;
- Suggesting modifications in land acquisition and economic rehabilitation, where necessary, to achieve the principles and objectives as set before; and
- Making final ex-post evaluation to ensure all resettlement and land acquisition activities have been completed; and any problems/issues identified are followed-up (including recommendation of mitigation measures with budget requirement).

More specifically, the following activities should be performed by the external monitoring agency:

- Verification of internal monitoring – to ensure appropriateness of activities being carried out by PMU and field offices;
- Evaluation of delivery and impacts of entitlements – to determine if they are as per the approved land acquisition plan;
- Evaluation of consultation and grievance procedures – especially levels of public awareness of grievance procedures, access of APs and households to information and rapid conflict resolution;
- Evaluation of actual operations of grievance committee – assisting APs as required and acting as observers;
- Declaration of successful implementation – summing up the outcome of activities on completion of all entitlements distribution and land acquisition activities; and
- Recommend follow-up actions for the Executing Agency, i.e. CAAN – relating to outstanding actions required to complete achievement of objectives of the land acquisition, additional mitigation measures for APs, if required, and timing and budget of these additional measures.
- Describe lessons learned for future projects.

During the construction phase, the contractors for site preparation and equipment installation shall report the monitoring result monthly to CAAN. CAAN shall report the summary to JICA on (i) commencement of the land reclamation work (baseline survey result), (ii) completion of the land reclamation work (commencement of the equipment installation work), (iii) completion of the equipment installation work.

When necessary, the project proponent should refer to the following monitoring form for submitting reports.

Monitoring Form (Draft)

I. Pre-Construction Phase

1. Resettlement (Land Acquisition)

Monitoring item	Monitoring results during report period	Remarks
Proper compensation, Agreement with the affected people 1. Internal Monitoring • Verification that there are no outstanding or unresolved land acquisition issues and that property valuation and economic rehabilitation has been carried out in accordance with the provisions in land acquisition plan; • Information campaign and consultation has been carried out with APs; • Status of land acquisition and payments on land compensation; • Value of entitlement received is equal to that of original structure or land acquired; • Effective utilization of entitlements received; • Compensation for affected structures and other assets; • Economic rehabilitation measures are implemented, as approved; • Effective operation of both the Grievance Committees; and • Funds for implementing land acquisition and economic rehabilitation activities are available in a timely manner, are sufficient for the purposes, and are spent in accordance with land acquisition plan. 2. External Monitoring • Evaluating social and economic impact of land acquisition and rehabilitation of APs; • Verifying the objective of enhancement or at least restoration of income levels and standard of living of the APs; • Suggesting modifications in land acquisition and economic rehabilitation, where necessary, to achieve the principles and objectives as set before; and • Making final ex-post evaluation to ensure all resettlement and land acquisition activities have been completed; and any problems/issues identified are followed-up (including recommendation of mitigation measures with budget requirement). • Verification of internal monitoring – to ensure appropriateness of activities being carried out by PMU and field offices; • Evaluation of delivery and impacts of entitlements – to determine if they are as per the approved land acquisition plan; • Evaluation of consultation and grievance procedures – especially levels of public awareness of grievance procedures, access of APs and households to information and rapid conflict resolution; • Evaluation of actual operations of grievance committee – assisting APs as required and acting as observers; • Declaration of successful implementation – summing up the outcome of activities on completion of all entitlements distribution and land acquisition activities; and • Recommend follow-up actions for the Executing Agency, i.e. CAAN – relating to outstanding actions required to complete achievement of objectives of the land acquisition, additional mitigation measures for APs, if required, and timing and budget of these additional measures. • Describe lessons learned for future projects.		Location: - Frequency: Not later than the commencement of the construction

II. Construction Phase

1. Pollution

1-1 Air Quality (Emission Gas/Ambient Air Quality)

Item (unit)	Measured value (Mean)	Measured value (Max)	Country's standards	Reference to global standards	Remarks
Total Suspended Particulate (TSP)(μg/m^3)			<230 (24H)		Location: Construction site Frequency: Once at the beginning of construction period

Monitoring item	Monitoring results during report period	Remarks
Inspection of air quality		Location: Construction site Frequency: Monthly
Sprinkling water to control dust.		Location: Construction site Frequency: Dairy in dry season
Inspection and maintenance of construction equipment.		Location: Construction site Frequency: Monthly

1-2 Waste

Monitoring Item	Monitoring results during report period	Remarks
Waste at designated final disposal site		Location: Construction site Frequency: Monthly

1-3 Soil Contamination

Monitoring item	Monitoring results during report period	Remarks
Inspection and maintenance of construction equipment.		Location: Construction site Frequency: Monthly

1-4 Noise and vibration

Item (unit)	Measured value (Mean)	Measured value (Max)	Country's standards	Reference to global standards	Remarks
Ambient Noise (dBA)				Uncomfortable: 120-130 Very high: 90-100 Medium: 70-80 Peace: 50-60 (WHO)	Location: Construction site Frequency: Once at the beginning of construction period

Monitoring Item	Monitoring results during report period	Remarks
Inspection of noise		Location: Construction site Frequency: Monthly
Inspection and maintenance of construction equipment.		Location: Construction site Frequency: Monthly

2. Social Environment

2-1 Infectious diseases such as HIV/AIDS

Monitoring Item	Monitoring results during report period	Remarks
Training on infectious diseases for construction workers.		Location: Construction site Frequency: Once at the beginning of construction period

2-2 Labor environment (including work safety)

Monitoring Item	Monitoring results during report period	Remarks
Industrial health management.		Location: Construction site Frequency: Monthly

3. Others

3-1 Accidents

Monitoring Item	Monitoring results during report period	Remarks
Safety apparatus for construction workers, Compliance with traffic regulations.		Location: Construction site Frequency: Monthly

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 BASIC CONCEPT OF THE PROJECT

1) Project Purpose and Overall Goal

The overall goal of the Project is to improve safety and efficiency of air transport in Nepal. Under this overall goal, the Project aims at improving safety of navigation and landing of aircraft at Tribhuvan International Airport and major domestic airports.

2) Outline of the Project

In order to achieve above-mentioned Project Purpose, the Project will install the following aviation safety facilities at Tribhvan International, Lukla, Jomsom, Jumla, Rara, Simikot, Chandragadhi and Dhangadhi Airports and other sites.

- Installation of Localizer (LOC) with Terminal Distance Measuring Equipment (T-DME) at Tribhuvan International Airport
- Installation of VHF Omnidirectional Range/ Distance Measuring Equipment (VOR/DME) at Chandragadhi and Dhangadhi Airport
- Installation of VOR/DME Test Rack at Office of Com. & Nav Aid Department, Navigation Aid Maintenance Section at Sinamangal
- Replacement of Radar Maintenance Training Equipment, Radar Controller Training Simulator and Installation of LOC Maintenance Training Equipment at Civil Aviation Academy Sanotimi
- Installation of Runway Threshold Identification Lights and Runway Threshold and End Lights at Jomsom and Jumla Airports
- Installation of Runway Edge Lights and Runway Threshold and End Lights at Lukla Airport
- Installation of Flight Procedure Design System at CAAN Head Office
- Installation of Solar Power Supply Systems at Lukla, Jomsom, Jumla, Rara and Simikot Airports

With these outputs, it is expected (i) to increase number of flights that can land with precise approach by using LOC at Tribhuvan International Airport, (ii) to increase percentage of flights that can fly to the destination airports by using VOR/DME and (iii) to improve runway usability factor for jet aircraft at Tribhuvan International Airport. Furthermore, it is expected, (iv) to improve safety of aircraft operations through enhancement of aviation safety facilities and (v) to carry out continuously the operation and maintenance of aviation safety equipment.

2-2 OUTLINE DESIGN OF THE JAPANESE ASSISTANCE

2-2-1 Design Policy

1) Basic Policy

Scope of the Japanese assistance is to be selected after detailed assessment of the requests from Nepalese side based on the following criteria:

- To be required for improvement of aviation safety in Nepal.
- To ensure clear distinction of responsibility of this project with other project.
- Expectable fulfillment of the recipient country's responsibilities in timely manner.
- Continuous operation and maintenance under the finance by the implementing agency, CAAN.

2) Policy on Natural Conditions

The Government of Nepal has established its official Building Codes taking into account of the natural conditions of Nepal. Buildings and structure will be designed based on this Building Codes. With regard to the environmental conditions for navigational aids, design standards of Japanese Civil Aviation Bureau will be used because CAAN does not have any standards and climate of the eight project sites is considered not so different from that of Japan.

Access to the sites in the mountainous areas is difficult and/or unreliable during the rainy season from June to September. This factor will be taken into account in planning of the Project implementation schedule and demarcation of scope of work between Japanese and Nepalese sides.

3) Policy on Social Conditions

With regard to the issues to be considered in terms of lifestyle, history/tradition, religion, architectural style, economic situation, etc. in the outline design, it should be noted that most of the business activities are suspended during Banda, i.e. general strike, and festivals such as Dashain and Tihal. Ample room should be considered in planning of the Project implementation schedule.

4) Policy on Special Circumstances in the Industry

As the air navigation systems of Nepal constitute a part of the international aviation infrastructures, specifications of the equipment to be procured by the Project must meet ICAO's standards.

5) Policy on Use of Local Companies

Installation works of this project will require labors, skilled labors and electricians. In this regard effective use of the local construction companies for civil and electrical works should be considered. The civil works needed for the Project are construction of foundations for equipment and excavation/backfill for underground cabling, thus there should be no problem in ability of local construction companies for their work. Local electrical contractors have almost no experience in aviation related works. However, it will be feasible to provide general electrician for wiring between equipment under the supervision of Japanese or other foreign experts/engineers.

6) Policy on Operation and Maintenance Management

For all of the systems and equipment, it is planned to conduct operation and maintenance trainings by the manufacturer's specialists because even if the same kind of systems or equipment have been used by CAAN, methods of operation and maintenance are not exactly the same as the existing ones.

Among the cooperation target components, LOC is a system to be introduced in Nepal for the first time, thus it is necessary to develop maintenance capability by a technical cooperation project in

addition to the operation and maintenance training.

For the Flight Procedure Design System, it is necessary to develop flight procedure design capability also by a technical cooperation project so as to promote introduction of instrument approach procedures including PBN approach.

With regard to management, supply and replenishment of spare parts for the equipment procured by the Project, it is planned to be conduct centrally at the Spare Parts Management Center by labeling parts numbers in accordance with the manual to be developed by "the Project for the Development of a Spare Parts Management Center and En-route Radar Control Services".

7) Policy on Setting Grade of Facility and Equipment

Standards of Civil Aviation Bureau of Japan will be referred to for detailed specifications and environmental conditions for the air navigation systems/equipment. In light of international trend, use of commercial off-the-shelf (COTS) components will be encouraged for reducing maintenance expenses of CAAN.

8) Policy on Methods of Construction/Procurement and Work Schedule

In principle, the equipment shall be procured from Japan. However, procurement from the DAC member countries should be accepted for the Runway Lights since solar powered LED runway lights are not produced in Japan.

It is noted that CAAN requested to procure the Radar Maintenance Training Equipment, which can be used for practical training for maintenance of the radar system procured under "Tribhuvan International Airport Modernization Project".

It is planned to use air transportation from Kathmandu to the airports in mountainous areas since road transportation is difficult.

It is necessary to hand over the Flight Procedure Design System well in advance of hand over of the LOC/T-DME so that CAAN can utilize it for validation and safety assessment of the designed instrument approach procedures.

It was agreed that CAAN would conduct site preparation works and construction of access road to the VOR/DME Sites by June 2017. It is recommended to implement these preparatory works as early as possible, but not later than start of the 2017 rainy season.

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

2-2-2-1 Comparison of Project Scope and Original Request

Table 2-2-1 summarizes comparison of the Project Scope confirmed in the Minutes of Discussions signed on 04 March 2016 and the original request of CAAN dated 14 July 2014.

Table 2-2-1 Comparison of Project Scope and Original Request

Original Request		Minutes on 04 Mar. 2016	Reasons of Changes
Equipment Name	Q'ty		
Instrument Landing System (ILS)	1 set	Changed to LOC	ILS that is combination of LOC and GP will be less cost effective than LOC only, and introduction of ILS will require high-level technical capacity for safety assessment, etc.
Distance Measuring Equipment (DME)	1 set	No change	―
ILS Maintenance Equipment	1 set	Changed to LOC	Due to the change of the ILS.
VHF Omni-directional Range/ Distance Measuring Equipment (VOR/DME)	4 sets	Reduced to 2 sets	CAAN withdrew the request for Tumlingtar and Janakpur for the following reasons: - A waypoint for PBN flight would be sufficient at Tumlingtar as it is for the international air routes. - Priority of Janakpur should be low because growth of air traffic would not be high due to the improvement of roads.
VOR/DME Test Rack	-	1 set	It is for testing spare parts of VOR/DME, and needed for maintaining VOR/DME for a longer period.
Radar Maintenance Training Equipment	1 set	No change	―
Radar Controller Training Simulator	1 set	No change	―
Abbreviated Precision Approach Path Indicators	4 sets	Excluded from the Project	CAAN was concerned about feasibility of flight inspection and potential risks in case of improper maintenance, and withdrew the request.
Runway Edge Lights	1 set	No change	―
Runway Threshold/End Lights	1 set	Increased to 5 sets	It is necessary for improving visibility of threshold and end of the runway at Jomsom and Jumla Airports
Runway End Lights	1 set	No change	―
Runway Threshold Identification Lights	-	Added 4 sets	It is necessary for providing additional threshold conspicuity at Jomsom and Jumla Airports.
VHF Remote Control Air-to-Ground Communication System	3 sets	Excluded from the Project	CAAN judged that increase of coverage is too small as compared with the burden of operation and maintenance, and withdrew the request.
Flight Procedure Design System	1 set	No change	―
Solar Power Supply System	5 sets	6 sets	One set each will be required for Tower and Terminal Building at Lukla.

Source: JICA Survey Team

2-2-2-2 Overall Plan

1) Localizer (with Distance Measuring Equipment)

Localizer (LOC) is one of the international standard navigational aids for landing defined by ICAO, and indicate precise approach path to the aircraft by developing horizontal orientation of approach path with radio signal transmitted along the extended centerline of the runway.

Tribhuvan International Airport is surrounded by rugged mountains of over 2,000m, and cannot use LOC with a standard descent gradient. Therefore, the following three alternative instrument approach procedures (refer Figures 2-2-1 through 2-2-3) were drafted in accordance with ICAO PANS-OPS after obstacle survey.

- Alt-A: Establish the Final Approach Fix (FAF) "after" completely flying over the top of Mt. Bhattedada, and intercept a 3-deg. standard descent gradient path at 3NM before "the Missed Approach Point (MAPt)"
- Alt-B: Intercept the 3-deg. standard descent gradient path at 3NM before "RWY02 threshold" instead of "MAPt" in Alt-A.
- ALT-C: Establish FAF "slightly before" flying over the top of Mt. Bhattedada instead of "after" in Alt-A.

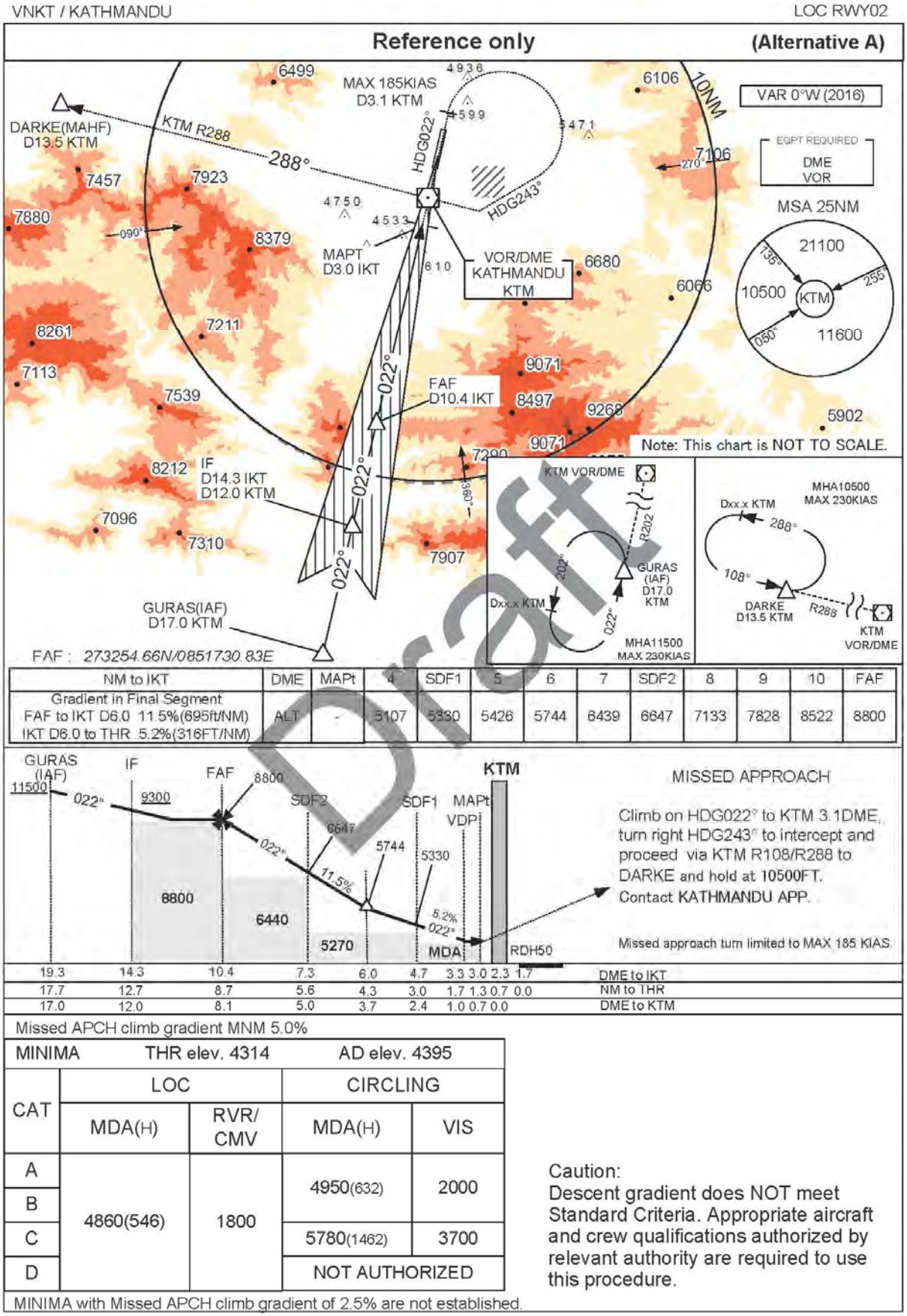
Outline of the design of these instrument flight procedures is described in Appendix 2. Advantages and disadvantages of each alternative instrument approach procedures are shown in Table 2-2-2.

Table 2-2-2 Advantages and Disadvantages of Each Alternatives

Alt.	Advantage	Disadvantage
A	• Clear Mt. Bhattedada with an Minimum Obstavle Clearance (MOC) for Intermediate Approach Segment, i.e. 300m. • Maintain the distance necessary for stabilization of aircraft with the 3^{o} descent angle before MAPT.	• Descent gradient after the FAF is 11.5% that is steepest among the three alternatives.
B	• Clear Mt. Bhattedada with an MOC for Intermediate Approach Segment, i.e. 300m. • Descent gradient after the FAF is 10% that is less steep than Alt-A.	• The distance necessary for stabilization of aircraft with the 3^{o} descent angle will be up to the threshold.
C	• Maintain the distance necessary for stabilization of aircraft with the 3^{o} descent angle before MAPT. • Descent gradient after the FAF is 9.8% that is least steep among the three alternatives.	• Clear Mt. Bhattedada with an MOC for Final Approach Segment, i.e. 150m, the same as the existing VOR approach.

Source: JICA Survey Team

The CAAN should determine the best instrument approach procedures through consultations of these alternatives with the concerned parties including all air operators at TIA, design and validate the instrument approach procedures, and conduct safety assessment as its own responsibility.



NM to IKT	DME	MAPt	4	SDF1	5	6	7	SDF2	8	9	10	FAF
Gradient in Final Segment FAF to IKT D6.0 11.5%(695ft/NM) IKT D6.0 to THR 5.2%(316FT/NM)	ALT	-	5107	5330	5426	5744	6439	6647	7133	7828	8522	8800

19.3	14.3	10.4	7.3	6.0	4.7	3.3	3.0	2.3	1.7			DME to IKT
17.7	12.7	8.7	5.6	4.3	3.0	1.7	1.3	0.7	0.0			NM to THR
17.0	12.0	8.1	5.0	3.7	2.4	1.0	0.7	0.0				DME to KTM

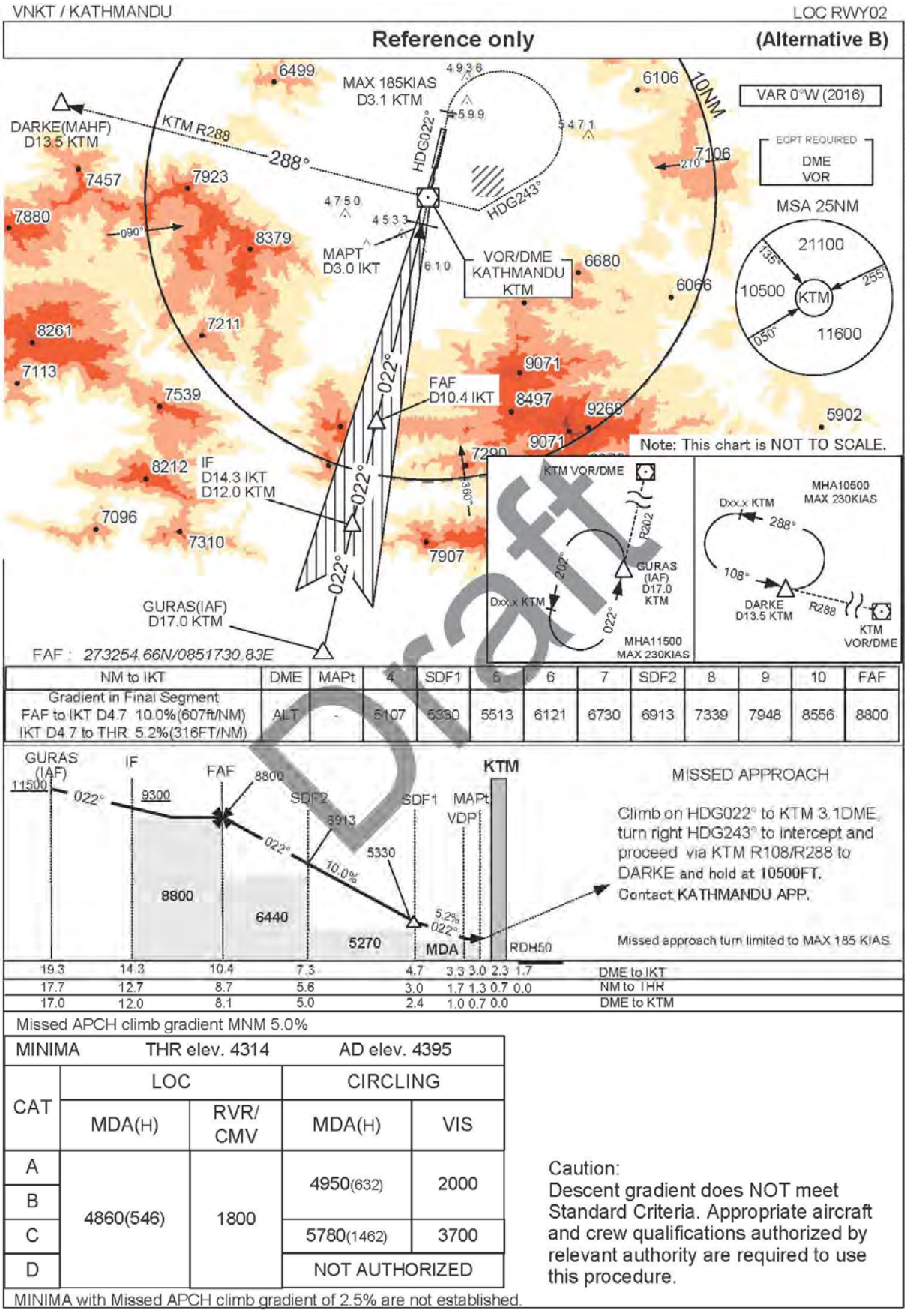
Missed APCH climb gradient MNM 5.0%

MINIMA	THR elev. 4314		AD elev. 4395	
CAT	LOC		CIRCLING	
	MDA(H)	RVR/ CMV	MDA(H)	VIS
A	4860(546)	1800	4950(632)	2000
B				
C			5780(1462)	3700
D			NOT AUTHORIZED	

MINIMA with Missed APCH climb gradient of 2.5% are not established.

Caution:
Descent gradient does NOT meet Standard Criteria. Appropriate aircraft and crew qualifications authorized by relevant authority are required to use this procedure.

Figure 2-2-1 LOC RWY02 - Alternative A



NM to IKT	DME	MAPt	4	SDF1	5	6	7	SDF2	8	9	10	FAF
Gradient in Final Segment												
FAF to IKT D4.7 10.0%(607ft/NM)	ALT	-	5107	5330	5513	6121	6730	6913	7339	7948	8556	8800
IKT D4.7 to THR 5.2%(316FT/NM)												

19.3	14.3	10.4	7.3	4.7	3.3	3.0	2.3	1.7		DME to IKT
17.7	12.7	8.7	5.6	3.0	1.7	1.3	0.7	0.0		NM to THR
17.0	12.0	8.1	5.0	2.4	1.0	0.7	0.0			DME to KTM

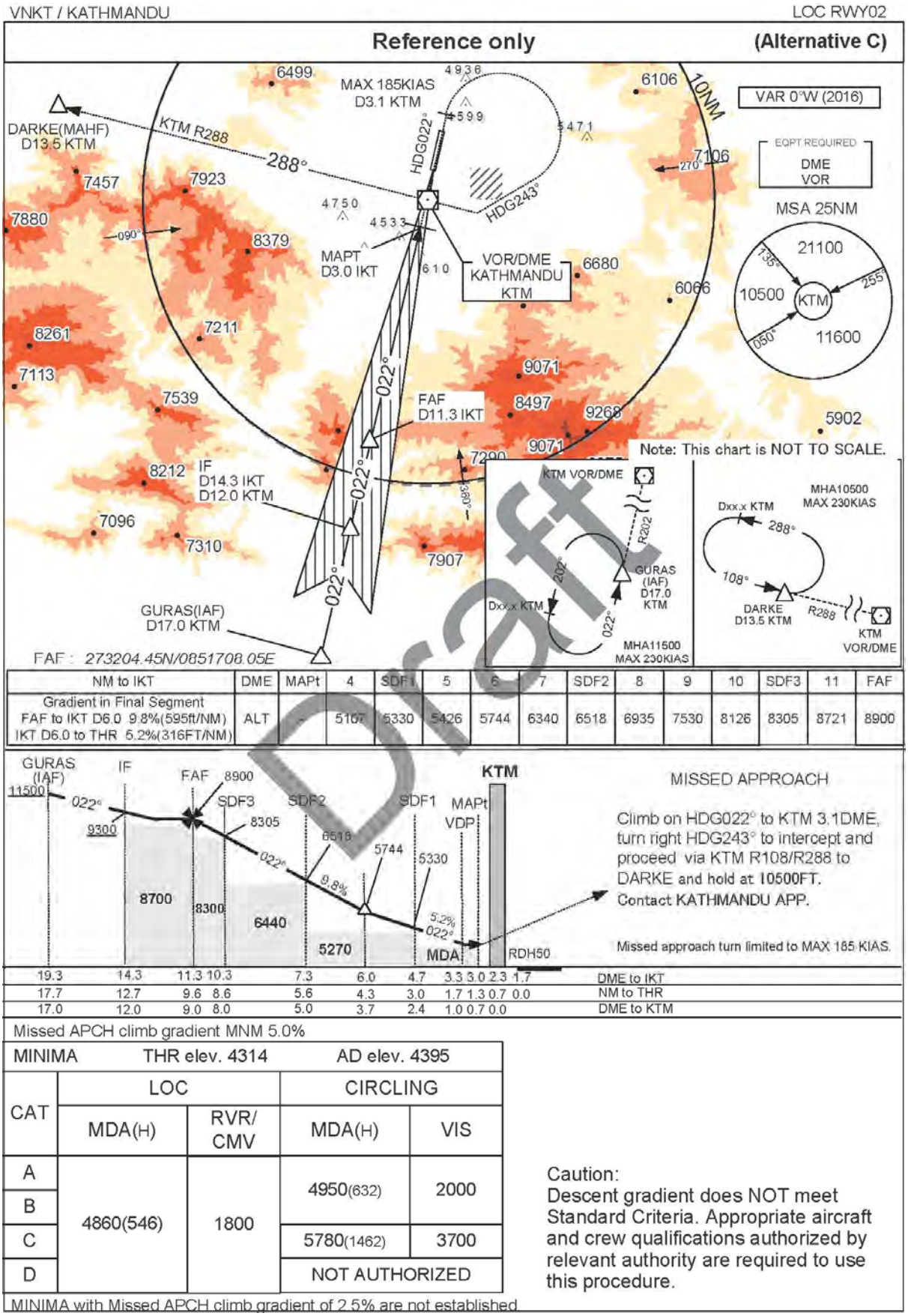
Missed APCH climb gradient MNM 5.0%

MINIMA	THR elev. 4314		AD elev. 4395	
CAT	LOC		CIRCLING	
	MDA(H)	RVR/ CMV	MDA(H)	VIS
A	4860(546)	1800	4950(632)	2000
B				
C			5780(1462)	3700
D			NOT AUTHORIZED	

MINIMA with Missed APCH climb gradient of 2.5% are not established.

Caution:
Descent gradient does NOT meet Standard Criteria. Appropriate aircraft and crew qualifications authorized by relevant authority are required to use this procedure.

Figure 2-2-2 LOC RWY02 - Alternative B



NM to IKT	DME	MAPt	4	SDF1	5	6	7	SDF2	8	9	10	SDF3	11	FAF
Gradient in Final Segment FAF to IKT D6.0 9.8%(595ft/NM) IKT D6.0 to THR 5.2%(316FT/NM)	ALT	-	5107	5330	5426	5744	6340	6518	6935	7530	8126	8305	8721	8900

19.3	14.3	11.3	10.3	7.3	6.0	4.7	3.3	3.0	2.3	1.7		DME to IKT
17.7	12.7	9.6	8.6	5.6	4.3	3.0	1.7	1.3	0.7	0.0		NM to THR
17.0	12.0	9.0	8.0	5.0	3.7	2.4	1.0	0.7	0.0			DME to KTM

Missed APCH climb gradient MNM 5.0%

MINIMA	THR elev. 4314		AD elev. 4395	
CAT	LOC		CIRCLING	
	MDA(H)	RVR/ CMV	MDA(H)	VIS
A	4860(546)	1800	4950(632)	2000
B				
C			5780(1462)	3700
D			NOT AUTHORIZED	

MINIMA with Missed APCH climb gradient of 2.5% are not established.

Caution:
Descent gradient does NOT meet Standard Criteria. Appropriate aircraft and crew qualifications authorized by relevant authority are required to use this procedure.

Figure 2-2-3 LOC RWY02 - Alternative C

With regard to the location of the Localizer Antenna, two alternatives shown below were studied, and Alt-1, which is less costly for installation and easier in operation and maintenance, was selected based on the following conditions:

- The existing 123m long stopway will be used for stopping and taxiing of aircraft.
- RWY20 takeoff run will be started from the existing RWY20 threshold (or further south).

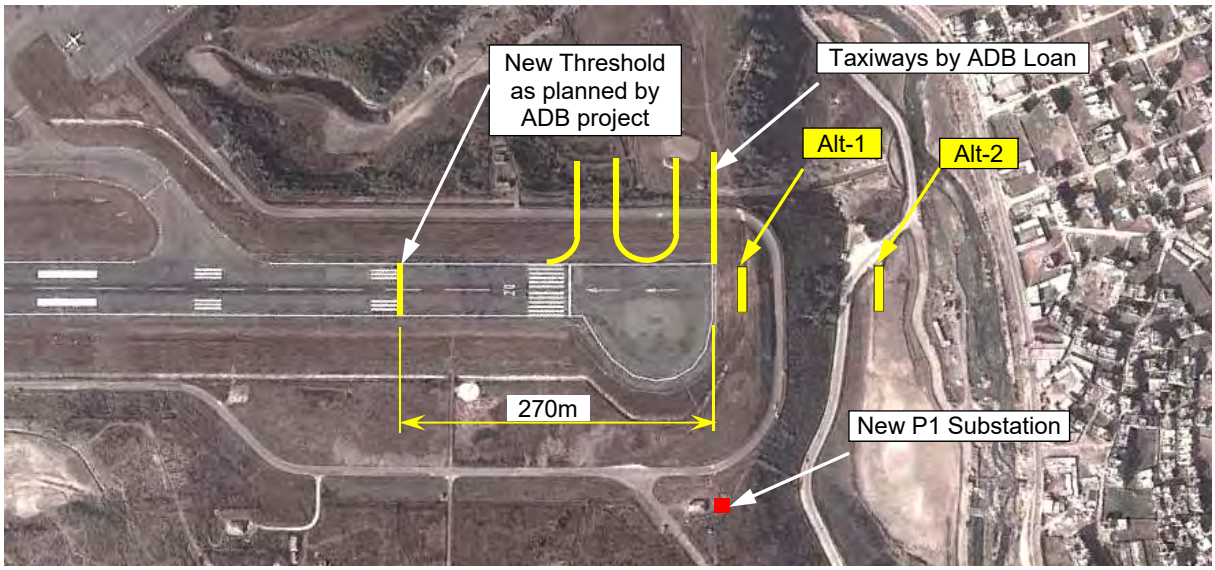


Figure 2-2-4 Alternative Locations of Localizer Antenna

Distance Measuring Equipment (DME) is equipment, which transmit a radio signal in response to a distance question radio signal from aircraft, and enable the equipment on aircraft to calculate distance to the ground station based on the time difference between transmission of the question radio signal and reception of the answer radio signal. DME will be collocated with the abovementioned Localizer.

Figure 2-2-5 shows system block diagram of LOC/T-DME.

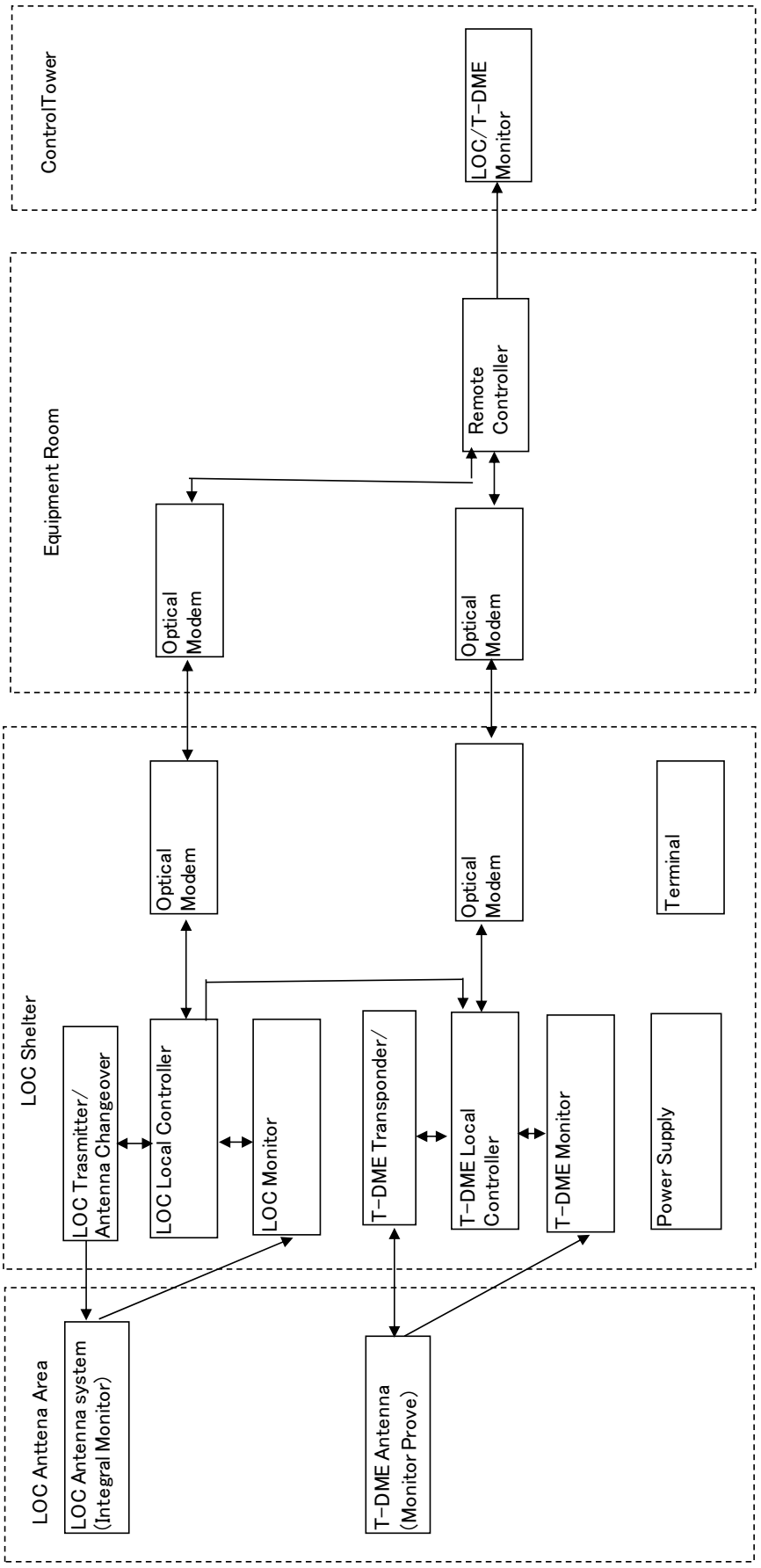


Figure 2-2-5 System Block Diagram of LOC/T-DME

2) LOC Maintenance Training Equipment

One set of Localizer will be procured as the maintenance training equipment for the LOC to be newly introduced by the Project. It is planned to install the LOC Maintenance Training Equipment in a vacant space in Radar Lab of CAA Sanothimi.

3) VHF Omni-directional Range/Distance Measuring Equipment

VHF Omni-directional Range (VOR) is equipment to provide continuously orientation to the magnetic north from the VOR to the aircraft within its coverage area. It is used with Distance Measuring Equipment (DME) for establishing accurate air routes and/or instrument approach procedures.

(1) Chandragadhi

VOR/DME at Chandragadhi Airport can be used for both enroute and instrument approach. Location of the VOR/DME was studied on the extended centerline of the runway so that aircraft can make straight-in approach exactly on the runway centerline, and from 460 to 660m from the runway threshold so that the VOR/DME antenna will not infringe the approach surface. As a result of the site survey, it was decided to install the VOR/DME within 460 to 660m from the Runway 28 threshold because area on the west of Runway 10 is relatively developed and there are some buildings. Figure 2-2-8 shows proposed VOR/DME site within the surveyed area.

Figure 2-2-6 Existing Conditions on Extended Centerline of Runway 10

Figure 2-2-7 Existing Conditions on Extended Centerline of Runway 28

Figure 2-2-8 VOR/DME Site for Chandragadhi

It is necessary to install a simple approach lighting system in accordance with ICAO standards for

operations as an instrument approach runway. It is also necessary to remove the old perimeter fence to expand the runway strip to 150m wide. There are obstacles to the approach surface of the Runway 10, such as the perimeter fence, vehicles on the road outside of the perimeter fence, some buildings of military and CDO, etc., and they should as far as practicable be removed.

(2) Dhangadhi

VOR/DME at Dhangadhi Airport can be used for both enroute and instrument approach. Location of the VOR/DME was studied on the extended centerline of the runway and from 460 to 660m from the runway threshold the same as in case of Chandragadhi. As a result of the site survey, it was decided to install the VOR/DME within 460 to 660m from the Runway 27 threshold because area on the west of Runway 09 is being newly developed and there are buildings under construction. Figure 2-2-11 shows proposed VOR/DME site within the surveyed area.

Figure 2-2-9 Existing Conditions on Extended Centerline of Runway 09

Figure 2-2-10 Existing Conditions on Extended Centerline of Runway 27

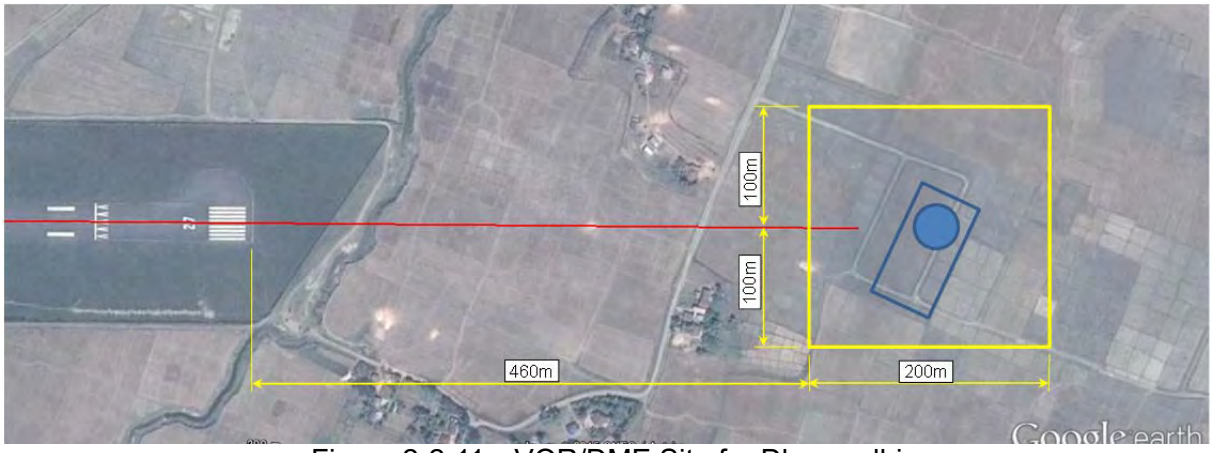


Figure 2-2-11 VOR/DME Site for Dhangadhi

It is necessary to install a simple approach lighting system in accordance with ICAO standards for operations as an instrument approach runway.

(3) Remote Control and Monitoring System

A Remote Control and Monitoring System will be installed at VOR/DME Test Room at Sinamangal because there are no technical staff for maintenance of radio air navigation systems at the two airports.

(4) Overall System

Figure 2-2-12 shows overall system block diagram including the VOR/DMEs at the two airports and the Remote Control and Monitoring System.

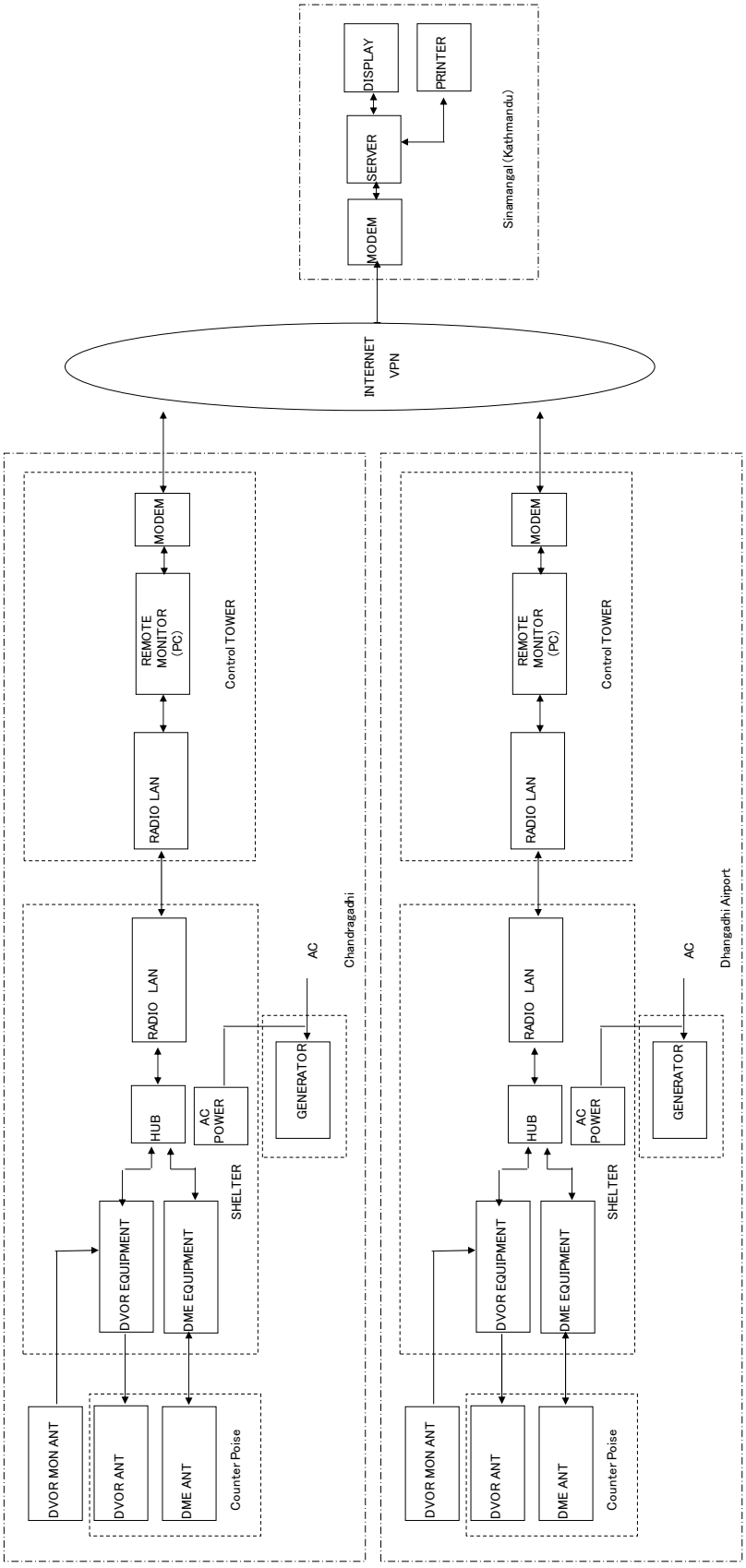


Figure 2-2-12 System Block Diagram of VOR/DME

4) VOR/DME Test Rack

VOR/DME Test rack is equipment for identifying malfunctioning parts/units and/or testing functions of repaired parts/units for the VOR/DME installed by the Project. It is planned to install the VOR/ DME Test Rack in a vacant space in VOR/DME Test Room at Office of Com. & Nav Aid department, Navigation Aid Maintenance Section at Sinamangal.

5) Radar Maintenance Training Equipment

One set of Mono-pulse Secondary Surveillance Radar will be procured as training equipment for maintenance of the radar system being installed under "Tribhuvan International Airport Modernization Project". Multi-sensor Surveillance Data Processing System, Flight Data Processing System, Remote Control and Monitoring System and Radar Display System, which are parts of the components of the radar system of "Tribhuvan International Airport Modernization Project", are not included because they are basically computer systems and do not require specialized maintenance training.

The Radar Maintenance Training Equipment will be installed in Radar Lab of CAA Sanothimi in a space after relocating parts of the existing radar maintenance training equipment.

6) Radar Controller Training Simulator

Radar Controller Training Simulator is a system for training of air traffic controller for approach control (APP) and enroute control (ACC), which will become possible by "Tribhuvan International Airport Modernization Project". "Tribhuvan International Airport Modernization Project" includes installation of a radar controller training simulator with functions as a backup system for the actual air traffic control operations in the Operations Building. That simulator will be used for refresher training of the licensed radar controllers and semi-OJT, and deferent from the simulator to be installed in CAA Sanotimi by the Project, which will be used for training of new radar controllers. Figure 2-2-13 shows a system block diagram of the Radar Controller Training Simulator.

The Radar Controller Training Simulator will be installed in the Simulator Room of CAA Sanotimi as replacement of the existing radar controller training simulator.

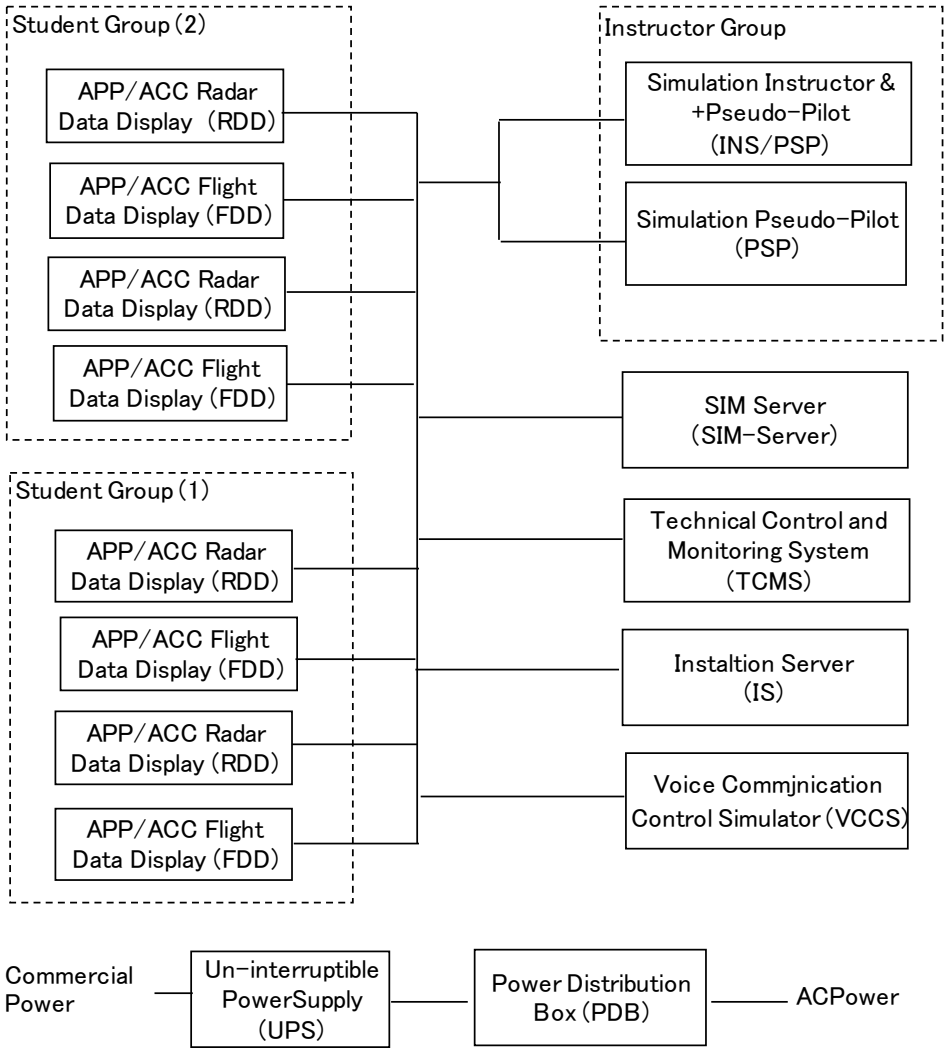


Figure 2-2-13 System Block Diagram of Radar Controller Training Equipment

7) Runway Lighting System (Runway Threshold Identification Light, Runway Edge Light, Runway Threshold Light and Runway End Light)

Runway Threshold Identification Light, Runway Edge Light, Runway Threshold Light and Runway End Light are aerodrome lights for increasing visibility of the runway threshold/end and outline.

Runway Edge Lights, Runway Threshold Lights and Runway End Lights will be installed at Lukla Airport, where meteorological conditions tend to change rapidly. Runway Threshold Identification Lights, Runway Threshold and End Lights will be installed at Jomsom and Jumla Airports, where there are precipices at both runway ends.

8) Flight Procedure Design System

Flight Procedure Design System is a system to aid designing various flight procedures for arrival/ approach and departure in accordance with the conventional procedures and/or RNAV procedures/ satellite-based procedures of ICAO PANS-OPS. It will be installed in the flight procedure design office in CAAN head office.

9) Solar Power Supply System

Solar power supply system is a system to supplement insufficient commercial power supply. Solar power supply systems will be provided for the control tower/terminal buildings at Lukla, Jomsom, Jumla, Rara and Simikot Airports, where power supply is unstable for airport operations.

The solar power supply system for Rara Airport is designed based on the existing design of the terminal building in this Preparatory Survey, but will be reviewed in the detailed design stage because CAAN plans to change the existing design of the terminal building to be built at Rara Airport.

Figures 2-2-14 to 2-2-19 show block diagrams of the solar power supply systems.

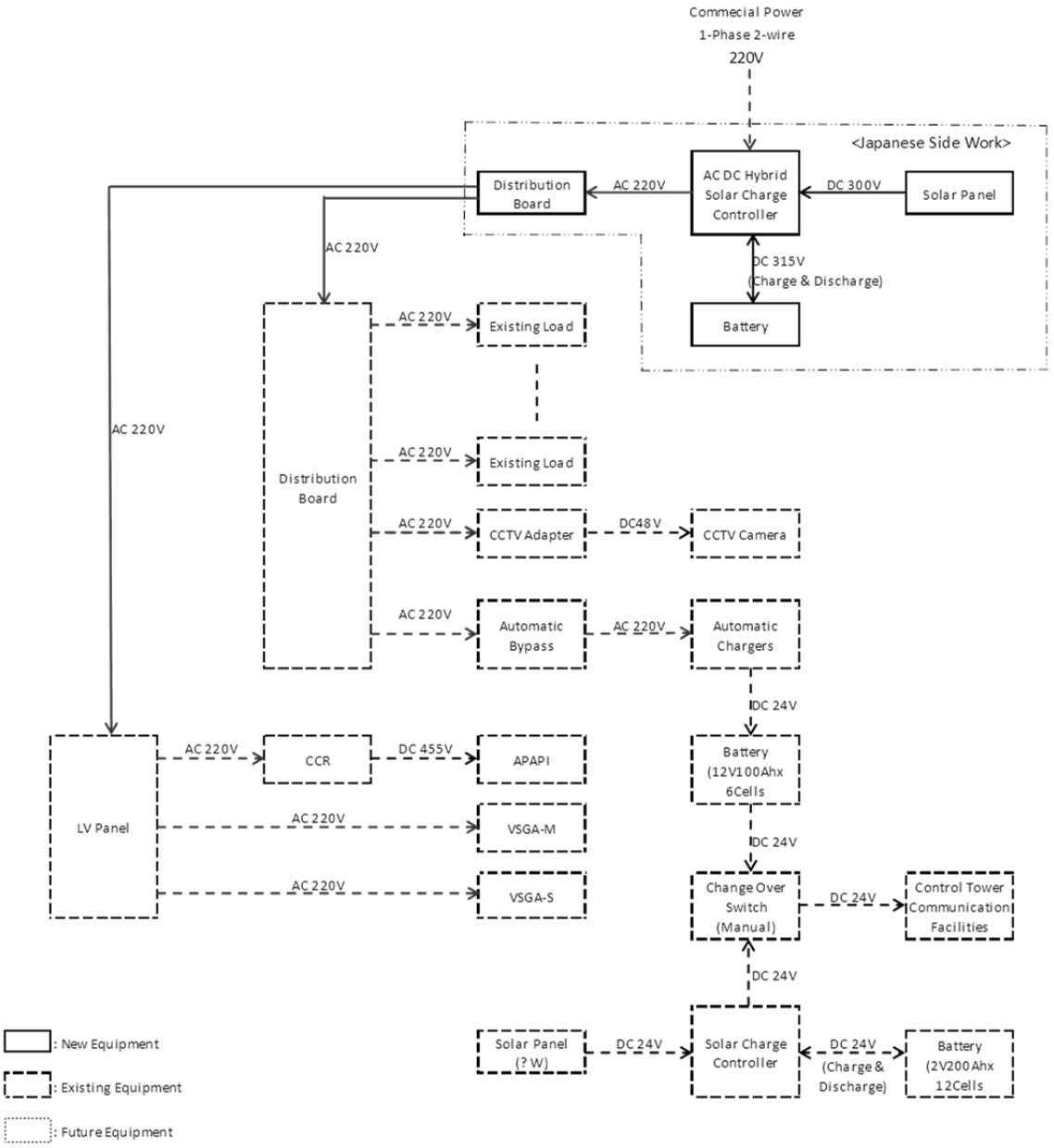


Figure 2-2-14 System Block Diagram of Solar Power Supply System for Lukla Control Tower

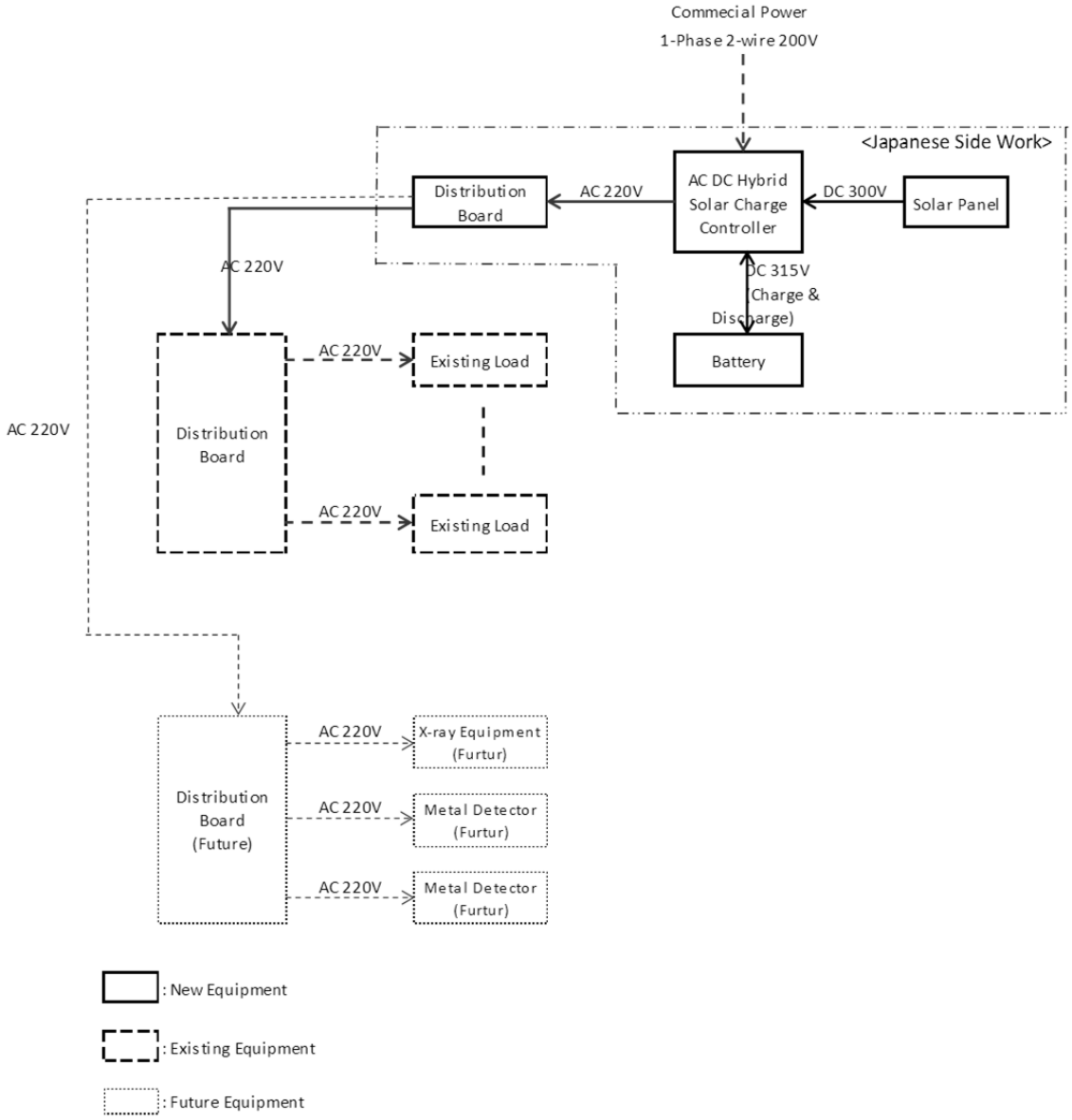


Figure 2-2-15 System Block Diagram of Solar Power Supply System for Lukla Terminal Bldg,

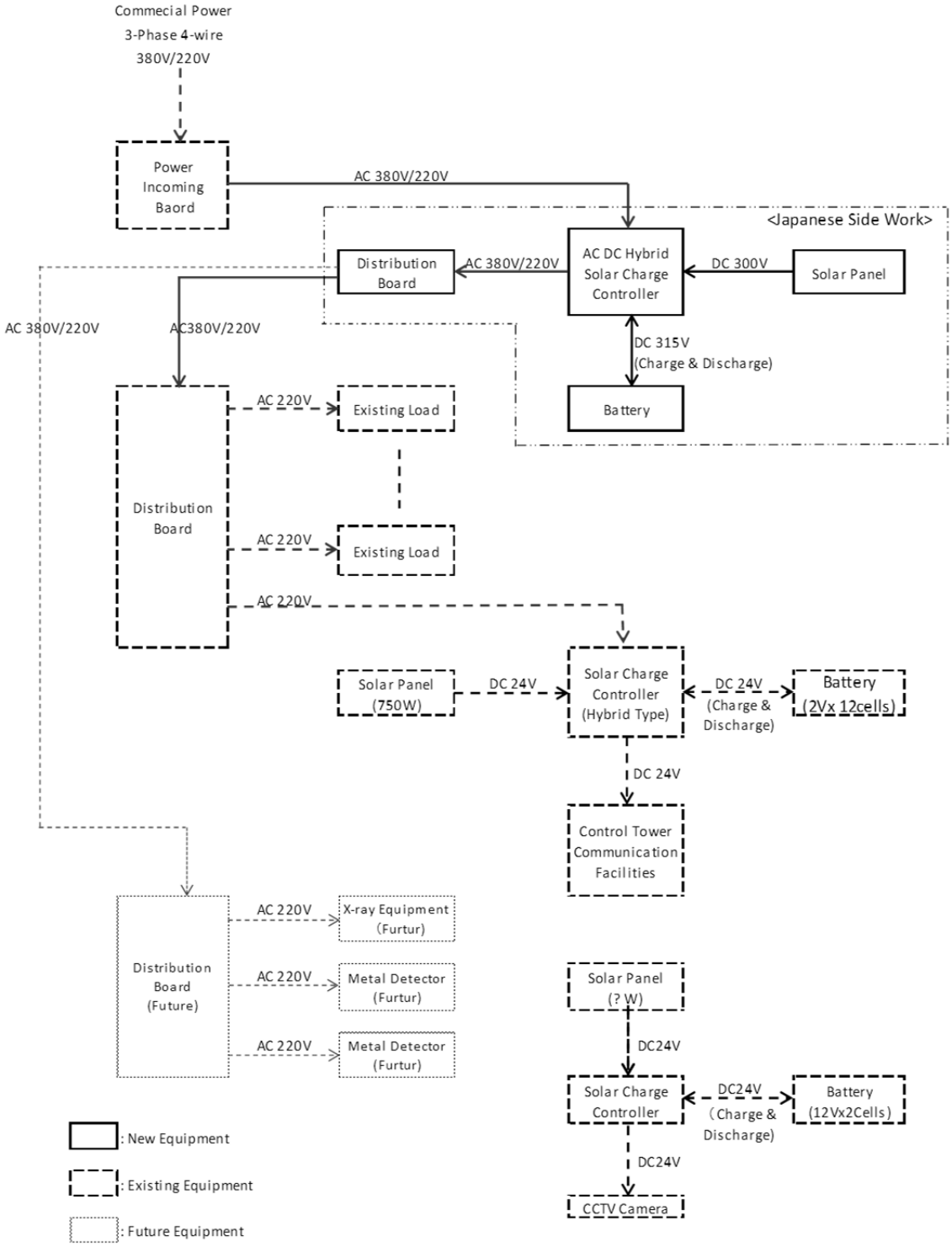


Figure 2-2-16 System Block Diagram of Solar Power Supply System for Jomsom Airport

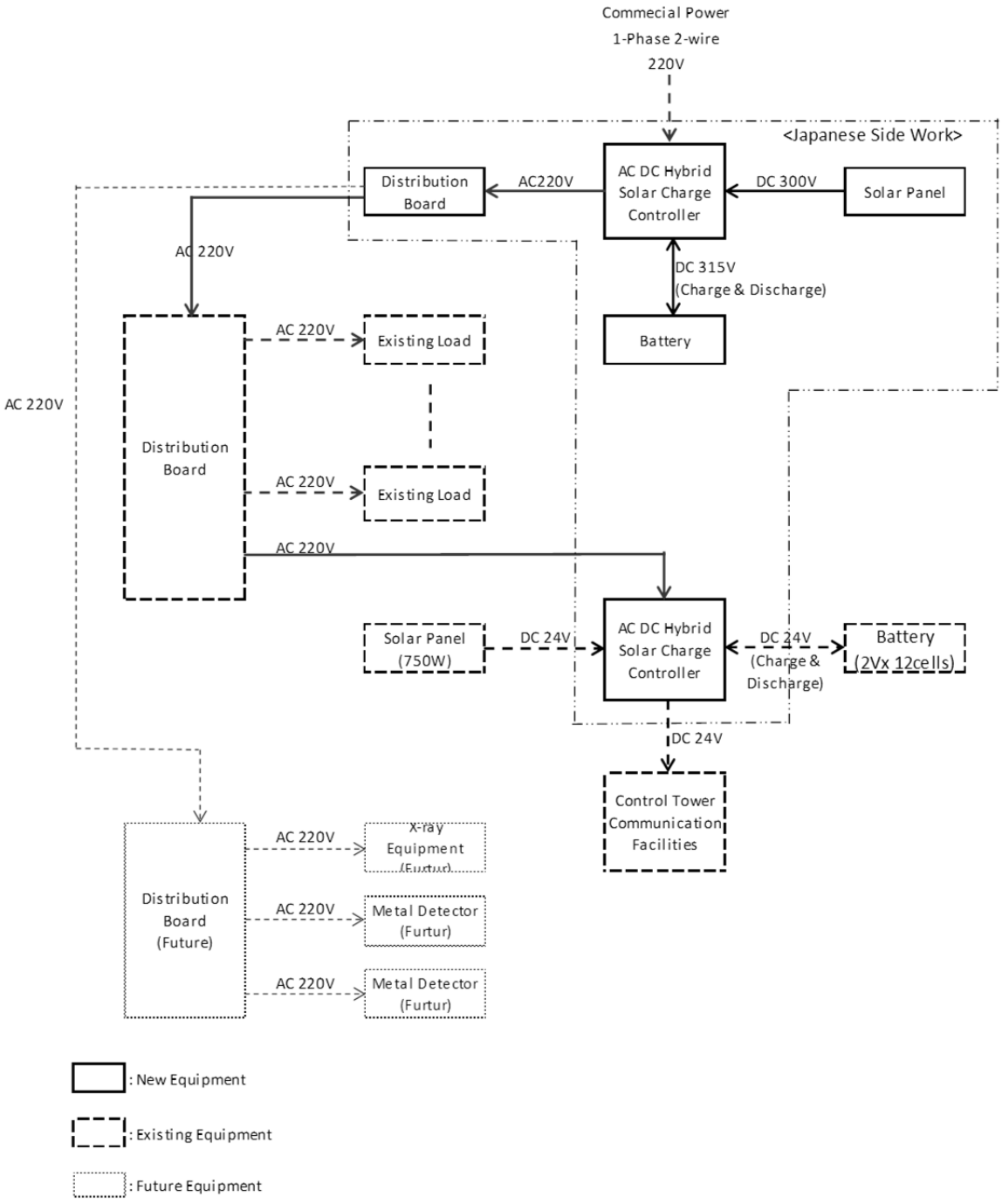


Figure 2-2-17 System Block Diagram of Solar Power Supply System for Jumla Airport

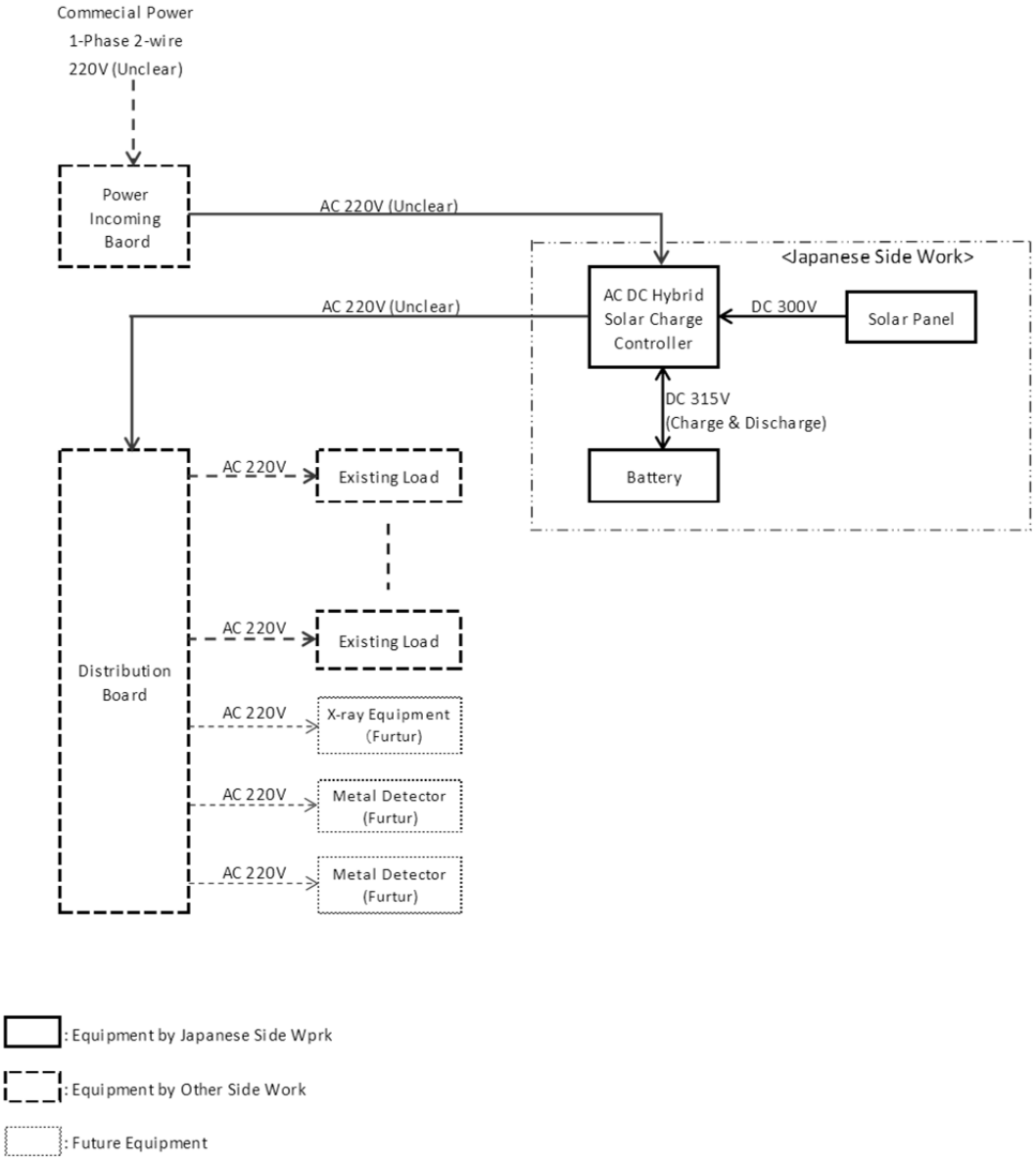


Figure 2-2-18 System Block Diagram of Solar Power Supply System for Rara Airport

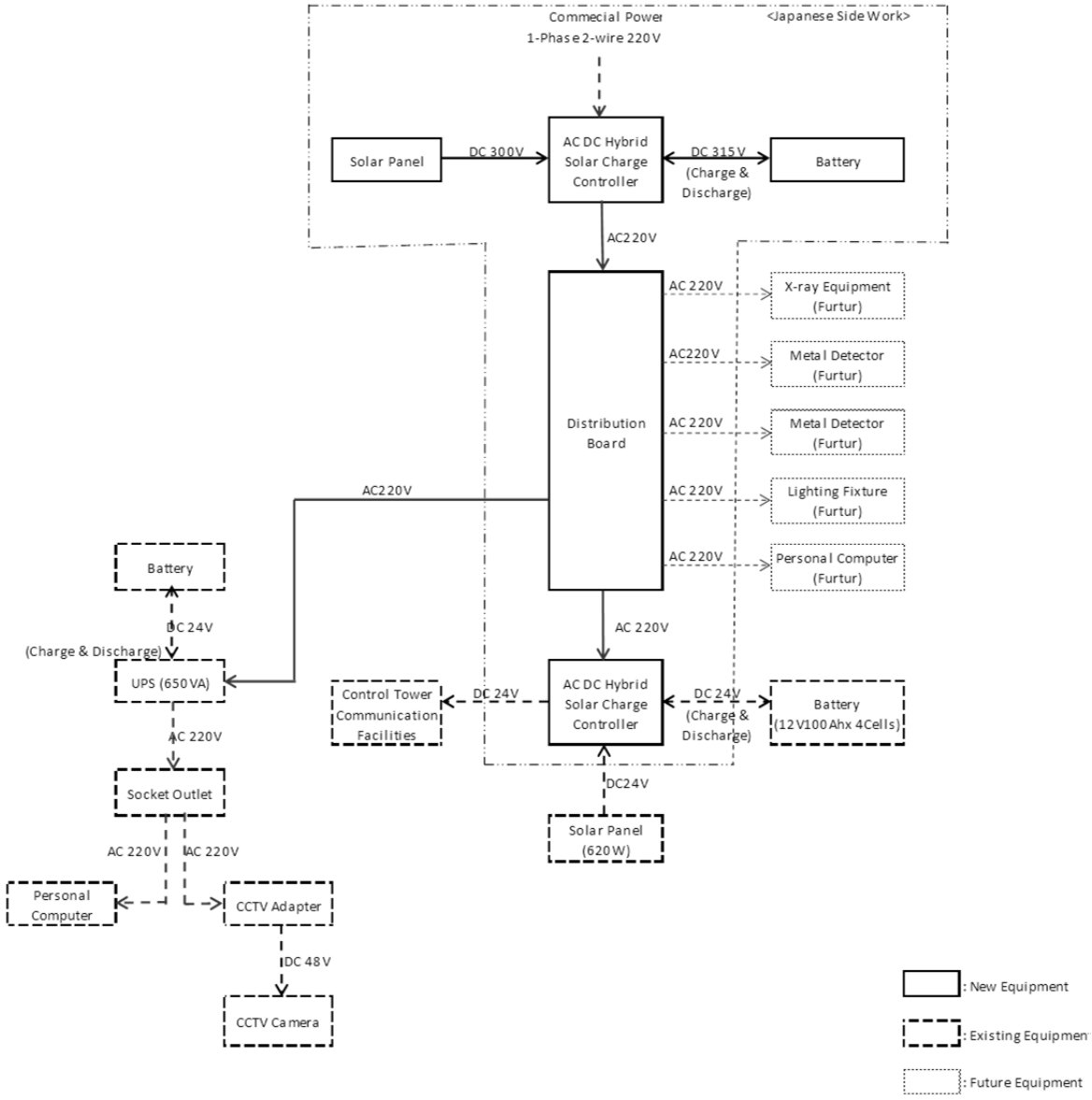


Figure 2-2-19 System Block Diagram of Solar Power Supply System for Simikot Airport

2-2-2-3 Equipment Plan

Tables 2-2-3 to 2-2-11 show main sub-components of the LOC/T-DME, LOC Maintenance Training Equipment, VOR/DME, VOR/DME Test Rack, Radar Maintenance Training Equipment, Radar Controller Training Simulator, Runway Lighting System, Flight Procedure Design System and Solar Power Supply System.

Table 2-2-3 Main Sub-components of LOC/T-DME

Equipment Name	Specifications	Q'ty	Purpose
Localizer	Compliance with ICAO Annex 10 Volume I, Para 3.1, Category I, dual configuration	1 set	Provide information of extended centerline of the runway to landing aircraft.
Terminal DME	Compliance with ICAO Annex 10 Volume I, Para 3.5, dual configuration	1 set	Provide information of distance from T-DME to landing aircraft.
Remote Control and Monitoring System	Be able to control, monitor operational status and indicate readings of built-in test device of LOC/T-DME	1 set	Control and monitoring of LOC/T-DME by Air Traffic Safety Electronics Personnel.
ILS Monitor	Indicate operational status of LOC/T-DME	1 set	Notify operational status of LOC/T-DME to air traffic controller.

Table 2-2-4 Main Sub-components of LOC Maintenance Equipment

Equipment Name	Specifications	Q'ty	Purpose
Localizer	Compliance with ICAO Annex 10 Volume I, Para 3.1, Category I, single configuration	1 set	Training of maintenance staff of Localizer.

Table 2-2-5 Main Sub-components of VOR/DME System

Equipment Name	Specifications	Q'ty	Purpose
VHF Omni-directional Range	Compliance with ICAO Annex 10 Volume I, Para 3.3, dual configuration	2 sets	Provide information of direction from DME to landing aircraft.
Distance Measuring Equipment	Compliance with ICAO Annex 10 Volume I, Para 3.5, dual configuration	2sets	Provide information of distance from DME to landing aircraft.
Central Control and Monitoring System	Be able to control, monitor operational status and indicate readings of built-in test device of the VOR/DMEs at two airports	1 set	Control and monitoring of the two DOR/DMEs by Air Traffic Safety Electronics Personnel in Kathmandu.
Emergency Power Generator	230V AC, 50Hz, 10kVA	2 sets	Supply electric power to VOR/DME when commercial power is cut off.

Table 2-2-6 Main Sub-components of VOR/DME Test Rack

Equipment Name	Specifications	Q'ty	Purpose
VOR	Compliance with ICAO Annex 10 Volume I para 3.3, single configuration	1 set	Test spare parts of VOR.
DME	Compliance with ICAO Annex 10 Volume I para 3.5, single configuration	1 set	Test spare parts of DME.

Table 2-2-7 Main Sub-components of Radar Maintenance Training Equipment

Equipment Name	Specifications	Q'ty	Purpose
Mono-pulse Secondary Surveillance Radar	Identical to MSSR procured by "Tribhuvan International Airport Modernization Project", single configuration	1 set	Training maintenance staff of MSSR.

Table 2-2-8 Main Sub-components of Radar Controller Training Equipment

Equipment Name	Specifications	Q'ty	Purpose
Radar Controller Training Simulator	APP / ACC Radar Data Display: 4, APP / ACC Flight Data Display: 4, Training Instructor/ Pseudo-pilot: 1, Pseudo-pilot: 1	1 set	Training of air traffic controller on APP and/or ACC operations.

Table 2-2-9 Main Sub-components of Runway Lighting System

Equipment Name	Specifications	Q'ty	Purpose
Runway Threshold Identification Light	Compliance with ICAO Annex 14 para 5.3.8, solar powered LED, flashing white, uni-direction	8 nos.	Provide additional conspicuity of the runway threshold.
Runway Edge Lights (1)	Compliance with ICAO Annex 14 para 5.3.9, solar powered LED, white, omni-direction	24 nos.	Indicate edge of the first 2/3 length of the runway.
Runway Edge Light (2)	Compliance with ICAO Annex 14 para 5.3.9, solar powered LED, white/yellow, bi-direction	10 nos.	Indicate edge of the last 1/3 length of the runway.
Runway Threshold Light	Compliance with ICAO Annex 14 paras 5.3.10 and 5.3.11, solar powered LED, green/red, bi-direction	30 nos.	Indicate the runway threshold by green light from the approach side and by red light from the runway side.
Runway End Light	Compliance with ICAO Annex 14 para 5.3.9, solar powered LED, red, uni-direction	6 nos.	Indicate the runway end by red light from the runway side.
Handheld Radio Controller	ON/OFF and brilliance control	3 nos.	Control the lighting system.

Table 2-2-10 Main Sub-components of Flight Procedure Design System

Equipment Name	Specifications	Q'ty	Purpose
Flight Procedure Design System	Compliance with ICAO Doc. 8168 PANS- OPS Volume II	1 set	Aid design of various flight procedures based on conventional procedures and RNAV procedures/satellite-based procedures.

Table 2-2-11 Main Sub-components of Solar Power Supply System

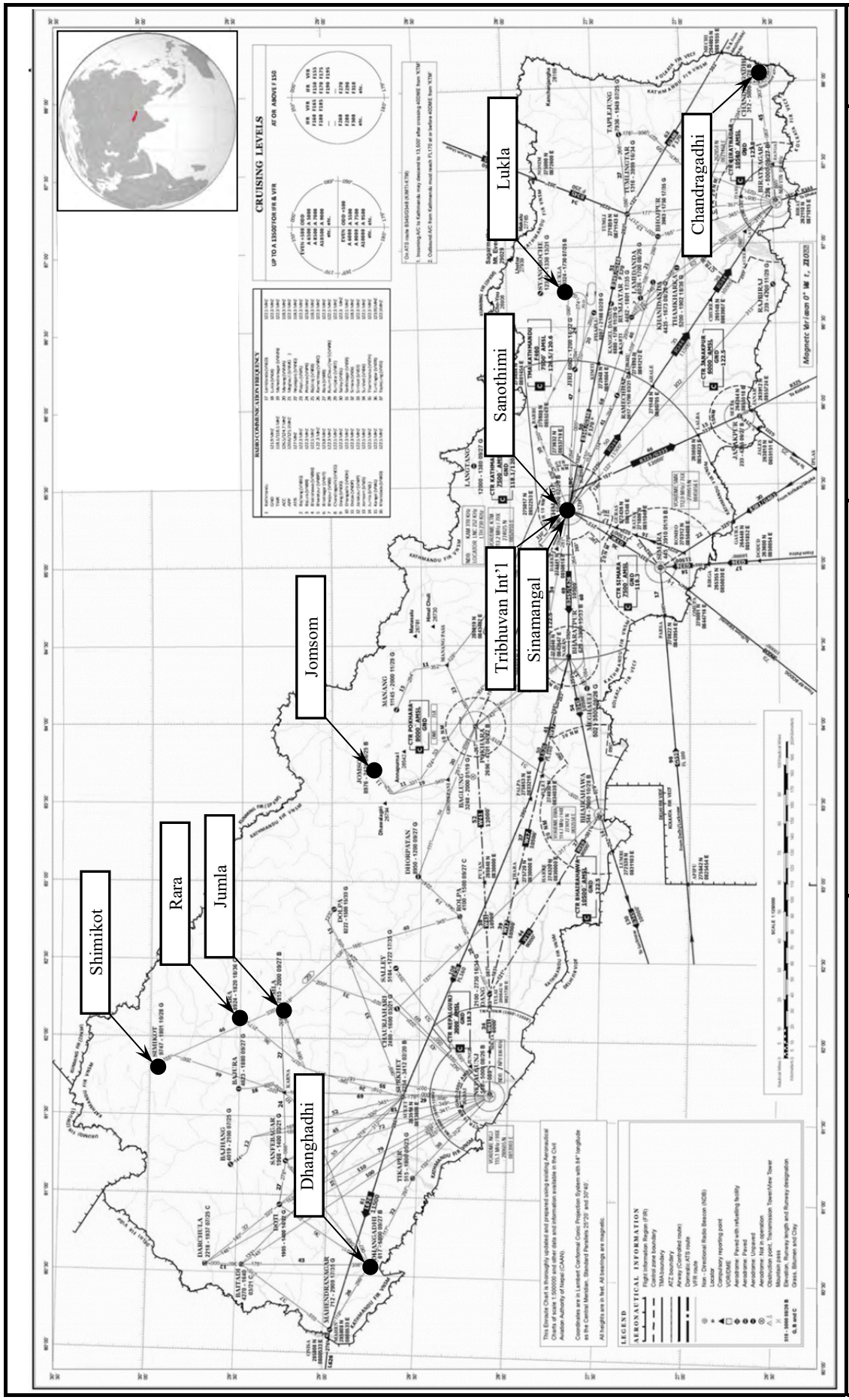
Equipment Name	Specifications	Q'ty	Purpose
PV Panel (1)	5.5kW	1 set	PV Panel for Jumla Airport
PV Panel (2)	7kW	1 set	PV Panel for Jomsom Airport
PV Panel (3)	10.5kW	1 set	PV Panel for Simikot Airport
PV Panel (4)	11.5kW	1set	PV Panel for Rara Airport
PV Panel (5)	12kW	1 set	PV Panel for Control Tower of Lukla Airport
PV Panel (6)	13.5kW	1 set	PV Panel for Terminal Building of Lukla Airport
Charge Controller (1)	1.5kW	2 sets	Charge Controller for Jumla and Simikot Airport
Charge Controller (2)	4kW	2 sets	Charge Controller for Rara and Simikot Airport
Charge Controller (3)	5kW	1 set	Charge Controller for Jumla Airport
Charge Controller (4)	6kW	1 set	Charge Controller for Lukla Controll Tower
Charge Controller (5)	9kW	2 sets	Charge Controller for Lukla Terminal Building and Jomsom Airport
Battery Bank (1)	288V 400Ah	1 set	Battery Bank for Jomsom Airport

Battery Bank (2)	288V 500Ah	1 set	Battery Bank for Jumla Airport
Battery Bank (3)	288V 700Ah	3 sets	Battery Bank for Rara and Simikot Airport and Lukla Control Tower
Battery Bank (4)	288V 900Ah	1 set	Battery Bank for Lukla Terminal Building
Distribution Board (1)	Input 220V, 10 branches	1 set	Power Distribution Board for Simikot Airport
Distribution Board (2)	Input 220V, 2 branches	3 sets	Power Distribution Board for Lukla Control Tower and Terminal Building, and Jumla Airport
Distribution Board (3)	Input 380/220V, 2 branches	1 set	Power Distribution Board for Jomsom Airport

2-2-3 OUTLINE DESIGN DRAWING

Drawing List

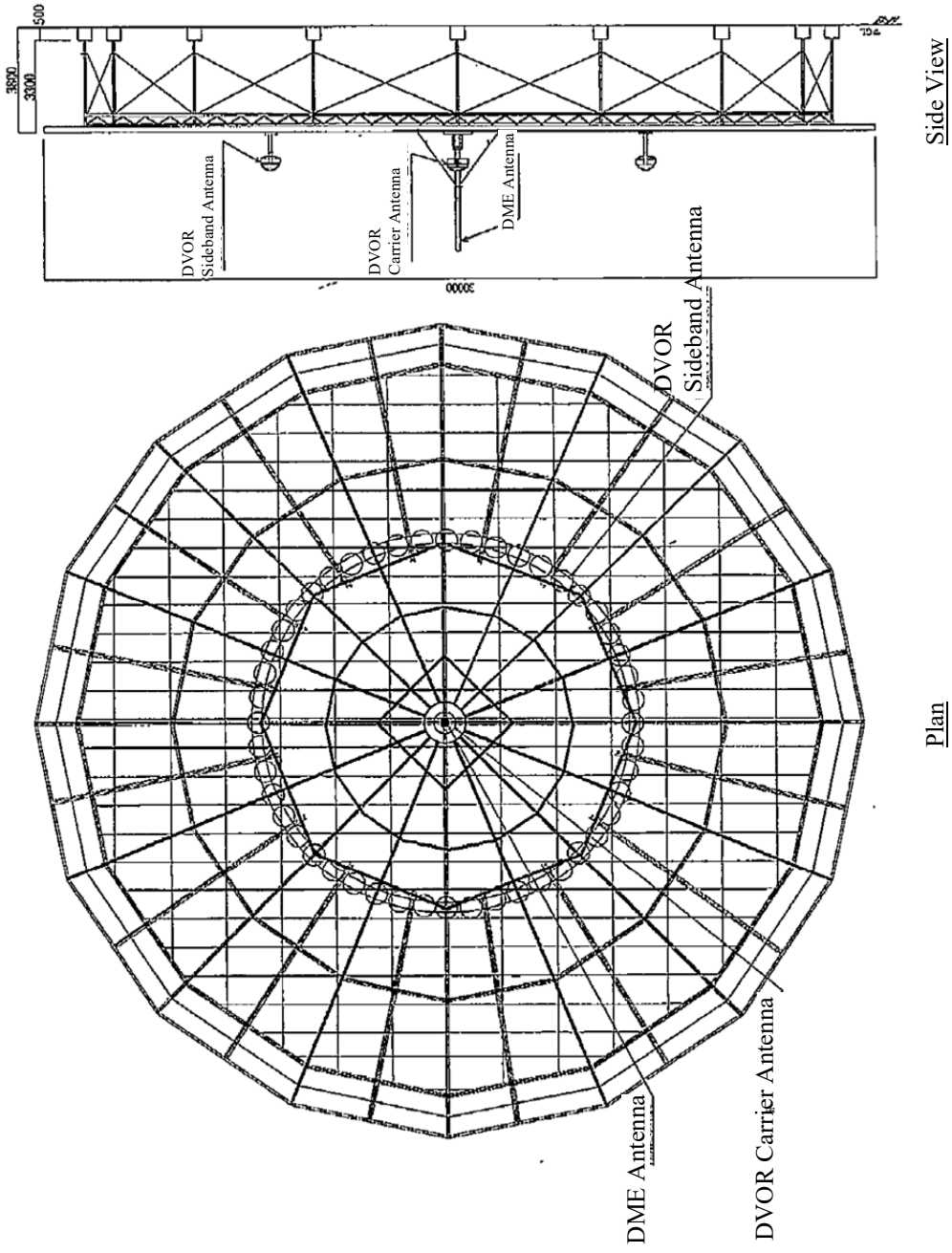
No.	Title
1	Project Location Map
	Localizer/Terminal Distance Measuring Equipment (LOC/T-DME)
2-1	Equipment Layout Plan (1)
2-2	Equipment Layout Plan (2)
3	LOC Maintenance Training Equipment, Equipment Layout Plan
	VOR/DME System
4-1	Equipment Layout Plan, Dhangadhi
4-2	Equipment Layout Plan, Chandragadhi
4-3	Equipment Layout Plan, Sinamangal
4-4	DVOR/DME Counterpoise & Antenna Typical Arrangement
5	DVOR/DME Test Rack, Equipment Layout Plan
6	Radar Maintenance Training Equipment, Equipment Layout Plan
7	Radar Controller Training Equipment, Equipment Layout Plan
	Runway Lighting System
8-1	Equipment Layout Plan, Lukla Airport
8-2	Equipment Layout Plan, Jomsom Airport
8-3	Equipment Layout Plan, Jumla Airport
9	Flight Procedure Design System, Equipment Layout Plan
	Solar Power Supply System
10-1	Equipment Layout Plan, Lukla Airport
10-2	Equipment Layout Plan, Jomsom Airport
10-3	Equipment Layout Plan, Jumla Airport
10-4	Equipment Layout Plan, Rara Airport
10-5	Equipment Layout Plan, Simikot Airport



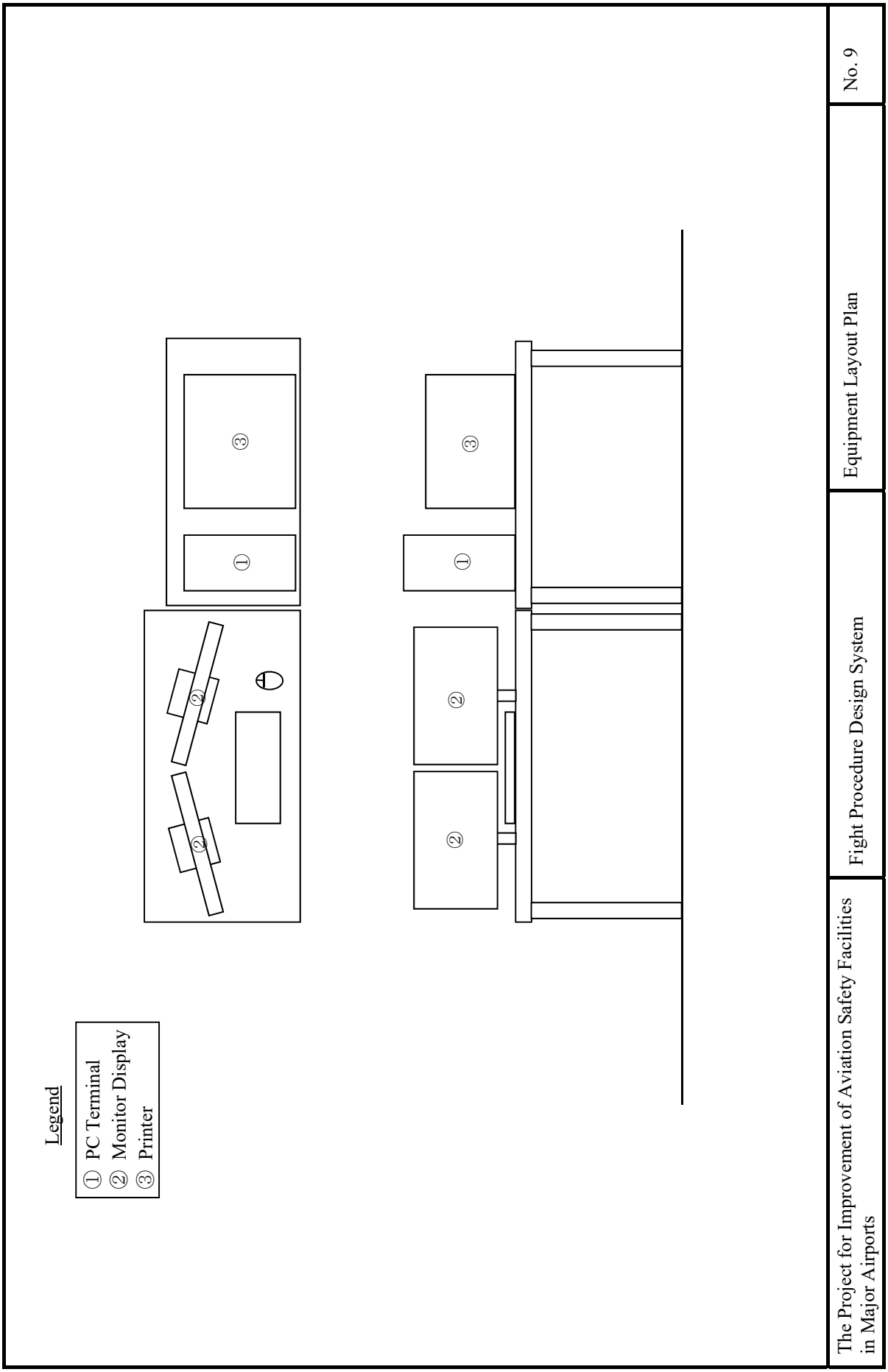
The Project for Improvement of Aviation Safety Facilities in Major Airports

Project Location Map

No. 1



The Project for Improvement of Aviation Safety Facilities in Major Airports	VOR/DME System	DVOR/DME Counterpoise & Antenna Typical Arrangement	No. 4-4


Legend
① PC Terminal
② Monitor Display
③ Printer
① ② ③
① ② ③
The Project for Improvement of Aviation Safety Facilities in Major Airports
Fight Procedure Design System
Equipment Layout Plan
No. 9

2-2-4 IMPLEMENTATION PLAN

2-2-4-1 Implementation Policy

- Implementing organization of the Project will be the Civil Aviation Authority of Nepal, and the supervising organization will be the Ministry of Culture, Tourism and Civil Aviation.
- Since the equipment and systems to be procured under the Project are not produced in Nepal, they shall, in principle, be the products of Japan except a special case, in which procurement from the third country will be permitted.
- It is planned to bid out in two lots for sufficient competition.
- Since the Nepalese contractors for electrical/communication works has little experience in aviation projects, specialists of the manufacturers or specialized sub-contractors from foreign countries will be required. It will be possible for the Nepalese workers and electricians to conduct equipment installation and cabling works under the supervision of the foreign specialists.

2-2-4-2 Implementation Conditions

- It should be noted that most of the business activities are suspended during Banda, i.e. general strike, and festivals such as Dashain and Tihal, and ample room should be incorporated in the Project implementation schedule.
- Some of the installation works should be conducted while keeping the existing equipment in operation or outside of the airport operation hours so as not to disturb the airport operations.
- Since the Project sites are roughly divided into eight, i.e. Kathmandu (TIA, CAA Sanotimi and CAAN head office), Lukla, Jomsom, Jumla, Rara Simikot, Chandragadhi and Dhangadhi Airports, appropriate assignments of the Procurement Supervision Engineers of the consultant and Procurement Supervision Staff of the supplier will be required for quality control and schedule management.
- Since only about 80% of the staff positions of CAAN are filled at present, and the number of technical staff is insufficient, CAAN should strengthen the technical staff and employ temporary staff for proper implementation/management of the Project.

2-2-4-3 Scope of Works

Scope of work of the Japan and Nepalese sides are summarized in Table 2-2-12.

Table 2-2-12 Scope of Work

Category	No.	Item	To be covered by Grant Aid (Japan)	To be covered by recipient side (Nepal)
General Scope	1.1	Process and charges of Banking Arrangement and Authorization to Pay		✓
	1.2	Customs clearance of import equipment & material		✓
	1.3	Permissions for entrance to the site and works at the site		✓
	1.4	Bearing duties and taxes in Nepal for procurement of materials and services		✓
	1.5	Provision of facilities to Japanese nationals involved in the project		✓
	1.6	Procurement of equipment	✓	
	1.7	Transportation of equipment (sea and land transportation)	✓	
	1.8	Provision of temporary storage area of equipment and materials		✓
	1.9	Land acquisition for VOR/DME sites		✓
	1.10	Restriction of operation of airport facilities necessary for installation works		✓
Installation, Adjustment, Testing, Training	2.1	Preparation of VOR/DME sites		✓
	2.2	Chop-off top of trees obstructing line-of-sight between tower and VOR/DME sit		✓
	2.3	Preparation of space for equipment installation in existing buildings		✓
	2.4	Air conditioning of Radar Lab and Simulator Room		✓
	2.5	Provision of cable ducts under runway/taxiway or permission for use of existing fiber optic cable at TIA		✓
	2.6	Provision of Internet Connections between Two Airports & Sinamangal		✓
	2.7	Provision of LAN with internet access for Flight Procedure Design System		✓
	2.8	Provision of available obstacle and terrain data for Flight Procedure Design System		✓
	2.9	Maintenance/update service contract for Flight Procedure Design System after 1-Year		✓
	2.10	Provision of an additional breaker in power distribution board at TIA's P1 Substation		✓
	2.11	Check and repair existing power distribution system to be connected with Solar Power Supply System		✓
	2.12	Cabling between existing and new power distribution boards for Solar Power Supply System	(Note)	✓
	2.13	Provision of commercial power supply to each site		✓
	2.14	Installation of equipment	✓	
	2.15	Adjustment and testing	✓	
	2.16	Flight check	✓	✓
	2.17	Operation and maintenance training	✓	

Note: Japanese side will assist CAAN in cabling works until completion of on-site operation and maintenance training.

Source: JICA Survey Team

2-2-4-4 Consultant Supervision

The consultant will supervise quality, schedule and safety management by the main contractor, who will procure/supply equipment/systems of various manufacturers, in accordance with the contract. Major activities of supervision are as follows:

- Confirmation and Verification of Shop Drawings and Specifications: Confirm and verify shop drawings, construction/installation drawings, specifications, construction/installation plan, implementation schedule, etc. that will be submitted by equipment manufacturer prior to the production of the equipment.

- Review of Factory Test Results: After manufacturing of equipment, review the factory test report and other related documents to be submitted by the manufacturer.

- Confirmation of Site Conditions and Coordination with Nepalese Side: Prior to shipping the manufactured equipment, confirm progress of the arrangements by the Nepalese side, such as land acquisition, site preparation and removal of existing equipment necessary for installation of new equipment, etc. at the site. If there is a problem in receiving equipment or starting installation work, request improvement to Nepalese side and coordinate with the implementing agency and main contractor.

- Installation Supervision: Supervise at the site the quality of the works, safety management and work progress management by the main contractor during the installation work period.

- Commissioning Test: Prior to the commissioning test by the equipment manufacturer, prepare a checklist. Attend the commissioning test, then guide the manufacturer in compilation of test results and tested data.

- Taking Over: Reconfirm results of the factory tests and commissioning tests at the site, prepare the certificate of completion of installation, coordinate with Nepalese side for issuing the certificate, and coordinate with relevant organizations for preparation of taking over.

Table 2-2-13 describes assignment position, period and task of the consultant's supervision.

Table 2-2-13 Assignment Position, Period and Task of Consultant's Supervision

Position	Period	Tasks
Project Manager (Japanese)	Spot	Overall management of procurement supervision.
Resident Procurement Supervision Engineer-1 (Japanese)	Resident	Overall management of consultant's on-site supervision (coordination with Nepalese side, supervision of installation work, adjustment and trial operation and operation & maintenance training, commissioning and taking over of the systems) at Chandragadhi and Dhangadhi Airports.
Resident Procurement Supervision Engineer-2 (Japanese)	Resident	Overall management of consultant's on-site supervision (coordination with Nepalese side, supervision of installation work, adjustment and trial operation and operation & maintenance training, commissioning and taking over of the systems) at Kathmandu and five airports in mountainous area.
Procurement Supervision Engineer-1 (Japanese)	Spot	Supervise adjustment, test operations and operation & maintenance training for Radar Maintenance Training Equipment, and witness its commissioning test.
Procurement Supervision Engineer-2 (Japanese)	Spot	Supervise adjustment, test operations and operation & maintenance training for Radar Controller Training Simulator, and witness its commissioning test.
Procurement Supervision Engineer-3 (Japanese)	Spot	Supervise adjustment, test operations and operation & maintenance training for Flight Procedure Design System, and witness its commissioning test.
Inspection Engineer-1 (Japanese)	Spot	Confirmation and validation of shop drawings, construction/ installation drawings, specifications, implementation schedule, construction/ installation plan, etc., review/approval of factory test results and conduct inspection before end of the manufacturer's warranty period related to LOC/T-DME, LOC Maintenance Training Equipment, VOR/DME and VOR/DME Test Rack.
Inspection Engineer-2 (Japanese)	Spot	Confirmation and validation of shop drawings, construction/ installation drawings, specifications, implementation schedule, construction/ installation plan, etc. and review/approval of factory test results related to Radar Maintenance Training Equipment.

Inspection Engineer-3 (Japanese)	Spot	Confirmation and validation of shop drawings, construction/ installation drawings, specifications, implementation schedule, construction/ installation plan, etc., review/approval of factory test results and conduct inspection before end of the manufacturer's warranty period related to Radar Controller Training Simulator.
Inspection Engineer-4 (Japanese)	Spot	Confirmation and validation of shop drawings, construction/ installation drawings, specifications, implementation schedule, construction/ installation plan, etc. and review/approval of factory test results related to Runway Lighting System and Solar Power Supply System.
Inspection Engineer-5 (Japanese)	Spot	Confirmation and validation of shop drawings, construction/ installation drawings, specifications, implementation schedule, construction/ installation plan, etc. and review/approval of factory test results related to Flight Procedure Design System.

Source: JICA Survey Team

2-2-4-5 Quality Control Plan

1) Procurement of Goods Manufactured at ISO9001 Certified Factory

For main equipment, it will be specified that the equipment shall be products of factories, which apply the ISO9001 Quality Management System, and that a copy of ISO9001 certification shall be submitted at the time of tendering.

2) Confirmation and Validation of Shop Drawings

The consultant will check shop drawings of the equipment, construction/installation drawings, specifications, structural design calculations, implementation schedule and construction/installation plan to be submitted by the equipment manufacturers and sub-contractor for construction/installation works, and confirm if production of the equipment and installation/construction works will be done in accordance with the contract.

3) Factory Test

After production of equipment, the manufacturers will be required to conduct factory tests and submit the factory test report to the consultant for confirming if the produced equipment has performance as required in the specifications.

4) Verification of Equipment for Shipment

Verification of numbers and types of the equipment will be conducted immediately before packing at the manufacturer's warehouse with the presence of the main contractor.

5) Verification of Equipment for Loading

Third party auditor, who will be employed by the consultant, will conduct verification of numbers and types of the equipment before loading a ship.

6) Commissioning Test

After completion of adjustment of the individual equipment and interconnection of equipment, commissioning tests of the corresponding system will be conducted with presence of the consultant and main contractor. During the commissioning test, the system will be operated by the manufacturer's engineer for obtaining the test data needed for taking over. Performance of individual and interconnected equipment and quantity of the equipment will also be verified. The commissioning test will be performed at the end of adjustment/test/trial operation period.

7) Flight Check

For the LOC/T-DME and VOR/DMEs, a flight check will be conducted to confirm if the equipment is performing as required in the specifications, by using the aircraft arranged by the CAAN with presence of both the CAAN representative and consultant.

8) Taking Over

After the operation and maintenance training, the main contractor, consultant and CAAN representative will confirm results of the factory tests, commissioning tests and flight check, then the system will be taken over to the implementing agency.

9) Inspection before End of Manufacturer's Guarantee Period

For the LOC/T-DME and Radar Controller Training Simulator, the consultant will conduct inspections to check if the equipment is used as planned, if there are any defects that were not found at the time of taking over, etc. at two weeks before the end of the manufacturer's guarantee period. The consultant will also check manufacturers' agents and urge maintenance contracts between CAAN and manufacturers if necessary.

2-2-4-6 Procurement Plan

The equipment and systems to be procured under the Project are not produced in Nepal, and no third-country's products are sold regularly in Nepal. Therefore, it is planned that the equipment/ systems will be procured from Japan. However, procurement from the third country will be permitted for the equipment, which Japanese manufacturers do not produce such equipment meeting the specifications.

Table 2-2-14 List of Equipment to Be Procured

Equipment	Nepal	Japan	3rd Country	Remarks
LOC/T-DME		✓		
LOC Maintenance Training Equipment		✓		
VOR/DME		✓		
VOR/DME Test Rack		✓		
Radar Maintenance Training Equipment		✓		
Radar Controller Training Simulator		✓		
Runway Lighting System			✓	Solar powered LED runway lights are not manufactured in Japan
Flight Procedure Design System		✓		
Solar Power Supply System		✓		

Source: JICA Survey Team

It is planned to limit the equipment manufacturers only from the member countries of the Organization for Economic Co-operation and Development (OECD). However, it is not planned to limit origin of the equipment since manufacturing at its own factories in developing countries is very common. In order to avoid crude goods, it is planned to require in the specifications that the equipment shall be products of the manufacturers of the OECD member countries and be manufactured in their ISO 9000 series certified factories.

Considering competitiveness, economy and efficiency of procurement, the equipment/systems will be procured in two lots as shown in Table 2-2-15.

Table 2-2-15 Components of Each Lot

Lot 1	Lot 2
LOC/T-DME LOC Maintenance Training Equipment VOR/DME System VOR/DME Test Rack	Radar Maintenance Training Equipment Radar Controller Training Simulator Runway Lighting System Flight Procedure Design System Solar Power Supply System

Source: JICA Survey Team

The Project will install equipment/systems necessary for improving safety of operations at Tribhuvan International Airport and seven major domestic airports, thus proper maintenance of the procured equipment/systems will be very important for socio-economic activities in Nepal. As mentioned later in 2-5-2, the CAAN's current account shows substantial surplus in recent years, and there will be no problem to procure and maintain appropriate number and types of spare parts. Therefore, one set each of major spare parts/modules, which are required as immediate stock, will be procured in the Project.

2-2-4-7 Operational Guidance Plan

Some of the equipment/systems, which will be procured by the Project will have the function almost same as the existing equipment/systems, but their operation and maintenance methods differ from the existing ones. Thus, training of operation and maintenance staff is required for achievement of full effects of the Japan's Grant Aid. Outline of operation and maintenance training is shown in Table2-2-16. It is planned that the engineers, who conduct adjustments and tests of the equipment/ systems, will conduct training of corresponding equipment/systems.

Table 2-2-16 Outline of Operation and Maintenance Training

Trainees	Equipment Operator (Air Traffic Controller)	Maintenance Engineer
Subject	- LOC/T-DME (1 day x 3 group) - VOR/DME (1 day x 2 airport) - Radar Controller Training Simulator (3 day) - Flight Procedure Design System (2 day)	- LOC/T-DME (3 day x 2 group) - LOC Maintenance Training Equipment (included in above) - VOR/DME (3day x 2 group) - VOR/DME Test Rack (included in above) - Radar Maintenance Training Equipment (3day x 2group) - Radar Controller Training Simulator (3 day) - Runway Lighting System(1 day) - Flight Procedure Design System (3 day) - Solar Power Supply System (1 day)
Contents of training	- Basic concept of system - Prohibition / limitation on system operation - Method of operation - Response in case of emergency	- Concept of system - Prohibition / limitation on system operation - Method of operation - Response in case of emergency - Periodic inspection - Theory of tests, handling of test equipment - Diagnosis of failure and method of repair - Instructions for storage/transportation of equipment - Management of test equipment, consumables and spare parts

Source: JICA Survey Team

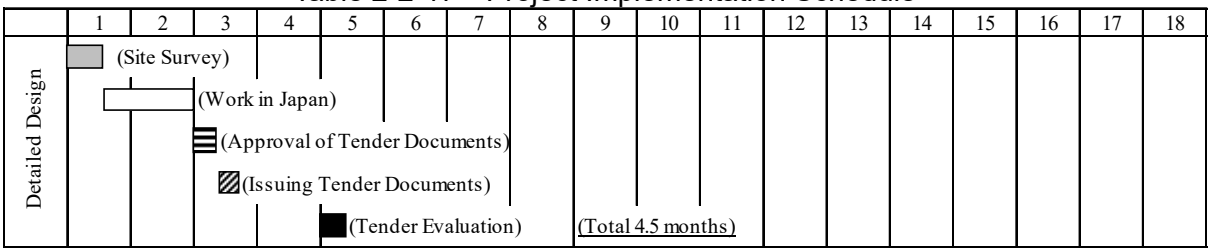
2-2-4-8 Soft Component (Technical Assistance) Plan

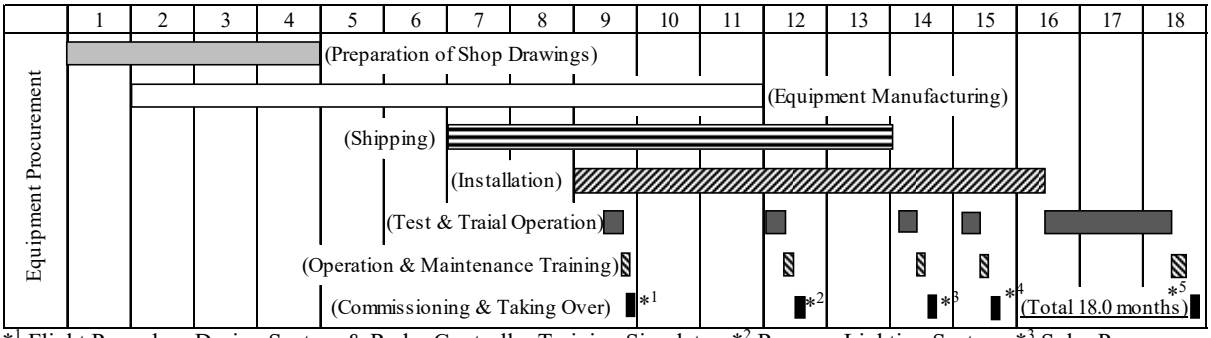
It is considered necessary to provide technical assistances for operation and maintenance of LOC/T-DME and designing PBN flight procedures by using the Flight Procedure Design System to be procured under the Project, but no soft component is planned because these assistances will be required for several years after taking over of the equipment/systems.

2-2-4-9 Implementation Schedule

The project implementation schedule including the detailed design, procurement/installation of equipment, commissioning and taking over of the equipment is shown in Table 2-2-17.

Table 2-2-17 Project Implementation Schedule





*1 Flight Procedure Design System & Radar Controller Training Simulator, *2 Runway Lighting System, *3 Solar Power Supply System, *4 Radar Maintenance Training Equipment, *5 LOC/T-DME, LOC Maintenance Equipment, VOR/DME & VOR/DME Test Rack

Source: JICA Survey Team

2-3 OBLIGATIONS OF RECIPIENT COUNTRY

The following paragraphs describe outline of obligations of Nepalese side identified in Table 2-2-12. It is understood possible and reasonable that the Nepalese side will bare these obligations. However, some of the obligations will require coordination within the CAAN and/or the Government of Nepal (GoN), negotiation with the third parties, preparatory work at the Project sites, etc., which shall be completed in timely manner. It is, therefore, indispensable to formulate good understanding of these obligations among the concerned parties of Nepalese side.

1) Process and Charges of Banking Arrangement and Authorization to Pay
The GoN shall open an account under the GoN's name in a bank in Japan, issue Authorization to Pay as appropriate, and bear all commissions paid to the bank.

2) Customs Clearance of Import Equipment and Material
The GoN shall make a customs clearance for importation of equipment and materials, which are to be used for the Project.

3) Permissions for Entrance to the Site and Works at the Site
The CAAN shall obtain or issue permissions necessary for entrance to and execution of the Works at the Site.

4) Bearing Duties and Taxes in Nepal for Procurement of Materials and Services
The GoN shall bear the customs duties, internal taxes and other fiscal levies which may be imposed in Nepal with respect to the local purchase of the products and the services.

5) Provision of Facilities to Japanese Nationals Involved in the Project
The GoN shall provide Japanese nationals, who are involved in the Project, such facilities as may be necessary for their entry into Nepal and their stay therein for the performance of their work.

6) Provision of Temporary Storage Areas of Equipment and Materials
The CAAN shall provide temporary storage areas of equipment and materials before distribution

to the installation sites.

7) Land Acquisition for VOR/DME Sites
In compliance with JICA's Guidelines for Environmental and Social Considerations, the CAAN shall acquire the land areas for installation of VOR/DME at Chandragadhi and Dhangadhi in advance.

8) Restriction of Operation of Airport Facilities Necessary for Installation Works
The CAAN shall implement restrictions of operation of airport facilities necessary for installation works around the runways of TIA, Lukla, Jomsom and Jumla Airport.

9) Preparation of VOR/DME Sites
The CAAN shall prepare the VOR/DME sites including earthworks, installation of face and gate, construction of an access road between the existing road and the site and provision of commercial power to the site in advance.

10) Chop-off Top of Trees obstructing line-of-sight between Tower and VOR/DME Site
The CAAN shall chop-off top of trees, which obstruct the line-of-sight between the control tower and VOR/DME site at Chandragadhi so that these two locations can be connected with a radio LAN.

11) Preparation of Space for Equipment Installation in Existing Buildings
The CAAN shall remove the existing equipment (including appropriate disposal) so as to secure spaces for installation of new equipment.

12) Air Conditioning of Radar Lab and Simulator Room
The CAAN shall provide air conditioning at Radar Lab and Simulator Room for proper operation of LOC Maintenance Equipment, Radar Maintenance Equipment and Radar Controller Training Simulator.

13) Provision of Cable Ducts under Runway/Taxiway or Permission for Use of Existing Fiber Optic Cable at TIA
The CAAN shall, based on the choice of the Supplier, provide, at no cost, cable ducts crossing the runway/taxiways or permit use of the existing fiber optic cable at TIA for transmission of control and monitoring signals between the Operations Building and the sheltes of Localizer.

14) Provision of Internet Connections between Two Airports and Sinamangal
The CAAN shall provide internet connections between Chandragadhi - Kathmandu and Dhangadhi - Kathmandu for central control and monitoring of the VOR/DMEs.

15) Provision of LAN with Internet Access
The CAAN shall provide LAN with internet access for remote maintenance and license management of the Flight Procedure Design System.

16) Provision of Available Obstacle and Terrain Data for Flight Procedure Design System
The CAAN shall provide topographic maps and existing obstacle data, which should be included in the database of the Flight Procedure Design System, to the Supplier at no cost.

17) Maintenance/Update Service Contract for Flight Procedure Design System after 1-ear
The CAAN shall make a maintenance service contract with software maker of the Flight Procedure Design System so that it will correspond to the revisions of ICAO PANS-OPS, etc. even after one year from the taking over.

18) Provision of an Additional Breaker in Power Distribution Board at TIA's P1 Substation
The CAAN shall provide an additional breaker in the existing power distribution board at TIA's

P1 Substation, from which electric power will be supplied to the Localizer.

19) Check and Repair Existing Power Distribution System to Be Connected with Solar Power Supply System
The CAAN shall check the existing power distribution boards and secondary power distribution cables of the terminal building/control tower at Lukla, Jomsom, Jumla, Rara and Simikot Airports, and repair them as necessary. It should be noted that the capacity of the solar power supply system was calculated by assuming use of LED lighting.

20) Cabling between Existing and New Power Distribution Boards for Solar Power Supply System
The CAAN shall make cabling between the existing power distribution board and the new power distribution board to be installed for the solar power supply system at Lukla, Jomsom, Jumla, Rara and Simikot Airports.

21) Provision of Commercial Power Supply to Each Site
The CAAN shall provide commercial power supply to the Sites, which will be necessary for the operation of equipment and systems after commissioning.

22) Flight Check
The CAAN shall arrange aircraft, inspector and ground support personnel (except for supporting personnel of the contractor) necessary for flight check of the LOC/T-DME and VOR/DMEs, and bear their costs.

2-4 PROJECT OPERATION PLAN

An Air Traffic Safety Electronics Personnel or an electrical engineer, who can maintain equipment, is not stationed at the domestic airports, where parts of equipment will be installed by the Project. Therefore, a central control and monitoring system of the VOR/DME, for which daily inspection is indispensable, is to be installed at Kathmandu. The Runway Lighting Systems and Solar Power Supply Systems will be operated (on/off, etc.) by the air traffic controllers of each airport. If a failure occurs, technical staff at Kathmandu will be dispatched for troubleshooting and maintenance based on the request from the airport manager or air traffic controller.

Table 2-4-1 shows department/section responsible for operation and maintenance of equipment in Kathmandu. Staff strength, number of current staff and electronics/ electrical engineers in these departments and sections are as shown in Table 2-4-2, and insufficiency of electronics/electrical engineers is evident.

Table 2-4-1 Department/Section Responsible for Operation/Maintenance of Equipment

Responsible Department/Section \ Equipment	LOC/T-DME	LOC Maintenance Training Equipment	VOR/DME	VOR/DME Test Rack	Radar Maintenance Training Equipment	Radar Control Training Simulator	Runway Lighting System*1	Flight Procedure System	Solar Power Supply System*1
TIA Com. & Nav. Aid Section	OM	(M)			(M)	(M)			
Com. & Nav. Dept.			OM	OM				(M)	
ATM Dept.								OM	
Electrical Mechanical Dept.							M		M
Civil Aviation Academy		OM			OM	OM			

Note: O – Operation, M – Maintenance, (M) – Maintenance Support
*1 : Operation by air traffic controllers of each airport

Source: JICA Survey Team

Table 2-4-2 Staff Strength, Number of Current Staff, Electronics/Electrical Engineers

Department/Section	Staff Strength	Current Staff	Electronics/Electrical Engineers
TIA, Com. & Nav. Aid Section	36	16	14
Com. & Nav. Dept.	15	6	6
ATM Dept.	14	3	0
Electrical Mechanical Dept.	14	10	1
Civil Aviation Academy	31	25	2

Source: JICA Survey Team

It is necessary to add at least five maintenance staffs as listed below for operation and maintenance of the equipment to be procured by the Project.

- TIA, Com. & Nav. Aid Section: 3 staffs
- Com. & Nav. Dept.: 1 staff
- Electrical Mechanical Dept.: 1 staff

With regard to the insufficiency of technical staff, the CAAN should, in addition to filling the vacancies as soon as possible, endeavor to increase the retention rate of staff through improving treatment of staff, establishing carrier development plan, etc. It is also recommendable to consider outsourcing parts of regular inspection and maintenance to the private sector for ensuring proper operation and maintenance of equipment.

It is planned that the spare parts to be procured by the Project will be registered in a spare parts management system being developed by "The Project for the Development of a Spare Parts Management Center and En-route Radar Control Services", and stored in a central storage at Kathmandu. When a failure occurs in the equipment, necessary spare parts will be carried to each site by the maintenance staff.

Operation and maintenance cost after the Project is described later in Section 2-5-2.

2-5 PROJECT COST ESTIMATION

2-5-1 Initial Cost Estimation

(1) Nepalese Portion: approximately 56.6 million Nepal Rupee (about 66.7 million Yen) except for the project management costs, such as remunerations for staff, travel expenses and others
  (i) Land acquisition for VOR/DME sites: 22.4 million Nepal Rupee (about 26.4 million Yen)
  (ii) Site preparation of VOR/DME sites: 4.0 million Nepal Rupee (about 4.7 million Yen)
  (iii) Flight Check: 20.0 million Nepal Rupee (about 23.6 million Yen)
  (iv) Bank Commission: 2.1 million Nepal Rupee (about 2.5 million Yen)
  (v) Customs Duty: 8.1 million Nepal Rupee (about 9.5 million Yen)

(2) Conditions for Estimation
  (i) Time of Estimation: October, 2015
  (ii) Exchange Rate :1 US$ = 123.31 Yen
  :1 Nepal Rupee (NPR) = 1.179 Yen
  (iii) Procurement Period : Detailed design, equipment procurement and installation periods as shown in Table 2-17.
  (iv) Others : Cost should be estimated in accordance with relevant rules and guidelines of Japan's Grant Aid.

2-5-2 Operation and Maintenance Cost

An average annual operation and maintenance cost for the equipment to be procured by the Project, including costs for the additional maintenance personnel, is estimated as shown in Table 2-5-1. Note that the Radar Maintenance Training Equipment and Radar Controller Training Simulator are replacement of the existing equipment, but almost no operation and maintenance costs have been incurred for these existing equipment in the recent years because no spare parts were produced by the manufacturers.

Table 2-5-1 Annual Incremental Operation and Maintenance Costs by the Project

Item	Amount (million NPR)
Personnel Expenses	3.0
Operation and Maintenance Cost	20.0
LOC/T-DME and LOC Maintenance Training Equipment	(4.1)
VOR/DME System and VOR/DME Test Rack	(4.8)
Radar Maintenance Training Equipment	(3.5)
Radar Controller Training Simulator	(1.0)
Runway Lighting System	(0.4)
Flight Procedure Design System	(2.5)
Soloar Power Supply System	(3.7)
Total	23.0

Source: JICA Survey Team

Table 2-5-2 shows CAAN's personnel expenses and equipment maintenance in the last three fiscal years. The above incremental costs are less than 1% of F/Y 2013-2014 for the personnel expenses and about 25% for the equipment maintenance.

Table 2-5-2 Personnel Expense and Equipment Maintenance Expenses

(million NPR)

Item	F/Y 2011-2012	F/Y 2012/-013	F/Y 2013-2014
Personnel Expenses	567.4	719.4	964.0
Equipment Maintenance	23.9	52.0	78.8

Note: Personnel Expenses include Pay Roll Cost & Benefits and Bonus.
Equipment Maintenance includes both aviation and support system equipment maintenance.

Source: JICA Survey Team

In order to prepare for the future replacements of the equipment to be procured by the Project (in about 15-year cycle except batteries for the Solar Power Supply System, for which in about 7-year cycle), it is recommendable to add about NPR 50 million per year to the current depreciation cost (about NPR 600 million in F/Y 2013-2014).

It is considered that the CAAN is capable to bear these additional operation and maintenance cost and depreciation cost since it has been recording the net profit of more than NPR 1 billion in the recent years.

CHAPTER 3 PROJECT EVALUATION

3-1 Preconditions

Preconditions for implementation of the Project are as follows:

- Nepalese side should ensure corporation of the Government of Nepal on "2-3 Obligations of Recipient Country".
- CAAN should promise implementation of design, verification and safety assessment of LOC/T-DME approach procedures.
- CAAN should acquire the land for VOR/DME at Chandragadhi and Dhangadhi.
- CAAN should implement site preparation, installation of fence and gate, construction of an access road and power supply works for the VOR/DME sites.

3-2 Necessary Inputs by Recipient Country

Inputs by Nepalese side necessary for completing overall project plan are as follows:

- CAAN should strengthen its permanent staff, employs temporary staff as required, and establishes a Project Management Unit (PMU).
- PMU, with cooperation of other units and organizations, should fulfill "Obligations of Recipient Country"
- CAAN should secure the budget necessary for operation and maintenance of the equipment procured by the Project.
- CAAN should increase its technical staff and endeavor to increase the retention rate of staff through improving treatment of staff, establishing carrier development plan, etc.

3-3 Important Assumptions

Important assumptions for achievement/sustainment of the Project effects are as follows:

- CAAN staffs, who have been involved in the Project, will continue to involve in improvement of safety of aircraft operations in navigation and landing at Tribhuvan International Airport and the seven target domestic airports.
- CAAN will operate and maintain the existing aviation safety facilities properly.
- Air operators will maintain safety of aircraft operations under the CAAN's safety oversight.
- Air traffic demands at the target eight airports will not decrease due to the change in socio-economic conditions, etc.
- There will be no shortage of fuel, etc., which was occurred in Nepal for several months from September 2015 due to the blockage of Indian border.

3-4 Project Evaluation

3-4-1 Relevance

The relevance of implementation of the Project as one of the Japan's Grant Aid projects is judged high for the following reasons:

(1) Beneficiaries

Direct beneficiaries of the Project will be CAAN's air traffic controllers, air traffic safety electronics personnel, air operators at Tribhuvan International Airport and the target seven domestic airports and their users. Indirect beneficiaries through tourism, trade and international exchanges will be all the people of Nepal.

(2) Project Purpose

The objective of the Project is to improve safety of navigation and landing of aircraft at Tribhuvan International Airport and major domestic airports through procurement and installation of the LOC/T-DME System, LOC Maintenance Training Equipment, VOR/DME System, VOR/DME Test Rack, Radar Maintenance Training Equipment, Radar Controller Training Simulator, Runway Lighting System, Flight Procedure Design System and Solar Power Supply System at Tribhuvan International, Chandragadhi, Dhangadhi, Lukla, Jomsom, Jumla, Rara and Simikot Airports, thereby contributing to improve the safety and efficiency of air transport in Nepal.

(3) Compatibility with Nepalese National Development Policy

The Government of Nepal identified development of physical infrastructure as one of the strategies to bring down the population living below the poverty line to 18 percent in "Thirteenth Plan (FY 2013/14-2015/16) Approach Paper". The Project can be placed in the priority areas of (i) development of roads and other physical infrastructure and (ii) development of tourism, industries and trade sector.

(4) Compatibility with Japanese ODA Policy

The Japanese "Country Assistance Policy for Nepal" (April 2012) sets "Building social infrastructure and institutions for balanced and sustainable economic growth" as one of the priority areas, and states "In order to directly improve the living standard of people, Japan supports the building of social infrastructure and institutions relating to transportation, with due attention to the environment and disaster prevention." The Project is in line with this policy. Furthermore, it includes radar maintenance training equipment and radar controller training simulator as the project components, which supplements ongoing "Tribhuvan International Airport Modernization Project (Surveillance System)" and "The Project for the Development of a Spare Parts Management Center and En-route Radar Control Services"

3-4-2 Effectiveness

The following Outputs are expected to be achieved by the Project, and the effectiveness of implementation of the Project as one of the Japan's Grant Aid is expected to be high for achievement of the Project Purpose.

1) Quantitative Effect

Indicator	Baseline (Year 2014)	Target (Year 2021)
Number of flights that can land with precise approach by using LOC at Tribhuvan International Airport (Number/Year)	0	27,000
Percentage of domestic flights that can fly to destination airports by using VOR/DME[2]	48.5%	51.2%
Runway Usability Factor for jet aircraft at Tribhuvan International Airport[3]	89%	95.6%

[2] (Total number of domestic aircraft movements at the airport with VOR/DME) / (Total number of domestic aircraft movements at all airports in Nepal)

[3] Weighted average of (Total number of meteorological observations, which are better than the weather minima of the conventional approach procedures) / (Total number of periodic observations) for CAT-C and CAT-D aircraft

2) Qualitative Effect

- Enhancing safety of aircraft operations at eight target airports through improvement of aviation safety facilities, equipment and power supply system
- Enabling sustainable operation and maintenance of Monopulse Secondary Surveillance Radar (MSSR)
- Enabling sustainable training for new radar air traffic controllers of CAAN
- Creating an environment to improve efficiency and advancement of flight procedure design services by CAAN

[Appendices]

1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions
5. Technical Memorandum
6. Environmental Checklist: 9. Airport
7. Outline of Design of LOC RWY02 Approach Procedures

Appendix 1: Member List of the Study Team

Name	Responsibility	Affiliation
Hiroyuki Ueda	Team Leader	JICA
Shinichi Saito	Planning Management	JICA
Toru Shimada	Chief Consultant/Air Nav. Facility Plan	ADAMIS Ltd.
Koichi Kawamoto	Air Nav. Facility Design (1)	Aviation Systems Consultants Co. Ltd.
Tadayoshi Tanno	Air Nav. Facility Design (2)	Aviation Systems Consultants Co. Ltd.
Keiji Yamazaki	Aeronautical Ground Light Design	ADAMIS Ltd.
Minoru Sakata Seiji Okada	Installation Plan/Cost Estimate	Aviation Systems Consultants Co. Ltd.
Shinji Hara	Flight Procedure Design	Oriental Consultants Global Co. Ltd.
Niso Wada	Natural Condition Survey	Oriental Consultants Global Co. Ltd.
Yuki Morinaga	Environmental & Social Consideration	Oriental Consultants Global Co. Ltd.

Appendix 2: Study Schedule

The 1st Field Survey (from 04 April to 09 May 2015)

No.	Date		JICA Team Leader	JICA Planning Management	Chief Consultant/ Air Navigation System Plan	Air Navigation System Design (1)	Air Navigation System Design (2)	Aviation Lighting Facility Plan	Installation Plan/ Cost Estimate	Flight Procedure Design	Natural Condition Survey	Environmental Consideration
1	4-Apr	Sat	Trip TG319 (Bangkok →12:45 Kathmandu)	Trip TG661/TG319 (Tokyo 00:20→Bangkok→12:45 Kathmandu)								
2	5-Apr	Sun	Presentation of/Discussion on Inception Report Confirmation of Background of the Project						Presentation of/Discussion on Inception Report Starting Respective Survey Work			
3	6-Apr	Mon	Survey of Site Conditions (TIA)					Survey of Site Conditions (Data Collection)	Survey of Site Conditions (TIA)	Survey of Site Conditions (Meeting w/ Counterpart)	Survey of Site Conditions (Data Collection)	
4	7-Apr	Tue	Survey of Site Conditions (Lukla)			Survey of Site Conditions (Data Collection)	Survey of Site Conditions (Sanothimi)	ditto	Survey of Procurement Conditions/ Installation Plan	Survey of Site Conditions (Obstacle Survey)	ditto	
5	8-Apr	Wed	Trip (Kathmandu) Survey of Site Condition (Sanotimi) Discussion on Draft Minutes of Meeting				ditto	ditto	dktto	dktto	ditto	
6	9-Apr	Thu	Clarification of Obligation of Recipient Country Discussion on Draft Minutes of Meeting			Survey of Site Conditions (Data Collection)	Survey of Site Conditions (Data Collection)	ditto	dktto	dktto	ditto	
7	10-Apr	Fri	Signing Minutes of Meetings Report to Embassy of Japan			ditto	ditto	ditto	dktto	dktto	ditto	
8	11-Apr	Sat	Trip TG320/TG682 (Kathmandu 13:50→Bangkok→)		Internal Meeting						Analysis of Data Trip (Pokhara)	
9	12-Apr	Sun	Trip TG682 (→06:55 Tokyo)		Survey of Site Conditions (TIA)		Survey of Site Conditions (Data Collection)	Analysis of Data Trip (Pokhara)	Survey of Procurement Conditions/ Installation Plan	Survey of Site Conditions (Meeting w/ Counterpart)	Survey of Site Conditions (Jomsom)	
10	13-Apr	Mon			dktto		ditto	Survey of Site Conditions (Jomsom)	dktto	Survey of Site Conditions (Obstacle Survey)	ditto	Trip TG661/TG319 (Tokyo 00:20→Bangkok →12:45 Kathmandu)
11	14-Apr	Tue			Survey of Site Conditions (Janakpur)			ditto	Survey of Site Conditions (Janakpur)	dktto	Trip (Pokhara-Kathmandu)	Environmental Consideration (Janakpur)
12	15-Apr	Wed			dktto			Trip (Pokhara-Kathmandu)	dktto	dktto	Trip (Janakpur)	ditto
13	16-Apr	Thu			Trip (Kathmandu)			Survey of Site Conditions (Data Collection)	Trip (Kathmandu)	dktto	Survey of Site Condition (Janakpur)	ditto
14	17-Apr	Fri			Survey of Procurement Conditions Survey for Installation Planning					dktto	Trip (Kathmandu)	
15	18-Apr	Sat			Internal Meeting							
16	19-Apr	Sun			Confirmation of Project Background	Survey of Site Conditions (TIA)	Survey of Site Conditions (Data Collection)	Trip (Nepalgunj)	Survey of Procurement Conditions/ Installation Plan	Survey of Site Conditions (Meeting w/ Counterpart)	Survey of Site Conditions (TIA)	Environmental Consideration
17	20-Apr	Mon			dktto	ditto	Survey of Procurement Conditions/ Installation Plan	Survey of Site Conditions (Simikot)	dktto	Survey of Site Conditions (Obstacle Survey)	ditto	ditto
18	21-Apr	Tue			dktto	ditto	Survey of Site Conditions (Tumlingtar)	ditto	Survey of Site Conditions (Tumlingtar)	dktto	Survey of Site Conditions (Tumlingtar)	Environmental Consideration (Tumlingtar)
19	22-Apr	Wed			dktto	ditto	ditto	ditto	dktto	dktto	ditto	ditto
20	23-Apr	Thu			dktto	ditto	Trip (Kathmandu)	Trip (Nepalgunj-Jumla)	Trip (Kathmandu)	dktto	Trip (Kathmandu)	
21	24-Apr	Fri			Survey of Site Conditions (Analysis of Data)			Survey of Site Conditions (Jumla)	Survey of Procurement Conditions/ Installation Plan (Analysis of Data)	Survey of Site Conditions (Analysis of Data)	Survey of Site Conditions (Analysis of Data)	Environmental Consideration (Analysis of Data)
22	25-Apr	Sat			Internal Meeting			Stranded at Jumla	Internal Meeting	Survey of Site Conditions (Obstacle Survey)	Internal Meeting	
23	26-Apr	Sun			Project Coordination	Internal Meeting Analysis of Data		Trip (Nepalgunji)	Internal Meeting Analysis of Data			
24	27-Apr	Mon			dktto	Analysis of Data		Trip (Kathmandui)	Analysis of Data			
25	28-Apr	Tue			Survey of Site Conditions (Chandragadhi)	Survey of Site Conditions (TIA)	Survey of Site Conditions (Chandragadhi)	Survey of Site Conditions (Analysis of Data)	Survey of Site Conditions (Chandragadhi)	Meeting with Counterpart Trip TG320/TG640 (Kathmandu→Bangkok→)	Survey of Site Conditions (Chandragadhi)	Environmental Consideration (Chandragadhi)
26	29-Apr	Wed			Trip (Kathmandu)	ditto	ditto	Trip (Lukla)	dktto	Trip TG682 (→06:55 Tokyo)	ditto	ditto
27	30-Apr	Thu			Project Coordination	ditto	Trip (Kathmandu)	Survey of Site Conditions (Lukla)	Trip (Kathmandu)		ditto	ditto
28	1-May	Fri			dktto	ditto	Survey of Site Conditions (Analysis of Data)	Trip (Kathmandu)	Survey of Procurement Conditions/ Installation Plan (Analysis of Data)		Trip (Kathmandu)	Trip (Kathmandu)
29	2-May	Sat			Internal Meeting						Internal Meeting	
30	3-May	Sun			Coordination with CAAN Report Preparation	Trip TG320/TG682	Survey of Site Conditions (Analysis of Data)	Trip TG320/TG682	Survey of Procurement Conditions/ Installation Plan (Analysis of Data)		Survey of Site Conditions (Analysis of Data)	Environmental Consideration (Analysis of Data)
31	4-May	Mon			dktto	Trip TG682 (→06:55 Tokyo)	ditto	Trip TG682 (→06:55 Tokyo)	dktto		ditto	ditto
32	5-May	Tue			dktto		Survey of Site Conditions (Dhangadhi)		Survey of Site Conditions (Dhangadhi)		Survey of Site Conditions (Dhangadhi)	Environmental Consideration (Dhangadhi)
33	6-May	Wed			dktto		ditto		dktto		ditto	ditto
34	7-May	Thu			dktto		Trip (Kathmandu)		Trip (Kathmandu)		Trip (Kathmandu)	Trip (Kathmandu)
35	8-May	Fri			Trip TG320/TG682		Trip TG320/TG682		Trip TG320/TG682		Trip TG320/TG682	
36	9-May	Sat			Trip TG682 (→06:55 Tokyo)		Trip TG682 (→06:55 Tokyo)		Trip TG682 (→06:55 Tokyo)		Trip TG682 (→06:55 Tokyo)	
37	10-May	Sun										
38	11-May	Mon										
39	12-May	Tue										
40	13-May	Wed										
41	14-May	Thu										
42	15-May	Fri										
43	16-May	Sat										

The 2nd Field Survey (from 27 September to 11 October 2015)

No.	Date		JICA Team Leader	JICA Planning Management	Chief Consultant/Air Navigation System Plan	Air Navigation System Design (1)	Air Navigation System Design (2)	Aviation Lighting Facility Plan	Installation Plan/ Cost Estimate	Flight Procedure Design	Natural Condition Survey
1	27-Sep	Sun			Trip TG661/TG319 (Tokyo 00:20→Bangkok→12:45 Kathmandu)						Trip TG661/TG319 (Tokyo →Kathmandu)
2	28-Sep	Mon			10:30 Kick-off Meeting with CAAN Clarification/Discussion of CAAN's Comments on Progress Report						Kick-off Meeting
3	29-Sep	Tue	Trip TG319 Bangkok→12:45 Kathmandu)		Clarification/Discussion of CAAN's Comments on Progress Report						Tip to Rara Topo Survey
4	30-Sep	Wed	Reconfirmation of Requested Items and Priorities			Survey of Site Conditions (Chitrestan)		Data/Information Gathering			Topo Survey (Rara Airport)
5	1-Oct	Thu	Signing Minuets of Discussion Report to JICA Office			Survey of Site Conditions (Mathapla & Bharta Lagna)		ditto			Trip to Kathmandu
6	2-Oct	Fri	Trip TG320/TG682 (Kathmandu 13:30→Bangkok→)		Discussion with C/P on Solar Power System & Airfield Lights	Planning of VHF ROAG		Discussion with C/P on Solar Power System & Airfield Lights	ditto		Preparation of Report
7	3-Oct	Sat	Trip TG682 (→06:55 Tokyo)		Internal Discussions			Trip TG320/TG682	Internal Discussions		Trip TG320/TG682
8	4-Oct	Sun			Discussion with C/P on ILS and ILS Maintenance Training Equipment Discussion with C/P on VOR/DME and VOR/DME Test Rack			Trip TG682	Data/Information Gathering	MH753/MH114 (Hanoi→Kathmandu)	Trip TG682
9	5-Oct	Mon			Discussion with C/P on Radar Controller Training Simulator Discussion with C/P on Radar Maintenance Training Equipment				ditto	Discussion with C/P on Flight Procedure Design	
10	6-Oct	Tue			Discussion with C/P on VHF ROAG Discussion with C/P on Flight Procedure Design System				ditto	ditto	
11	7-Oct	Wed			Discussion with C/P on Flight Procedure Design	Data/Information Gathering			ditto	ditto	
12	8-Oct	Thu			Presentation of Results of Discussions with C/P Preparation of Technical Memorandum				Presentation of Results of Discussions with C/P	Trip MH115 (Kathmandu→)	
13	9-Oct	Fri			Signing Revised Minutes of Discussions & Technical Memorandum				Signing Revised M/D & Technical Memorandum	Trip MH115/MH752 (→Hanoi)	
14	10-Oct	Sat			Trip TG320/TG682 (Kathmandu 13:30→Bangkok→)				Trip TG320/TG682		
15	11-Oct	Sun			Trip TG682 (→06:55 Tokyo)				Trip TG682		

The 3rd Field Survey (from 06 December to 11 December 2015)

No.	Date		JICA Team Leader	Chief Consultant/Air Navigation System Plan
1	6-Dec	Sun		Trip TG661/TG319 (Haneda→Bangkok→Kathmandu)
2	7-Dec	Mon	Trip TG319 (Bangkok→Kathmandu)	Explanation/Discussion of Technical Memorandum
3	8-Dec	Tue	Explanation/Discussion of Technical Memorandum	
4	9-Dec	Wed	Signing Technical Memorandum	
5	10-Dec	Thu		Trip TG320/TG640 (Kathmandu→Bangkok→)
6	11-Dec	Fri		Trip TG682 (→Haneda)

The 4th Field Survey (from 27 February to 05 March 2016)

No.	Date		JICA Team Leader	JICA Planning Management	Chief Consultant/Air Navigation System Plan	Air Navigation System Design (1)	Aviation Lighting Facility Plan	Flight Procedure Design
1	27-Feb	Sat			Trip TG661/TG319 (Haneda 00:20→Bangkok→12:45 Kathmandu)			
2	28-Feb	Sun	Trip TG661/TG319		Submission of Draft Report			Trip TG661/TG319
			Courtesy call to CAAN			Preparation of Explanation		Meeting with CAAN
3	29-Feb	Mon	Meeting with JICA Office		Preparation of Explanation			
			Explanation/Discussion of Draft Report					
4	1-Mar	Tue	Meeting with Ministry of Finance		Explanation/Discussion of Draft Report			
			Drafting Minutes of Discussions			Explanation/Discussion of Draft Report		
5	2-Mar	Wed	Discussion on Draft Minutes of Discussions					Ditto Trip TG320/TG640 (Kathmandu→Bangkok→)
6	3-Mar	Thu	Signing of Minutes Discussions Report to Embassy of Japan					Trip TG682 (→Haneda)
7	4-Mar	Fri	Report to JICA Office Trip TG320/TG640 (Kathmandu 13:50→Bangkok→)					
8	5-Mar	Sat	Trip TG682 (→06:55 Haneda)					

Appendix 3: List of Parties Concerned in the Recipient Country

Organization	Position	Name
Civil Aviation Authority of Nepal	Director General (Deputy DG in 1st survey)	Sanjiv Gautam
	Deputy Director General	Raj Kumar Chhetri
	Deputy Director General (Retired)	Surya B. Thapa
	Deputy Director General (Officiating DG in 1st survey)	Mahendra Singh Rawal
	Deputy Director General	Devanand Upadhyay
	Deputy Director General	Devendra K.C.
	Director, CNS Planning & Development Dept.	Hansha Raj Pandey
	Director, ANS Safety Standard Dept.	P. B. Tiwari
	Director, AIM Dept.	Shishil
	Director, Aerodrome Engineering Dept.	Dhurba Das Bhochhibhoya
	Officiating Director ATM Dept.	Purusholtam Shakya
	Deputy Director, TIA Modernization Project	Sanjeev S. Kathayat
	Deputy Director, Com & Nav. Aid Dept.	Deo Narayan Shah
	Deputy Director, ATS/SAR	Bharat Pd. Sharma
	Deputy Director, ANS Safety Standard Dept.	Sobha Shrestha
	Deputy Director, ANS Safety Standard Dept.	Suwarn Raj Upadhyay
	Deputy Director ATCEP	Babu Ram Paudel
	Manager, CNS Planning & Development Dept.	Pravin Neupane
	Officer, CNS Planning & Development Dept.	Ram C. Adhikari
	Manager, Air Traffic Management Dept.	Mukesh Raj Dahul
	Manager, Air Traffic Management Dept.	Rajesh Dangol
	Manager, Electro/Mechanical Dept.	Kul P. Simkhada
	Deputy Manager, Electro/Mechanical Dept.	Sunil Kr. Kushwara
	Senior Officer, Aerodrome Engineering Dept.	Nal Bikram Thapa
	Manager, ANS Safety Standard Dept.	Ganesh Bahudur Kunwar
Tribhuvan International Airport Civil Aviation Office	Officiating Director, Technical Service Dept.	Madan L. Kafle
	Deputy Director, Radar Surveillance Div.	M. B. Vaidya
	Deputy Director, ATS/SAR Div.	Bharat Sharma
	Deputy Manager, Mechanical Section	Prabha Sharnia
	Deputy Manager, Electrical Section	Sanjay Kr. Chaudhay
	Chief, COM & NAV Div.	Suresh Pd. Sah
Chandragadhi Airport	Deputy Director	Rewant Bahadur Kunwar
Dhangadhi Airport	Airport Manager	Rajendra
Lukla Airport	Airport Manager	Shreehuri Bhatta
Jomsom Airport		Surya Bahadur Khatri
Simikot Airport	Airport Manager	Kailash Kumar Sharma
Jumla Airport		Santosh Adhikari
Civil Aviation Academy	Academy Chief (Deputy Director General)	Narendra Bahadur Thapa
	Deputy Director	Devendra Joshi
JICA Experts	Chief Advisor/CNS Maintenance Expert	Maksato Nomiya
	Spare Parts Management Expert	Jiro Harada, Toshiji Abe
	Enroute Radar Control Expert	Masahisa Oota
Embassy of Japan	First Secretary	Makoto Ooyama

Appendix 4: Minutes of Discussions
4.1 The 1st M/D dated 10 April 2015

THE MINUTES OF DISCUSSIONS ON THE PREPARATORY SURVEY FOR THE PROJECT FOR IMPROVEMENT OF AVIATION SAFETY FACILITIES IN MAJOR AIRPORTS INTHE FEDERAL DEMOCRATIC REPUBLIC OF NEPAL

In response to a request from the Government of the Federal Democratic Republic of Nepal (hereinafter referred to as "Nepal") , Japan International Cooperation Agency (hereinafter referred to as "JICA") in consultation with the Government of Japan had decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey")for the Project for Improvement of Aviation Safety Facilities in Major Airports (hereinafter referred to as "the Project"), and sent a Preparatory Survey Team (hereinafter referred to as "the Team") to Nepal.

The Team is headed by Mr. Hiroyuki UEDA, Senior Advisor of JICA, and is scheduled to stay in Nepal from 4 April to 15 May 2015.

The Team held a series of discussions with officials concerned of the Government of Nepal, and conducted field surveys of the Project sites. In the course of discussions and field surveys, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare a Preparatory Survey Report.

Kathmandu, 10April, 2015

Hiroyuki UEDA	Mahendra Singh Rawal
Leader	Officiating Director General
Preparatory Survey Team	Civil Aviation Authority of Nepal
Japan International Cooperation Agency	
Japan	

ATTACHMENT

1. Title of the Project

Both Japanese and Nepalese sides confirmed that the title of the Project shall be "The Project for Improvement of Aviation Safety Facilities in Major Airports".

2. Objective of the Project

Both sides confirmed that the objective of the Project is to enhance safe landing of aircraft at major airports and safe navigation of flights on major air routes through improvement of aviation safety facilities.

3. Project Site

Both sides confirmed that the sites of the Project are Tribhuvan International Airport, 5 tourist airports in mountainous areas (Lukla, Jomsom, Jumla, Rara and Simikot), 4 domestic Airports (Chandragadhi,Tumlingtar, JanakpurandDhangadi), new VHF Remote Control Air-Ground communication sites and Civil Aviation Academy Sanothimiin Bhaktapur. Project sites areshown in Annex 1.

4. Objective of the Preparatory Survey

Both sides confirmed the objective of the Survey as follows:

4-1. To understand the background and objective of the Project and examine its impacts and appropriateness;

4-2. To identify the components, and conduct outline design and cost estimation of the Project, based on the data and information collected from and the results of discussions with the Nepalese side; and

4-3. To study the issues of environmental and social considerations through the Survey.

5. Responsible and Implementing Organization

Both sides confirmed that the responsible and implementing organization of the Project is Civil Aviation Authority of Nepal (hereinafter referred to as "CAAN") of the Government of Nepal. The organization chart of CAANis shown in Annex 2.

6. Items requested by the Government of Nepal

6-1. As a result of discussions between both sides, the items described in Annex 3 were finally requested by the Nepalese side with the priorities.

6-2. Both sides confirmed that the appropriateness of the request will be examined in accordance with the further studies and analysis in Japan and the final components of the Project will be decided by the Japanese side from the viewpoint of necessity,

technical and financial viability, sustainability and cost-effectiveness. The Nepalese side understood that all the requested items, therefore, may not be accepted as final components of the Project.

6-3. Both sides confirmed that there isno duplication between requested items in 6-1 above and ones being implemented or to be implemented with assistance of other development partners or private enterprises.

7. Japan's Grant Aid Scheme

7-1. The Nepalese side understands the Japan Grant Aid scheme explained by the Team, as described in Annex 4 and Annex 5.

7-2. The Nepalese side will take the necessary measures, as described in Annex 6, to facilitate the smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented, according to the existing agreement between the Government of Japan and the Government of Nepal.

8. Environmental and Social Considerations

The Team explained thatthe Project is categorized as "Category B" in terms of environmental and social considerations according to the JICA Environmental and Social Consideration Guideline (April, 2010), since land acquisition for the installation of VOR/DME will be required for the Project.

The Nepalese side understood that the Project needs to follow the JICA guideline and that the Initial Environmental Examination (IEE) will be done through the Preparatory Survey.

The Nepalese side confirmed that the land acquisition for DVOR/DME will be completedby the end of November 2016 and associated preparatory works including access road, site preparation, electric power supply line, gate and fencefor installation of DVOR/DME by the end of February 2017.

9. Schedule of the Survey

Both sides confirmed the schedule of the Survey as follows. The schedule may be subject to change duringthe course of the Survey.

9-1. The Team will continue further field survey in Nepal until 15May2015.

9-2. JICA will prepare the Draft Final Report and send a mission team to explain its contents to the Nepalese side around November 2015. JICA will explain the details of the Project including the final components and cost estimation to the Nepalese side.

9-3. JICA will prepare the Final Report and send it to the Nepalese side around January 2016.

10. Technical Assistance

The Nepalese side requested technical assistance to capacity development of CAAN in the following subjectsfor effective operation and maintenance of the requested equipment.

- Maintenance of ILS equipment
- Design of Performance Based Navigation (PBN) flight procedures with Flight Procedure Design System

The Japanese side took note, and will evaluate the necessity and effects in the Survey.

11. Other Relevant Issues

11-1. The Nepalese side understood the principle of the Japan's Official Development Assistance (ODA) Charter, which stresses that ODA must not be utilized for military purpose or promoting international conflicts, and agreed to ensure that the equipment to be procured in the Project will never be used for any military purposes.

11-2. Both sides confirmed that the survey result excluding the project cost will be disclosed to the public after completion of the Preparatory Survey. All the study results including the Project cost will be disclosed to the public after the contracts of the Project are concluded.

11-3. The Nepalese side agreed that CAAN shall ensure that all necessary measures including securing enough budget and personnel will be taken to properly and effectively operate and maintain the equipment to be procured by the Project.

11-4. The Nepalese side shall provide security measures for all concerned Japanese nationals working for the Project, if deemed necessary.

11-5. The Nepalese side shall, at its own expenses, provide the Team with the following items in cooperation with CAAN and other organizations concerned.

(1) Security-related information as well as measures to ensure the safety of the Team;
(2) Information as well as support in obtaining medical service;
(3) Data and information related to the Preparatory Survey;
(4) Counterpart personnel;
(5) Suitable office space with necessary equipment and services;
(6) Credentials or identification cards;
(7) Entry permits necessary for the Team to conduct field surveys; and
(8) Support in obtaining other privileges and benefits if necessary.

11-6. The Nepalese side agreed that customs duties, internal taxes and other fiscal levies which may be imposed in Nepal are exempted under mutual agreement of Exchange of Note (E/N). If any expenses stated above are caused by some reasons such as the delay of execution of tax exemption, the Nepalese side shall pay for it temporarily.

Annex 1: Project Site

Annex 2: Organization Chart of CAAN

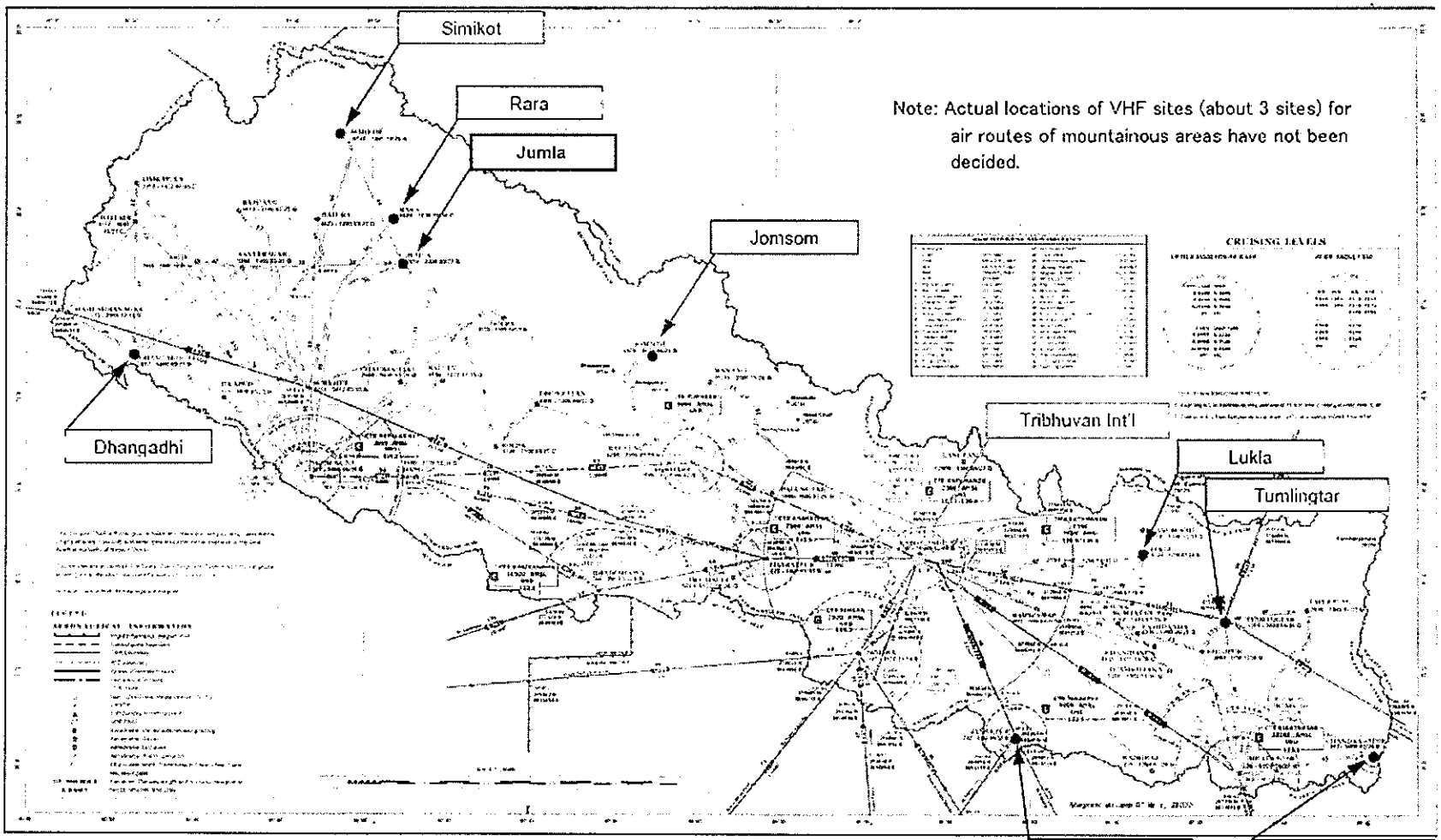
Annex 3: Items Requested by the Nepalese Side

Annex 4: Japan's Grant Aid

Annex 5: Flow Chart of Japan's Grant Aid Procedures

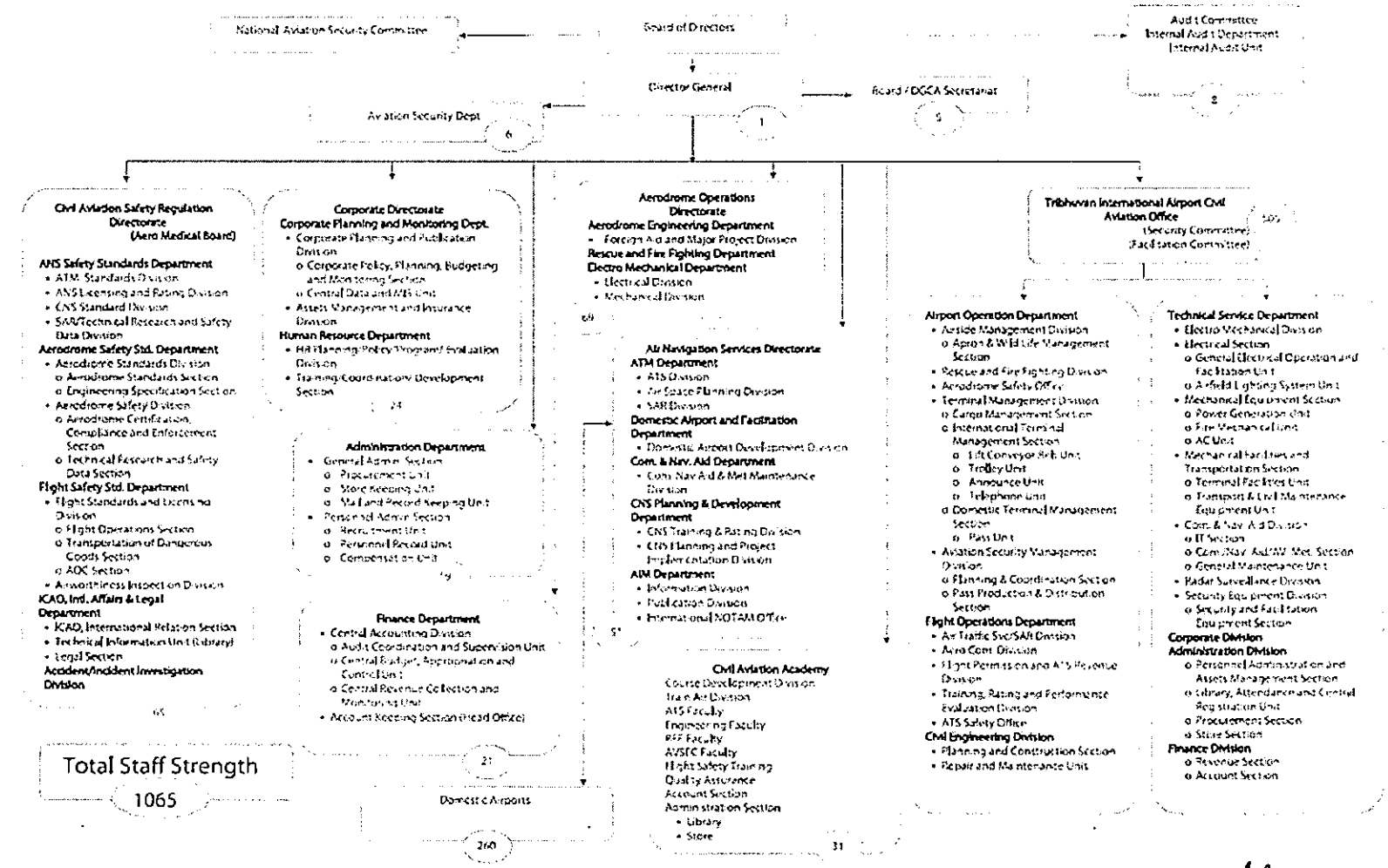
Annex 6: Major Undertakings to be taken by Each Government

Project Site



Project Location Map

Organization Chart of CAAN



Items Requested by the Nepalese Side

No	Item	Location	Q'ty
Priority 1			
1	Instrument Landing System (ILS)	Tribhuvan International Airport	1 set
2	Distance Measuring Equipment (DME)	Tribhuvan International Airport	1 set
3	Radar Controller Training Simulator	Civil Aviation Academy Sanothimi	1 set
4	Radar Maintenance Training Equipment	Civil Aviation Academy Sanothimi	1 set
5	ILS Maintenance Training Equipment	Civil Aviation Academy Sanothimi	1 set
Priority 2			
6	Abbreviated Precision Approach Path Indicator (APAPIs)	Jomsom, Jumla, Rara and SimikotAirports	4 sets
7	Runway Edge Lights	Lukla Airport	1set
8	Runway Threshold Lights	Lukla Airport	1set
9	Runway End Lights	Lukla Airport	1set
10	VHF Remote Control Air-Ground (RCAG) Communication	Hilltop sites with telecommunication network facilities	3 sets
Priority 3			
11	VHF Omni-directional Range (VOR/DME)	Chandragadhi, Tumlingtar, Janakpur and Dhangadi Airports	4 sets
12	VOR/DME Test Rack	CAAN Sinamangal	1 set
13	Flight Procedure Design System	CAAN Head Office	1 set
14	Solar Electric Power Supply System	Lukla, Jomsom, Jumla, Rara and SimikotAirports	5 sets

Japan's Grant Aid

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

a) Preparatory Survey
   - The Survey conducted by JICA

b) Appraisal and Approval
   - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

c) Authority for Determining Implementation
   - The Notes exchanged between the GOJ and a recipient country

d) Grant Agreement (hereinafter referred to as "the G/A")
   - Agreement concluded between JICA and a recipient country

e) Implementation
   - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.

- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services

including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex 6.

(6) Misconduct

If JICA receives information concerning suspected corrupt or fraudulent practices, the Government of the recipient country shall take necessary measures in accordance with the Procurement Guidelines in the competition for, or in execution of, the contract funded by the Grant:

(a) To provide JICA with such information, as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of the recipient country; and

(b) Not to treat unfairly or unfavorably the physical persons and juridical persons thatprovide the information.

(7) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(8) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(9) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

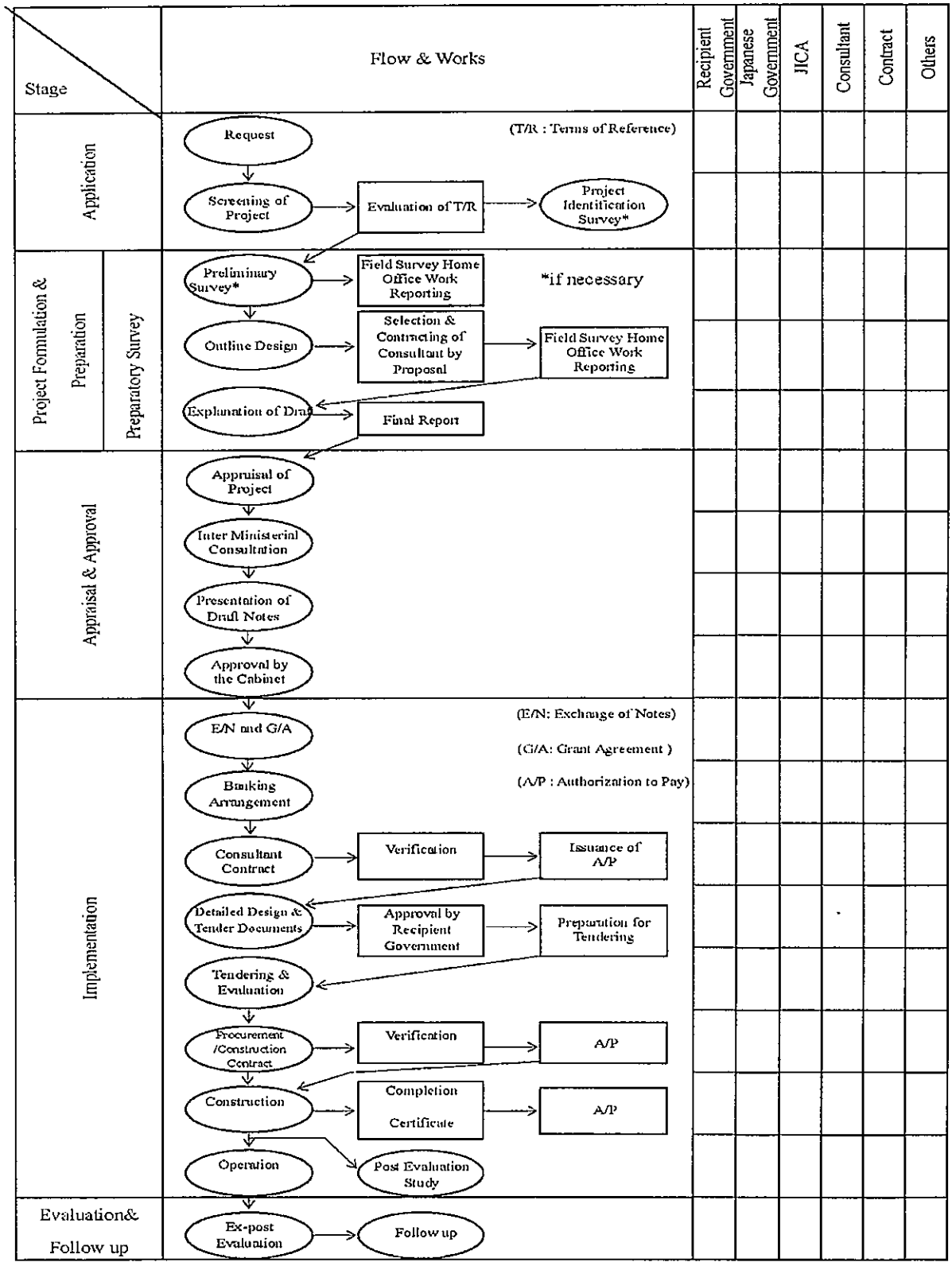
(10) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(11) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Flow Chart of Japan's Grant Aid Procedures



Annex6

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		✓
2	To clear, level and reclaim the site when needed		✓
3	To construct gates and fences in and around the site		✓
4	To provide preparatory works for the installation of equipment including supply of electric power and others as required, prior to installation of equipment		✓
5	To procure the equipment	✓	
6	To ensure prompt customs clearance of the products and assist internal transportation of the products in the recipient country		
	1) Marine/Air transportation of the Products from Japan to the recipient country	✓	
	2) Tax exemption and customs clearance of the product at the port of disembarkation		✓
	3) Internal transportation from the port of disembarkation to the project site	✓	✓
7	To install the equipment at project site	✓	✓
8	To provide training for operation and maintenance of the equipment by manufactures *	✓	
9	To conduct flight calibration for air navigation system and aeronautical ground lights, after installation of the equipment	✓	✓
10	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted or paid by the recipient side.		✓
11	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		✓
12	To ensure that the facilities and the products be maintained and used properly and effectively for the implementation of the Project		✓
13	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising Commission of A/P		✓
	2) Payment commission		✓
14	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		✓
15	To give due environmental and social consideration in the implementation of the Project.		✓

(B/A: Banking Arrangement, A/P: Authorization to Pay)

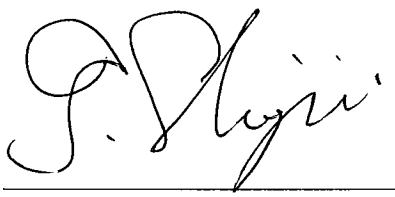
4.2 The 2nd M/D dated 09 October 2015

THE MINUTES OF DISCUSSIONS ON THE PREPARATORY SURVEY FOR THE PROJECT FOR IMPROVEMENT OF AVIATION SAFETY FACILITIES IN MAJOR AIRPORTS IN THE FEDERAL DEMOCRATIC REPUBLIC OF NEPAL (SECOND FIELD SURVEY)

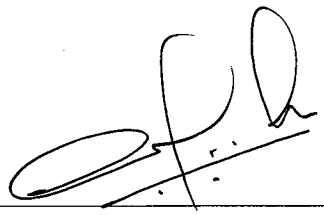
The second field survey of the Preparatory Survey (hereinafter referred to as "the Survey") for the Project for Improvement of Aviation Safety Facilities in Major Airports (hereinafter referred to as "the Project") was conducted by the Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Mr. Hiroyuki Ueda, Senior Advisor of Japan International Cooperation Agency (hereinafter referred to as "JICA") from 27 September to 10 October 2015.

The Team held a series of discussions with officials concerned of the Government of the Federal Democratic Republic of Nepal (hereinafter referred to as "Nepal"), and both Japanese and Nepalese sides confirmed the main items described in the attached sheets.

Kathmandu, 9 October 2015



Tsutomu Shimizu
Chief Representative
Nepal Office
Japan International Cooperation Agency



Sanjiv Gautam
Director General
Civil Aviation Authority of Nepal

ATTACHMENT

1. Validity of the Previous Minutes of Discussions

The both sides confirmed that the agreements in the Minutes of Discussions (MD) of the preceding Preparatory Study signed on 10 April 2015 remain valid unless they are updated by this Minutes of Discussion.

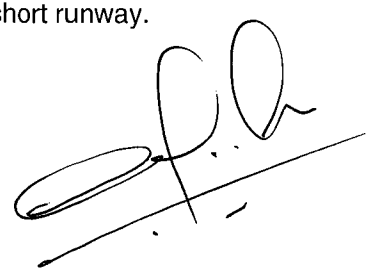
2. Equipment Requested by the Government of Nepal

The items requested by the Government of Nepal in the previous Minutes of Discussion were updated as shown in the following table. The Nepalese side understood that the final components of the Project will be decided by the Japanese side in consideration of necessity, technical viability, sustainability, cost-effectiveness and available budget, and thus, all the requested items may not be accepted as final components of the Project.

Items Requested by the Nepalese Side

No	Item	Location	Q'ty
Priority 1			
1	Instrument Landing System (ILS)	Tribhuvan International Airport	1 set
2	Distance Measuring Equipment (DME)	Tribhuvan International Airport	1 set
3	Radar Controller Training Simulator	Civil Aviation Academy Sanothimi	1 set
4	Radar Maintenance Training Equipment	Civil Aviation Academy Sanothimi	1 set
5	ILS Maintenance Training Equipment	Civil Aviation Academy Sanothimi	1 set
Priority 2			
6	Runway Threshold Identification Lights (See Note 1)	Jomsom and Jumla Airports	4 sets
7	Runway Threshold and End Lights	Jomsom and Jumla Airports	4 sets
8	Runway Edge Lights	Lukla Airport	1 set
9	Runway Threshold and End Lights	Lukla Airport	1 set
10	Runway End Lights	Lukla Airport	1 set
Priority 3			
11	VHF Omni-directional Range (VOR/DME)	Chandragadhi and Dhangadi Airports	2 sets
12	VOR/DME Test Rack	CAAN Sinamangal	1 set
13	Flight Procedure Design System	CAAN Head Office	1 set
14	Solar Electric Power Supply System	Lukla, Jomsom, Jumla, Rara and Simikot Airports	5 sets

Note 1: Items 6 and 7 were added to the requested items to improve visual identification of runway threshold and end at mountain airport with short runway.



3. Technical Assistance Requested by the Government of Nepal

The Nepalese side updated the request for technical assistance to capacity development of CAAN in the following subjects for effective introduction, operation and maintenance of the requested equipment.

3-1. Safety Assessment for Introduction of ILS and Localizer Approach
3-2. Maintenance of ILS equipment
3-3. Design of Performance Based Navigation (PBN) flight procedures with Flight Procedure Design System

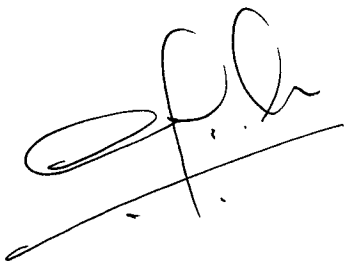
Item 3-1 was added to the requested items in the MD signed on 10 April 2015 to introduce new flight procedures at Tribhuvan Airport with safety assessment process required by ICAO.

The Japanese side took note on these requested items, and will evaluate the necessity and effects in the Survey.

4. Schedule of the Survey

Both sides confirmed the schedule of the Survey as follows. The schedule may be subject to change during the course of the Survey.

4-1. The Team will continue further field survey in Nepal until 10 October 2015.
4-2. JICA will prepare the Draft Final Report and send a mission team to explain its contents to the Nepalese side around February 2016. JICA will explain the details of the Project including the final components and cost estimation to the Nepalese side.
4-3. JICA will prepare the Final Report and send it to the Nepalese side around April 2016.



4.3 The 3rd M/D dated 03 March 2016

Minutes of Discussions
on the Preparatory Survey for the Project for
Improvement of Aviation Safety Facilities in Major Airports
in the Federal Democratic Republic of Nepal
(Explanation on Draft Preparatory Survey Report)

On the basis of the discussions and field surveys in the Federal Democratic Republic of Nepal (hereinafter referred to as "Nepal") in April, October and December 2015, and the technical examinations in Japan, the Japan International Cooperation Agency (hereinafter referred to as "JICA") prepared a draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") on the Project for Improvement of Aviation Safety Facilities in Major Airports (hereinafter referred to as "the Project").

In order to explain the Draft Report and to consult with the concerned officials of the Government of Nepal on its contents, JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team") headed by Mr. Hiroyuki Ueda, Senior Advisor on Transport Sector, to Nepal, and is scheduled to stay in the country from 27 February to 4 March 2016. The Team visited the Ministry of Fianance and the Ministry of Culture, Tourism and Civil Aviation during their stay.

As a result of the discussions, both sides confirmed the main items described in the attached sheets.

Kathmandu, 3 March 2016

Hiroyuki Ueda
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Sanjiv Gautam
Director General
Civil Aviation Authority of Nepal
Nepal

ATTACHEMENT

1. Objective of the Project

   The objective of the Project is to improve safety of navigation and landing of aircraft at Tribhuvan International Airport and major domestic airports through improvement of aviation safety facilities, thereby contributing to improve the safety and efficiency of air transport in Nepal.

2. Project Sites

   Both sides confirmed that the Project sites are Tribhuvan International Airport, five tourist airports in mountainous areas (Lukla, Jomsom, Jumla, Rara and Simikot), two domestic airports (Chandragadhi and Dhangadi). Project sites are shown in Annex 1.

3. Line Agency and Executing Agency

   Both sides confirmed the line agency and executing agency as follows:

   3-1. The line agency is the Ministry of Culture, Tourism and Civil Aviation, which would be the agency to supervise the executing agency.

   3-2. The executing agency is Civil Aviation Authority of Nepal (hereinafter referred to as "CAAN"). The executing agency shall coordinate with all the relevant agencies to ensure smooth implementation of the Project and ensure that the undertakings are taken by relevant agencies properly and on time.

4. Contents of the Draft Report

   After the explanation of the contents of the Draft Report on the Project by the Team, the Nepalese side agreed in principle to its contents.

5. Cost Estimation

   Both sides confirmed that the Project cost estimation described in Annex 2 was provisional and would be examined further by the Government of Japan for its final approval.

6. Confidentiality of the Cost Estimation and Specifications

   Both sides confirmed that the Project cost estimation and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts of the Project are concluded.

7. Japanese Grant Scheme

The Nepalese side understands the Japanese Grant scheme, Japanese Grant procedures and financial flow of Japanese Grant Aid as described in Annex 3, Annex 4 and Annex 5.

8. Project Implementation Schedule

The Team explained to the Nepalese side that the expected implementation schedule is as attached in Annex 6.

9. Expected Outcomes and Indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Nepalease side has responsibility to monitor the progress of the indicators and achieve the target in year 2021.

[Quantitative Effect]

Indicators	Baseline (in 2014)	Target (in 2021, 3 years after completion of the Project)
Number of flights that can land with precise approach by using LOC at Tribhuvan International Airport (Number/Year)	0	27,000
Percentage of domestic flights that can fly to destination airports by using VOR/DME	48.5%	51.2%
Runway Usability Factor at Tribhuvan International Airport	89.0%	95.5%

[Qualitative Effect]

a) Enhancing safety of aircraft operations through improvement of aviation safety facilities, equipment and power supply system
b) Enabling sustainable operation and maintenance of Monopulse Secondary Surveillance Radar (MSSR)
c) Enabling sustainable training for new radar air traffic controllers of CAAN
d) Creating an environment to improve efficiency and advancement of flight procedure design services by CAAN

10. Undertakings Taken by Both Sides

Both sides confirmed to undertake the undertakings described in Annex 7. The Nepalese side assured to take the necessary measures and coordination including

allocation of the necessary budget, which is preconditions for implementation of the Project. The Nepalease side confirmed that the land aquisition for VOR/DME and associated preparatory works including earthworks, installation of fence and gates, construction of accsess road between the existing road and the site, and provision of commercial electric power to the site will be completed by the end of June 2017 by the Nepalese side. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage. Contents of Annex 7 will be updated as the Detailed Design progresses, and will finally be the Attachment to the Grant Agreement.

11. Monitoring during the Implementation

The Project will be monitored every six months by the executing agency and using the Project Monitoring Report (PMR) described in Annex 8.

12. Ex-Post Evaluation

JICA will conduct ex-post evaluation three years after the project completion with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability) of the Project. Results of the evaluation will be publicized. The Nepalese side is required to provide necessary support for ex-post evaluation by JICA.

13. Schedule of the Study

JICA will complete the Final Report of the Preparatory Survey in accordance with the items confirmed and send it to the Nepalese side around June 2016.

14. Environmental and Social Considerations

14-1 General Issues

14-1-1 Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as 'the Guidelines') are applicable for the Project. The Project is categorized as environmenmtal category B because the Project is not a large-scale airrport project, not located in a sensitive area, and has none of the sensitive characteristics under the Guidelines; therefore the Project is not likely to have significant adverse impacts on the environment.

14-1-2 Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as Annex 9. Both sides confirmed that in case of major modification of the content of the Environmental Checklist, the Nepalease side shall submit the modified version to JICA in a timely manner.

14-2 Environmental Issues

14-2-1 Initial Environmental Examination (IEE)

Both sides confirmed IEE and Environmenral Impact Assessment (EIA) are not required for installation of air navigation facilities under the Environment Protection Rules (EPR) 1997 in Nepal. However, since land acuisition for installation of VOR/DME equipment is required near Chandragadhi and Dhangadhi airports, the Project is categorized as environmetal category B in accordance with the Guidelines of JICA, which requires an IEE to determine the nature and extent of impact from implementation of the Project. Therefore, an IEE was carried out in this preparatory survey.

14-2-2 Environmental Management Plan and Environmental Monitoring Plan

Both sides confirmed Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) of the Project is as at Annex 10 and Annex 11 respectively. Both side agreed that environmental mitigation measures and monitoring shall be conducted based on the EMP and EMoP, which may be updated during the detailed design stage.

14-3 Social Environment

14-3-1 Land Acquisition and Resettlement

Both sides confirmed the 1.0 ha of land would be aquired for the Project. Such land acquisition shall be implemented based on the (Abbreviated) Resettlement Action Plan (RAP) to be prepared in line with the Guidelines.

14-4 Environmental and Socail Monitoring

14-4-1 Environmental and Social Monitoring

Both sides confirmed that the Nepalease side will submit results of environmental and social monitoring to JICA by using the monitoring form attached as Annex 12.

14-4-2 Disclosure of Monitoring Results

Both sides confirmed that the Nepalease side will disclose results of environmental and social monitoring to local stakeholders through their website and/or in their field offices. The Nepalease side agreed on that JICA will disclose results of environmental and social monitoring submitted by the Nepalease side as the monitoring form attached as Annex 12 on its website.

15. Other Relevant Issues

15-1 Operation and Maintenance of the Equipment

The Team explained the importance of operation and maintenance of the equipment provided by the Project considering that proper asset management impacts greatly on life-span of the facilities and its maintenance cost. The Nepalease side shall secure enough staff and budgets necessary for appropriate operation and maintenance of the equipment. The annual operation and maintenance costs are estimated and shown in Annex 13.

15-2 Safety Measures

To avoid accidents on site during the implementation of the Project, the Nepalease side agreed to take and cause the consultant and the contractor to take safety measures such as setting safety assurance to the site, providing information for security conrtol to public, and deploying adequate security personnel, based on "The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects" which has been published on JICA's URL below.

http://www.jica.go.jp/activities/schemes/oda_safety/ku57pq00001nz4eu-att/guidance_en.pdf

15-3 Misconduct

If JICA receives information related to suspected corrupt practice or fraudulent practices in the implementation of the Project, CAAN and relevant organizations will provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of Nepal.

CAAN and relevant organizations will not, unfairly or unfavorably treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

15-4 Production of Maximum Effects with Japanese Grant Assistance

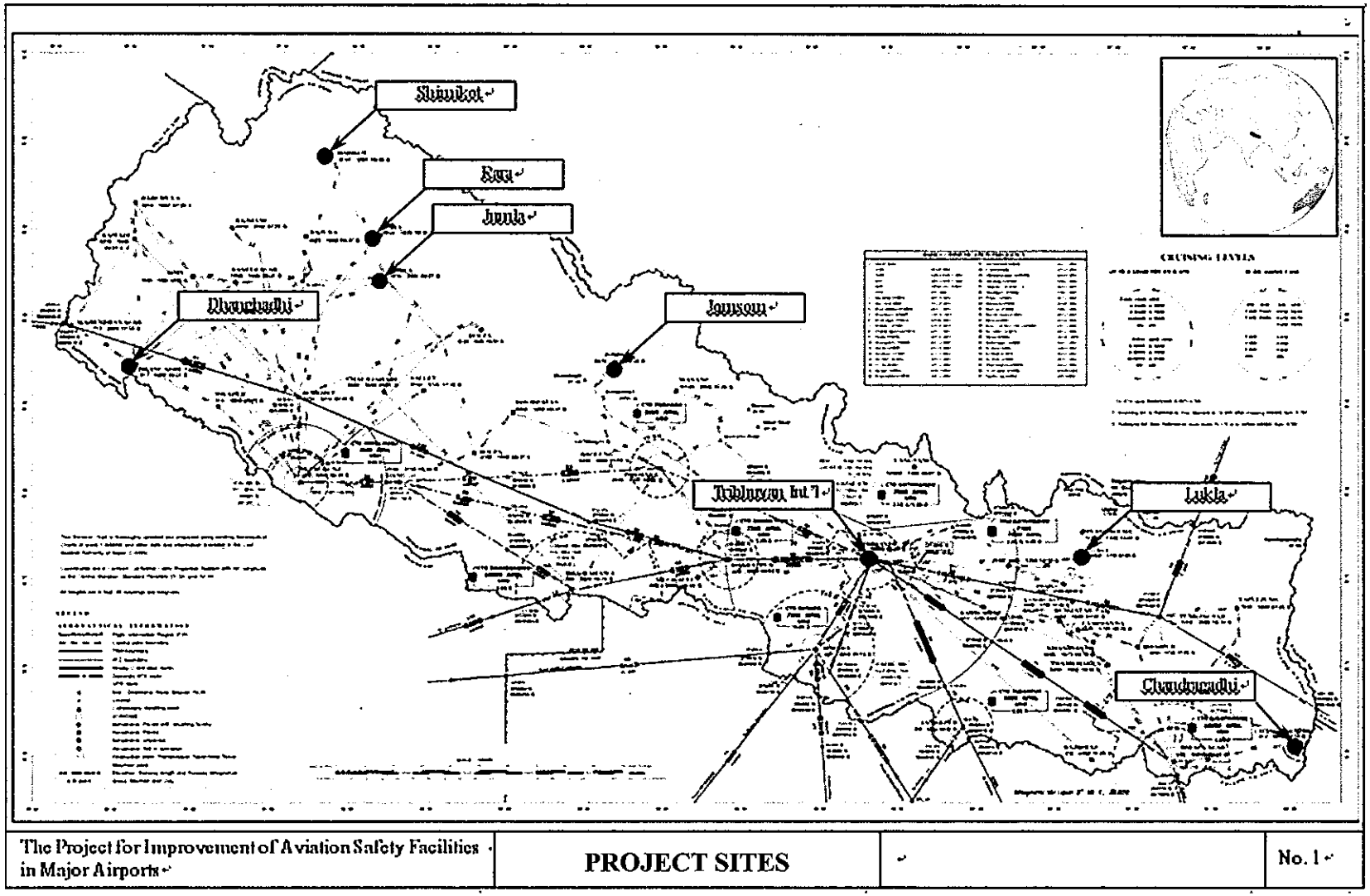
JICA noted that the Government of Nepal should ensure that Japanese Grant Assistance to beneficiary organization should be implemented with maximum effects. Given the nature of the Project is enhancement of public air transportation safety, and the beneficiary organization, CAAN, is providing air navigation safety to the public users. JICA strongly requested the Nepalese side that;

1) the authority concerned of the government of Nepal shall hand over the Project equipment after completion of the Project to the beneficiary organization in grant basis without delay, and
2) the customs duties for importation of the Project equipment should be same as those applied to the government departments under Japanese Grant Assistance.

15-5 Disclosure of Information

Both sides confirmed that the study results excluding the Project cost will be disclosed to the public after completion of the Preparatory Survey. All the study results including the project cost will be disclosed to the public after all the contracts for the Project are concluded.

Annex 1: Project Sites
Annex 2: Project Cost Estimation
Annex 3: Japanese Grant
Annex 4: Flow Chart of Japanese Grant Procedures
Annex 5: Financial Flow of Japanese Grant
Annex 6: Project Implementation Schedule
Annex 7: Major Undertakings to be taken by Each Government
Annex 8: Project Monitoring Report (PMR)
Annec 9: Environmental Check List
Annex 10: Environmental Management Plan (EMP)
Annex 11: Environmental Monitoring Plan (EMoP)
Annex 12: Environmental and Social Monitoring Form
Annex 13: Operation and Maintenance Cost



The Project for Improvement of Aviation Safety Facilities in Major Airports	PROJECT SITES		No. 1

PROJECT COST ESTIMATION

1. Cost Estimation Borne by the Government of Japan

Components		Estimated Cost (Million Yen)
Equipment	- LOC/T-DME - LOC Maintenance Equipment - VOR/DME System - VOR/DME Test Rack - Radar Maintenance Training Equipment - Radar Controller Training Simulater - Runway Lighting System - Flight Procedure Design System - Solar Power Supply System	[redacted]
Detailed Design and Supervision Work		[redacted]
TOTAL		[redacted]

2. Cost Estimation Borne by the Government of Nepal

Item	Estimated Cost (Million Nepalese Rupee)
Land acquisition for VOR/DME sites	22.4
Site preparation of VOR/DME sites	4.0
Flight Check	20.0
Customs Duties	8.1
Bank Commissions	2.1
TOTAL	**56.6**

Notes:

1) Conditions of cost estimation
   - Estimated timing: October 2015
   - Exchange rates: USD 1.00 = JPY 123.31
     Nepalese Rupee 1.00 = JPY 1.179

2) Others

The project is implemented in accordance with the system of Japanese Grant. The above cost estimation does not assure the ceiling cost on the E/N and will be reviewed by the Government of Japan before the conclusion of E/N between the two governments.

Cost estimate borned by the Government of Nepal in the above is provisional, and requires review for implementation.

JAPANESE GRANT

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.
Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1. Grant Procedures

The Grant is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
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(3) Result of the Survey

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(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an

account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April 2010) .

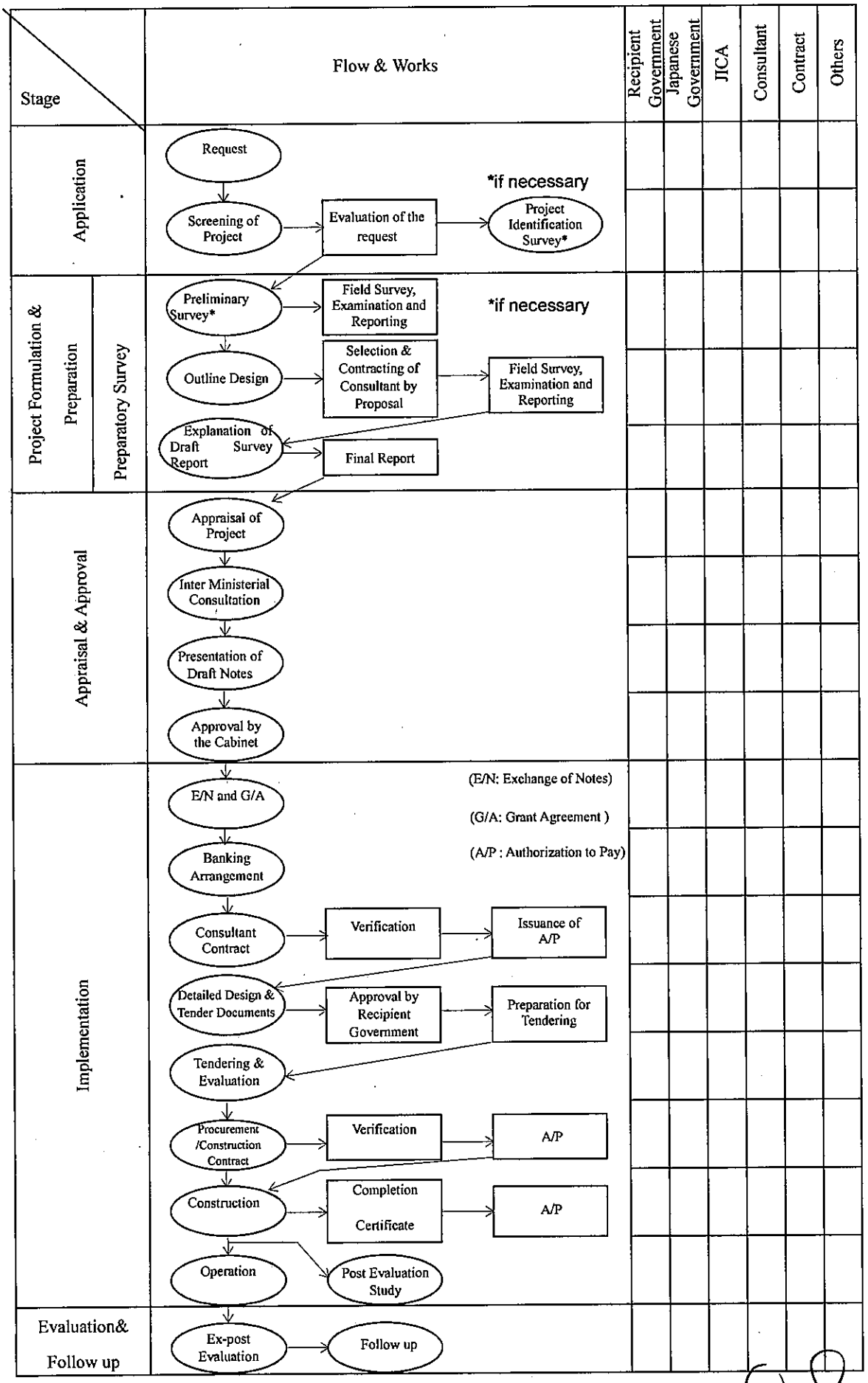
(11) Monitoring

The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

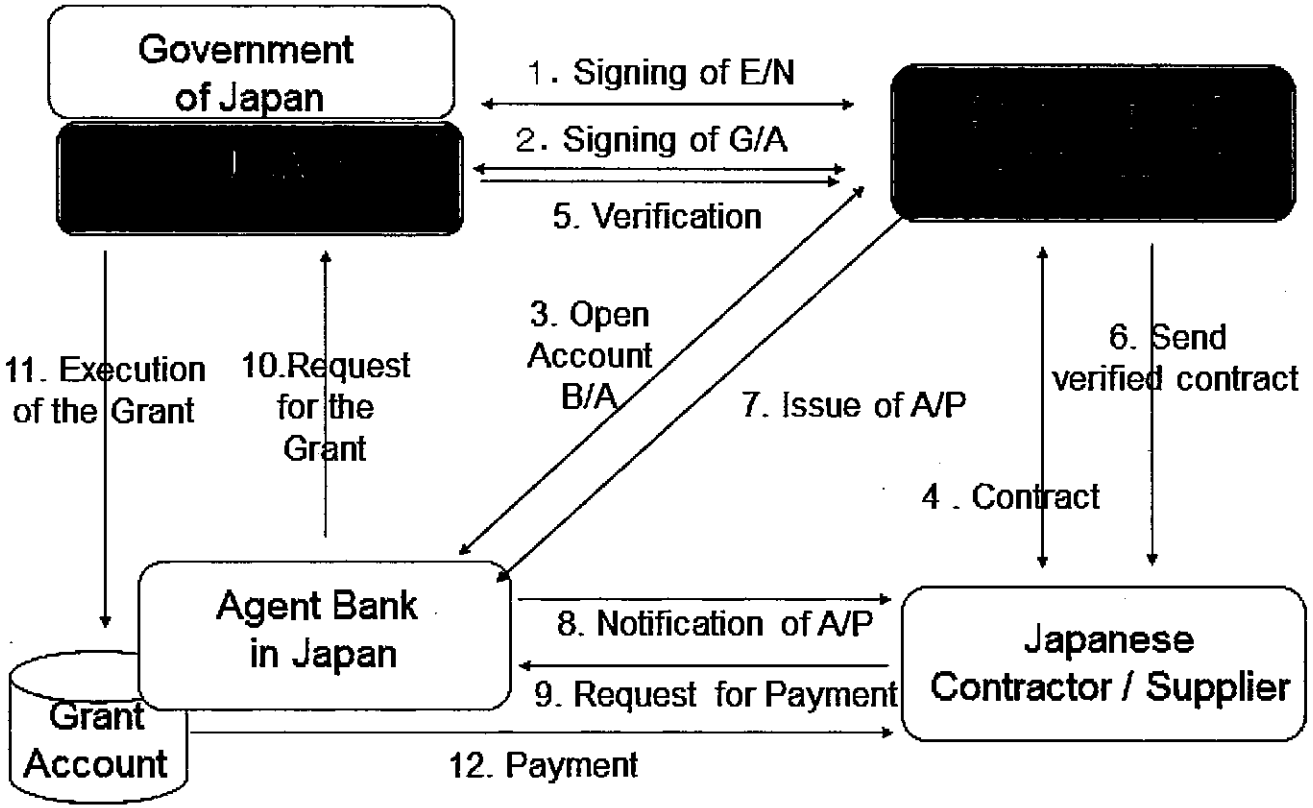
(12) Safety Measures

The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

FLOW CHART OF JAPANESE GRANT PROCEDURES

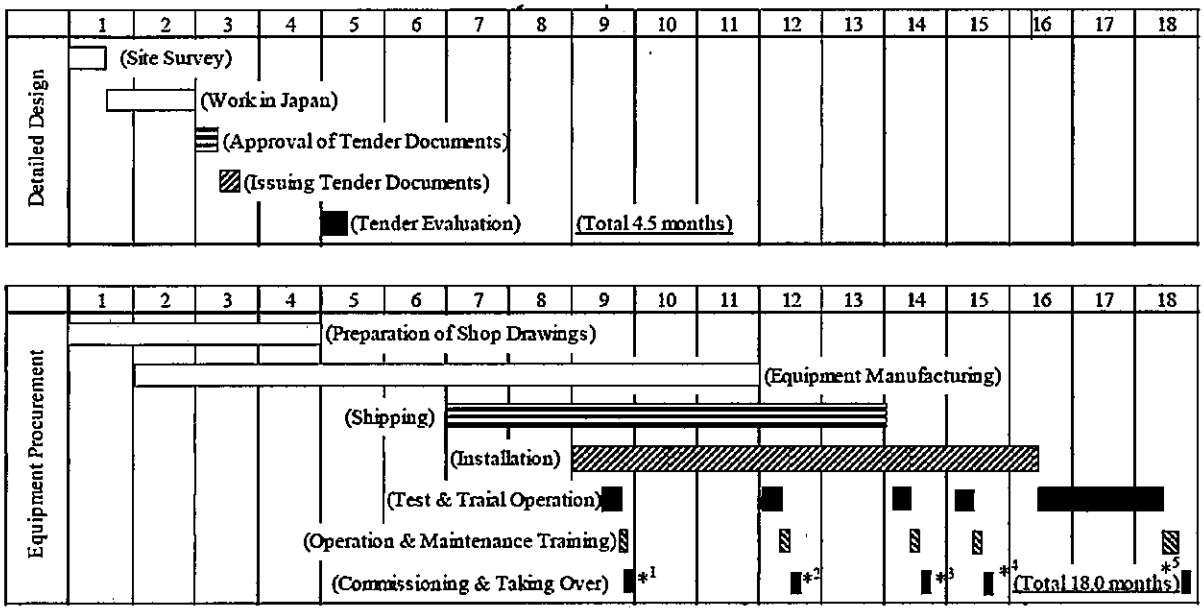


FINANCIAL FLOW OF JAPANESE GRANT AID (AUTHORIZATION TO PAY (A/P) TYPE)



Annex 6

PROJECT IMPLEMENTATION SCHEDULE



*[1] Flight Procedure Design System & Radar Controller Training Simulator

*[2] Runway Lighting System

*[3] Solar Power Supply System

*[4] Radar Maintenance Training Equipment

*[5] LOC/T-DME, LOC Maintenance Equipment, VOR/DME & VOR/DME Test Rack

Annex 7

MAJOR UNDERTAKINGS TO BE TAKEN BY EACH GOVERNMENT

Major Undertakings to be taken by Recipient Government

1. Before the Tender

No	Items	Deadline	In charge	Cost (Million NPR)	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	MOF		
2	To secure the budget for land acquitision including compensation with full replacement cost and prepration of VOR/DME sites	before notice of the tender document	CAAN	26.4	

2. During the Project Implementation

No	Items	Deadline	In charge	Cost (Million NPR)	Ref.
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		CAAN	2.1	
	1) Advising commission of Authrization to Pay (A/P)	within 1 month after the singing of the contract	CAAN		
	2) Payment commission for A/P	every payment	CAAN		
2	To ensure prompt unloading and customs clearance in recipient country	during the Project	CAAN		
3	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	CAAN coordinate with relevant authorites		
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be borne by its designated authority without using the Grant. Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.	during the Project	CAAN coordinate with relevant authorites	8.1	
5	To bear necessary expenses, other than those to be borne by the Grant Aid.	during the Project	CAAN		
6	To implement land acquisition (1.0ha) including compensation with full replacement cost in accordance with abbreviated Resettlement Action Plan (RAP) for VOR/DME sites	End of February 2017	CAAN		
7	To prepare VOR/DME sites including earthworks, installation of face and gate, construction of as accsess road between the existing road and the site, provision of commercial power to the site and removing the obstacle.	End of June 2017	CAAN		
8	To issue the permissions for entrance to the sites and works at the site	during the Project	CAAN		
9	To implement the restrictions of operation of airport facilities necessary for installation works around the runway of TIA, Lukla, Jomsom and Jumla Airport.	during the Project	CAAN		

10	To secure the tenporary storage aras of equipment and materials	during the Project	CAAN		
11	To provide necessary equipment such as air conditioning, internet connection, LAN in the Project sites.	during the Project	CAAN		
12	To provide cable ducts under runway/taxiway or permit use of existing fiber optic cable at TIA	during the Project	CAAN		
13	To provide available obstacle and terrain data for Flight Procedure Design System	during the Project	CAAN		
14	To provide an additional breaker in power distribution board at TIA's P1 Substation	during the Project	CAAN		
15	To check and repair existing Power Distribution System to be connected with Solar Power Supply System	during the Project	CAAN		
16	To make cabling between existing and new power distribution boards for Solar Power Supply System	during the Project	CAAN		
17	To implement EMP and EMoP	during the Project	CAAN		
18	To submit the monitoring results to JICA, by using the monitoring form, every six months as a part of Project Monitoring Report	during the Project	CAAN		
19	To provide commercial power supply to the Project sites	during the Project	CAAN		
20	To conduct Flight Check	during the Project	CAAN	20.0	

3. After the Project

No	Items	Deadline	In charge	Cost (Million NPR)	Ref.
1	To maintain and use properly and effectively the equipment provided under the Grant Aid 1) Additional technical staff 2) Allocation of maintenance cost 3) Operation and maintenance structure 4) Routine check/Periodic inspection	After provision of equipoment	CAAN	Refer to Annex 13	
2	To implement EMP and EMoP	for a period based on EMP and EMoP	CAAN		

Major Undertakings to be covered by the Grant Aid

No	Items	Deadline	Cost Estimated (Million Japanese Yen)*	Ref
1	To procure equipment	Before end of contract	[redacted]	
	1) Manufactuuring of the products			
	2) Marine (air) transportation of the products from Japan to the recipient country			
	3) Internal transportation from the port of disembarkation to the project site			
	4) To provide equipment with installation and commissioning			
2	To implement detailed design, tender support and construction supervision (Consultant)	Before end of contract	[redacted]	
	Total		[redacted]	

Annex 8

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX
Month 20XX

Organization Information

Authority (Signer of the G/A)	Person in Charge _____ Division _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	Person in Charge _____ Division _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Line Agency	Person in Charge _____ Division _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____
Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:

1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr)	Target (Yr)
Qualitative Effect		

2: Project Implementation

2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	**Original:** *(M/D)* **Attachment(s):Map**	**Actual:** *(PMR)* **Attachment(s):Map**

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual
(M/D) 'Soft component' shall be included in 'Items'.	*(M/D)*	*(PMR)* Please state not only the most updated schedule but also other past revisions chronologically. All change of design shall be recorded regardless of its degree.

2-1-2 Reason(s) for the modification if there have been any

(PMR)

2-2 Implementation Schedule

2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
(M/D) 'Soft component' shall be stated in the column of 'Items'. Project Completion Date*	*(M/D)*		*(PMR)* As of (Date of Revision) Please state not only the most updated schedule but also other past revisions chronologically.

*Project Completion was defined as _____ at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project

2-3 Undertakings by each Government

2-3-1 Major Undertakings

See Attachment 2.

2-3-2 Activities

See Attachment 3.

2-4 Project Cost

2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan
(Confidential until the Tender)

Items			Cost (Million Yen)	
	Original	Actual	Original	Actual
Procurement Equipment	'Soft component' shall be included in 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Consulting Services	- Detailed design -Procurement			

	Management -Construction Supervision			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

Table 2-4-1b Comparison of Original and Actual Cost by the Government of Nepal

Items			Cost (Million USD)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule but also other past revisions chronologically.
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = (local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results

(PMR)

2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: (M/D)
Actual, if changed: (PMR)

2-6 Environmental and Social Impacts

- The results of environmental monitoring as attached in Attachment 5 in accordance with Schedule 4 of the Grant Agreement.
- The results of social monitoring as attached in Attachment 5 in accordance with Schedule 4 of the Grant Agreement.

- Information on the disclosed results of environmental and social monitoring to local stakeholders, whenever applicable.

3: Operation and Maintenance (O&M)

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number ,qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: (M/D)
Actual: (PMR)

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: (M/D)

4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): *(M/D)*	
Potential Project Risks	Assessment
1.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):

2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR)	

5: Evaluation at Project Completion and Monitoring Plan

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan for the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Environmental Monitoring Form/Social Monitoring Form
6. Monitoring sheet on price of specified materials
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (Final Report Only)

ENVIRONMENTAL CHECK LIST

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)N (b)N (c)N (d) N	(a), (b) and (c) This Project for installation of VOR/DME equipment (the Project) is classified as an activity NOT to be required IEE by the Government of Nepal (GON). Accordingly, the IEE is conducted and reported based on JICA Guidelines for environmental and social considerations. (d) There are no other environmental permits required.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected in the project design?	(a) Y (b) Y	(a) Project awareness was disseminated and understanding was obtained from stakeholders. (b) The comment from the stakeholders is incorporated into the report and reflected on the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a)Y	(a) Several alternatives were studied for the installation of the equipment. The optimal candidate was proposed for the project site based on the study.
2. Pollution Control	(1) Air Quality	(a)Do Air pollutants, such as Sulfur Oxides (SOx), Nitrogen Oxides (NOx) and dust, etc., contained in emissions from vehicle, including airplanes, airport and related facilities comply with the country's effluent standards? Is there a possibility that the emissions from the project will cause areas not to comply with the country's ambient air quality standards?	(a) Y	(a) Negative impacts are foreseen on air pollution and dust due to work of the construction equipment on the construction phase. However, the impacts will be limited locally and temporarily since large-scale construction works are not included. EMP such as promoting utilization of sprinkling water to control dust will adequately mitigate all of the impacts.
	(2) Water Quality	(a) Do pollutants, such as Suspended Solids (SS), and oils contained in effluents comply with the country's effluent standards (BOD, COD etc.)? Is there a possibility that the effluents from the project will cause areas not to comply with the country's ambient water quality standards?	(a)N	(a) There is no river, stream or pond near the Dhangadhi construction site. A pond near the Chandragadhi construction site is surrounded by a dike of approx. 1m high, and it is not foreseen that surface water from the construction site flows into the pond. Therefore no impacts on water quality are foreseen.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(3) Wastes	(a) Are wastes generated from the airports and other project facilities properly treated and disposed of in accordance with the country's regulations?	(a)Y	(a) Negative impacts are foreseen on waste due to building waste materials by concrete works, civil works on the construction phase. EMP such as waste to the designated final disposal site will avoid or adequately mitigate all of the impacts.
	(4) Soil Contamination	(a) Has the soil in the project site been contaminated in the past? Are adequate measures taken to prevent soil contamination by leakage of fuels?	(a)N	(a) Negative impacts are foreseen on soil contamination by fuel outflow from construction equipment on the construction phase. EMP will avoid or adequately mitigate all of the impacts.
	(5) Noise and Vibration	(a) Does noise from aircraft comply with the country's standards? (b) Is there a possibility that noise and vibrations from various sources, such as airport user's vehicles and vehicles for airport operations will adversely affect ambient noise levels? If impacts are anticipated, are adequate noise mitigation measures considered?	(a)- (b) Y	(a) (This item shall be excluded on the evaluation since the installation of the equipment does not affect directly to aircraft noise.) (b) Negative impacts are foreseen on noise pollution due to work of construction equipment on the construction phase. EMP will avoid or adequately mitigate all of the impacts.
	(6) Ground Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a)N	(a)Activities which may cause this issue are not foreseen.
	(7) Odor	(a) Are there any odor sources? Are adequate odor control measures	(a)N	(a) Negative impacts on odor due to water pollution are not foreseen.
3. Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a)N	(a) The project site and the surrounding area are not designated as national park and protected area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(a)N (b)N (c)N (d)N	Negative impacts are not foreseen. There is no rare species and ecologically valuable habitats in the project site and the surrounding area.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(d) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce?		
	(3) Hydrology	(a) Is there any possibility that alteration of drainage system due to the constructions of airports and related facilities will adversely affect surface water and groundwater flows? (b) Do the facilities affect adversely flow regimes, waves, tides, currents of rivers and etc. if the project facilities are constructed on/by the seas?	(a) N (b) N	Activities which may cause this issue are not included.
	(4) Topography and Geology	(a) Does the project require the large scale change of Topographic/geographic features? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff? (d) In the case of offshore projects, is there any possibility that the project will erode natural beaches?	(a) N (b) Y (c) Y (d) N	Activities which may cause this issue are not included. However, construction surplus soil shall be disposed to the designated final disposal site.
4. Social Environment	(1) Involuntary Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f)Does the resettlement plan pay particular attention to	(a) N (b) - (c) - (d) Y (e) Y (f) - (g) - (h) - (i) - (j) Y	(a) (d) (e) and (j) No resettlement is required. However, land acquisition shall be required. Therefore, Abbreviated Resettlement Action Plan (RAP) such as the compensation policy shall be prepared.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		vulnerable groups or people, including women, children, the elderly people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?		
	(2) Living and Livelihood	(a) Is there any possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there any possibility that the project causes the change of land uses in the neighboring areas to affect adversely livelihood of local people? (c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (d) Is sufficient infrastructure (e.g., roads) available for the project implementation? If the existing infrastructure is insufficient, is a plan developed to construct new infrastructure or improve the existing infrastructure? (e) Is there any possibility that the airports and other project structures will cause a sun shading and radio interference?	(a)Y (b)N (c) Y (d) N (e) N	(a) Negative impacts are foreseen due to land acquisition. Therefore Abbreviated RAP such as the compensation policy shall be prepared to carry out land acquisition properly. (b), (d) Negative impacts specified for degrading user's convenience are expected due to traffic of the construction equipment on the construction phase. EMP such as improvement of construction material transport method will adequately mitigate all of the impacts and traffic congestion. Negative impacts specified for Land use and utilization of local resources, Water usage, are not expected. (c) Infectious diseases are possible to be spread due to inflow of construction workers into the local community on the construction phase. EMP will avoid or adequately mitigate all of the impacts. (e) Activities which cause this issue are not included.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	(a) There is no cultural heritage in the project site and the surrounding area.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local land scape? Are necessary measures taken?	(a)N	Activities which may cause this issue are not included.

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Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) - (b) -	(This item shall be excluded on the evaluation since there is no ethnic minorities and indigenous peoples.)
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a)Y (b)Y (c)Y (d)Y	Construction work environment needs to be considered on the construction phase. EMP such as industrial health management in compliance with the laws and the regulations will avoid or adequately mitigate all of the impacts.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	Mitigation measures on the negative impacts from construction activities are prepared as the Environmental Management and Monitoring Plan. The construction contractor will be responsible for carrying out the mitigation measures based on the EMP. The staff in the PMU established in the CAAN will monitor and supervise the contractor's mitigation activities.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring	(a) Y (b) Y (c) Y (d) Y	The construction contractor will be responsible for carrying out the mitigation measures based on the EMP. The staff in the PMU established in the CAAN will monitor and supervise the contractor's mitigation activities. Budget on environmental monitoring will be secured

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?		under the administration cost. Monitoring form addressing items to be monitored, monitoring site and monitoring frequency is prepared.
6. Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways, and Bridges checklist should also be checked (e.g., projects including large areas of deforestation). (b) If the airport is constructed on the sea, pertinent items described in the Ports and Harbors checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities). (c) Where necessary, pertinent items described in the Forestry Projects	(a) N (b) N (c) N	Reference to checklist of other sectors is not relevant to the Project
	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Cross boundary impacts and causing factors of climate change issues are not foreseen since the construction works are limited in the project site on the construction phase.

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

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Annex 10

ENVIRONMENTAL MANAGEMENT PLAN (MITIGATION MEASURES)
(PRE-CONSTRUCTION PHASE, CONSTRUCTION PHASE)

No.	Impacts	Possible Effects	Mitigation Measures	Implementation Organization	Supervising Organization
Pre-Construction Phase					
3. Social Environment					
3.1	Involuntary Resettlement	Land Acquisition	Proper compensation, Agreement with the affected people	CDC*1 CAAN	CAAN
Construction Phase					
1. Pollution					
1.1	Air Pollution	Air pollution due to construction works	Sprinkling water to control dust, Inspection and maintenance of construction equipment	Contractors*2	CAAN
1.2	Waste	Waste due to construction works	Waste at designated final disposal site	Contractor	CAAN
1.3	Soil Contamination	Soil contamination due to construction works	Inspection and maintenance of construction equipment	Contractor	CAAN
1.4	Noise and Vibration	Noise and vibration due to operation of construction equipment	Inspection and maintenance of construction equipment	Contractor	CAAN
Natural Environment					
Social Environment					
3.15	Infectious Diseases such as HIV/AIDS	Increase of infectious diseases due to inflow of construction workers into local community	Training on infectious diseases for construction workers	Contractor	CAAN
3.16	Labor Environment (including work safety)	Increase of accidents and diseases due to inappropriate labor environment management	Industrial health management	Contractor	CAAN
2. Others					
4.1	Accidents	Increase of accidents due to inappropriate construction management	Safety apparatus for construction workers, Compliance with traffic regulations	Contractor	CAAN

*1 CDC: Compensation Determination Committee, *2 Contractors for Site Preparation and Equipment Installation

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ENVIRONMENTAL MONITORING PLAN
(PRE-CONSTRUCTION PHASE, CONSTRUCTION PHASE)

No.	Impacts	Parameters to be monitored	Location	Frequency	Implementing Organization	Supervising Organization
Pre-Construction Phase						
3. Social Environment						
3.1	Involuntary Resettlement (Land Acquisition)	Proper compensation, Agreement with the affected people	—	Not later than the commencement of the construction	CDC*1 CAAN	CAAN
Construction Phase						
1. Pollution						
1.1	Air Pollution	Baseline survey and periodic air quality inspection of air quality (TSP*2)	Construction Site	Monthly	Contractors*3	CAAN
		Sprinkling water to control dust	Construction Site	Daily in dry season	Contractors	CAAN
		Inspection and maintenance of construction equipment	Construction Site	Monthly	Contractors	CAAN
1.2	Waste	Waste at designated final disposal site	Construction Site	Monthly	Contractors	CAAN
1.3	Soil Contamination	Inspection and maintenance of construction equipment	Construction Site	Monthly	Contractors	CAAN
1.4	Noise and Vibration	Baseline survey and periodic inspection of noise	Construction Site	Monthly	Contractors	CAAN
		Inspection and maintenance of construction equipment	Construction Site	Monthly	Contractors	CAAN
2. Natural Environment						
3. Social Environment						
3.15	Infectious diseases such as HIV/AID	Training on infectious diseases for construction workers	Construction Site	Beginning of construction period	Contractors	CAAN
3.16	Labor Environment (including work safety)	Industrial health management	Construction Site	Monthly	Contractors	CAAN
4. Others						
4.I	Accidents	Safety apparatus for construction workers, Compliance with traffic regulations	Construction Site	Monthly	Contractors	CAAN

*1 CDC: Compensation Determination Committee, *2 TSP: Total Suspended Particle, *3 Contractors for Site Preparation and Equipment Installation, *4 SS: Suspended Solid

Annex 12

ENVIRONMENTAL AND SOCIAL MONITORING FORM

I. Pre-Construction Phase

1. Resettlement (Land Acquisition)

Monitoring item	Monitoring results during report period	Remarks (Measurement point, Frequency, Implementation phase)
Proper compensation, Agreement with the affected people 1. Internal Monitoring • Verification that there are no outstanding or unresolved land acquisition issues and that property valuation and economic rehabilitation has been carried out in accordance with the provisions in RP; • Information campaign and consultation has been carried out with APs; • Status of land acquisition and payments on land compensation; • Value of entitlement received is equal to that of original structure or land acquired; • Effective utilization of entitlements received; • Compensation for affected structures and other assets; • Economic rehabilitation measures are implemented, as approved; • Effective operation of both the Grievance Committees; and • Funds for implementing land acquisition and economic rehabilitation activities are available in a timely manner, are sufficient for the purposes, and are spent in accordance with RP. 2. External Monitoring • Evaluating social and economic impact of land acquisition and rehabilitation of APs; • Verifying the objective of enhancement or at least restoration of income levels and standard of living of the APs; • Suggesting modifications in land acquisition and economic rehabilitation, where necessary, to achieve the principles and objectives as set before; and • Making final ex-post evaluation to ensure all resettlement and land acquisition activities have been completed; and any problems/issues identified are followed-up (including recommendation of mitigation measures with budget requirement). • Verification of internal monitoring – to ensure appropriateness of activities being carried out by PMU and field offices; • Evaluation of delivery and impacts of entitlements – to determine if they are as per the approved RP; • Evaluation of consultation and grievance procedures – especially levels of public awareness of grievance procedures, access of APs and households to information and rapid conflict resolution; • Evaluation of actual operations of grievance committee		Location: - Frequency: Not later than the commencement of the construction

– assisting APs as required and acting as observers; • Declaration of successful implementation – summing up the outcome of activities on completion of all entitlements distribution and land acquisition activities; and • Recommend follow-up actions for the Executing Agency (EA) – relating to outstanding actions required to complete achievement of objectives of the land acquisition, additional mitigation measures for APs, if required, and timing and budget of these additional measures. • Describe lessons learned for future projects.		

II. Construction Phase

1. Pollution

1-1 Air Quality (Emission Gas /Ambient Air Quality)

Item (unit)	Measured value (Mean)	Measured value (Max)	Country's standards	Reference to global standards	Remarks
Total Suspended Particulate (TSP)(μg/m^3)			<230 (24H)		Location: Construction site Frequency: Once at the beginning of construction period

Monitoring item	Monitoring results during report period	Remarks
Inspection of air quality		Location: Construction site Frequency: Monthly
Sparkling water to control dust.		Location: Construction site Frequency: Dairy in dry season
Inspection and maintenance of construction equipment.		Location: Construction site Frequency: Monthly

1-2 Waste

Monitoring Item	Monitoring results during report period	Remarks
Waste at designated final disposal site		Location: Construction site Frequency: Monthly

1-3 Soil Contamination

Monitoring item	Monitoring results during report period	Remarks
Inspection and maintenance of construction equipment.		Location: Construction site Frequency: Monthly

1-4 Noise and vibration

Item (unit)	Measured value (Mean)	Measured value (Max)	Country's standards	Reference to global standards	Remarks (Measurement point, Frequency, Implementation phase)
Ambient Noise (dBA)				Uncomfortable: 120-130 Very high: 90-100 Medium: 70-80 Peace: 50-60 (WHO)	Location: Construction site Frequency: Once at the beginning of construction period

Monitoring Item	Monitoring results during report period	Remarks
Inspection of noise		Location: Construction site Frequency: Monthly
Inspection and maintenance of construction equipment.		Location: Construction site Frequency: Monthly

2. Social Environment

2-1 Infectious diseases such as HIV/AIDS

Monitoring Item	Monitoring results during report period	Remarks
Training on infectious diseases for construction workers.		Location: Construction site Frequency: Once at the beginning of construction period

2-2 Labor environment (including work safety)

Monitoring Item	Monitoring results during report period	Remarks
Industrial health management.		Location: Construction site Frequency: Monthly

3. Others

3-1 Accidents

Monitoring Item	Monitoring results during report period	Remarks
Safety apparatus for construction workers, Compliance with traffic regulations.		Location: Construction site Frequency: Monthly

Annex 13

ANNUAL INCREMENTAL OPERATION AND MAINTENANCE COSTS BY THE PROJECT

Item	Amount (Million NPR)
Personnel Expenses	3.0
Operation and Maintenance Cost	20.0
- LOC/T-DME and LOC Maintenance Training Equipment	(4.1)
- VOR/DME System and VOR/DME Test Rack	(4.8)
- Radar Maintenance Training Equipment	(3.5)
- Radar Controller Training Simulator	(1.0)
- Runway Lighting System	(0.4)
- Flight Procedure Design System	(2.5)
- Soloar Power Supply System	(3.7)
Total	23.0

Appendix 5: Technical Memorandum

5.1 Memorandum dated 09 October 2015

TECHNICAL MEMORANDUM ON THE PREPARATORY SURVEY FOR THE PROJECT FOR IMPROVEMENT OF AVIATION SAFETY FACILITIES IN MAJOR AIRPORTS

The JICA Survey Team held technical discussions with officials concerned of CAAN for the captioned survey to wrap-up the survey works carried out during their stays in Nepal from 06 April to 08 May and from 28 September to 08 October 2015.

In the course of technical discussions and field survey, the both sides confirmed the main items described in the attached sheets.

Kathmandu, 09 October, 2015

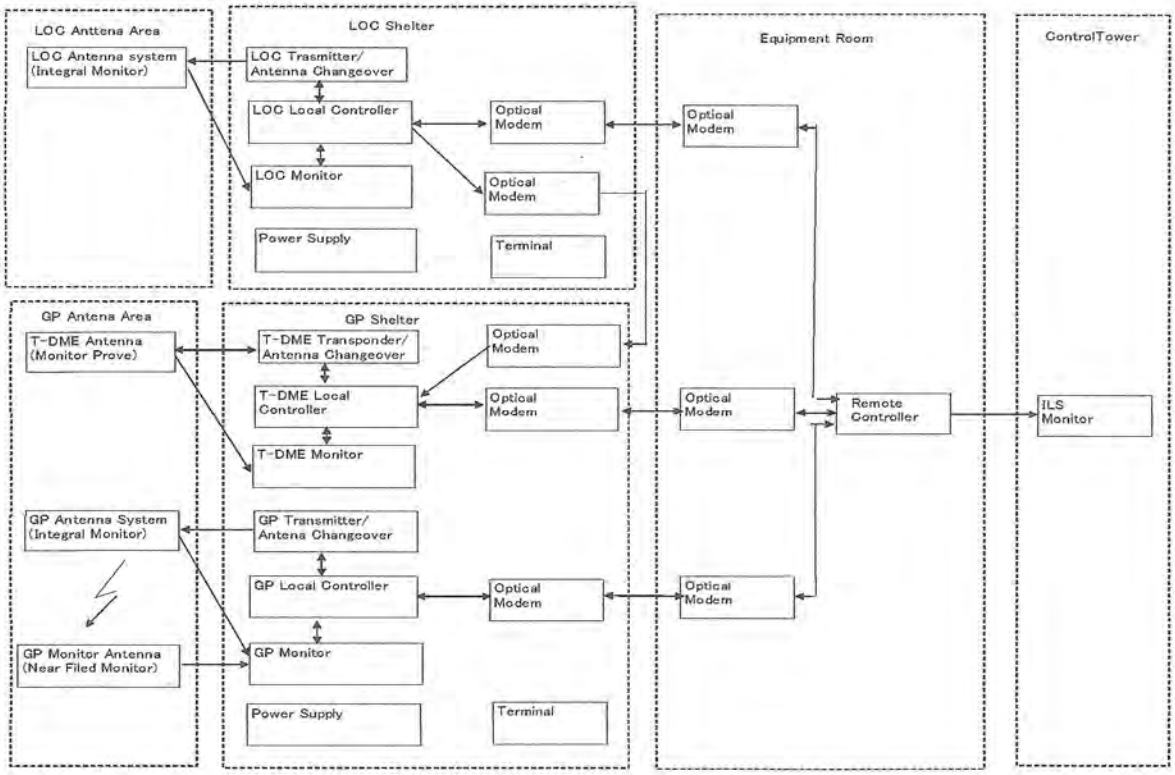
Toru Shimada
Chief Consultant
Preparatory Survey Team
Japan International Cooperation Agency

Sanjiv Gautam
Director General
Civil Aviation Authority of Nepal

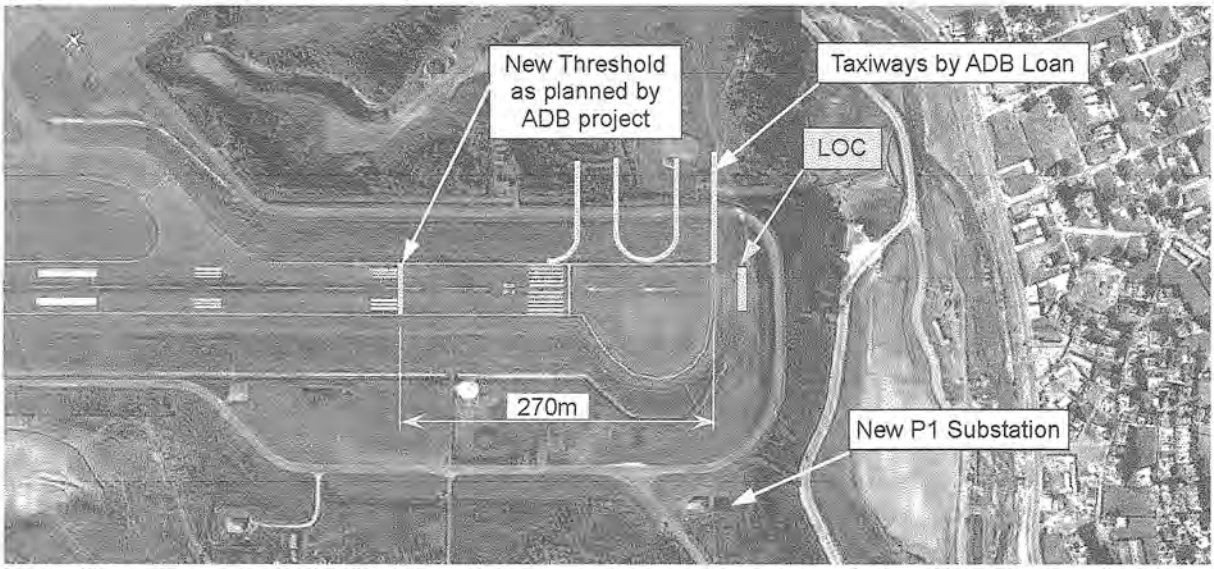
ATTACHMENT

1. Instrument Landing System (ILS) and Distance Measuring Equipment (T-DME)

(1) System Block Diagram

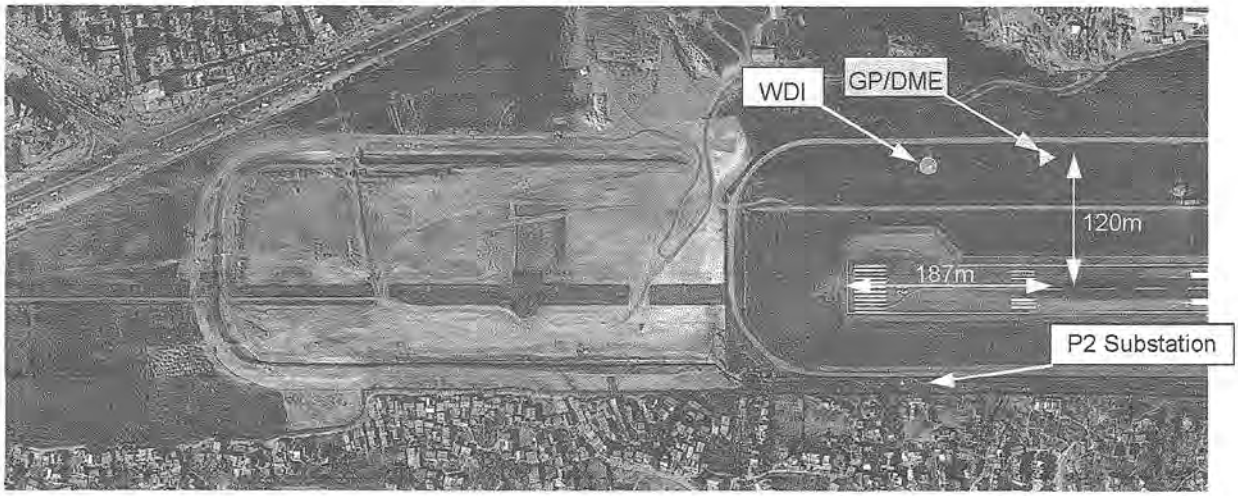


(2) Localizer (LOC) Antenna Site



Note: Takeoff run for RWY20 takeoff shall be started from the existing RWY20 threshold (or further south).

(3) Glide Path (GP) and T-DME Antenna Site



(4) Work Demarcations

Work Item	Grant Aid Project	CAAN
Relocation of Wind Direction Indicator		✓
Grading in front of GP Antenna		✓
Provision of Cable Ducts under Runway/Taxiway or Permission for Use of Existing Fiber Optic Cable		✓
Equipment Shelter with Air Conditioner	✓	
Cabling for Power Supply and Control/Monitoring Signal	✓	
Connection to the Existing Power Distribution Board	✓	
Procurement of Equipment (Note 1)	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Connection of Power Cable to P1 and P2 Substation	✓	
Provision of Additional Breakers in Power Distribution Boards		✓
Electric Power Supply		✓
Provision of Aircraft and Inspector for Flight Calibration/Inspection (Note 2)		✓
Ground Staff for Flight Calibration/Inspection	✓	✓

Note 1: CAAN confirmed that Japanese air navigational equipment is acceptable even without a type approval that is required in Section 75, (1) of "Civil Aviation Regulation, 2058" because there is no system of type approval in Japan.

Note 2: CAAN confirmed that "the organization having flight inspection approval from the concerned country" in Section 75, (6) of "Civil Aviation Regulation, 2058" means "the organization having flight inspection approval from its home country".

(5) Flight Procedure Design Criteria

- MOC for Mountainous Area:
  - Additional 100% MOC will be applied for Intermediate and some section of Final Approach Segments
- Height Loss Margin:
  - Modified calculation method is developed with additional margin based on PANS-OPS
- OAS Coefficients:
  - PANS-OPS criteria for 3.5 degree OAS are applied.
- Adjustments of W surface of OAS:
  - PANS-OPS criteria for steeper slope are applied.
- Origin of Z surface of OAS :

- PANS-OPS criteria for steeper slope are applied.

➢ Correction of Elevation
- Terrain maps are applied with rules of next contour and 30m vegetation.

➢ Turn Altitude due to height restriction of Thimi Gatthaghar:
- 500m clearance from Ground Level (6037ft) has to be secured even if DH and MDH are increased.

2. Radar Controller Training Simulator

(1) Major Components

Equipment	Quantity	Remarks
ACC Radar Controller Working Position	2 nos.	convertible to APP
ACC Coordinator Position	2 nos.	convertible to APP
APP Radar Controller Working Position	2 nos.	convertible to ACC
APP Coordinator Position	2 nos.	convertible to ACC
Instructor + Pilot Position	1 nos.	common use for ACC and/or APP
Pilot Position	1 nos.	common use for ACC and/or APP
Scenario Generator	1 no.	
Voice Communication Control Simulator	1 no.	

(2) Work Demarcations

Work Item	Grant Aid Project	CAAN
Preparation of Space for Equipment Installation in Simulator Room		✓
Procurement of Equipment	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Provision of Electric Power		✓
Air Conditioning of Simulator Room		✓

3. Radar Maintenance Training Equipment

(1) Major Components

Equipment	Quantity	Remarks
M-SSR Interrogator	1 no.	Single configuration
Local Control and Monitoring System	1 no.	Single configuration
Dummy Antenna	1 no.	
Maintenance Display	1 no.	
M-SSR Reply Simulator	1 no.	

Note: CAAN requested procurement of the same model as that of "Tribhuvan International Airport Modernization Project (Surveillance System)" for practical training.

(2) Work Demarcations

Work Item	Grant Aid Project	CAAN
Preparation of Space for Equipment Installation in Radar Laboratory		✓
Procurement of Equipment	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Provision of Electric Power		✓
Air Conditioning of Radar Laboratory		✓

4. ILS Maintenance Training Equipment

(1) Major Components

Equipment	Quantity	Remarks
Localizer Transmitter	1 no.	Single Confutation
Localizer Monitor	1 no.	Single Confutation
Localizer Controller	1 no.	Single Confutation
Localizer Signal Generator	1 no.	
Localizer Dummy Antenna	1 no.	
Glide Path Transmitter	1 no.	Single Confutation
Glide Path Monitor	1 no.	Single Confutation
Glide Path Controller	1 no.	Single Confutation
Glide Path Signal Generator	1 no.	
Glide Path Dummy Antenna	1 no.	

(2) Work Demarcations

Work Item	Grant Aid Project	CAAN
Preparation of Space for Equipment Installation in Radar Class Room		✓
Procurement of Equipment	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Provision of Electric Power		✓
Air Conditioning of Radar Class Room		✓

5. Runway Lights

(1) Major Components

Equipment	Quantity	Remarks
Runway Edge Light (White) for Lukla	24 nos.	LED, Self-contained Solar Power Supply
Runway Edge Light (Yellow) for Lukla	10 nos.	
Runway Threshold/End Light (Green/Red) for Lukla, Jomsom, Jumla	30 nos.	
Runway End Light (Red) for Lukla	6 nos.	
Runway Threshold Identification Lights for Jomsom, Jumla	8 nos.	
Radio Control Unit for Lukla, Jomsom, Jumla	3 set	

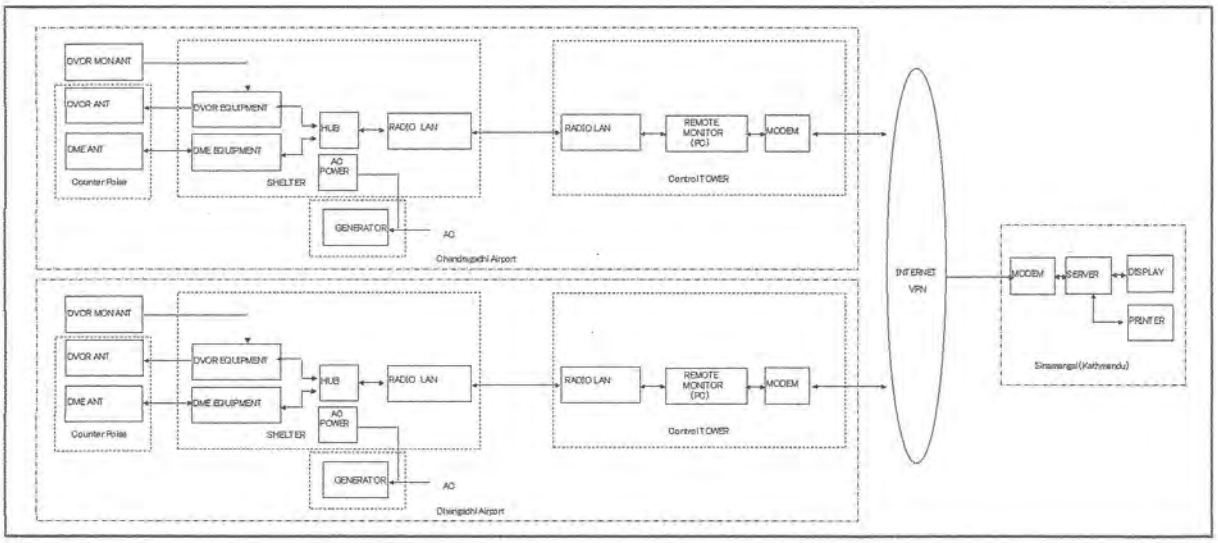
(2) Work Demarcations

Work Item	Grant Aid Project	CAAN
Procurement of Equipment (Note 1)	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	

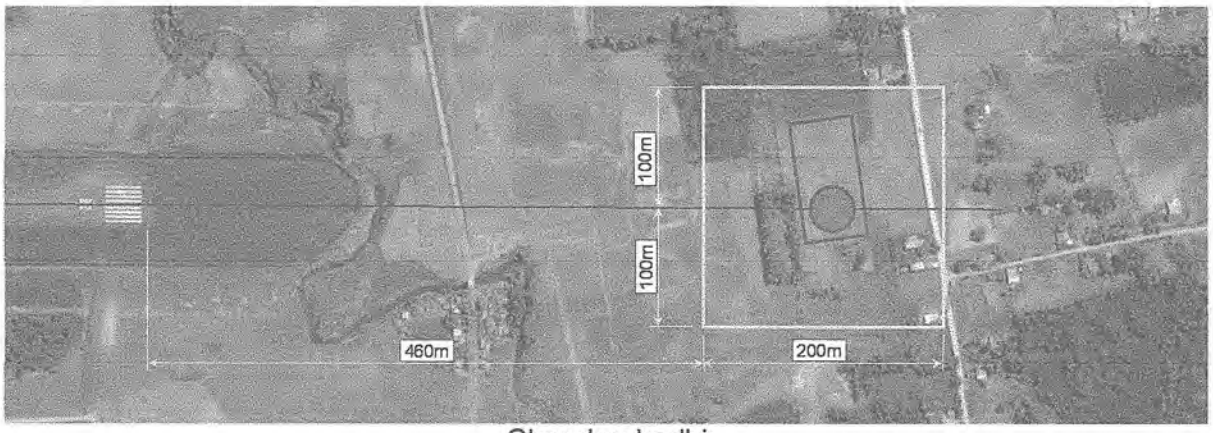
Note 1: CAAN confirmed that test report certifying compliance with Annex 14 is acceptable instead of the type approval that is required in Section 75a, (1) of "Civil Aviation Regulation, 2058".

6. VHF Omnidirectional Range/Distance Measuring Equipment (VOR/DME)

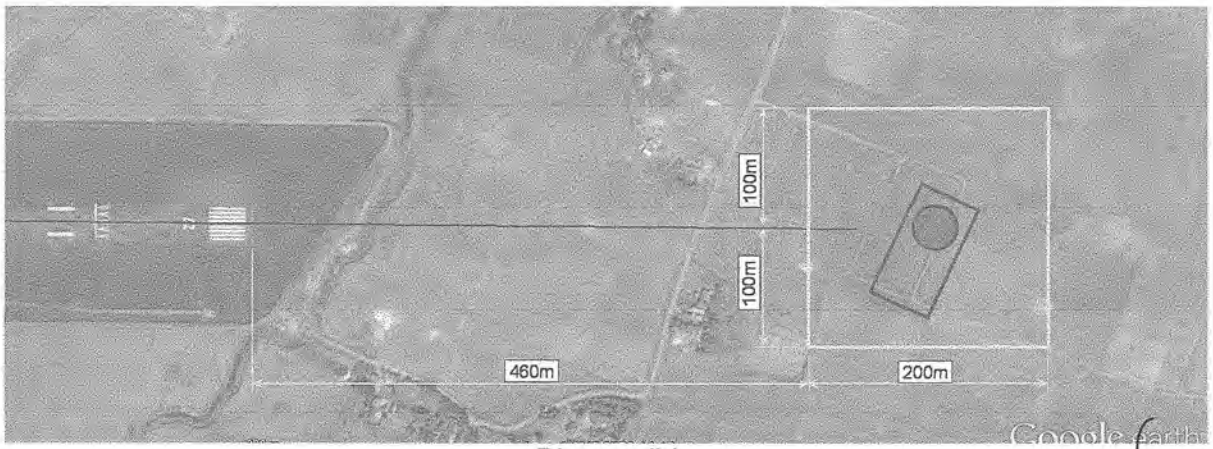
(1) System Block Diagram



(2) Proposed Location of VOR/DME Sites



Chandraghadhi



Dhangadhi

(4) Work Demarcations

Work Item	Grant Aid Project	CAAN
Land Acquisition		✓
Site Preparation including Earthworks and Storm Water Drainage		✓
Construction of Access Road		✓
Provision of City Power Supply up to Power Distribution Board		✓
Internet Connections between 2 Airports and Sinamangal		✓
Equipment Shelter with Air Conditioner	✓	
Power Distribution Board	✓	
Procurement of Equipment (Note 1)	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Emergency Power Supply System	✓	
Chop-off Trees obstructing line-of-sight between TWR & VOR/DME site		✓
Provision of Aircraft and Inspector for Flight Calibration/Inspection (Note 2)		✓
Ground Staff for Flight Calibration/Inspection	✓	✓

Note 1: CAAN confirmed that Japanese air navigational equipment is acceptable even without a type approval that is required in Section 75, (1) of "Civil Aviation Regulation, 2058" because there is no system of type approval in Japan.

Note 2: CAAN confirmed that "the organization having flight inspection approval from the concerned country" in Section 75, (6) of "Civil Aviation Regulation, 2058" means "the organization having flight inspection approval from its home country".

7. VOR/DME Test Rack

(1) Major Components

Equipment	Quantity	Remarks
D-VOR Equipment	1 no.	Single Confutation
D-VOR Dummy Antenna	1 no.	
DME Equipment	1 no.	Single Confutation
DME Dummy Interrogator	1 no.	

(2) Work Demarcations

Work Item	Grant Aid Project	CAAN
Preparation of Space for Equipment Installation		✓
Procurement of Equipment	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Provision of Electric Power		✓

8. Flight Procedure Design System

(1) Major Components

Equipment	Quantity	Remarks
Flight Procedure Design Software	1 set	
CAD/GIS Software	1 set	
Desktop PC with Database Server Function	1 no.	
External Hard Disk	1 no.	RAID1
PC Monitor Display	2 nos.	24 inch wide monitor
Switching Hub	1 no.	
Firewall	1 no.	
Color Laser Printer	1 no.	A3 size
UPS	1 no.	

Note: A specific model that is used by Civil Aviation Bureau of Japan shall be procured so that Japanese experts can transfer their flight procedure design technology most effectively.

(2) Work Demarcations

Work Item	Grant Aid Project	CAAN
Desk and Chair		✓
Procurement of Equipment	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Provision of Electric Power		✓
Provision of LAN with Internet Access		✓
Provision of Available Obstacle and Terrain Data		✓
Construction of Obstacle and Terrain Database	✓	
1 Year Maintenance Service	✓	
Maintenance/Update Service after 1 Year (approx. US$25,000/year)		✓

9. Solar Electric Power Supply System

(1) Estimated Power Consumption and Planned PV Panel and Battery Capacity

	Power Consumption (kWh/day)	PV Panel Capacity (kW)	Battery Capacity
Jomsom	32.92	12.0	288V 700Ah
Jumla	39.45	13.5	288V 900Ah
Rara	20.01	7.0	288V 500Ah
Simikot	14.61	5.5	288V 400Ah
Lukla Control Tower	32.07	11.5	288V 700Ah
Lukla Terminal Bldg.	29.65	10.5	288V 700Ah

(2) System Block Diagrams

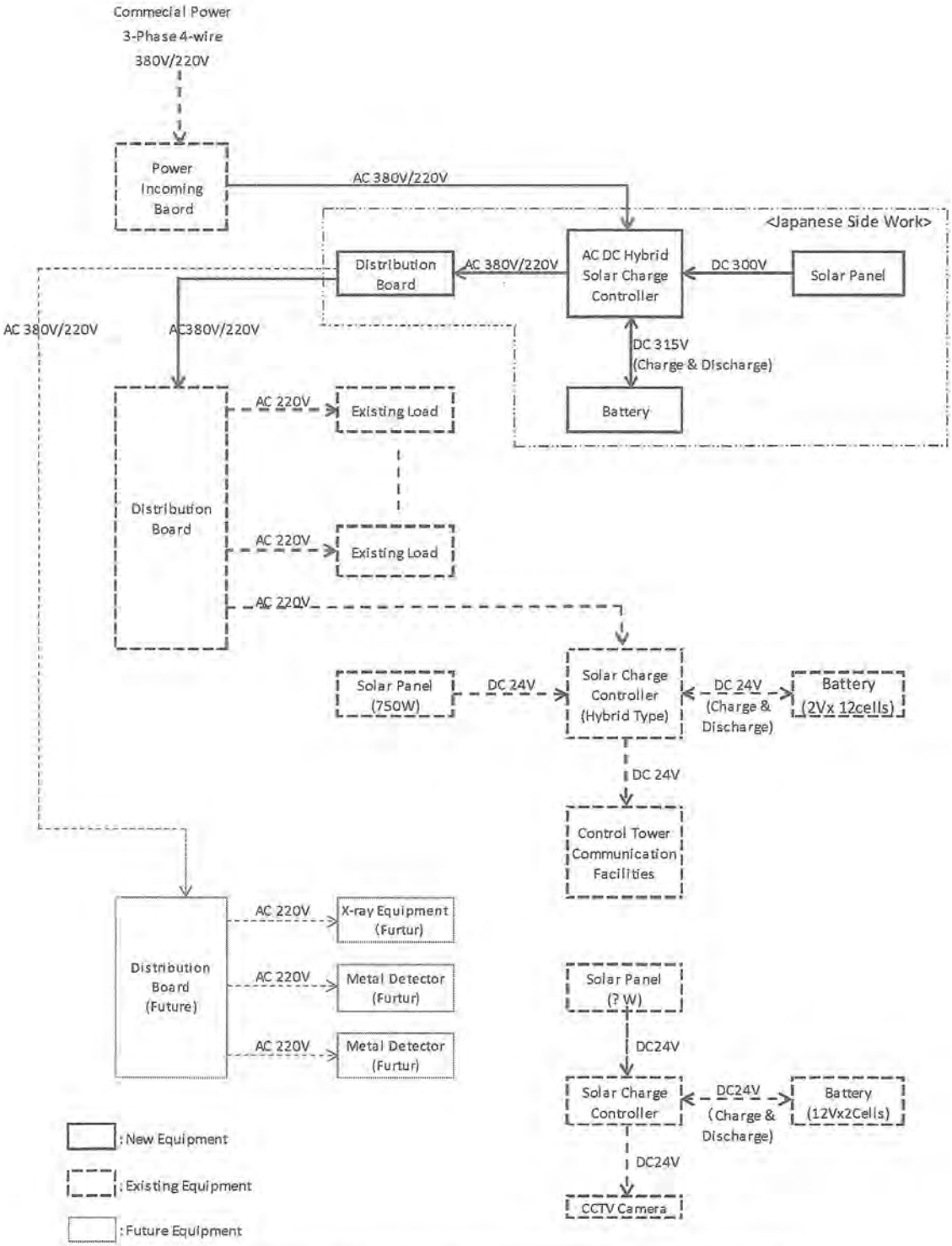
As shown in Figure-1 through -6.

(3) Work Demarcations

Work Item	Grant Aid Project	CAAN
Preparation of Space for Equipment Installation		✓
Procurement of Equipment	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Cabling from Existing Power Distribution Board to Solar Charge Controller	✓	
Check and Repair Existing Power Distribution System (Note 1)		✓
Cabling between Existing and New Power Distribution Boards	(Note 2)	✓
Supply of Commercial Power		✓

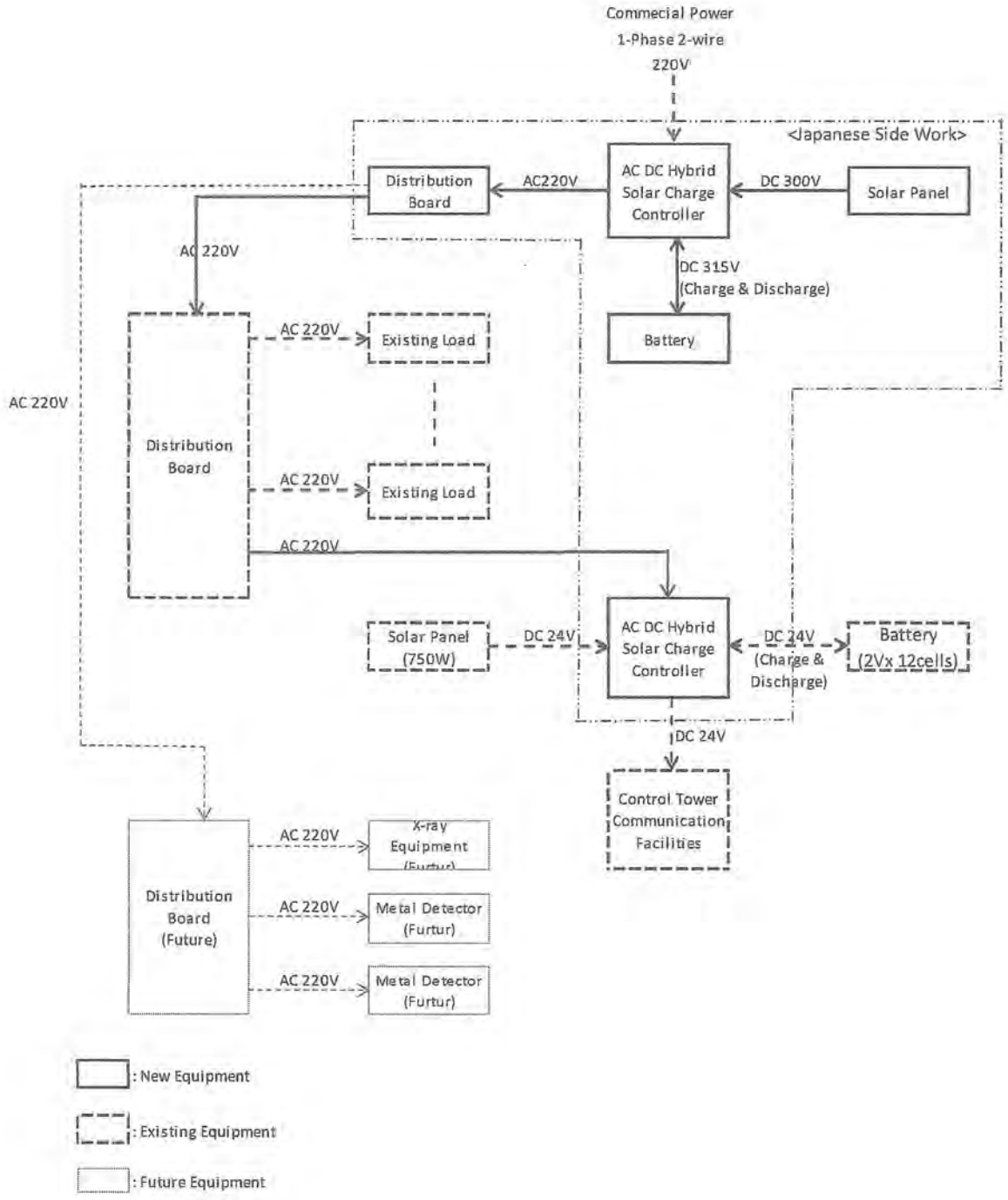
Note 1: It is recommended to replace all the existing lights by LED for energy saving. The load calculation was based on the LED lights.

Note 2: Grant aid project will assist CAAN in cabling works until completion of on-site operation and maintenance training.



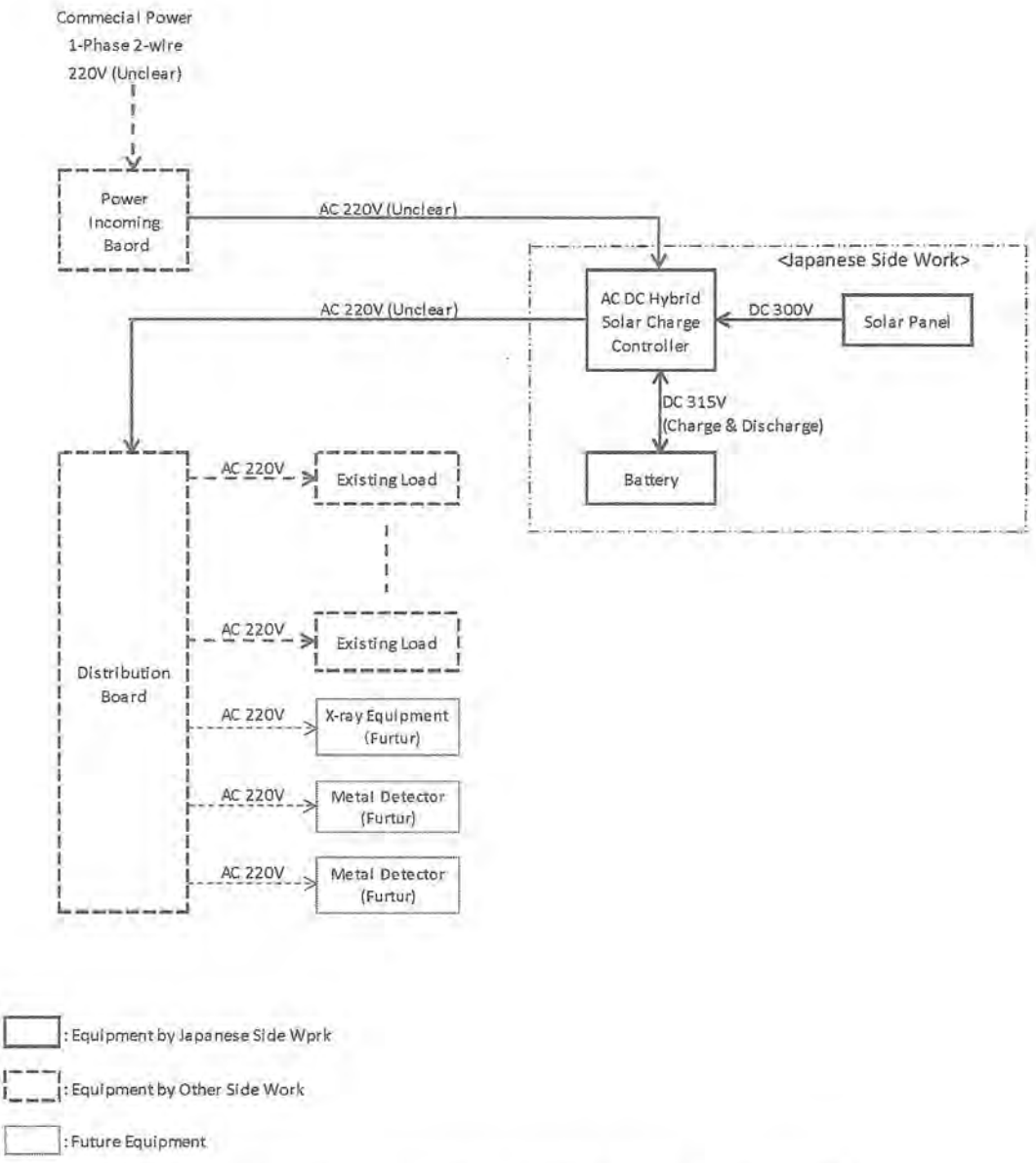
Renovating PV Generating Power Supply Diagram (Jomson Airport)

Figure-1 System Block Diagram for Jomsom



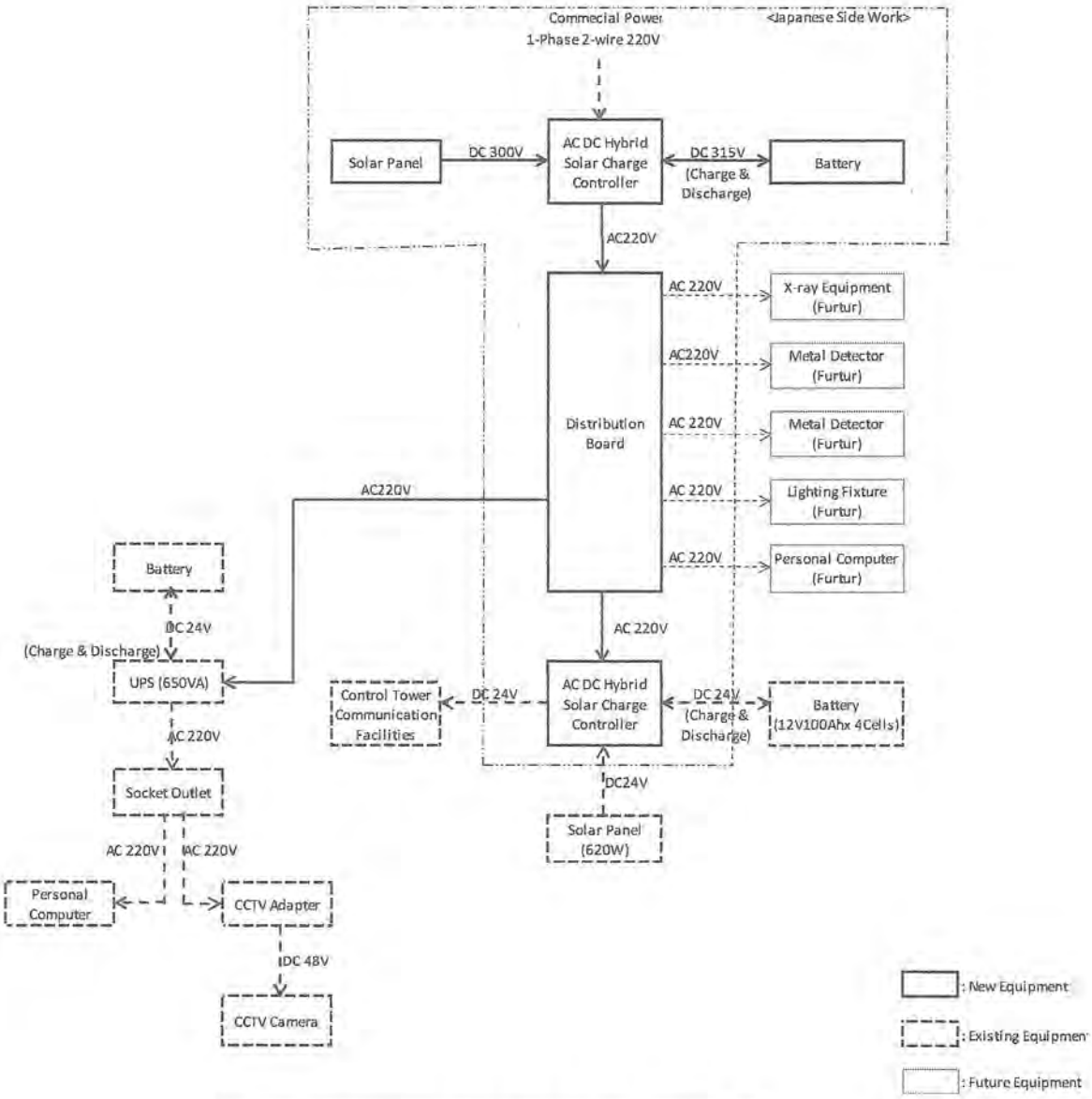
Renovating PV Generating Power Supply Diagram (Jumla Airport)

Figure-2 System Block Diagram for Jumla



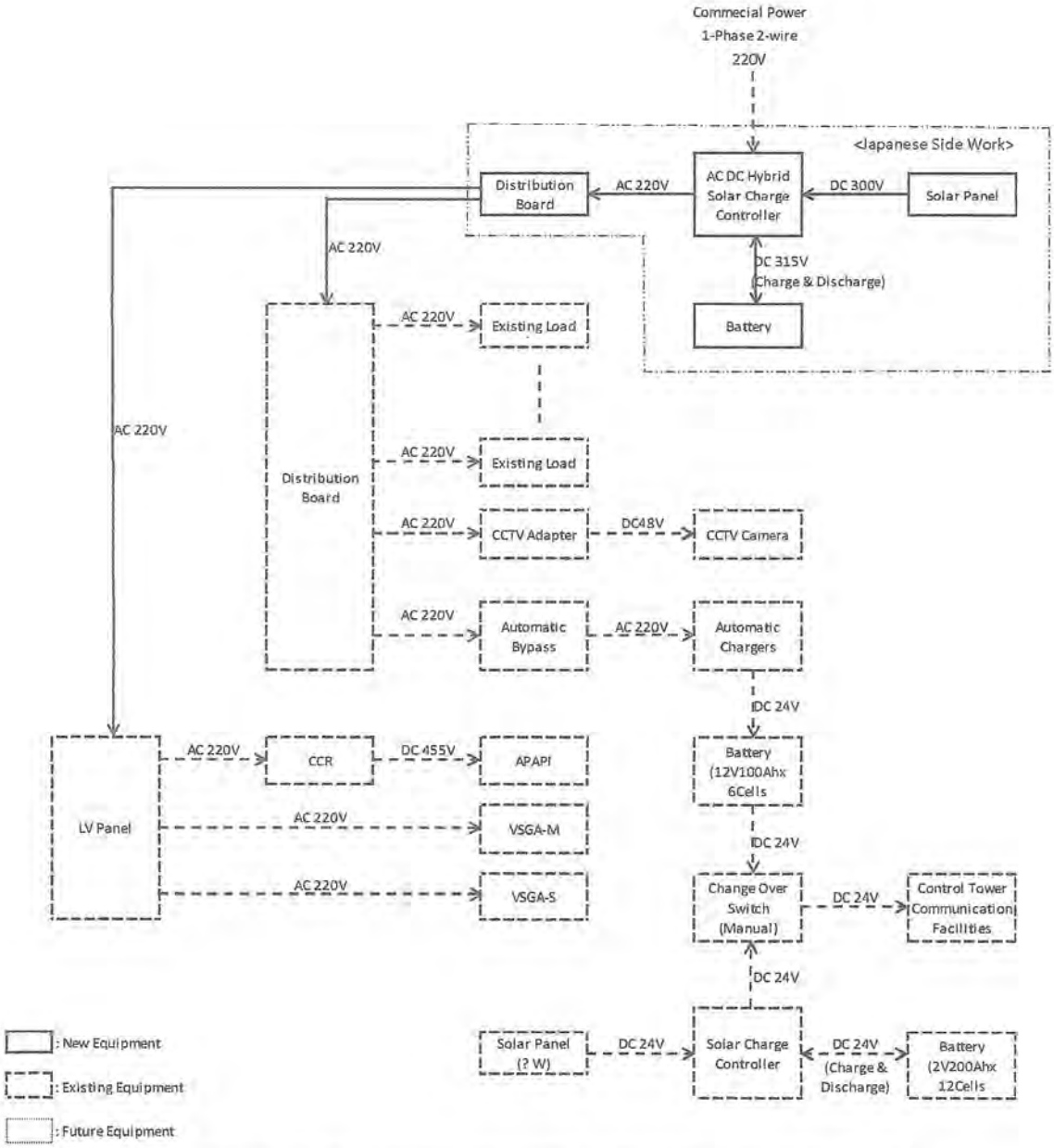
Renovating PV Generating Power Supply Diagram (Rara Airport)

Figure-3 System Block Diagram for Rara



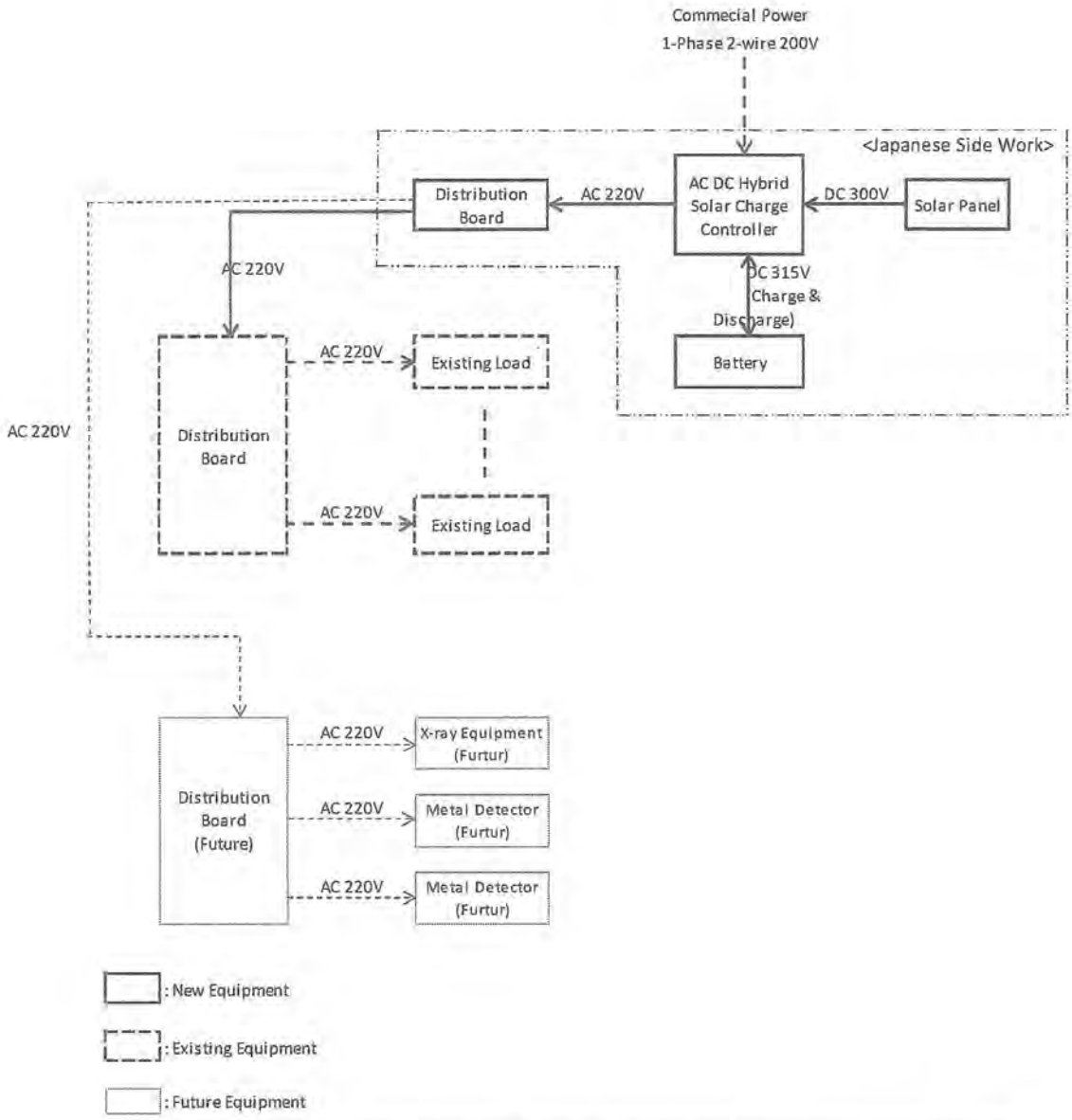
Renovating PV Generating Power Supply Diagram (Simikot Airport)

Figure-4 System Block Diagram for Simikot



Renovating PV Generating Power Supply Diagram (Lukla Airport Control Tower)

Figure-5 System Block Diagram for Lukla Control Tower



Renovating PV Generating Power Supply Diagram (Lukla Airport Terminal Building)

Figure-6 System Block Diagram for Lukla Terminal Building

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5.2 Memorandum dated 09 December 2015

TECHNICALMEMORANDUM ON THE PREPARATORY SURVEY FOR THE PROJECT FOR IMPROVEMENT OF AVIATION SAFETY FACILITIES IN MAJOR AIRPORTS

PROJECT COMPONENT: INSTRUMENT LANDIN SYSTEM (ILS)

The JICA Survey Team visited Nepal from 6 to 10 December 2015, and held technical discussions with officials concerned of CAAN on the Instrument Landing System (ILS), which is one of the requested items of the Project for Improvement of Aviation Safety Facilitiesin Major Airports.

As a result of technical discussions, both sides confirmed the main items described in the attached sheet.

Kathmandu, 9 December 2015

Toru Shimada Chief Consultant Preparatory Survey Tem Japan International Cooperation Agency	SanjivGautam Director General Civil Aviation Authority of Nepal Japan International Cooperation Agency

1. Exclusion of Glide Path at Tribhuvan International Airport from the Project

Both side confirmed that Glide Path (GP) at Tribhuvan International Airport be excluded from the Project component for the following reasons:

On the basis of further analysis by the Preparatory Survey Team in Japan, on-course Localizer (LOC) approach will provide significant benefits over current VOR approach. Benefits of adding GP to LOC are relatively small in terms of improvement in runway usability factor. These are shownin Table 1. Therefore, LOC approach is the most cost-effective solution to improve poor-weather usability of the runway at Tribhuvan International Airport.

Table-1 Comparison of Runway Usability Factor

IFPs		Aircraft Category for Instrument Approaches			
		CAT A	CAT B	CAT C	CAT D
			ATR72, ATR42, Do228	B737, A320	B777, A330
No-Precision Approach	VOR(Existing)	95.0%	95.0%	90.4%	85.3%
	LOCApproach	95.5%	95.5%	95.5%	95.5%
	Improvement over VOR Approach	+0.5%	+0.5%	+5.1%	+10.2%
Precision Approach	ILS(LOC+GP)	96.4%	95.9%	not authorized	not authorized
	Improvement over VOR approach	+1.4%	+0.9%		

Note: Draft IFP charts for LOC approach and ILS (LOC+GP) approach are indicated in Figures 2 and 3 respectively.
Source: JICA Survey Team

Another reason for exclusion of GP is technical hurdlesinvolved inintroducingnew instrument flight procedures (IFPs). Since IFPsat Tribhuvan International Airport include the decent gradients that exceed the maximum specified in ICAO PANS-OPS, these approach procedures shallbe subject to an aeronautical study and require special approval by the national competent authority, i.e. CAAN.

In the case of ILS (LOC+GP) precision approach, CAAN's technical ability to establish and implement the new IFPis limitedas the new IFP is very different from the existing non-precision VOR approach. With regard to the LOC approach, it is a non-precision approach procedure and its profile is very similar to the existing VOR approach. Therefore, CAAN has ability to establish and implement the new IFP.

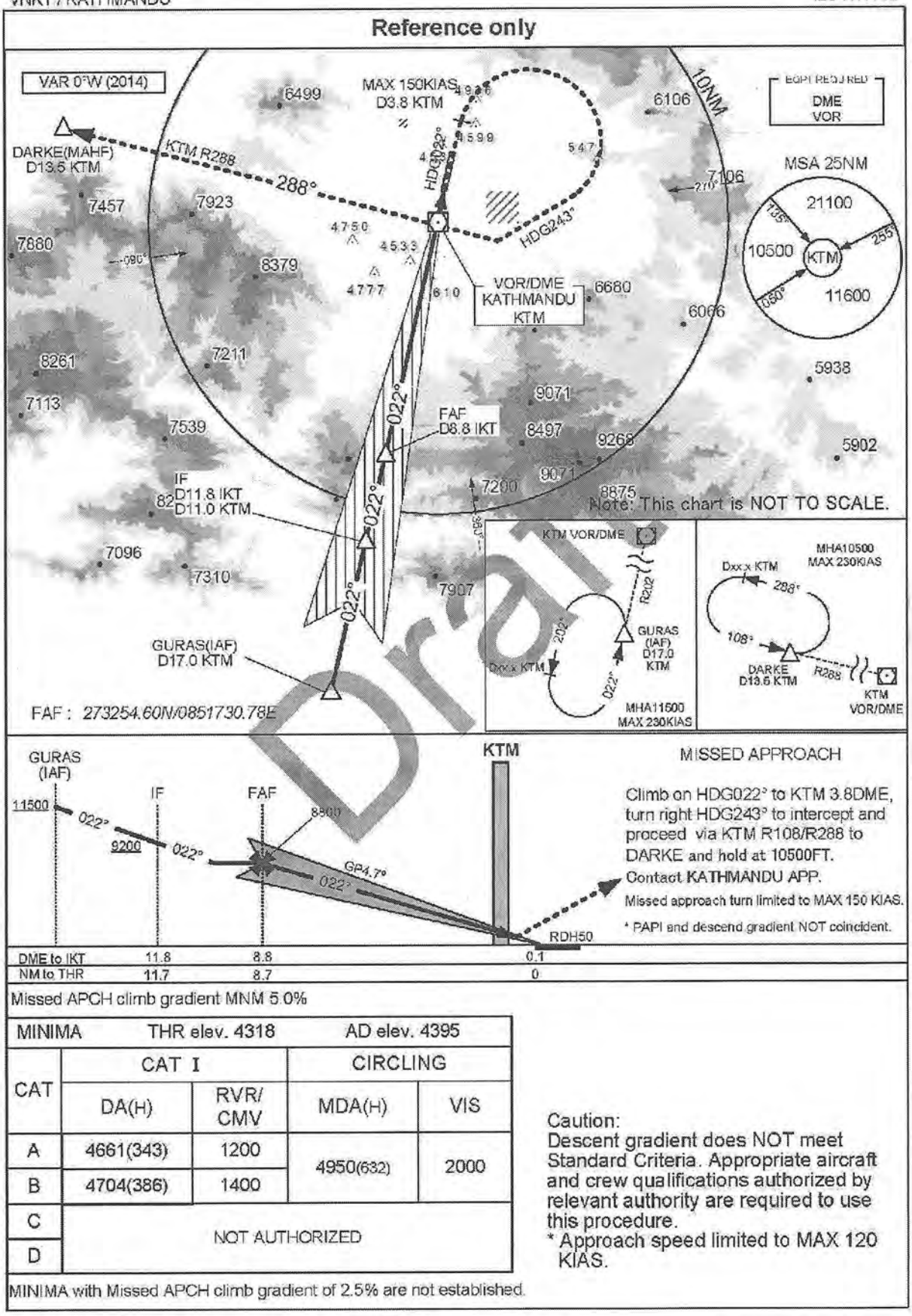
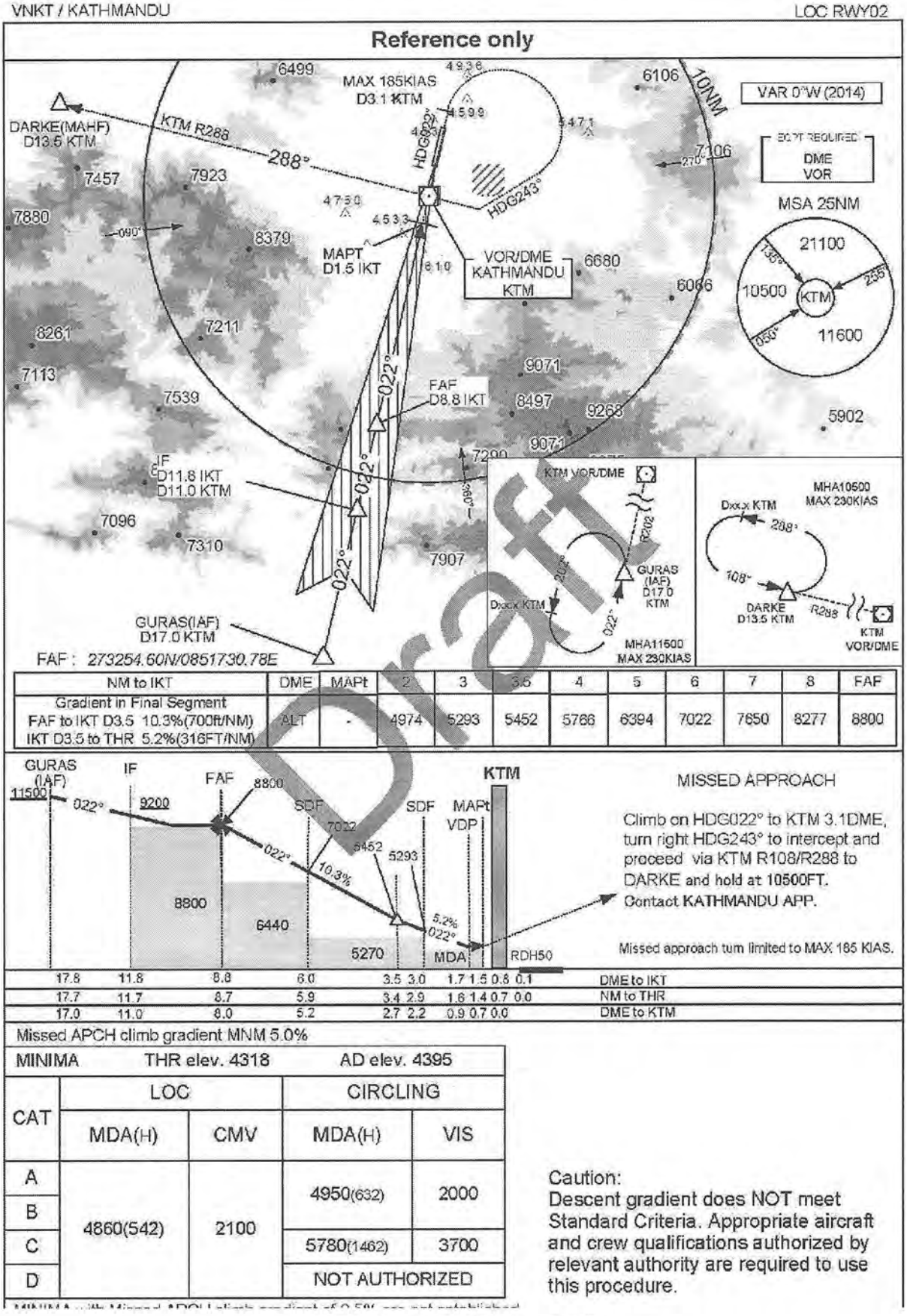


Figure-1 ILS RWY02 (Draft)



NM to IKT	DME	MAPt	2	3	3.5	4	5	6	7	8	FAF
Gradient in Final Segment											
FAF to IKT D3.5 10.3%(700ft/NM)	ALT	-	4974	5293	5452	5766	6394	7022	7650	8277	8800
IKT D3.5 to THR 5.2%(316FT/NM)											

17.8	11.8	8.8	6.0	3.5	3.0	1.7	1.5	0.8	0.1	DME to IKT
17.7	11.7	8.7	5.9	3.4	2.9	1.6	1.4	0.7	0.0	NM to THR
17.0	11.0	8.0	5.2	2.7	2.2	0.9	0.7	0.0		DME to KTM

Missed APCH climb gradient MNM 5.0%

MINIMA	THR elev. 4318		AD elev. 4395	
CAT	LOC		CIRCLING	
	MDA(H)	CMV	MDA(H)	VIS
A	4860(542)	2100	4950(632)	2000
B				
C			5780(1462)	3700
D			NOT AUTHORIZED	

Caution:
Descent gradient does NOT meet Standard Criteria. Appropriate aircraft and crew qualifications authorized by relevant authority are required to use this procedure.

Figure-2 LOC RWY02 (Draft)

Note: Distances for DME to IKT in the chart will be revisedin the Draft Final Report.
Some other alternatives of LOC approaches will be presented in the Draft Final Report.

2. System Diagram and Work Demarcation

Both sides agreed on the system diagram for LOC and co-located DME as shown in Figure-3, and work demarcation as shown in Table-2.

Table-2 Work Demarcations

Work Item	Grant Aid Project	CAAN
Provision of Cable Ducts under Runway/Taxiway or Permission for Use of Existing Fiber Optic Cable		✓
Equipment Shelter with Air Conditioner	✓	
Cabling for Power Supply and Control/Monitoring Signal	✓	
Connection to the Existing Power Distribution Board	✓	
Procurement of Equipment (Note 1)	✓	
Transportation of Equipment	✓	
Installation of Equipment	✓	
Connection of Power Cable to P1 Substation	✓	
Provision of Additional Breakers in Power Distribution Board		✓
Electric Power Supply		✓
Provision of Aircraft and Inspector for Flight Calibration/Inspection (Note 2)		✓
Ground Staff for Flight Calibration/Inspection	✓	✓

Note 1: CAAN confirmed that Japanese air navigational equipment is acceptable even without a type approval that is required in Section 75, (1) of "Civil Aviation Regulation, 2058" because there is no system of type approval in Japan.

Note 2: CAAN confirmed that "the organization having flight inspection approval from the concerned country" in Section 75, (6) of "Civil Aviation Regulation, 2058" means "the organization having flight inspection approval from its home country".

3. Change of Components of ILS Maintenance Training Equipment

Due to the exclusion of GP, "ILS Maintenance Training Equipment" is to be renamed as "LOC Maintenance Training Equipment". Major components of LOC Maintenance Training Equipment are shown in Table-3.

Table-3 Major Components of LOC Maintenance Training Equipment

Equipment	Quantity	Remarks
Localizer Transmitter	1 no.	Single Configuration
Localizer Monitor	1 no.	Single Configuration
Localizer Controller	1 no.	Single Configuration
Localizer Signal Generator	1 no.	
Localizer Dummy Antenna	1 no.	

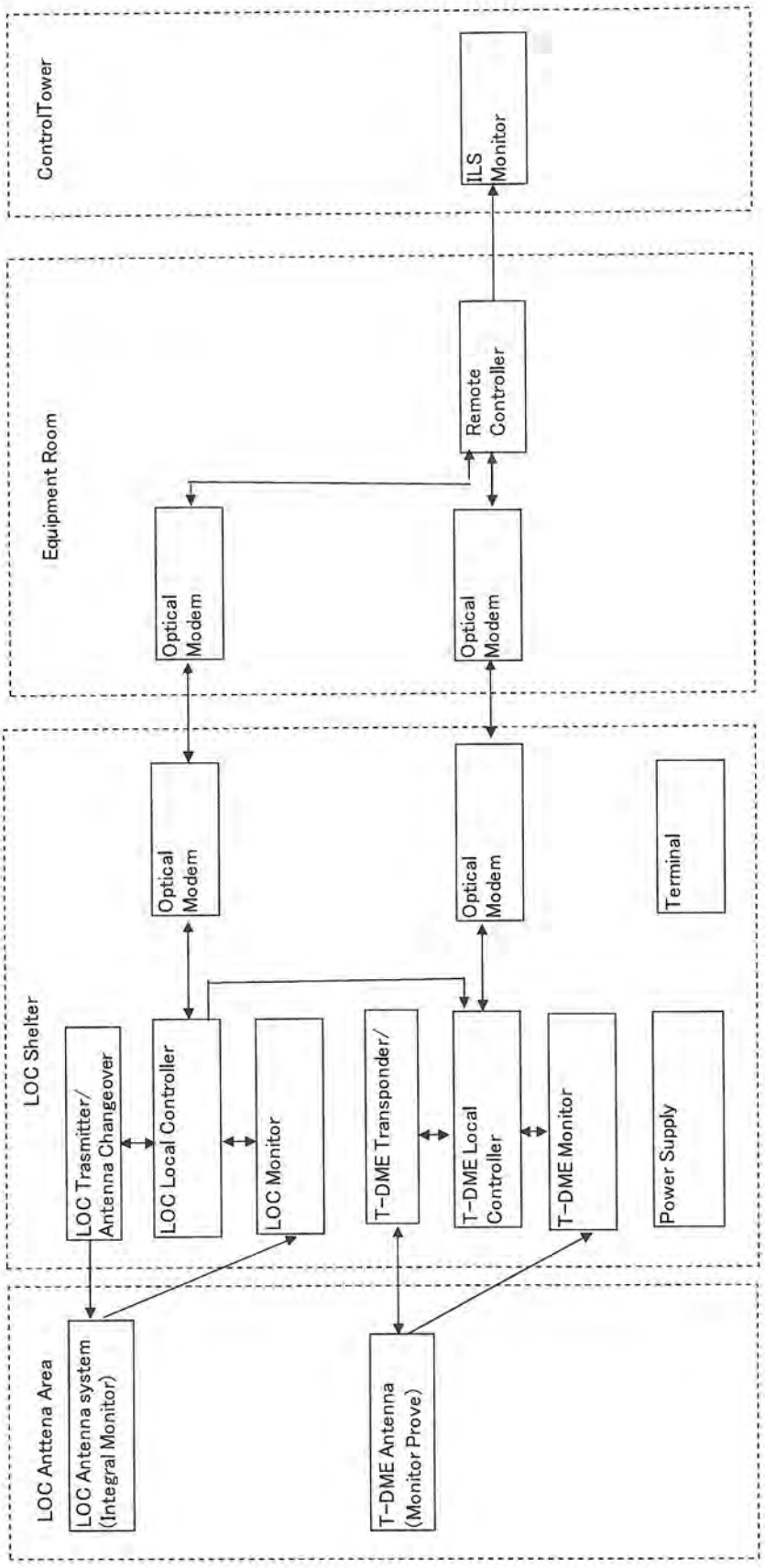


Figure-3 LOC/T-DME System Block Diagram

Appendix 6 Environmental Checklist: 9. Airport

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)N (b)N (c)N (d) N	(a), (b) and (c) This Project for installation of VOR/DME equipment (the Project) is classified as an activity NOT to be required IEE by the Government of Nepal (GON). Accordingly, the IEE is conducted and reported based on JICA Guidelines for environmental and social considerations. (d) There are no other environmental permits required.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected in the project design?	(a) Y (b) Y	(a) Project awareness was disseminated and understanding was obtained from stakeholders. (b) The comment from the stakeholders is incorporated into the report and reflected on the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a)Y	(a) Several alternatives were studied for the installation of the equipment. The optimal candidate was proposed for the project site based on the study.
2. Pollution Control	(1) Air Quality	(a)Do Air pollutants, such as Sulfur Oxides (SOx), Nitrogen Oxides (NOx) and dust, etc., contained in emissions from vehicle, including airplanes, airport and related facilities comply with the country's effluent standards? Is there a possibility that the emissions from the project will cause areas not to comply with the country's ambient air quality standards?	(a) Y	(a) Negative impacts are foreseen on air pollution and dust due to work of the construction equipment on the construction phase. However, the impacts will be limited locally and temporarily since large-scale construction works are not included. EMP such as promoting utilization of sprinkling water to control dust will adequately mitigate all of the impacts.
	(2) Water Quality	(a) Do pollutants, such as Suspended Solids (SS), and oils contained in effluents comply with the country's effluent standards (BOD, COD etc.)? Is there a possibility that the effluents from the project will cause areas not to comply with the country's ambient water quality standards?	(a) N	(a) There is no river, stream or pond near the Dhangadhi construction site. A pond near the Chandragadhi construction site is surrounded by a dike of approx. 1m high, and it is not foreseen that surface water from the construction site flows into the pond.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				Therefore no impacts on water quality are foreseen.
	(3) Wastes	(a) Are wastes generated from the airports and other project facilities properly treated and disposed of in accordance with the country's regulations?	(a)Y	(a) Negative impacts are foreseen on waste due to building waste materials by concrete works, civil works on the construction phase. EMP such as waste to the designated final disposal site will avoid or adequately mitigate all of the impacts.
	(4) Soil Contamination	(a) Has the soil in the project site been contaminated in the past? Are adequate measures taken to prevent soil contamination by leakage of fuels?	(a)N	(a) Negative impacts are foreseen on soil contamination by fuel outflow from construction equipment on the construction phase. EMP will avoid or adequately mitigate all of the impacts.
	(5) Noise and Vibration	(a) Does noise from aircraft comply with the country's standards? (b) Is there a possibility that noise and vibrations from various sources, such as airport user's vehicles and vehicles for airport operations will adversely affect ambient noise levels? If impacts are anticipated, are adequate noise mitigation measures considered?	(a)- (b) Y	(a) (This item shall be excluded on the evaluation since the installation of the equipment does not affect directly to aircraft noise.) (b) Negative impacts are foreseen on noise pollution due to work of construction equipment on the construction phase. EMP will avoid or adequately mitigate all of the impacts.
	(6) Ground Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a)N	(a)Activities which may cause this issue are not foreseen.
	(7) Odor	(a) Are there any odor sources? Are adequate odor control measures	(a)N	(a) Negative impact is not foreseen on odor due to water pollution.
3. Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a)N	(a) The project site and the surrounding area are not designated as national park and protected area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts	(a)N (b)N (c)N (d)N	Negative impacts are not foreseen. There is no rare species and ecologically valuable habitats in the project site and the surrounding area.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		on the ecosystem? (d) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce?		
	(3) Hydrology	(a) Is there any possibility that alteration of drainage system due to the constructions of airports and related facilities will adversely affect surface water and groundwater flows? (b) Do the facilities affect adversely flow regimes, waves, tides, currents of rivers and etc. if the project facilities are constructed on/by the seas?	(a) N (b) N	Activities which may cause this issue are not included.
	(4) Topography and Geology	(a) Does the project require the large scale change of Topographic/geographic features? (b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff? (d) In the case of offshore projects, is there any possibility that the project will erode natural beaches?	(a) N (b) Y (c) Y (d) N	Activities which may cause this issue are not included. However, construction surplus soil shall be disposed to the designated final disposal site.
4. Social Environment	(1) Involuntary Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the	(a) N (b) - (c) - (d) Y (e) Y (f) - (g) - (h) - (i) - (j) Y	(a) (d) (e) and (j) No resettlement is required. However, land acquisition shall be required. Therefore, Abbreviated Resettlement Action Plan (RAP) such as the compensation policy shall be prepared.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		resettlement? (e) Are the compensation policies prepared in document? (f)Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?		
	(2) Living and Livelihood	(a) Is there any possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there any possibility that the project causes the change of land uses in the neighboring areas to affect adversely livelihood of local people? (c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (d) Is sufficient infrastructure (e.g., roads) available for the project implementation? If the existing infrastructure is insufficient, is a plan developed to construct new infrastructure or improve the existing infrastructure? (e) Is there any possibility that the airports and other project structures will cause a sun shading and radio interference?	(a)Y (b)N (c) Y (d) N (e) N	(a) Negative impacts are foreseen due to land acquisition. Therefore Abbreviated RAP such as the compensation policy shall be prepared to carry out land acquisition properly. (b), (d) 'Increase of traffic volume is foreseen during the construction works. However, traffic congestion is not foreseen in consideration of the current traffic condition. Negative impacts specified for Land use and utilization of local resources, Water usage, are not expected. (c) Infectious diseases are possible to be spread due to inflow of construction workers into the local community on the construction phase. EMP will avoid or adequately mitigate all of the impacts. (e) Activities which cause this issue are not included.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect	(a)N	(a) There is no cultural heritage in the project site and the surrounding area.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		these sites in accordance with the country's laws?		
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local land scape? Are necessary measures taken?	(a)N	Activities which may cause this issue are not included.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) - (b) -	(This item shall be excluded on the evaluation since there is no ethnic minorities and indigenous peoples.)
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a)Y (b)Y (c)Y (d)Y	Construction work environment needs to be considered on the construction phase. EMP such as industrial health management in compliance with the laws and the regulations will avoid or adequately mitigate all of the impacts.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	Mitigation measures on the negative impacts from construction activities are prepared as the Environmental Management and Monitoring Plan. The construction contractor will be responsible for carrying out the mitigation measures based on the EMP. The staff in the PMU established in the CAAN will monitor and supervise the contractor's mitigation activities.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to	(a) Y (b) Y	The construction contractor will be responsible for carrying out the mitigation measures based on the

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(c) Y (d) Y	EMP. The staff in the PMU established in the CAAN will monitor and supervise the contractor's mitigation activities. Budget on environmental monitoring will be secured under the administration cost. Monitoring form addressing items to be monitored, monitoring site and monitoring frequency is prepared.
6. Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways, and Bridges checklist should also be checked (e.g., projects including large areas of deforestation). (b) If the airport is constructed on the sea, pertinent items described in the Ports and Harbors checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities). (c) Where necessary, pertinent items described in the Forestry Projects	(a) N (b) N (c) N	Reference to checklist of other sectors is not relevant to the Project
	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Cross boundary impacts and causing factors of climate change issues are not foreseen since the construction works are limited in the project site on the construction phase.

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Appendix 7: Outline of Design of LOC RWY02 Approach Procedures

(1) Alt-A: Start descending after flying-over the top of Mt. Bhattedada, and intercept a 3-deg. standard descent gradient path at 3NM before MAPt

Proc. Name	Kathmandu Tribhuvan Airport　LOC RWY02 (Alternative A)
Design Criteria	PANS-OPS Volume II Sixth Edition (2014)
Magnetic Variation	ARP (27:41:49.778 N/085:21:28.535 E): 00°25'57.5040" W（0.4326°E）（WMM2015, October 1st, 2016）
Design Requirements and Conditions	- This procedure is "non-standard" procedure due to the steep descent angle, which largely exceeds ICAO standard, caused by the severe terrain at the south of the airport such as Mt. Bhattedada. - Final approach track (FAT) is set as "on-set" (as agreed with CAAN). - Descending profile is set as (1) to start descending after flying-over the top of Mt. Bhattedada and (2) to intercept a 3-degree standard descent gradient path at 3NM before missed approach point (MAPt). - Minimum obstacle clearance (MOC) has been increased by 100% (or doubled) for initial, intermediate and some sections of final approach segment up to 6NM point from the landing threshold (THR02) due to the severe terrain at the south of the airport (as agreed with CAAN). - Penalty on minimum descent altitude (MDA) due to the steep angle descent is not considered for this procedure as same as the existing VOR approach (as agreed with CAAN). - Circling, MSA and holding procedures are not covered in this study so that CAAN should be responsible to update them for publication.

1. Final Approach Segment

Design Outline and Reasons	- The location of FAF is set at the point of IKT 10.4 DME which is after flying-over the top of Mt. Bhattedada. That is, descending for final approach starts after flying over the top of the mountain securing 300m MOC for intermediate approach segment. The procedure altitude for FAF is set based on the top altitude of the mountain. - Two stepdown fixes are introduced at the points of IKT 7.3 DME and IKT 4.7 DME as per the ICAO standard, maximum two in the final approach segment. - The location of MAPt, which should be after visual descent point (VDP), is set at the point of IKT 3.0 DME in order to secure sufficient clearance against the terrain at the north of the airport and the restricted area of Thimi Gattagher at the east of the airport, which upper limit is set as 6037ft based on its ground altitude of 1340m with height clearance of 500m (as agreed with CAAN).
FAT	022° (022.0176°T)　* value from FAF to THR02
FAF	IKT D10.4　(27:32:54.6577 N / 85:17:30.8276 E) 8.7368NM from THR02, KTM D8.0719
Procedure Alt.	8800 FT　* Based on OCA of Intermediate Approach Segment
SDF2	IKT D7.3　(27:35:47.5675 N / 85:18:49.3172 E) 5.6369NM from THR02, KTM D4.9720
Procedure Alt.	6647 FT　* Based on the descending Profile of Design Requirements
SDF1	IKT D4.7　(27:38:12.5849 N / 85:19:55.1991 E) 3.0369NM from THR02, KTM D2.3720
Procedure Alt.	5330 FT　* Based on the descending Profile of Design Requirements
MAPt	IKT D3.0　(27:39:47.3999 N / 85:20:38.3006 E) 1.3370NM from THR02, KTM D0.6719
Seg. Length	7.400NM　* Distance between FAF to MAPt

OCA/H	4860ft / 546ft * The elevation of 4314ft for THR02, which was measured after the earthquake, is applied for the OCA calculation. * Obstacle assessment for this segment was conducted using the protection areas for Cat-D aircraft, which is the most critical. * The obstacles in the initial phase of the missed approach segment are lower than the control obstacle of the final segment so that they are confirmed not to be critical for OCA calculation. * The obstacles in the intermediate and final phases of the missed approach segment are confirmed to be cleared having sufficient MOC with 5.0% climb gradient for missed approach. * The rules of "lower limit on OCA" is not applied since FAT is on-set.		
Final Seg. OCA (FAF to MAPt)	MOCA2 (FAF to SDF2)	6440ft * 1810.2m+150m=1960.2m (6431.1ft)	
	Control Obst. of MOCA2	Name	No.151 Ananda Hospital3
		Altitude	1810.2m * 1780.2m(GPS)+30m(vegetation)
		Location	27:34:54.3521 N 85:19:18.2415 E
		MOC	150m * added MOC100% (75m)
			Primary Secondary
	MOCA1 (SDF2 to SDF1)	5270ft * 1530m+75m=1605m (5265.8ft)	
	Control Obst. of MOCA1	Name	1480m contour (Chapagau District)
		Altitude	1530m * 1500m(next contour)+30m(veg.)
		Location	27:36:22.8051 N 85:19:52.1255 E
		MOC	75m
			Primary Secondary
	OCA (SDF1 to MAPt)	4860ft * 1406m+75m=1481m (4858.9ft) - The top altitude of the same obstacle under the obstacle survey before the earthquake was almost equal with 1404.5m, but it become 1392.1m under the obstacle survey after the earthquake, which may be due to the damage on the top of the structure. However, the original value was applied for OCA calculation due to the possibility of repairing works.	
	Control Obst. of OCA	Name	KT924 Harisiddhi Chimney
		Altitude	1406m
		Location	27:38:38.7550 N 85:20:32.0460 E
		MOC	75m
			Primary Secondary
VDP	IKT D3.3152 * 0.3148NM before MAPt 1.6518NM from THR, KTM D0.9868		
Descent Gradient	Value for Publication	11.5% / 5.2% - Based on the descending Profile of Design Requirements (to intercept 3-degree descent path at 3NM before MAPt (IKE 6.0 DME))	
	FAF to IKT D6.0	11.5%	
		Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = (8800FT - 5744FT) / 4.4NM = 0.1143 (11.5%)

		Seg. Length	4.4NM (Distance from FAF to IKT D6.0)
		Start Alt.	8800 FT (OCA of Intermediate Seg.)
		Ending Alt.	5744 FT (Alt. at IKT D6.0 on 3deg. path)
	IKT D6.0 to MAPt	5.2%	
		Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = (5744FT - 4364FT) / 4.3368NM = 0.05237 (5.2%)
		Seg. Length	4.3368NM (Dist. from IKT D6.0 to THR)
		Start Alt.	5744 FT (Alt. at IKT D6.0 on 3deg. path)
		Ending Alt.	4364 FT (THR elev. 4314FT + 50FT)
ALS	Full Intermediate Basic No (used for Minima calculation) * Based on the development under the ADB project		

2. Missed Approach Segment

Description	Climb on HDG022°to KTM 3.1 DME, turn right HDG243° to intercept and proceed via KTM R108/R288 to DARKE and hold at 10500FT.
Design Outline and Reasons	- The route structure of missed approach is based on the existing VOR procedure due to the simplification of procedures for the airport: to climb along FAT (022°) up to the designated turning point (KTM 3.1 DME), to turn right and to intercept and proceed via KTM R108/R288 to DARKE. - Turning at the designated turning point (TP) is applied in order to clear the upper limit of the restricted area of Thimi Gatthagher, which is military shooting range. The location of MAPt and TP are set to secure sufficient clearance not only the severe terrain at the north of the airport but also the restricted area. The climb gradient of missed approach is increased to 5.0 % for this purpose. - In order to secure the sufficient clearance to the terrain at the west of the airport, stabilization of the route in operation and sufficient altitude at the ending point of DARKE, intercepting heading is designated to KTM R108/R288.
Climb Gradient	5.0% - The climb gradient of missed approach is set as 5.0 % in order to secure sufficient clearance to both the terrain at the north of the airport and the restricted are of Thimi Gatthagher. - Speed restriction of maximum 185kt is applied in order to avoid aircraft flying beyond the expected outer limit of the protection area.
TP	KTM D3.1000 (27:43:17.7640 N / 85:22:14.0041 E)

3. Intermediate Approach Segment

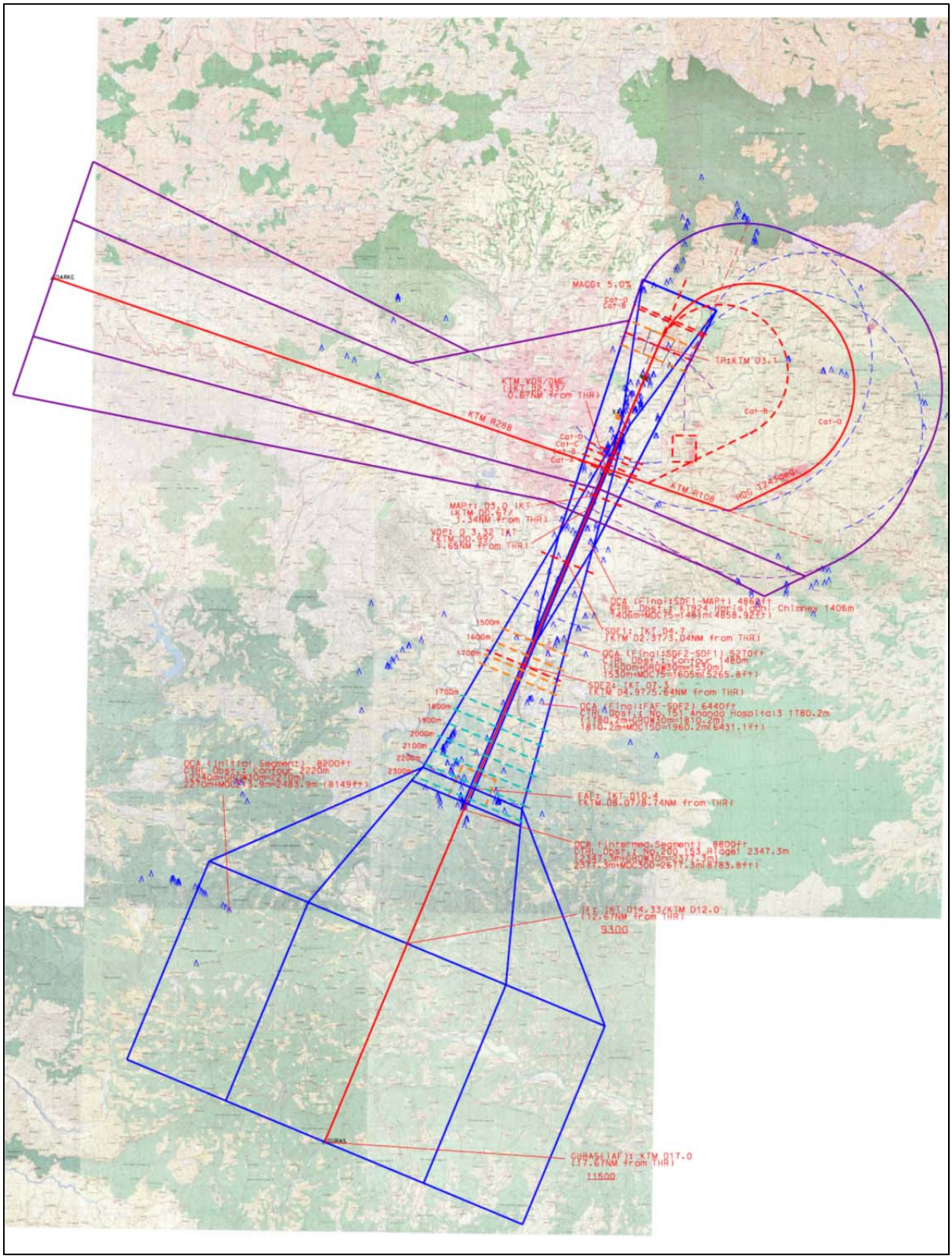
Design Outline	- The location of IF is common among Alternatives A to C with consideration of minimum segment length of intermediate segment (3.0NM), which assumes 90 degree LOC interception of FAT at IF.
IF	IKT D14.3281 (27:29:15.5358 N / 85:15:51.4605 E) 12.6650NM from THR02, KTM R202/D12.0
Track	022° (022.0074°T) * value from IF to FAF (same as FAT)
Seg. Length	3.9281NM * Distance between IF to FAF
OCA	8800ft * 2377.3m+300m=2677.3m (8783.8ft) - While OCA for this segment is 8800ft based on the control obstacle below, altitude limitation of 9300ft above is applied at IF considering descending profile before FAF and influence of terrain to LOC beam.

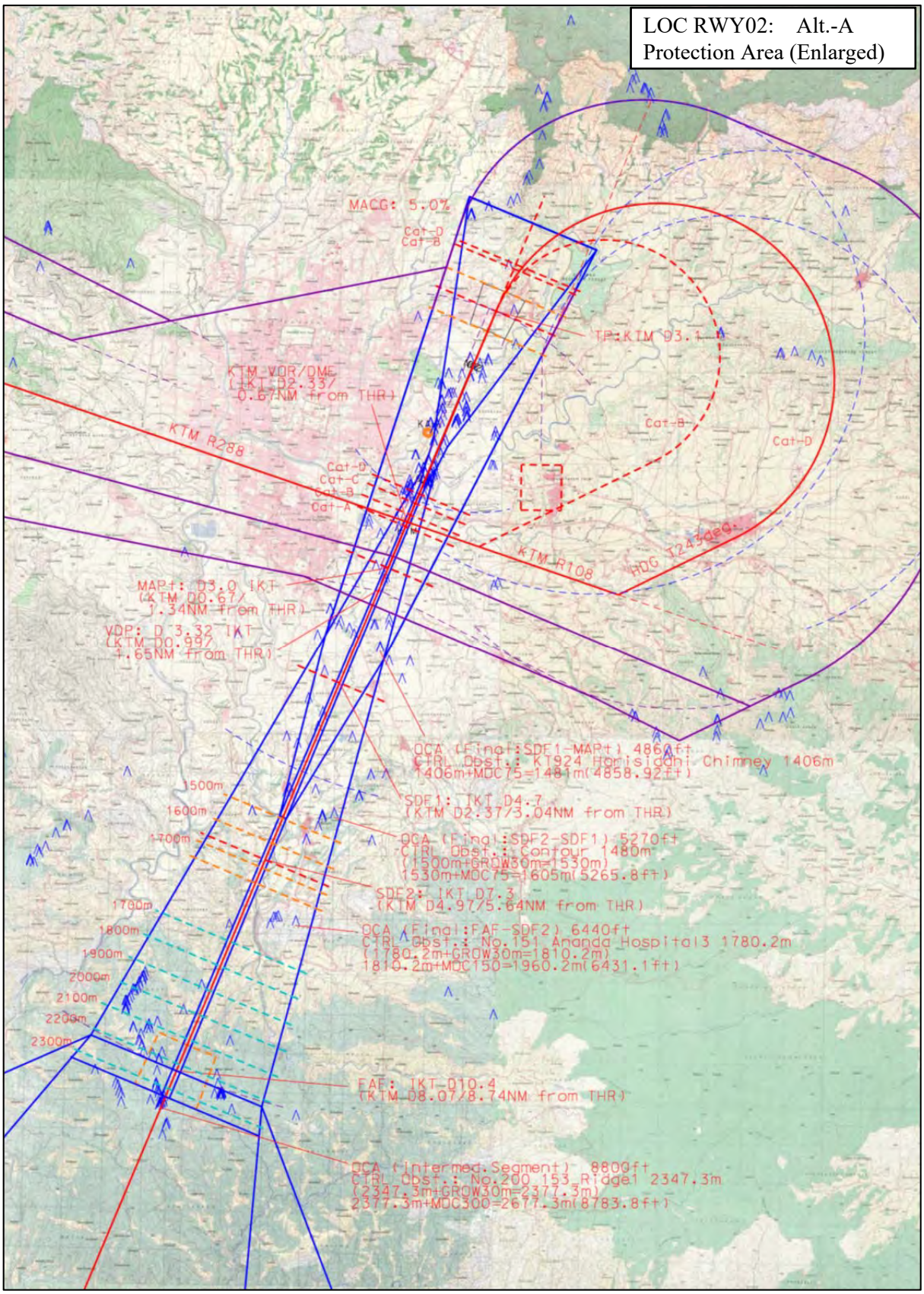
	Control Obst. of OCA	Name	No.200 153_Ridge1 * The Highest Point from Obstacle Survey
		Altitude	2377.3m * 2347.3m(GPS)+30m(vegetation)
		Location	27:32:24.5498 N 85:17:16.8522 E
		MOC	300m * added MOC100% (150m)
			Primary Secondary
Descent Gradient	3.4% * below the maximum descent gradient value (5.2%)		
	Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = 3.3891%	
	Seg. Length	2.4281NM * 3.9281NM-1.5000NM(flat section)	
	Start Alt.	9300 FT (Altitude restriction at IF)	
	Ending Alt.	8800 FT (Altitude restriction at FAF/OCA above)	

4. Initial Approach Segment

Design Outline	- GURAS, the starting fix of the existing VOR approach with a holding procedure, is set as IAF, and IF is directly connected from IAF with a simple straight coniguration.		
IAF	GURAS: KTM R202/D17.0044 (27:24:36.00 N / 85:13:46.00 E) 17.6694NM from THR02, IKT D19.3324		
Track	022° (021.8134°T) * value from IAF to IF (same as FAT)		
Seg. Length	5.0044NM * Distance between IAF to IF		
OCA	8200ft * 2270m+213.9m=2483.9m (8149.3ft) - While OCA for this segment is 8200ft based on the control obstacle below, altitude limitation of 11500ft above is applied at IAF due to MHA at IAF (GURAS).		
	Control Obst. of OCA	Name	2220m contour (east ridge of Dumse Dada)
		Altitude	2270m * 2240m(next contour)+30m(veg.)
		Location	27:29:55.6608 N 85:11:10.6295 E
		MOC	213.9m * 35.65% of MOC (600m) with additional MOC of 100%
			Primary Secondary
Descent Gradient	7.3% * below the maximum descent gradient value (8.0%) * 5.978% from IAF to FAF with flat section (1.5NM)		
	Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = 7.2351%	
	Seg. Length	5.0044NM	
	Start Alt.	11500 FT (Altitude restriction at IAF)	
	Ending Alt.	9300 FT (Altitude restriction at IF)	

LOC RWY02: Alt.-A
Protection Area (Whole Area)




LOC RWY02: Alt.-A
Protection Area (Enlarged)
MACG: 5.0%
Cat-D
Cat-B
TP:KTM D3.1
KTM VOR/DME
(IKT-D2.33/
0.67NM from THR)
KTM R288
Cat-D
Cat-C
Cat-B
Cat-A
Cat-B
Cat-D
KTM R108
HDG 124.50
MAPt: D3.0 IKT
(KTM D0.67/
1.34NM from THR)
VDP: D 3.32 IKT
(KTM D0.997
1.65NM from THR)
OCA (Final:SDF1-MAPt) 4860ft
CTRL Obst.: KT924 Homisidahi Chimney 1406m
1406m+MOC75=1481m(4858.92ft)
SDF1: IKT D4.7
(KTM D2.37/3.04NM from THR)
OCA (Final:SDF2-SDF1) 5270ft
CTRL Obst.: Contour 1480m
(1500m+GROW30m=1530m)
1530m+MOC75=1605m(5265.8ft)
SDF2: IKT D7.3
(KTM D4.97/5.64NM from THR)
OCA (Final:FAF-SDF2) 6440ft
CTRL Obst.: No.151 Ananda Hospital3 1780.2m
(1780.2m+GROW30m=1810.2m)
1810.2m+MOC150=1960.2m(6431.1ft)
FAF: IKT-D10.4
(KTM D8.07/8.74NM from THR)
OCA (Intermed.Segment) 8800ft
CTRL Obst.: No.200 153_Ridge1 2347.3m
(2347.3m+GROW30m=2377.3m)
2377.3m+MOC300=2677.3m(8783.8ft)
1500m
1600m
1700m
1700m
1800m
1900m
2000m
2100m
2200m
2300m

(2) Alt-B: Start descending after flying-over the top of Mt. Bhattedada, and intercept a 3-deg. standard descent gradient path at 3NM before RWY02 Threshold

Proc. Name	Kathmandu Tribhuvan Airport　LOC RWY02 (Alternative A)
Design Criteria	PANS-OPS Volume II Sixth Edition (2014)
Magnetic Variation	ARP (27:41:49.778 N/085:21:28.535 E): 00°25'57.5040" W（0.4326°E）（WMM2015, October 1st, 2016）
Design Requirements and Conditions	- This procedure is "non-standard" procedure due to the steep descent angle, which largely exceeds ICAO standard, caused by the severe terrain at the south of the airport such as Mt. Bhattedada. - Final approach track (FAT) is set as "on-set" (as agreed with CAAN). - Descending profile is set as (1) to start descending after flying-over the top of Mt. Bhattedada and (2) to intercept a 3-degree standard descent gradient path at 3NM before the landing threshold (THR02). - Minimum obstacle clearance (MOC) has been increased by 100% (or doubled) for initial, intermediate and some sections of final approach segment up to 6NM point from THR02 due to the severe terrain at the south of the airport (as agreed with CAAN). - Penalty on minimum descent altitude (MDA) due to the steep angle descent is not considered for this procedure as same as the existing VOR approach (as agreed with CAAN). - Circling, MSA and holding procedures are not covered in this study so that CAAN should be responsible to update them for publication.

1. Final Approach Segment

Design Outline and Reasons	- The location of FAF is set at the point of IKT 10.4 DME which is after flying-over the top of Mt. Bhattedada. That is, descending for final approach starts after flying over the top of the mountain securing 300m MOC for intermediate approach segment. The procedure altitude for FAF is set based on the top altitude of the mountain. - Two stepdown fixes are introduced at the points of IKT 7.3 DME and IKT 4.7 DME as per the ICAO standard, maximum two in the final approach segment. - The location of the second SDF at IKT D4.7 DME is 3.0369NM from THR02 so that this point is considered as the point to intercept 3-degree standard descent gradient path although it is slightly before 3NM before THR02. - The location of missed approach point (MAPt), which should be after visual descent point (VDP), is set at the point of IKT 3.0 DME in order to secure sufficient clearance against the terrain at the north of the airport and the restricted area of Thimi Gattagher at the east of the airport, which upper limit is set as 6037ft based on its ground altitude of 1340m with height clearance of 500m (as agreed with CAAN).
FAT	022° (022.0176°T)　* value from FAF to THR02
FAF	IKT D10.4　(27:32:54.6577 N / 85:17:30.8276 E) 8.7368NM from THR02, KTM D8.0719
Procedure Alt.	8800 FT　* Based on OCA of Intermediate Approach Segment
SDF2	IKT D7.3　(27:35:47.5675 N / 85:18:49.3172 E) 5.6369NM from THR02, KTM D4.9720
Procedure Alt.	6913 FT　* Based on the descending Profile of Design Requirements
SDF1	IKT D4.7　(27:38:12.5849 N / 85:19:55.1991 E) 3.0369NM from THR02, KTM D2.3720
Procedure Alt.	5330 FT　* Based on the descending Profile of Design Requirements
MAPt	IKT D3.0　(27:39:47.3999 N / 85:20:38.3006 E) 1.3370NM from THR02, KTM D0.6719

Seg. Length	7.400NM * Distance between FAF to MAPt		
OCA/H	4860ft / 546ft * The elevation of 4314ft for THR02, which was measured after the earthquake, is applied for the OCA calculation. * Obstacle assessment for this segment was conducted using the protection areas for Cat-D aircraft, which is the most critical. * The obstacles in the initial phase of the missed approach segment are lower than the control obstacle of the final segment so that they are confirmed not to be critical for OCA calculation. * The obstacles in the intermediate and final phases of the missed approach segment are confirmed to be cleared having sufficient MOC with 5.0% climb gradient for missed approach. * The rules of "lower limit on OCA" is not applied since FAT is on-set.		
Final Seg. OCA (FAF to MAPt)	MOCA2 (FAF to SDF2)	6440ft * 1810.2m+150m=1960.2m (6431.1ft)	
	Control Obst. of MOCA2	Name	No.151 Ananda Hospital3
		Altitude	1810.2m * 1780.2m(GPS)+30m(vegetation)
		Location	27:34:54.3521 N 85:19:18.2415 E
		MOC	150m * added MOC100% (75m)
			Primary Secondary
	MOCA1 (SDF2 to SDF1)	5270ft * 1530m+75m=1605m (5265.8ft)	
	Control Obst. of MOCA1	Name	1480m contour (Chapagau District)
		Altitude	1530m * 1500m(next contour)+30m(veg.)
		Location	27:36:22.8051 N 85:19:52.1255 E
		MOC	75m
			Primary Secondary
	OCA (SDF1 to MAPt)	4860ft * 1406m+75m=1481m (4858.9ft) - The top altitude of the same obstacle under the obstacle survey before the earthquake was almost equal with 1404.5m, but it become 1392.1m under the obstacle survey after the earthquake, which may be due to the damage on the top of the structure. However, the original value was applied for OCA calculation due to the possibility of repairing works.	
	Control Obst. of OCA	Name	KT924 Harisiddhi Chimney
		Altitude	1406m
		Location	27:38:38.7550 N 85:20:32.0460 E
		MOC	75m
			Primary Secondary
VDP	IKT D3.3152 * 0.3148NM before MAPt 1.6518NM from THR, KTM D0.9868		
Descent Gradient	Value for Publication	10.0%／5.2% - Based on the descending Profile of Design Requirements (to intercept 3-degree descent path at 3NM before THR02 (IKE 4.7 DME))	
	FAF to IKT D6.0	10.0%	
		Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = (8800FT - 5330FT) / 5.7NM = 0.10019 (10.0%)
		Seg. Length	5.7NM (Distance from FAF to IKT D4.7)

		Start Alt.	8800 FT (OCA of Intermediate Seg.)
		Ending Alt.	5330 FT (Alt. at IKT D4.7 on 3deg. path)
	IKT D6.0 to MAPt	5.2%	
		Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = (5330FT - 4364FT) / 3.0368NM = 0.05235 (5.2%)
		Seg. Length	3.0368NM (Dist. from IKT D4.7 to THR)
		Start Alt.	5330 FT (Alt. at IKT D6.0 on 3deg. path)
		Ending Alt.	4364 FT (THR elev. 4314FT + 50FT)
ALS	[Full] Intermediate Basic No (used for Minima calculation) * Based on the development under the ADB project		

2. Missed Approach Segment

Description	Climb on HDG022°to KTM 3.1DME, turn right HDG243° to intercept and proceed via KTM R108/R288 to DARKE and hold at 10500FT.
Design Outline and Reasons	- The route structure of missed approach is based on the existing VOR procedure due to the simplification of procedures for the airport: to climb along FAT (022°) up to the designated turning point (KTM 3.1 DME), to turn right and to intercept and proceed via KTM R108/R288 to DARKE. - Turning at the designated turning point (TP) is applied in order to clear the upper limit of the restricted area of Thimi Gatthagher, which is military shooting range. The location of MAPt and TP are set to secure sufficient clearance not only the severe terrain at the north of the airport but also the restricted area. The climb gradient of missed approach is increased to 5.0 % for this purpose. - In order to secure the sufficient clearance to the terrain at the west of the airport, stabilization of the route in operation and sufficient altitude at the ending point of DARKE, intercepting heading is designated to KTM R108/R288.
Climb Gradient	5.0% - The climb gradient of missed approach is set as 5.0 % in order to secure sufficient clearance to both the terrain at the north of the airport and the restricted are of Thimi Gatthagher. - Speed restriction of maximum 185kt is applied in order to avoid aircraft flying beyond the expected outer limit of the protection area.
TP	KTM D3.1000（27:43:17.7640 N / 85:22:14.0041 E）

3. Intermediate Approach Segment

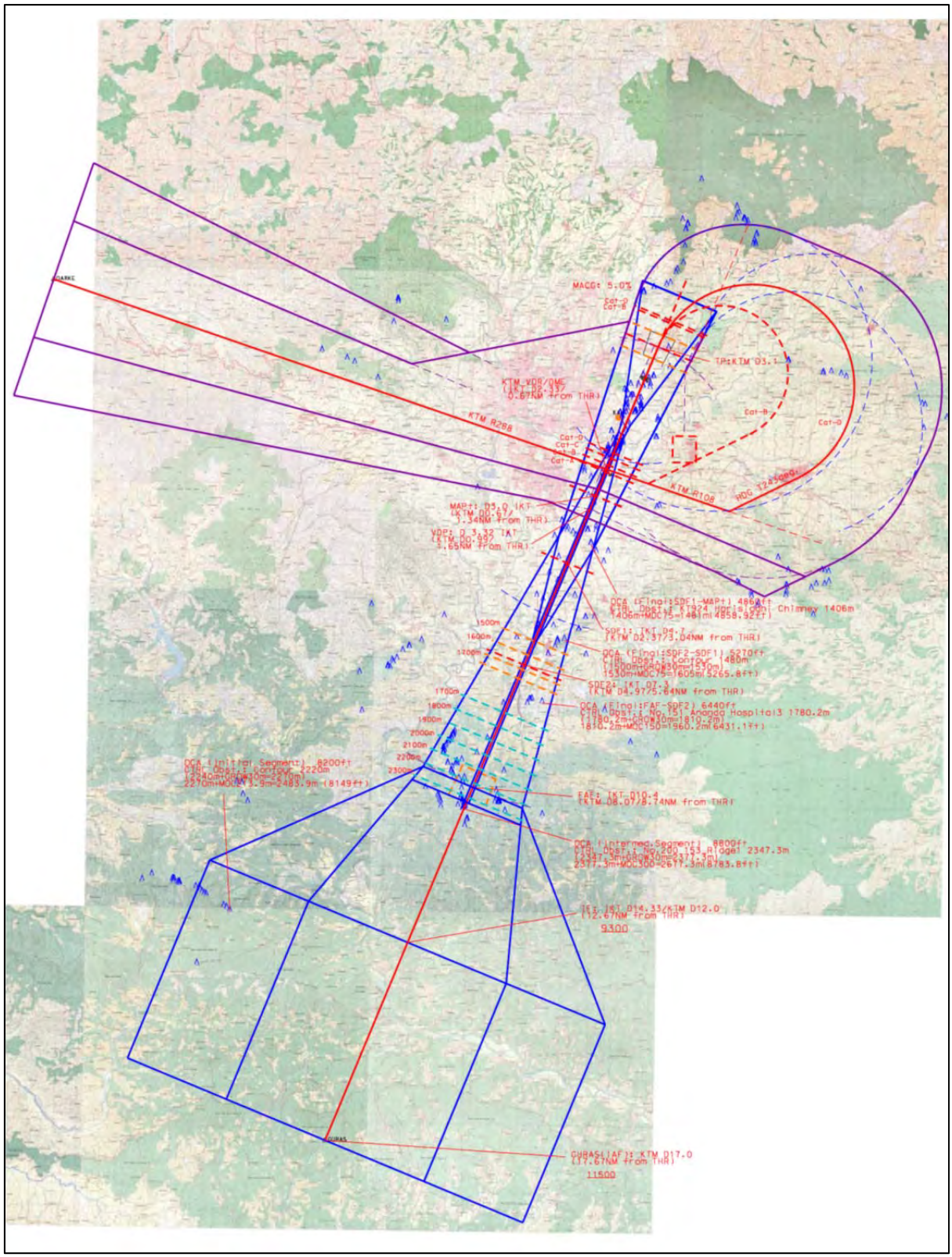
Design Outline	- The location of IF is common among Alternatives A to C with consideration of minimum segment length of intermediate segment (3.0NM), which assumes 90 degree LOC interception of FAT at IF.		
IF	IKT D14.3281 (27:29:15.5358 N / 85:15:51.4605 E) 12.6650NM from THR02, KTM R202/D12.0		
Track	022° (022.0074°T) * value from IF to FAF (same as FAT)		
Seg. Length	3.9281NM * Distance between IF to FAF		
OCA	8800ft * 2377.3m+300m=2677.3m (8783.8ft) - While OCA for this segment is 8800ft based on the control obstacle below, altitude limitation of 9300ft above is applied at IF considering descending profile before FAF and influence of terrain to LOC beam.		
	Control Obst.	Name	No.200 153_Ridge1

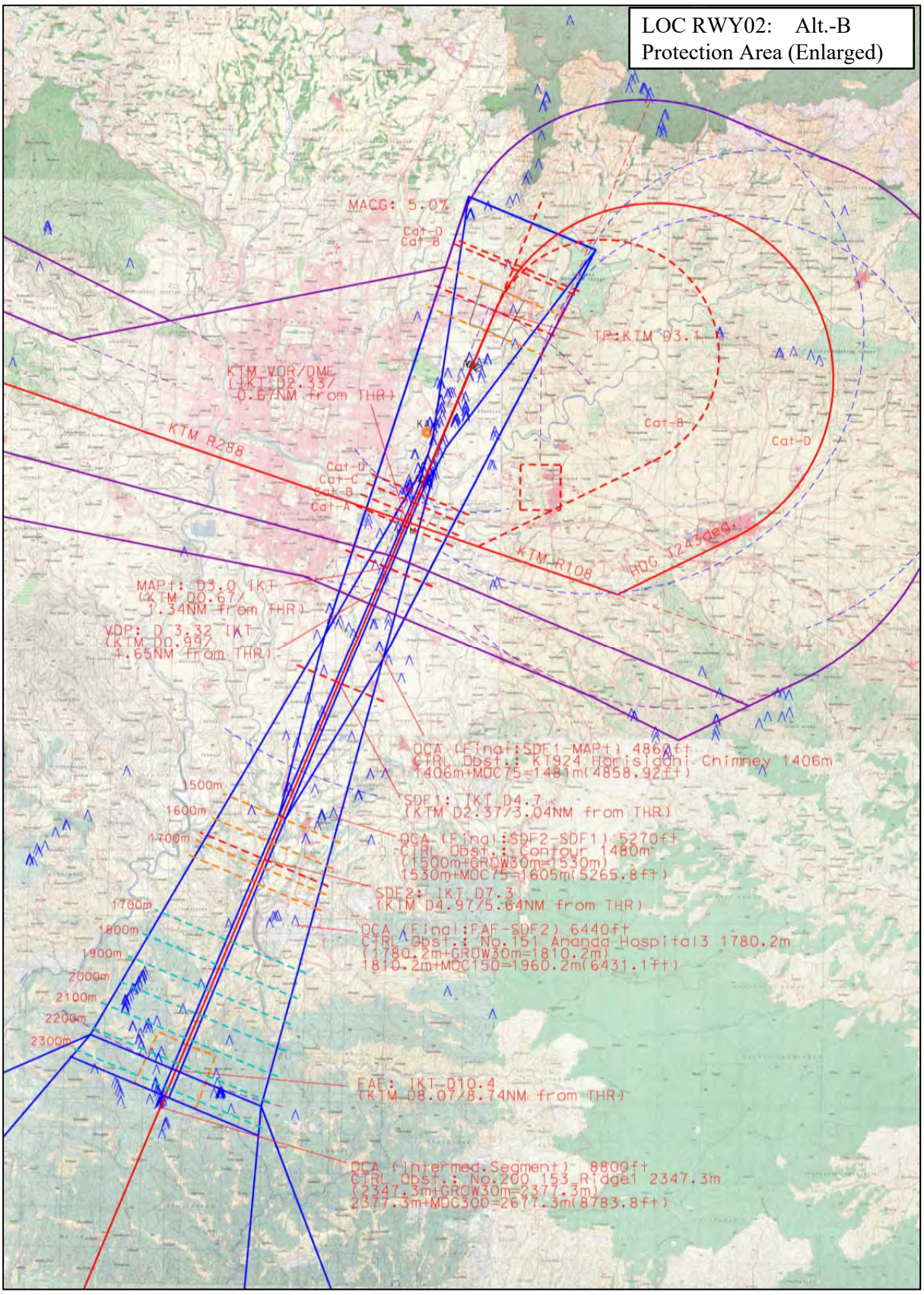
	of OCA		* The Highest Point from Obstacle Survey
		Altitude	2377.3m * 2347.3m(GPS)+30m(vegetation)
		Location	27:32:24.5498 N 85:17:16.8522 E
		MOC	300m * added MOC100% (150m)
			Primary Secondary
Descent Gradient	3.4% * below the maximum descent gradient value (5.2%)		
	Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = 3.3891%	
	Seg. Length	2.4281NM * 3.9281NM-1.5000NM(flat section)	
	Start Alt.	9300FT (Altitude restriction at IF)	
	Ending Alt.	8800FT (Altitude restriction at FAF/OCA above)	

4. Initial Approach Segment

Design Outline	- GURAS, the starting fix of the existing VOR approach with a holding procedure, is set as IAF, and IF is directly connected from IAF with a simple straight configuration.		
IAF	GURAS: KTM R202/D17.0044 (27:24:36.00 N / 85:13:46.00 E) 17.6694NM from THR02, IKT D19.3324		
Track	022° (021.8134°T) * value from IAF to IF (same as FAT)		
Seg. Length	5.0044NM * Distance between IAF to IF		
OCA	8200ft * 2270m+213.9m=2483.9m (8149.3ft) - While OCA for this segment is 8200ft based on the control obstacle below, altitude limitation of 11500ft above is applied at IAF due to MHA at IAF (GURAS).		
	Control Obst. of OCA	Name	2220m contour (east ridge of Dumse Dada)
		Altitude	2270m * 2240m(next contour)+30m(veg.)
		Location	27:29:55.6608 N 85:11:10.6295 E
		MOC	213.9m * 35.65% of MOC (600m) with additional MOC of 100%
			Primary Secondary
Descent Gradient	7.3% * below the maximum descent gradient value (8.0%) * 5.978% from IAF to FAF with flat section (1.5NM)		
	Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = 7.2351%	
	Seg. Length	5.0044NM	
	Start Alt.	11500FT (Altitude restriction at IAF)	
	Ending Alt.	9300FT (Altitude restriction at IF)	

LOC RWY02: Alt.-B
Protection Area (Whole Area)




LOC RWY02: Alt.-B
Protection Area (Enlarged)
MACG: 5.0%
Cat-D
Cat-B
TP:KTM D3.1
KTM VOR/DME
(IKT D2.33/
0.67NM from THR)
KTM R288
Cat-B
Cat-D
Cat-D
Cat-C
Cat-B
Cat-A
KTM R108
HDG 124.50
MAPt: D3.0 IKT
(KTM D0.67/
1.34NM from THR)
VDP: D 3.32 IKT
(KTM D0.99/
1.65NM from THR)
OCA (Final:SDF1-MAPt) 4860ft
CTRL Obst.: KT924 Hamisiddhi Chimney 1406m
1406m+MOC75=1481m(4858.92ft)
SDF1: IKT D4.7
(KTM D2.37/3.04NM from THR)
OCA (Final:SDF2-SDF1) 5270ft
CTRL Obst.: Contour 1480m
(1500m+GROW30m=1530m)
1530m+MOC75=1605m(5265.8ft)
SDF2: IKT D7.3
(KTM D4.97/5.64NM from THR)
OCA (Final:FAF-SDF2) 6440ft
CTRL Obst.: No.151 Ananda Hospital3 1780.2m
(1780.2m+GROW30m=1810.2m)
1810.2m+MOC150=1960.2m(6431.1ft)
FAF: IKT D10.4
(KTM D8.07/8.74NM from THR)
OCA (Intermed.Segment) 8800ft
CTRL Obst.: No.200 153_Ridge1 2347.3m
(2347.3m+GROW30m=2377.3m)
2377.3m+MOC300=2677.3m(8783.8ft)
1500m
1600m
1700m
1790m
1800m
1900m
2000m
2100m
2200m
2300m

(3) Alt-C：Start descending slightly before flying-over the top of Mt. Bhattedada, and intercept a 3-deg. standard descent gradient path at 3NM before MAPt

Proc. Name	Kathmandu Tribhuvan Airport　LOC RWY02 (Alternative A)
Design Criteria	PANS-OPS Volume II Sixth Edition (2014)
Magnetic Variation	ARP (27:41:49.778 N/085:21:28.535 E)： 00°25'57.5040" W（0.4326°E）（WMM2015, October 1st, 2016）
Design Requirements and Conditions	- This procedure is "non-standard" procedure due to the steep descent angle, which largely exceeds ICAO standard, caused by the severe terrain at the south of the airport such as Mt. Bhattedada. - Final approach track (FAT) is set as "on-set" (as agreed with CAAN). - Descending profile is set as (1) to start descending slightly before flying-over the top of Mt. Bhattedada and (2) to intercept a 3-degree standard descent gradient path at 3NM before missed approach point (MAPt). - Minimum obstacle clearance (MOC) has been increased by 100% (or doubled) for initial, intermediate and some sections of final approach segment up to 6NM point from the landing threshold (THR02) due to the severe terrain at the south of the airport (as agreed with CAAN). - Penalty on minimum descent altitude (MDA) due to the steep angle descent is not considered for this procedure as same as the existing VOR approach (as agreed with CAAN). - Circling, MSA and holding procedures are not covered in this study so that CAAN should be responsible to update them for publication.

1. Final Approach Segment

Design Outline and Reasons	- The location of FAF is set at the point of IKT 11.3 DME which is slightly before flying-over the top of Mt. Bhattedada. That is, descending for final approach starts slightly before flying over the top of the mountain with 150m MOC for final approach segment. The procedure altitude for FAF at 8900ft is increased in order to secure a sufficient separation with the first stepdown fix at IKT 10.3 DME. - Three stepdown fixes are introduced at the points of IKT 10.3 DME, IKT 7.3 DME and IKT 4.7 DME, which exceeds the ICAO standard of maximum two in the final approach segment. - The location of MAPt, which should be after visual descent point (VDP), is set at the point of IKT 3.0 DME in order to secure sufficient clearance against the terrain at the north of the airport and the restricted area of Thimi Gattagher at the east of the airport, which upper limit is set as 6037ft based on its ground altitude of 1340m with height clearance of 500m (as agreed with CAAN).
FAT	022° (022.0148°T)　* value from FAF to THR02
FAF	IKT D11.3　(27:32:04.4540 N / 85:17:08.0515 E) 9.6369NM from THR02, KTM D8.9719
Procedure Alt.	8900 FT *Increased due to required separation from SDF3
SDF3	IKT D10.3　(27:33:00.2358 N / 85:17:33.3586 E) 8.6368NM from THR02, KTM D7.9719
Procedure Alt.	8305 FT　* Based on the descending Profile of Design Requirements
SDF2	IKT D7.3　(27:35:47.5675 N / 85:18:49.3172 E) 5.6369NM from THR02, KTM D4.9720
Procedure Alt.	6518 FT　* Based on the descending Profile of Design Requirements
SDF1	IKT D4.7　(27:38:12.5849 N / 85:19:55.1991 E) 3.0369NM from THR02, KTM D2.3720
Procedure Alt.	5330 FT　* Based on the descending Profile of Design Requirements

MAPt	IKT D3.0 (27:39:47.3999 N / 85:20:38.3006 E) 1.3370NM from THR02, KTM D0.6719		
Seg. Length	8.3000NM * Distance between FAF to MAPt		
OCA/H	4860ft / 546ft * The elevation of 4314ft for THR02, which was measured after the earthquake, is applied for the OCA calculation. * Obstacle assessment for this segment was conducted using the protection areas for Cat-D aircraft, which is the most critical. * The obstacles in the initial phase of the missed approach segment are lower than the control obstacle of the final segment so that they are confirmed not to be critical for OCA calculation. * The obstacles in the intermediate and final phases of the missed approach segment are confirmed to be cleared having sufficient MOC with 5.0% climb gradient for missed approach. * The rules of "lower limit on OCA" is not applied since FAT is on-set.		
Final Seg. OCA (FAF to MAPt)	MOCA3 (FAF to SDF3)	8300ft * 2377.3m+150m=2527.3m (8291.7ft)	
	Control Obst. of MOCA3	Name	No.200 153_Ridge1 * The Highest Point from Obstacle Survey
		Altitude	2377.3m * 2347.3m(GPS)+30m(vegetation)
		Location	27:32:24.5498 N 85:17:16.8522 E
		MOC	150m * added MOC100% (75m)
			Primary Secondary
	MOCA2 (SDF3 to SDF2)	6440ft * 1810.2m+150m=1960.2m (6431.1ft)	
	Control Obst. of MOCA2	Name	No.151 Ananda Hospital3
		Altitude	1810.2m * 1780.2m(GPS)+30m(vegetation)
		Location	27:34:54.3521 N 85:19:18.2415 E
		MOC	150m * added MOC100% (75m)
			Primary Secondary
	MOCA1 (SDF2 to SDF1)	5270ft * 1530m+75m=1605m (5265.8ft)	
	Control Obst. of MOCA1	Name	1480m contour (Chapagau District)
		Altitude	1530m * 1500m(next contour)+30m(veg.)
		Location	27:36:22.8051 N 85:19:52.1255 E
		MOC	75m
			Primary Secondary
	OCA (SDF1 to MAPt)	4860ft * 1406m+75m=1481m (4858.9ft) - The top altitude of the same obstacle under the obstacle survey before the earthquake was almost equal with 1404.5m, but it become 1392.1m under the obstacle survey after the earthquake, which may be due to the damage on the top of the structure. However, the original value was applied for OCA calculation due to the possibility of repairing works.	
	Control Obst. of OCA	Name	KT924 Harisiddhi Chimney
		Altitude	1406m
		Location	27:38:38.7550 N 85:20:32.0460 E
		MOC	75m

			Primary Secondary
VDP	IKT D3.3152 * 0.3148NM before MAPt 1.6518NM from THR, KTM D0.9868		
Descent Gradient	Value for Publication	9.8%／5.2% - Based on the descending Profile of Design Requirements (to intercept 3-degree descent path at 3NM before MAPt (IKE 6.0 DME))	
	FAF to IKT D6.0	9.8%	
		Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = (8900FT - 5744FT) / 5.3001NM = 0.0980 （9.8%）
		Seg. Length	5.3001NM (Dist. from FAF to IKT D6.0)
		Start Alt.	8900 FT (Procedure Altitude at FAF
		Ending Alt.	5744 FT (Alt. at IKT D6.0 on 3deg. path)
	IKT D6.0 to MAPt	5.2%	
		Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = (5744FT - 4364FT) / 4.3368NM = 0.05237 （5.2%）
		Seg. Length	4.3368NM (Dist. from IKT D6.0 to THR)
		Start Alt.	5744 FT (Alt. at IKT D6.0 on 3deg. path)
		Ending Alt.	4364 FT (THR elev. 4314FT + 50FT)
ALS	Full Intermediate Basic No (used for Minima calculation) * Based on the development under the ADB project		

2. Missed Approach Segment

Description	Climb on HDG022°to KTM 3.1DME, turn right HDG243° to intercept and proceed via KTM R108/R288 to DARKE and hold at 10500FT.
Design Outline and Reasons	- The route structure of missed approach is based on the existing VOR procedure due to the simplification of procedures for the airport: to climb along FAT (022°) up to the designated turning point (KTM 3.1 DME), to turn right and to intercept and proceed via KTM R108/R288 to DARKE. - Turning at the designated turning point (TP) is applied in order to clear the upper limit of the restricted area of Thimi Gatthagher, which is military shooting range. The location of MAPt and TP are set to secure sufficient clearance not only the severe terrain at the north of the airport but also the restricted area. The climb gradient of missed approach is increased to 5.0 % for this purpose. - In order to secure the sufficient clearance to the terrain at the west of the airport, stabilization of the route in operation and sufficient altitude at the ending point of DARKE, intercepting heading is designated to KTM R108/R288.
Climb Gradient	5.0% - The climb gradient of missed approach is set as 5.0 % in order to secure sufficient clearance to both the terrain at the north of the airport and the restricted are of Thimi Gatthagher. - Speed restriction of maximum 185kt is applied in order to avoid aircraft flying beyond the expected outer limit of the protection area.
TP	KTM D3.1000（27:43:17.7640 N / 85:22:14.0041 E）

3. Intermediate Approach Segment

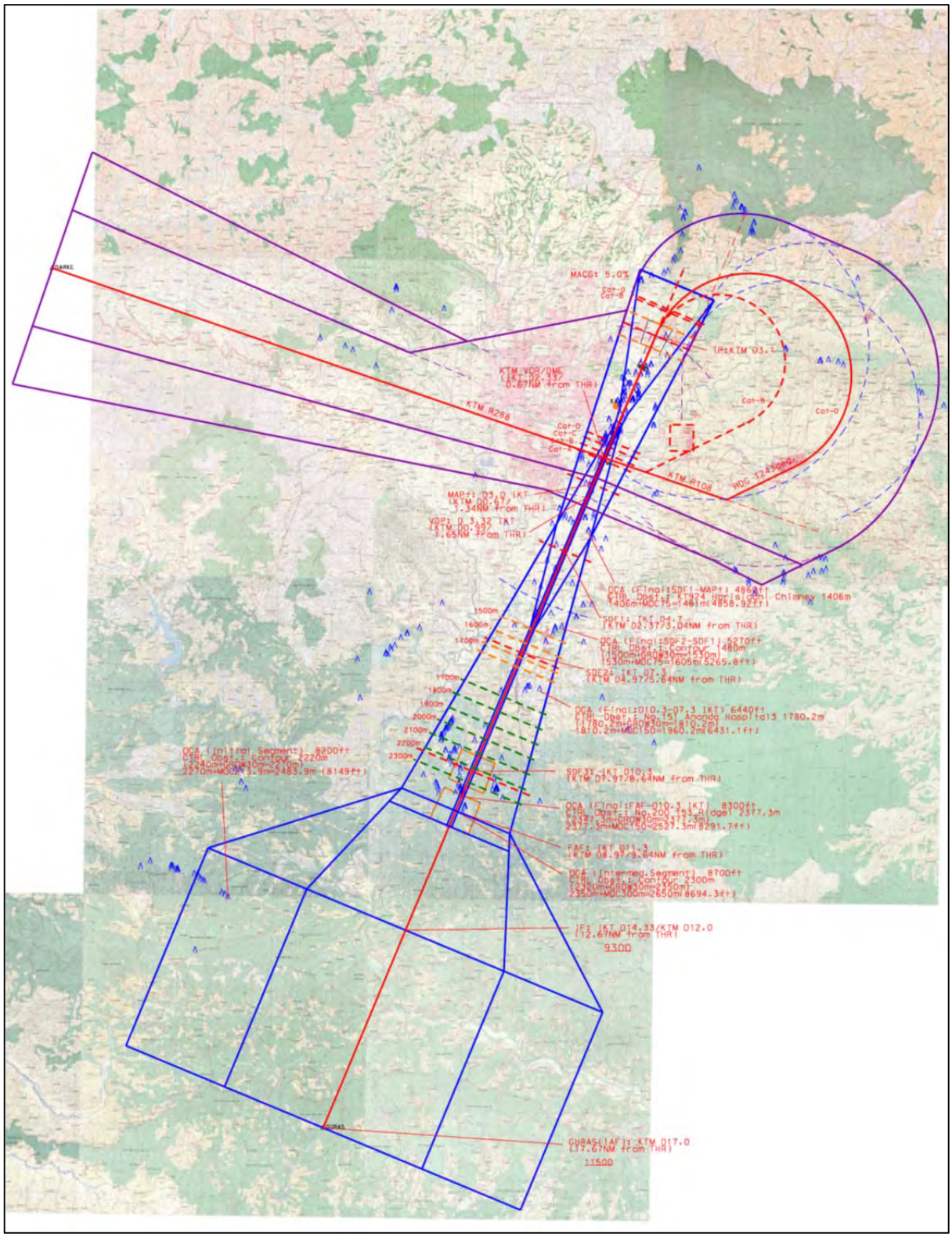
Design	- The location of IF is common among Alternatives A to C with consideration of

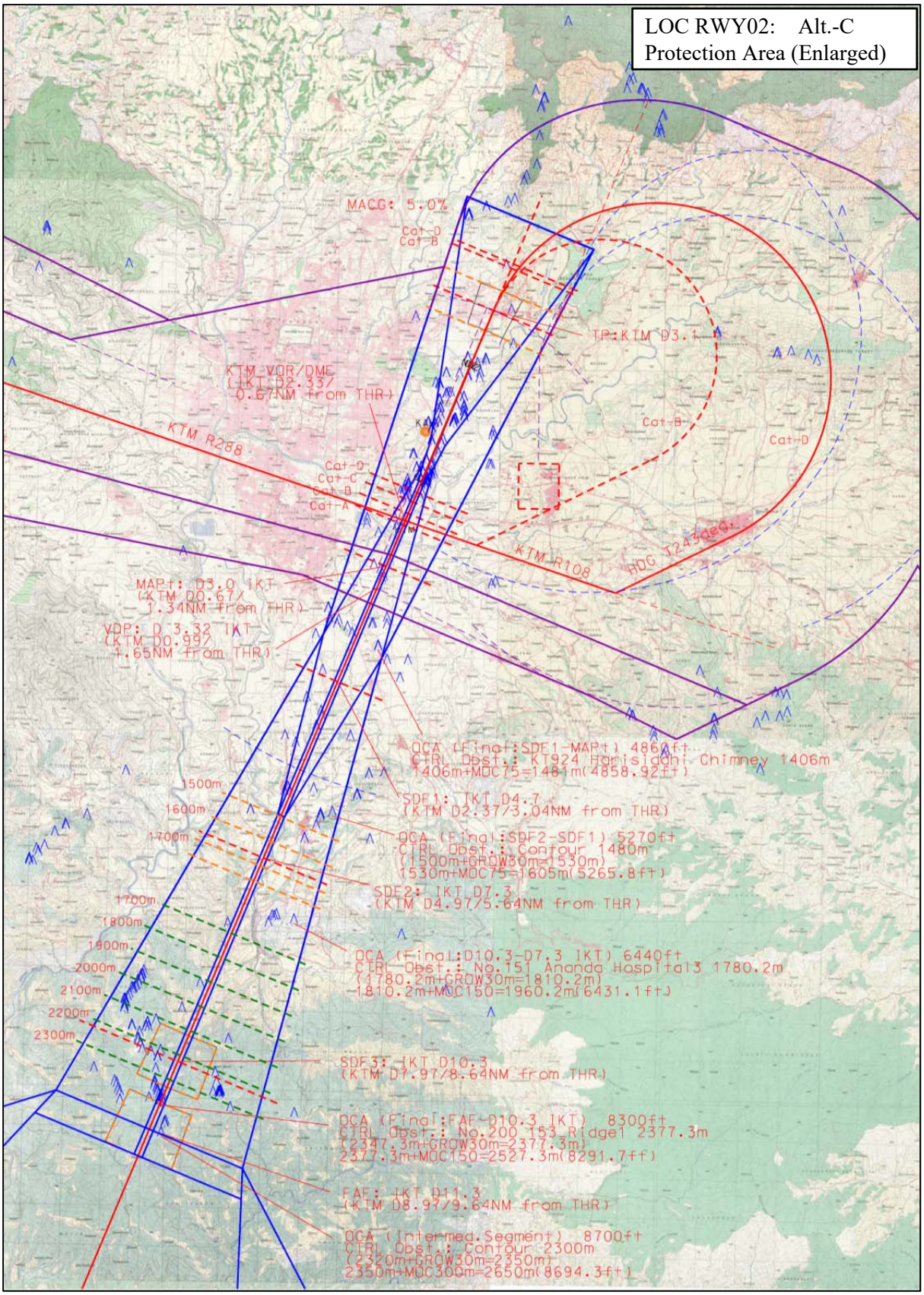
Outline	minimum segment length of intermediate segment (3.0NM), which assumes 90 degree LOC interception of FAT at IF.		
IF	IKT D14.3281 (27:29:15.5358 N / 85:15:51.4605 E) 12.6650NM from THR02, KTM R202/D12.0		
Track	022° (022.0076°T) * value from IF to FAF (same as FAT)		
Seg. Length	3.0281NM * Distance between IF to FAF		
OCA	8700ft * 2350m+300m=2650m (8694.3ft) - While OCA for this segment is 8700ft based on the control obstacle below, altitude limitation of 9300ft above is applied at IF considering descending profile before FAF and influence of terrain to LOC beam.		
	Control Obst. of OCA	Name	2300m contour (south side of Mt. Bhattedada)
		Altitude	2350m * 2320m(next contour)+30m(veg.)
		Location	27:31:58.9164 N 85:17:18.9284 E
		MOC	300m * added MOC100% (150m)
			Primary Secondary
Descent Gradient	4.3% * below the maximum descent gradient value (5.2%)		
	Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = 4.3081%	
	Seg. Length	1.5281NM * 3.0281NM - 1.5000NM (flat section)	
	Start Alt.	9300FT (Altitude restriction at IF)	
	Ending Alt.	8900FT (Procedure altitude at FAF)	

4. Initial Approach Segment

Design Outline	- GURAS, the starting fix of the existing VOR approach with a holding procedure, is set as IAF, and IF is directly connected from IAF with a simple straight configuration.		
IF	GURAS: KTM R202/D17.0044 (27:24:36.00 N / 85:13:46.00 E) 17.6694NM from THR02, IKT D19.3324		
Track	022° (021.8134°T) * value from IAF to IF (same as FAT)		
Seg. Length	5.0044NM * Distance between IAF to IF		
OCA	8200ft * 2270m+213.9m=2483.9m (8149.3ft) - While OCA for this segment is 8200ft based on the control obstacle below, altitude limitation of 11500ft above is applied at IAF due to MHA at IAF (GURAS).		
	Control Obst. of OCA	Name	2220m contour (east ridge of Dumse Dada)
		Altitude	2270m * 2240m(next contour)+30m(veg.)
		Location	27:29:55.6608 N 85:11:10.6295 E
		MOC	213.9m * 35.65% of MOC (600m) with additional MOC of 100%
			Primary Secondary
Descent Gradient	7.3% * below the maximum descent gradient value (8.0%) * 6.5504% from IAF to FAF with flat section (1.5NM)		
	Calculation	(Start Alt.) - (ending Alt.) / Seg. Length = 7.2351%	
	Seg. Length	5.0044NM	
	Start Alt.	11500FT (Altitude restriction at IAF)	
	Ending Alt.	9300FT (Altitude restriction at IF)	

LOC RWY02: Alt.-C
Protection Area (Whole Area)




LOC RWY02: Alt.-C
Protection Area (Enlarged)
MACG: 5.0%
Cat-D
Cat-B
TP:KTM D3.1
KTM VOR/DME
(IKT D2.33/
0.67NM from THR)
KTM R288
Cat-B
Cat-D
Cat-D
Cat-C
Cat-B
Cat-A
KTM R108
HDG 243deg.
MAPt: D3.0 IKT
(KTM D0.67/
1.34NM from THR)
VDP: D 3.32 IKT
(KTM D0.99/
1.65NM from THR)
OCA (Final:SDF1-MAPt) 4860ft
CTRL Obst.: KT924 Harisiddhi Chimney 1406m
1406m+MOC75=1481m(4858.92ft)
SDF1: IKT D4.7
(KTM D2.37/3.04NM from THR)
OCA (Final:SDF2-SDF1) 5270ft
CTRL Obst.: Contour 1480m
(1500m+GROW30m=1530m)
1530m+MOC75=1605m(5265.8ft)
SDF2: IKT D7.3
(KTM D4.97/5.64NM from THR)
OCA (Final:D10.3-D7.3 IKT) 6440ft
CTRL Obst.: No.151 Ananda Hospital3 1780.2m
(1780.2m+GROW30m=1810.2m)
1810.2m+MOC150=1960.2m(6431.1ft)
SDF3: IKT D10.3
(KTM D7.97/8.64NM from THR)
OCA (Final:FAF-D10.3 IKT) 8300ft
CTRL Obst.: No.200 153_Ridge1 2377.3m
(2347.3m+GROW30m=2377.3m)
2377.3m+MOC150=2527.3m(8291.7ft)
FAF: IKT D11.3
(KTM D8.97/9.64NM from THR)
OCA (Intermed.Segment) 8700ft
CTRL Obst.: Contour 2300m
(2320m+GROW30m=2350m)
2350m+MOC300m=2650m(8694.3ft)
1500m
1600m
1700m
1700m
1800m
1900m
2000m
2100m
2200m
2300m