MINISTRY OF TRANSPORT AND COMMUNICATION
THE KYRGYZ REPUBLIC

THE PREPARATORY SURVEY REPORT ON THE PROJECT FOR IMPROVEMENT OF EQUIPMENT OF THE MANAS INTERNATIONAL AIRPORT IN THE KYRGYZ REPUBLIC

AUGUST 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.
JAPAN AIRPORT CONSULTANTS, INC.
DAIKEN SEKKEI, INC.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Consortium consist of Nippon Koei Co., Ltd., Japan Airport Consultants, Inc. and Daiken Sekkei, Inc.

The survey team held a series of discussions with the concerned officials of the Government of the Kyrgyz Republic, 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 express my sincere appreciation to the officials concerned of the Government of the Kyrgyz Republic for their close cooperation extended to the survey team.

August, 2014

Mr. Akira NAKAMURA
Director General,
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

SUMMARY

1. Outline of the Country

(1) National Land and Nature

The Kyrgyz Republic (hereinafter referred to as "Kyrgyz") has 5.66 million people (Kyrgyz Statistics 2013). Kyrgyz is a landlocked country surrounded by four countries, namely, Kazakhstan, Uzbekistan, Tajikistan, and China. The country runs long from east to west, and its land area is 198,500 km^2. Approximately 90% of the whole country is more than 1,500 m above sea level, and 40% of the land area is mountainous at more than 3,000 m above sea level. The Tian Shan Mountains lie on the Chinese border. The highest peak of the Tian Shan Mountains is beyond 7,000 m. In addition, Pamir Mountains open toward Tajikistan. Kyrgyz's capital city is Bishkek, which is located near the border of Kazakhstan. Bishkek has an altitude of 800 m, and annual precipitation of around 450 mm. The Manas International Airport (hereinafter referred to as "MIA"), which is a project target, is located 30 km north-northwest of Bishkek.

Source: JICA Study Team

Figure 1 Country Map of Kyrgyz

(2) National Economy

Kyrgyz has a gross domestic product (GDP) of US$6,470 million in total, and GDP per capita of US$1,158 (International Monetary Fund (IMF) 2012). The breakdown by industry group is: 37.7% for primary industries, 23.3% for secondary industries, and 39% for tertiary industries (World Development Indicators Online 2013).

The main industries are agriculture (wheat, raw cotton, and tobacco), cattle breeding, agricultural and light industries (food, leather, and drinking water), mining (gold, mercury, and antimony), and hydropower generation. The main export items are hydropower electricity, tobacco, cotton, and gold. The main import items are oil products and natural gas.

Kyrgyz is one of the first countries from the former Soviet Union (CIS) which introduced a market economy, and joined the World Trade Organization (WTO) in 1998. However, although a basic market economy system is relatively maintained, economic laws are not promulgated. Kyrgyz experience problems such as unclear laws and poverty.

Kyrgyz promoted a radical market reform route according to a curtailed budget advice from the IMF after its independence in 1991. Economic dullness continued in confusion of the CIS collapse, but GDP growth turned positive in 1996 for the first time after its independence. Kyrgyz was affected by the financial crisis in Russia in 1998, but in that time positive growth continued. Main economic indicators for Kyrgyz are shown in Table 1.

Table.1 Major Economic Indexes in Kyrgyz

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
GDP Growth Rate, Real (%)	7.0	7.0	-0.2	3.1	8.5	8.4	2.9	-0.5	6.0	-0.9
Nominal GDP (KGS million)	83,872	94,351	100,899	113,800	141,897	187,991	201,222	220,369	285,989	304,350
GDP per person (US$)	381	435	480	545	724	953	902	874	1,131	1,154
Inflation Rate (%)	3.1	4.1	4.9	5.1	20.1	20.0	0.0	19.2	5.7	7.5

Source: Website of the Embassy of Japan in the Kyrgyz Republic

2. Background of the Project

(1) Overall Goals and Project Objective

Kyrgyz government states that there is an urgent necessity for the implementation and modernization of the airport as stated in the "Medium Term Development Program of the Kyrgyz Republic for 2012-14" (formulated in 2012). Also the "Strategy of the Kyrgyz Republic Civil Aviation Development for 2013-2020" (formulated in 2013) states the upgrading of air navigation and the strength of airport security are the two of important targets, because efficient development of the airport sector ensures sustainable economic development in Kyrgyz. This project corresponds to these policies.

Traffic infrastructure maintenance and reducing the disparity among the regions are designed under the "Country Assistance Policy to Kyrgyz". The "JICA Country Analysis Paper to Kyrgyz" analyzed that "Implementation of Transportation" is the priority target too. Therefore, the project meets the analysis and policy.

(2) Current condition and problem related to the Project

1) Aged Air Navigation Safety Equipment

a) Instrument Landing System (ILS)

There are two sets of ILS for both approach runways (RWY 08 and RWY 26) installed in 1999 under a Japanese yen loan project. Assuming the design life of equipment to be 15 years in order to ensure operational reliability, availability of spare parts, and increasing rate of equipment breakdown, it is considered desirable to replace the ILS in 2014. In case the existing obsolete ILS remain operational, spare parts or any substitutes and repair/maintenance service should be procured and measures to prevent equipment malfunction should be implemented. According to Kyrgyz Aeronavigatsia (hereinafter referred to as "KAN"), which is responsible for the operation, repair, and maintenance of ILS, although there are spare parts or any substitutes still available, KAN recognized immediate need to replace the existing ILS equipment. Even in case an equipment manufacturer stops supply of the spare parts, the operation of ILS could be maintained by concluding an equipment repair/warrantee contract with the manufacturer. Furthermore, KAN has been implementing preventive equipment maintenance rather than repair of equipment upon occurrence of malfunction. Therefore, KAN could continue to utilize the existing ILS until 2016, but replacement would be necessary before that.

b) VHF Omni-directional Range/Distance Measuring Equipment (VOR/DME)

VOR/DME provides directional and distance guidance to flying aircraft. The existing VOR/DME is located at about 1.5 km from the RWY 26 threshold on its extended centerline. The VOR/DME site is 70 m x 80 m within KAN's property located outside of the airport. The

existing VOR/DME was installed in 1995 as radio navigational aids for arriving/departing as well as overflying aircraft. Nearly 20 years have passed since its installation and no spare parts are available. In September 2012, KAN entered into a two-year contract with a Russian company for repair and maintenance of the existing VOR/DME, which may be extended for two more years. Before its expiration the VOR/DME should be replaced. The location of a new VOR/DME is preferably the existing site as it can offer the same VOR/DME approach procedure without negotiation and cost for new land acquisition.

2) Aged Airport Firefighting Vehicles

MIA has six firefighting vehicles, a rescue car and an ambulance which are used for firefighting and rescue. Two of the six firefighting vehicles are new and have been introduced in 2010. The other four vehicles were introduced in the 1980s. Those old vehicles are aged and difficult to maintain adequately because it is hard to obtain spare parts.

The standard of placement requirement of airport firefighting vehicles is suggested in the "Airport Service Manual Part 1 Rescue and Fire Fighting" by the International Civil Aviation Organization (hereinafter referred to as "ICAO"). The requirement is categorized by the largest aircraft normally used. In the case of MIA, it is categorized category-9 because the largest aircraft is B-747. The requirement decides the necessary total water volume of the firefighting vehicles. It is 36,400 L for category-9. The volume is covered by all six vehicles. But it is confirmed that 12,000 L cannot be covered by the two new vehicles. To cover the firefighting capacity suggested by ICAO, it is necessary to replace with new firefighting vehicles.

3) Aged Ground Support Equipment

Ground support equipment activities which support parking aircraft have important roles to ensure aircraft safety. The ground support equipment are categorized by such purpose. Some equipment ensure safety during aircraft landing, takeoff, and taxing. Some are for handling boarding passengers and cargo handling. MIA has more than 80 equipment; however, some of such equipment are aged as they have been used since the 1980s. It is expected that some equipment will be inadequate in consideration of future air transportation demand. Most of the X-ray screening systems for security purposes were installed in the 2000s. Some of such equipment are necessary to be replaced because they are aged more than seven years, which is the lifetime of X-ray equipment.

3. Outline of the Survey/Contents of the Project

(1) Period of Dispatch

Study team was dispatched to Site survey from 12th January 2014 to 2nd February 2014. And from 28th May to 30th May, Study team presented draft report.

(2) Requested Item and Studied Item

Kyrgyz 's initial request was as listed below.

This project aims to contribute in the upgrade of airport and aircraft safety and reliability by securing flight safety at low visibility condition and effective airport operation by improving the air navigation facilities and ground support equipment

According to the aim, result of the discussion with Kyrgyz, following plan is designed for the project.

Table 2 Requested item and Planned item

Item	Requested	Planned
Instrument Landing System (ILS)	2	2
DME (Distance Measuring Equipment) located with Glide Path Antenna for the both landing directions	2	2
VOR/DME	1	1
Aircraft Rescue and Fire Fighting Vehicle	2	1
Airport Runway Sweepers for Snow Removal	2	2
Airport Runway Snow Blower	2	2
Airport Runway Spray	0	1
Aircraft De/Anti-Icing Vehicle	2	Deleted. Already posses enough number
Aircraft Bulk Cargo and Container High Loader	2	2
Aircraft Tow Tractor	2	1
Aircraft Air Conditioning Unit	2	2
Aircraft Air Start Unit (ASU)	1	1
Passenger Stair	2	Deleted. Already posses enough number
Aircraft Lavatory Service Truck	2	1
Aircraft Water Service Truck	2	2
Aircraft Ground Power Unit	2	2
Tow tractor (Power Hybrid Type) for Baggage Carts & Container dollies	4	5
Baggage Carts	8	13
Container Dollies	8	12
Belt loaders (for loading and unloading of baggage)	2	2
Airport Security Baggage X-Ray units	4	MIA already purchased.
Airport Security Walk-Through Metal Detectors	4	

Source：JICA Study Team

(3) Position of this project

The objectives of procurement of air navigation safety equipment under the Project are to enhance safety and efficiency of air traffic and to maintain a low rate of flight cancellation and delay at MIA. In order to achieve such objectives, the design of the equipment is to be carried out based on the following basic considerations:

- ✈ Specifications of the instrument landing system (ILS), VHF omni directional radio range (VOR) and distance measuring equipment (DME) shall be prepared to meet relevant requirements of ICAO Annex 10 in terms of facility requirements, performance requirements, and electrical specifications.
- ✈ These types of air navigation safety equipment are being manufactured domestically by Toshiba and NEC, and internationally by Indra Nav (Norway), SELEX (Italy), and Thales (France and Germany). These manufacturers are competing with each other in terms of performance and price. In this study, it has been intended that the best among all the equipment systems, especially those that have easy operation and maintenance, shall be formulated taking into account the proposed equipment systems by Japanese and international manufacturers.
- ✈ The requests from the Kyrgyz side described in the Minutes of Discussion have been confirmed during the site survey through a Technical Memorandum, and the design policy proposed in this study shall be carried out accordingly.

The intended firefighting vehicles are used for the purpose of firefighting and rescue support for aircrafts.

The equipment procurement plan shall be developed based on the maintenance and management ability, and financial ability of the Kyrgyz side. It shall be suitable for the framework of airport firefighting in Kyrgyzstan as well. The basic policies are as follows:

- Only the necessary equipment shall be planned based on ICAO standards and world trends.
- The equipment procurement plan shall be conducted based on the condition of maintenance and procurement of spare parts in Kyrgyzstan.
- The equipment procurement plan shall be conducted based on the ability of the operator.

The intended GSE are used for supporting safe aircraft operations in the time between landing and taking off.

The equipment procurement plan shall be developed based on the maintenance and management ability, and financial ability of the Kyrgyz side. It shall be suitable for the framework of airport ground support in Kyrgyz as well. The basic policies are as follows:

- Minimal and necessary equipment shall be planned based on ICAO standards and world trends.
- The equipment procurement plan shall be conducted based on the condition of maintenance and procurement of spare parts in Kyrgyz.
- The equipment procurement plan shall be conducted based on the ability of the operator.

(4) Outline of Planned Equipment

Table 3 List of Major Equipment for ILS

Place	Name of Equipment	Q'ty	Remarks
Localizer site (Runway 08, 26)	Localizer Equipment	2 sets	2-frequency type, hot-standby
	Localizer Antenna with monitor antenna	2 sets	16 or 20 elements
	Localizer Far Field Monitor	2 sets	
	Wireless System (radio link)	2 sets	
	DC Power Supply Equipment with batteries	2 sets	
	Automatic Voltage Regulator	2 sets	5kVA
	Equipment Shelter (metallic shelter)	2 sets	With air conditioners, power supply panel
GP/DME site (Runway 08, 26)	GP Equipment	2 sets	2-frequency type, hot-standby
	GP Antenna with monitor antenna	2 sets	3 elements
	DME Equipment	2 sets	100W, hot-standby
	DME Antenna	2 sets	
	Wireless System (radio link)	2 sets	
	DC Power Supply Equipment with batteries	2 sets	
	Automatic Voltage Regulator	2 sets	5kVA
	Equipment Shelter (metallic shelter)	2 sets	With air conditioners, power supply panel
Operation Building Monitor Room	ILS Remote Maintenance Monitoring System	2 sets	
	Remote Control Status Unit (RCSU)	2 sets	
	Localizer Interlock System	1 set	
	Wireless System (radio link)	4 sets	
Operation Building Radar Control Room	ILS Status Unit	2 sets	

Source: JICA Study Team

Table 4 List of Major Equipment for VOR/DME

Place	Name of Equipment	Q'ty	Remarks
VOR/DME site	VOR Equipment	1 set	
	VOR Antenna	1 set	
	DME Equipment	1 set	
	DME Antenna	1 set	
	DC Power Supply Equipment with batteries	1 set	
	Automatic Voltage Regulator	1 set	5kVA
	Equipment shelter with counterpoise	1 set	With air conditioners, power supply panel
Operation Building Monitor Room	VOR/DME Remote Maintenance Monitoring System	1 set	
	Remote Control Status Unit (RCSU)	1 set	
Operation Building Radar Control Room	VOR/DME Status Unit	1 set	

Source: JICA Study Team

Table 5 Fire Fighting Vehicle

Location	Item	Nos	Note
Fire station	Airport Fire Fighting Vehicle	1	

Source：JICA Study Team

Table 6 GSE (Land-based use)

Requested equipment	Amount	Planned amount
Airport Runway Sweepers for Snow Removal	2	Widt of broom: 5m + snowplow
Airport Runway Snow Blower	2	Working speed: 40km/h and more, working width: 2m and more
Airport Runway Sprayer	1	Capacity of tank: 10KLclass, ability of spraying liquid and powder to the width of 27.5 m

Table 7 Equipment List of GSE

Requested equipment	Amount	Planned amount
Lower deck Container /Pallet Loader	2	Compliant with IATA AHM 931. 7t / 14t capacity respectively
Self-propelled conveyor Belt Loader	2	Compliant with IATA AHM 925. Width of belt: 600mm
Aircraft Nose Gear Tow bar tractor	1	Compliant with IATA AHM 955. Weight of vehicle: 60t, GPU with the capacity of 90KVA attached
Aircraft Air Start Unit (ASU)	1	Compliant with IATA AHM 976. Suitable for 250PPM class
Aircraft Lavatory Service Truck	1	Compliant with IATA AHM 971 Self-propelled type mounting water tank with about 2,000L capacity
Aircraft Water Service Truck	2	Compliant with IATA AHM 970. Self-propelled type mounting water tank with about 3,000L capacity
Battery Powered Ramp Equipment Tractor	5	Compliant with IATA AHM 968. Diesel or Hybrid vehicle
Baggage Carts	13	Compliant with IATA AHM 963 Same size classes the existing equipment
Aircraft Ground Power Unit	2	Compliant with IATA AHM 972. Towing 180 KVA class, unnecessary for DC
Aircraft Air Conditioning Unit	2	Compliant with IATA AHM 974. Towing type air conditioner unit suitable for wide body type aircraft
Container Dollies	12	Compliant with IATA AHM 965. Capacity of weight: 1,600kg

Source: JICA Study Team

4. Construction Period and Cost Estimation of the Project

Necessary periods for implementation of the Project are 5.5 months for detailed design, 9 months for Air Navigation safety equipment's product, 12 months for Fire Fighting Vehicle's product, from 5month to 12 month for Ground support equipment product. 2 month for inspection and Transportation for Air Navigation Safety Equipment, 6 month for installation, adjustment, test operation, initial training, accept inspection and handover of Air Navigation Safety Equipment, 3month for inspection and transportation for Ground Support Equipment. Required period for procurement is 15 months in total.

5. Evaluation of the Project

In view of the above, it is judged that the project is appropriate for technical assistance project, by using Japanese grant aid.

(1) Relevance

1) Project Suitability

This project aims to contribute in the upgrade of airport and aircraft safety and reliability by securing flight safety at low visibility condition and effective airport operation by improving the air navigation facilities and ground support equipment.

This project is appropriate because; flight safety at low visibility condition is secured by air navigation facilities improvement, safety level of fire fighting of MIA is satisfied by the airport fire fighting vehicle's improvement and upgrade flight operation reliability by improving ground support equipment.

2) Benefit Target

MIA is a capital airport and one of the two international airports in Kyrgyz. The results in the upgrade of airport and aircraft safety will provide benefits to all 5.66 million Kyrgyz nationals, both directly and indirectly.

3) Purpose of the Project

Bad weather poses possible danger when low cloud ceiling/visibility occurs causing problem in flight operation. Due to VOR/DME's continuous operation and introduction of further PBN flight method as the current movement among ICAO member countries, upgrading air navigation facilities is an urgent issue in view of securing safety, in-service-rate, and on-time operation.

Existing fire fighting vehicles are aged more than 21 years except for two vehicles which were purchased in 2010. Among the six vehicles, four vehicles are over 13 years which is the lifetime of the fire fighting vehicles. Although ICAO's requirement of total water tank volume is 36,400 L, the total volume of the two water tank vehicles which were purchased in 2010 is 24,000 L, therefore, there is 12,000 L shortage to meet ICAO's requirement. In case the fire fighting vehicle is not provided by this project, the condition which does not satisfy ICAO requirement will practically continue. If this condition will continue, fire and rescue operation will not be adequately executed in the airport despite the current water volume is formally fulfilled. Therefore, replacement of the fire fighting vehicles is an urgent issue in view of securing airport safety.

MIA has eight runway snow sweepers but five of these are aged and have decrease snow removal performance. Continuing with such conditions, runway closing time will be longer in winter, which may disturb on-time flights. Therefore, aircraft takeoff/landing safety can be upgraded by disposing adequate snow sweepers.

It is expected that existing ground support equipment would not able to handle middle or larger size aircrafts, which are expected to be increased in the future, because the existing equipment can only handle small size aircrafts. When airport traffic is congested, the shortage in number of equipment will cause problem to on-time flight. Therefore, it is appropriate to provide ground support equipment.

4) Mid- and long-term development policy

Kyrgyz government states that there is an urgent necessity for the implementation and modernization of the airport as stated in the "Medium Term Development Program of the Kyrgyz Republic for 2012-14" (formulated in 2012). Also the "Strategy of the Kyrgyz Republic Civil Aviation Development for 2013-2020" (formulated in 2013) states the upgrading of air navigation

and the strength of airport security are the two of important targets, because efficient development of the airport sector ensures sustainable economic development in Kyrgyz. This project corresponds to these policies.

Traffic infrastructure maintenance and reducing the disparity among the regions are designed under the "Country Assistance Policy to Kyrgyz". The "JICA Country Analysis Paper to Kyrgyz" analyzed that "Implementation of Transportation" is the priority target too. Therefore, the project meets the analysis and policy.

(2) Effectiveness

1) Quantitative Effect Indicators

The quantitative effect indicators' target year is settled in 2019; three years after the completion of the project in 2016. By the social, economic, and technical results of this survey, the quantitative effect indicators are shown in Table 8.

Table 8 Quantitative Effect Indicators

Indicator	Basis (year 2013)	Target (year 2019) [3 years after project completion]
Weather condition when aircrafts are able for landing. (visible distance at runway)	More than350 m	More than200 m
Percentage of landing/take off aircraft under the condition which satisfy international requirements on fire and rescue at MIA.	0 %	100 %

Source: JICA Study Team

2) Qualitative Effect Indicators

Qualitative effect indicators by implementation of the project are as follows:

- ✈ Aircrafts which have route to Russia-Turkey, Asian, and other countries, operation safety and reliability is upgraded by the improvement of air navigation facilities.
- ✈ To be able to correspond to increase of air transport demand by using adequate ground support equipment.

Contents

Appendices

Location Map of the Manas International Airport

List of Figures

List of Tables

Abbreviations

A/P	Authorization to Pay
AFTN	Aeronautical Fixed Telecommunication Network
AGL	Aeronautical Ground Lights
AHM	Airport Handling Manual
ATIS	Automatic Terminal Information System
AVR	Automatic Voltage Regulator
B/A	Banking Arrangement
CAA	Civil Aviation Agency
CIS	Commonwealth of Independent States
COTS	Cost Of The Shelf
CO2	Carbon dioxide
DAC	Development Assistance Committee
DH	Decision Height
DME	Distance Measuring Equipment
E/N	Exchange of Note
G/A	Grant Agreement
GDP	Gross Domestic Product
GP	Glide Path
GSE	Ground Support Equipment
HF	High Frequency
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
KAN	Kyrgyz Aeronavigatsia
KGS	Kyrgyz Com
KHz	Kilo Hertz
KVA	Kilo Volt Ampere
LLZ	Localizer
M/D	Minutes of Discussion
MHz	Mega Hertz
MIA	Manas International Airport
MM	Middle Marker
MOTC	Ministry of Transport and Communications
MTBF	Mean Time Between Failures
NDB	Non directional Radio Beacon
ODA	Official Development Assistance
OIA	Osh International Airport

OJT	On the Job Training
OM	Outer Marker
PALS	Precision Approach Lighting System
PC	Personal Computer
RCSU	Remote Control Status Unit
RMMS	Remote Maintenance Monitoring System
RVR	Runway Visual Range
R/W	Runway
SSR	Secondary surveillance Radar
T/M	Technical Memorandum
UPS	Uninterruptible Power Supply System
VFR	Visual Flight Rule
VHF	Very High Frequency
VOR	VHF Omni-directional Range
W	Watt
WAM	Wide Area Multi-lateration
WTO	The World Trade Organization

CHAPTER 1
Background of the Project

Chapter 1 Background of the Project

1-1 Background of Request for Grant Aid

The air transport demand is expected to increase in the future. Air navigation equipment are necessary to be upgraded because such cases when aircrafts are not able to land due to low visibility as caused by dense fog, which usually happens in winter. The airport firefighting vehicles are aged and do not fully satisfy the ICAO requirements. The shortage of ground support equipment and security equipment may cause problems affecting on-time and safe operations of aircraft.

Implementation and upgrading of the air navigation equipment and ground support equipment is an urgent problem for MIA. Under such conditions, the Kyrgyz government requested Japan for grant aid assistance. The equipment which the Kyrgyz government requested are as listed in Table 1.2.1.

Table 1-1.1 List of Requested Equipment

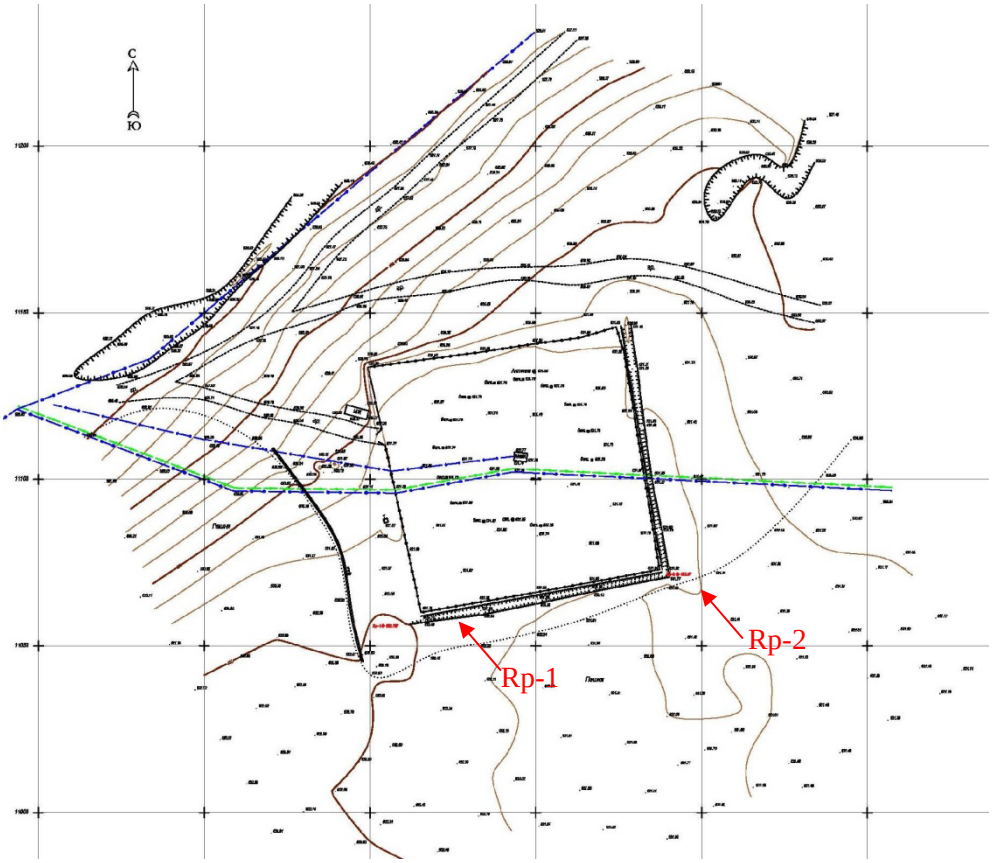
Category	Equipment	No.
Air Navigation Facilities	Instrument Landing System (ILS)	2
	VHF Omnidirectional Range / Distance Measuring Equipment (VOR/DME)	1
Airport Firefighting Vehicle	Aircraft Rescue and Firefighting Vehicle	2
	Airport Runway Sweepers for Snow Removal	2
	Airport Runway Snow Blower	2
	Aircraft Bulk Cargo and Container High Loader	2
	Aircraft Tow Tractor	2
	Aircraft Air Start Unit	1
	Aircraft Lavatory Service Truck	2
	Aircraft Water Service Truck	2
	Baggage Carts	8
	Aircraft Ground Power Unit	2
	Aircraft Air Conditioning Unit	2
	Passenger Stair	2
	Container Dollies	8
	Aircraft De/Anti-Icing Vehicle	2
	Belt Loaders (for Loading and Unloading of Baggage)	2
	Tow tractor (Power Hybrid Type) for Baggage Carts and Container Dollies	4
Airport Security Equipment	Airport Security Baggage X-Ray Units	4
	Airport Security Walk-Through Metal Detectors	4

Source: JICA Study Team

1-2 Natural Condition

(1) Topological Conditions

To confirm the topological conditions around the VOR installation area, plane surveying and spot survey were conducted to know the altitude. The existing VOR area is gently sloping and its altitude is from 631 m to 632 m above sea level. Rp-1 and Rp-2 are temporary benchmarks which are installed at the south boundary.



Source：JICA Study Team

Figure 1-2.1 Survey Location

(2) Geotechnical conditions

To know the geotechnical conditions around the VOR installation area, the following surveys were conducted at the site and laboratory:

- ✈ Core boring：20 m (one place)
- ✈ Standard penetration test：20 samples

- ✈ Laboratory test (natural moisture content, liquid limit, plastic limit, fine content, specific gravity)：20 samples

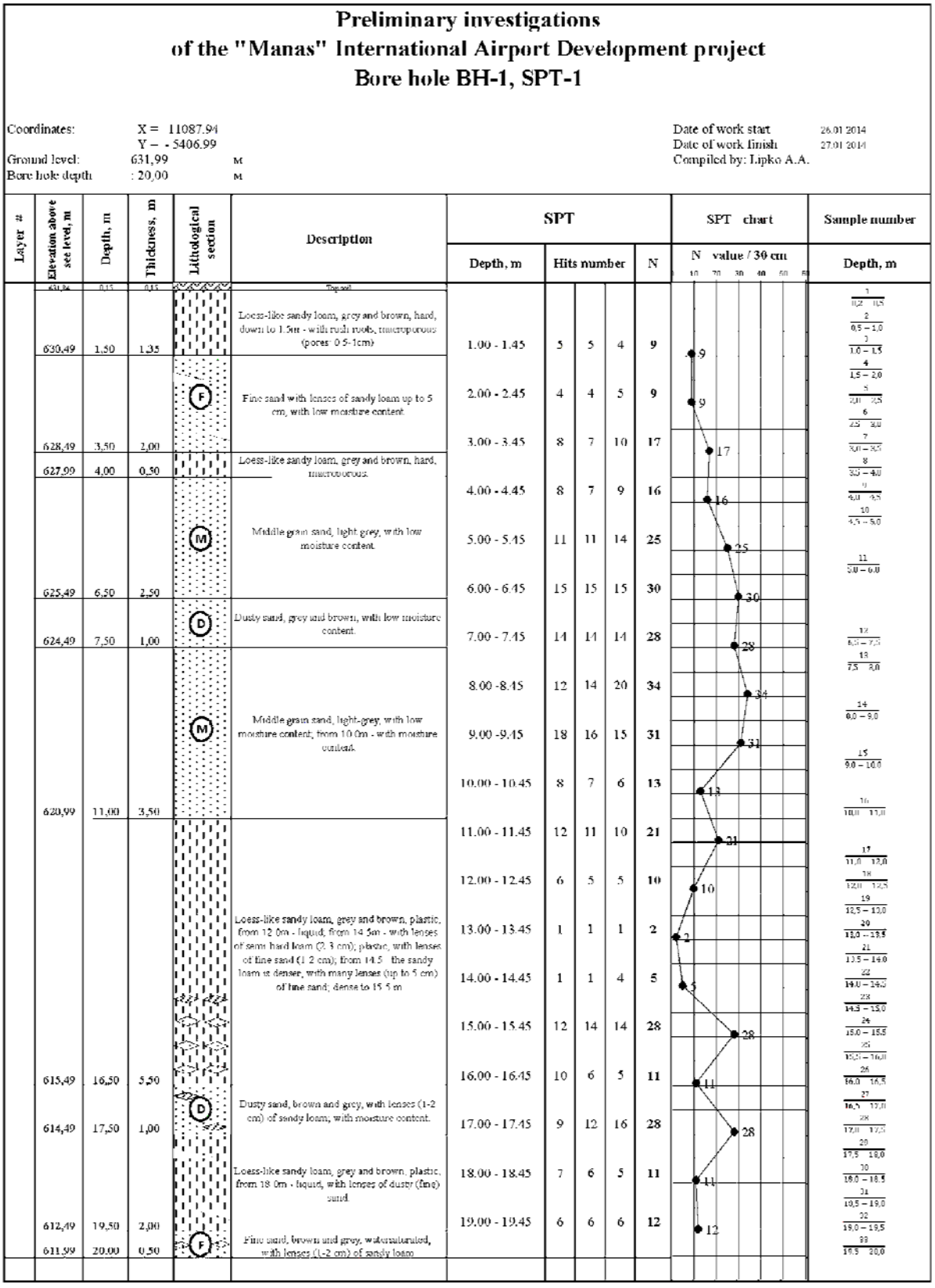
1) Results of the Survey

The results of boring are shown in Figure 1-2.2. The site has sandwich ground of loam and sand layer. There is a loam layer at 1.5 m of depth. Below the loam layer is a sand layer from 1.5 m to 11.0 m. This sand layer consists of fine sand, dusty sand, and medium-grained sand. The N value is from 9 to 34. It is hard enough to bear the foundation of the air navigation facilities. Groundwater was found from 13 m to 14 m depth. But this does not affect the design of the VOR/DME foundation.

Table 1-2.1 Physical Properties of Each Layer

Layer		Loam (Upper)	Loam (Lower)	Dusty sand	Fine sand	Medium-grained sand
Natural Moisture Content Wn (%)	Minimum	1.8	15.6	1.5	1.1	0.8
	Maximum	9.1	22.8	16.0	17.0	3.4
	Average	4.9	18.6	10.9	4.6	2.2
Liquid Limit W_L (%)	Minimum	17.1	16.3	N.P.	N.P.	N.P.
	Maximum	21.6	20.0	N.P.	N.P.	N.P.
	Average	19.3	18.3	N.P.	N.P.	N.P.
Plastic Limit W_P (%)	Minimum	13.3	13.2	N.P.	N.P.	N.P.
	Maximum	15.7	16.0	N.P.	N.P.	N.P.
	Average	14.5	14.6	N.P.	N.P.	N.P.
Fine Content (<0.1 mm) (%)	Minimum	100.0	100.0	28.7	10.6	5.8
	Maximum	100.0	100.0	40.0	21.0	15.4
	Average	100.0	100.0	35.9	15.0	12.5
Specific Gravity Gs	Minimum	2.67	2.66	2.67	2.65	2.64
	Maximum	2.70	2.69	2.68	2.68	2.66
	Average	2.68	2.67	2.67	2.66	2.65

Source：JICA Study Team



Preliminary investigations
of the "Manas" International Airport Development project
Bore hole BH-1, SPT-1

Coordinates: X = 11087.94
Y = - 5406.99
Ground level: 631,99 м
Bore hole depth : 20,00 м

Date of work start 26.01.2014
Date of work finish 27.01.2014
Compiled by: Lipko A.A.

Layer #	Elevation above see level, m	Depth, m	Thickness, m	Lithological section	Description	SPT Depth, m	SPT Hits number			SPT N	SPT chart N value / 30 cm	Sample number Depth, m
	631,84	0,15	0,15		Top soil							
	630,49	1,50	1,35		Loess-like sandy loam, grey and brown, hard, down to 1.5m - with rush roots, microporous (pores 0.5-1cm)	1.00 - 1.45	5	5	4	9	9	1 0,2 – 0,5; 2 0,5 – 1,0; 3 1,0 – 1,5; 4 1,5 – 2,0; 5 2,0 – 2,5; 6 2,5 – 3,0; 7 3,0 – 3,5; 8 3,5 – 4,0; 9 4,0 – 4,5; 10 4,5 – 5,0; 11 5,0 – 6,0
				F	Fine sand with lenses of sandy loam up to 5 cm, with low moisture content.	2.00 - 2.45	4	4	5	9	9	
	628,49	3,50	2,00			3.00 - 3.45	8	7	10	17	17	
	627,99	4,00	0,50		Loess-like sandy loam, grey and brown, hard, microporous.	4.00 - 4.45	8	7	9	16	16	
				M	Middle grain sand, light grey, with low moisture content.	5.00 - 5.45	11	11	14	25	25	
	625,49	6,50	2,50			6.00 - 6.45	15	15	15	30	30	
				D	Dusty sand, grey and brown, with low moisture content.	7.00 - 7.45	14	14	14	28	28	12 6,5 – 7,5; 13 7,5 – 8,0
	624,49	7,50	1,00			8.00 -8.45	12	14	20	34	34	
				M	Middle grain sand, light-grey, with low moisture content; from 10.0m - with moisture content.	9.00 -9.45	18	16	15	31	31	14 8,0 – 9,0; 15 9,0 – 10,0
	620,99	11,00	3,50			10.00 - 10.45	8	7	6	13	13	16 10,0 – 11,0
						11.00 - 11.45	12	11	10	21	21	
						12.00 - 12.45	6	5	5	10	10	17 11,0 – 12,0; 18 12,0 – 12,5; 19 12,5 – 13,0
					Loess-like sandy loam, grey and brown, plastic, from 12.0m - liquid, from 14.5m - with lenses of semi hard loam (2-3 cm); plastic, with lenses of fine sand (1-2 cm); from 14.5 - the sandy loam is denser, with many lenses (up to 5 cm) of fine sand; dense to 15.5 m	13.00 - 13.45	1	1	1	2	2	20 13,0 – 13,5; 21 13,5 – 14,0; 22 14,0 – 14,5; 23 14,5 – 15,0; 24 15,0 – 15,5; 25 15,5 – 16,0
						14.00 - 14.45	1	1	4	5	5	
						15.00 - 15.45	12	14	14	28	28	
	615,49	16,50	5,50			16.00 - 16.45	10	6	5	11	11	26 16,0 – 16,5; 27 16,5 – 17,0; 28 17,0 – 17,5; 29 17,5 – 18,0; 30 18,0 – 18,5; 31 18,5 – 19,0; 32 19,0 – 19,5; 33 19,5 – 20,0
				D	Dusty sand, brown and grey, with lenses (1-2 cm) of sandy loam, with moisture content.	17.00 - 17.45	9	12	16	28	28	
	614,49	17,50	1,00			18.00 - 18.45	7	6	5	11	11	
					Loess-like sandy loam, grey and brown, plastic, from 18.0m - liquid, with lenses of dusty (fine) sand.	19.00 - 19.45	6	6	6	12	12	
	612,49	19,50	2,00									
	611,99	20,00	0,50	F	Fine sand, brown and grey, watersaturated, with lenses (1-2 cm) of sandy loam							

Source：JICA Study Team

Figure 1-2.2 Boring Log

1-3 Environmental Society Consideration

Because the project is likely to have minimal or little adverse impact on the environment and society taking into account the "Guidelines for Environmental and Social Considerations", the project is categorized as Category-C.

CHAPTER 2
Contents of the Project

Chapter 2 CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

(1) Overall Goals and Project Objectives

1) Overall Goals and Project Objectives

The Medium Term Development Program of the Kyrgyz Republic for 2012-14 states that the development and modernization of air navigation safety equipment will proceed rapidly. In the strategy of the Kyrgyz Republic Civil Aviation Development for 2013-2020, improvement of air transportation safety and airport security are set as one of the goals with an aim to ensure the sustainability of economic development of Kyrgyz through the effective development of the aviation sector. This project corresponds to those policies.

And Traffic infrastructure maintenance and reducing the disparity among the regions is designed by "Assistant policy to Kyrgyz". By "JICA country-by-country analysis to Kyrgyz" analyzed that "Implementation of Transportation" is the priority target too. Therefore, the project meets those analysis and policy.

2) Current condition and problem in the sector

Air transportation in Kyrgyz is almost occupied by MIA and OIA. MIA has 60% of International transport and 43% of domestics. MIA's passenger reaches 1.05 million for International and 320 thousand of domestic. Especially, International passengers have been increased more than 20past% past three years. Year 2013, it was more than double of year 2010.While it is expected that air traffic demand will be increased, their airport security equipments are aged. It is concerned that the influence to the safety and on-time flight

And Airport Fire fighting vehicles are eged and the total capacity are not satisfy the ICAO requirement.

3) Project goal

In the Project, appropriate equipment placement based on International Civil Aviation Organization (ICAO) standards and improvement of flight operation safety will be implemented to achieve the above goal.

(2) Outline of the project

It is expected to improve safety of landing and reliability of flights. The Project is to support the procurement of air navigation safety equipment, airport firefighting vehicles, and ground support equipment (GSE).

Site Map of the Project is shown as Figure 2-1.1.

2-2 Outline Design of Requested Japanese Assistance

2-2-1 Design Policy

(1) Air Navigation Safety Equipment

1) Basic Consideration

The objectives of procurement of air navigation safety equipment under the Project are to enhance safety and efficiency of air traffic and to maintain a low rate of flight cancellation and delay at MIA. In order to achieve such objectives, the design of the equipment is to be carried out based on the following basic considerations:

- Specifications of the instrument landing system (ILS), VHF omni directional radio range (VOR) and distance measuring equipment (DME) shall be prepared to meet relevant requirements of ICAO Annex 10 in terms of facility requirements, performance requirements, and electrical specifications.
- These types of air navigation safety equipment are being manufactured domestically by Toshiba and NEC, and internationally by Indra Nav (Norway), SELEX (Italy), and Thales (France and Germany). These manufacturers are competing with each other in terms of performance and price. In this study, it has been intended that the best among all the equipment systems, especially those that have easy operation and maintenance, shall be formulated taking into account the proposed equipment systems by Japanese and international manufacturers.
- The requests from the Kyrgyz side described in the Minutes of Discussion have been confirmed during the site survey through a Technical Memorandum, and the design policy proposed in this study shall be carried out accordingly.

2) Design Policy for the Natural Environment

Design for air navigation safety equipment should be carried out according to the architectural design standards established in Kyrgyzstan and considering natural environmental conditions such as earthquake (vibration), heavy wind (wind force), and weather (atmospheric temperature and humidity). In the case of design of commercial off-the-shelf products, the manufacturing company's design criteria are used.

3) Design Policy for Social and Economic Condition

The Project proposes the renewal of old equipment specifically the air navigation safety equipment. Social and economic factors such as lifestyle, history, cultural tradition, religion, and architectural style were not considered in the design policy.

4) Design Policy for Business Environment on Construction/Procurement

Air navigation safety equipment is critical aviation infrastructure that is common around the world. The equipment specifications to be provided under the Project shall meet the technical requirements specified in the ICAO standards.

5) Design Policy for Local Consultants and Contractors

Since the installation of equipment to be provided under the Project requires unskilled labor, skilled labor, and electrical engineers, it was decided to use a local electrical contractor. However, a local electrical contractor with specialization on air navigation safety equipment does not exist in Kyrgyzstan. However, field works for this Project comprise mainly of general construction such as foundation work, steel frame construction, equipment installation, and wiring.

It was planned that the local contractor shall be under the supervision of engineers dispatched from Japan.

6) Design Policy for Operation and Maintenance

The types of air navigation safety equipment to be procured under the Project are in principle similar to those currently operated and maintained in Kyrgyzstan. At MIA, the existing air navigation safety equipment is operated and maintained on a day-to-day basis without any problems. The operation and maintenance personnel are being subjected to refresher training as well as operational and technical training scheduled every year for the enhancement of their knowledge and maintenance of their technical capability regarding international standards. They also learn how to accommodate technical problems and to repair any deficiencies through on-the-job training (OJT). Considering these facts, it can be concluded that the current operation and maintenance personnel possess sufficient technical capability.

However, since the operation and maintenance of the new equipment will differ from the existing equipment, they shall plan an advisory for the initial operation of engineers that shall be dispatched from the manufacturing companies.

7) Design Policy of Equipment Grade

The equipment that will be procured for this Project shall be based on the specifications set by the ICAO standards. With regard to the standards related to quality and the environment, the specifications given by the architectural design standard established in Kyrgyzstan will be applied. For quality, in particular, any commercial off-the-shelf product should be utilized to reduce maintenance cost after the commencement of operations as it is a worldwide trend in air navigation safety equipment.

8) Method of Construction/Procurement and Work Scheduling

Careful consideration should be given when formulating the method of construction and work scheduling so that adverse impacts on airport operations and services are lessened, specifically by replacing the ILS for both runway directions.

The critical path of the Project should be decided based on the period of manufacture, transportation, adjustment, and testing. Delivery time of each system to the site should be adjusted so that the work on site is not crowded, and the procurement period is shortened.

(2) Fire Fighting Vehicle

1) Basic Consideration

The intended firefighting vehicles are used for the purpose of firefighting and rescue support for aircrafts.

The equipment procurement plan shall be developed based on the maintenance and management ability, and financial ability of the Kyrgyz side. It shall be suitable for the framework of airport firefighting in Kyrgyzstan as well. The basic policies are as follows:

- Only the necessary equipment shall be planned based on ICAO standards and world trends.
- The equipment procurement plan shall be conducted based on the condition of maintenance and procurement of spare parts in Kyrgyzstan.
- The equipment procurement plan shall be conducted based on the ability of the operator.

2) Design Policy for the Natural Environment

Firefighting vehicles shall be planned with sufficient consideration of natural environmental conditions like intense cold.

3) Design Policy for Social and Economic Condition

The Project proposes the renewal of old equipment like the firefighting vehicles. Social and economic factors such as lifestyle, history, cultural traditions, religion, and building styles were not considered in the design policy.

4) Design Policy for Business Environment on Construction/Procurement

No firefighting vehicle under the request is manufactured in Kyrgyzstan. Leading manufacturers of firefighting vehicles are located in Japan, Germany, Italy and the U.S. Procurement from one of these countries shall be considered as well.

5) Design Policy for Local Consultants and Contractors

There is no agency in Kyrgyzstan that deals with airport firefighting vehicles. Since these new items procured for the Project need to be highly maintained and managed, maintenance and management after procurement shall be conducted by a qualified agency from a neighboring country.

6) Design Policy for Operation and Maintenance

For the purpose of appropriate maintenance of airport firefighting vehicles to be procured, the trainings below shall be conducted by the manufacturer. Technical information as well as operation and maintenance/repair manuals shall be developed.

In addition, since few personnel speak English in the firefighting department, the vehicle operations manual shall be translated to Russian for new procurement.

- ✈ Operation method including outline of vehicles, operation order, and confirmation.
- ✈ Regular maintenance/repair method for cleaning, adjustments, and small damages.

7) Design Policy for Equipment Grade

The specifications of the procured security and firefighting equipment shall be satisfactory for ICAO standards. The equipment procurement plan shall be conducted in consideration of suitable specifications for each activity.

8) Method of Construction/Procurement and Work Scheduling

The vehicles to be procured are planned to be placed at the existing fire station. The plan shall be developed sufficiently with the Kyrgyz side and conducted without shutting down the firefighting activity.

(3) Ground Support Equipment (GSE)

1) Basic Consideration

The intended GSE are used for supporting safe aircraft operations in the time between landing and taking off.

The equipment procurement plan shall be developed based on the maintenance and management ability, and financial ability of the Kyrgyz side. It shall be suitable for the framework of airport ground support in Kyrgyz as well. The basic policies are as follows:

- ✈ Minimal and necessary equipment shall be planned based on ICAO standards and world trends.
- ✈ The equipment procurement plan shall be conducted based on the condition of maintenance and procurement of spare parts in Kyrgyzkl.
- ✈ The equipment procurement plan shall be conducted based on the ability of the operator.

2) Design Policy for the Natural Environment

GSE shall be planned with sufficient consideration of the natural environmental conditions like intense cold.

3) Design Policy for Social and Economic Conditions

The Project proposes the renewal of old equipment, specifically the ground support equipment. Social and economic factors such as lifestyle, history, cultural tradition, religion, and building styles, were not considered in the design policy.

4) Design Policy for Business Environment on Construction/Procurement

No GSE in the request is manufactured in Kyrgyzstan. Leading manufacturers of GSE are located in Japan and European countries. Procurement from one of these countries shall be considered as well.

5) Design Policy for Local Consultants and Contractors

There is no agency in Kyrgyzstan that deals with GSE. Since new GSE procured for the project need to be highly maintained and managed, maintenance and management after procurement shall be conducted by an agency from a neighboring country.

6) Design Policy for Operation and Maintenance

For the purpose of appropriate maintenance of GSE, the trainings below shall be conducted by the manufacturer. Technical information, operation, and maintenance/repair manuals shall be developed.

In addition, since few personnel speak English in the equipment department, equipment operation manuals shall be translated to Russian for new procurement.

- ✈ Operation method including outline of vehicles, operation order, and confirmation.
- ✈ Regular maintenance/repair method for cleaning, adjustments, and small damages.

7) Design Policy of Equipment Grade

The specifications of GSE to be procured shall be satisfactory for ICAO standards. The equipment procurement plan shall be conducted in consideration of suitable specifications for each activity.

8) Method of Construction/Procurement and Work Scheduling

The equipment to be procured are planned to be placed at the existing storage. The plan shall be developed sufficiently with the Kyrgyz side and conducted without shutting down the ground support activity.

2-2-2 Basic Plan (Equipment Plan)

(1) Whole Plan for Air Navigation Safety Equipment

1) Instrument Landing System (ILS)

a) Operational Category

ILS would enable approach and landing of aircrafts under low visibility conditions by providing aircraft navigational guidance with high accuracy. ILS operational categories for approach and landing are defined in the "ICAO MANUAL OF ALL WEATHER OPERATIONS" as shown below.

Table 2-2.1 ILS Operational Category

Category	Level of Precision Approach
Category I	A precision instrument approach and landing with a decision height (DH[1]) not lower than 60 M (200 ft) and with either a visibility not less than 800 M , or a runway visual range (RVR[2]) not less than 550 M.
Category II	A precision instrument approach and landing with a DH lower than 60 M (200 ft) but not lower than 30 M (100 ft), and a RVR not less than 350 M.
Category III A	A precision instrument approach and landing with: a) A DH lower than 30 M (100 ft), or no DH; and b) A RVR not less than 200 M
Category III B	A precision instrument approach and landing with: a) A DH lower than 15 M (50 ft), or no DH; and b) A RVR less than 200 M but not less than 50 M
Category III C	A precision instrument approach and landing with no DH and no RVR limitation.

Source: JICA Study Team

The current ILS operational category at MIA is category II (decision height of lower than 200 ft but not lower than 100 ft and runway visual range not less than 350 m). At MIA, weak westerly and easterly winds almost always prevail every month and ILS approaches are carried out in headwind conditions according to the wind direction. Occurrences of low visibility conditions due to fog from November to February necessitate ILS operational category II. In order to prevent the increase of aircraft flight cancellations and delays, it is at least necessary to maintain the current ILS category II for future operations.

Furthermore, low visibility conditions relevant to the ILS category III A occur during the winter season at MIA. In order to ensure continuous airport operations as well as safe and punctual scheduled aircraft operations thus accommodating the increasing future air traffic demand, upgrading of ILS category to category III A may need to be taken into account. Japanese and international manufacturers produce two types of ILS equipment which meet the requirements of category I as well as those of categories II and III, and introduction of the

[1] DH (Decision Height): A specified height at which a missed approach must be initiated during a precision approach if the required visual reference to continue the approach to land has not been established.
[2] RVR (Runway Visual Range) : In respect of a runway, means the maximum horizontal distance, as measured by an automated visual landing distance system and reported by an air traffic control unit for the direction of takeoff or landing, at which the runway, or the lights or markers delineating it, can be seen from a point above its center line at a height corresponding to the average eye of pilots at touchdown.

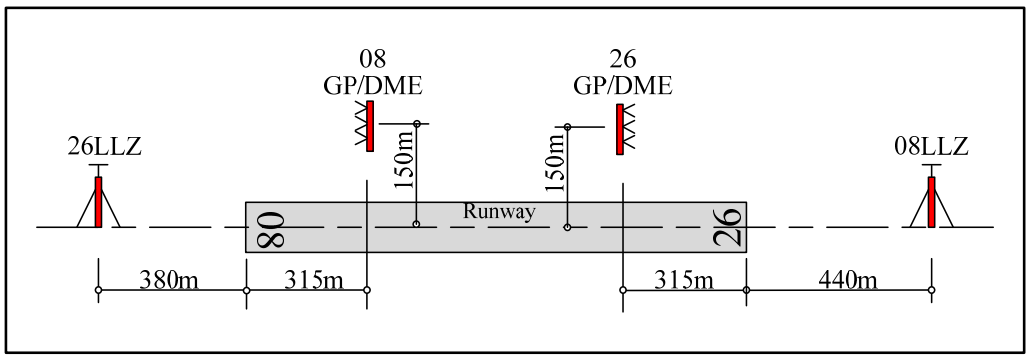
higher category equipment would enable the category III A operations. It is therefore considered appropriate to prepare the equipment specifications to meet category III A requirements.

b) Equipment Configuration

ILS normally consists of a localizer (LLZ) for providing azimuth guidance and a glide path (GP) for providing vertical guidance as well as a set of marker beacons or a distance measuring equipment (DME) for providing distance information. It is common practice around the world to utilize DME instead of a marker beacon due to economic, operational, and maintenance reasons. The Kyrgyz side also requested in its letter a grant aid in order to procure DME instead of beacons; therefore, DME should be chosen as a tool for providing distance information.

c) Locations for Installation of Equipment

The existing locations of ILS equipment are within the allowable ranges specified in ICAO Annex 10 and by relevant aviation authorities. Therefore, the new equipment should be installed at the existing locations.



Source: JICA Study Team

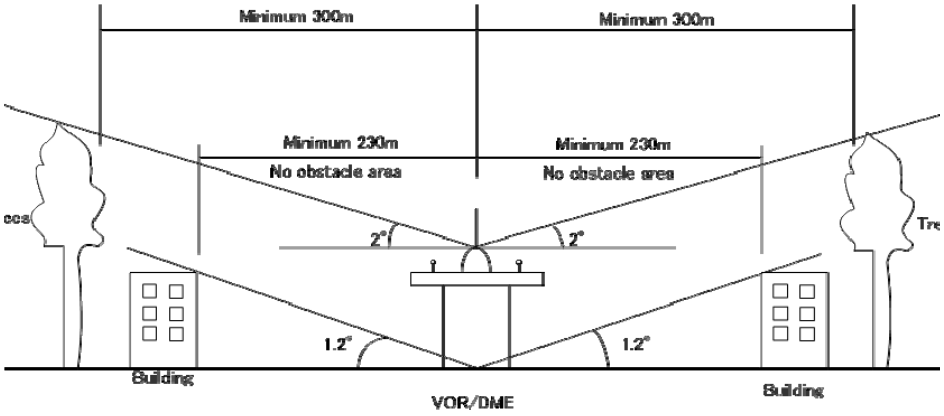
Figure 2-2.1 Location of ILS facility

2) VHF Omni directional Range／Distance Measuring Equipment (VOR/DME)

VOR/DME is to provide direction and distance information to flying aircrafts. The existing VOR/DME is located approximately 1.5 km on the extended runway centerline from runway 26 (RWY 26) threshold. The site is a 70 m x 80 m square lot located outside of the airport property which was purchased from a landowner. It is considered preferable to install new VOR/DME at the existing site so that change of the aircraft approach procedures as well as land acquisition should not be required.

There are two types of VOR systems, namely, conventional type and Doppler type. The existing one is of a conventional type. In the case of this type of VOR, signals tend to be adversely affected by the surrounding topographic conditions and structures that cause downgraded directional guidance. However, according to ICAO, there are neither building structures nor trees listed as potential causes of interference to the VOR signal near the existing VOR/DME site. No error in directional guidance has been detected by flight check in all airspaces at present. Therefore, it can be concluded that the conventional type VOR can meet operational requirements and the same type will be procured and installed under the Project.

The VOR surrounding condition, which is specified in the separation between VOR, trees, and buildings for ideal performance of VOR radio propagation, is shown in Figure 2-2.2.



Source: JICA Study Team

Figure 2-2.2 VOR Surrounding Condition

(2) Equipment Design for Air Navigation Safety Equipment

1) Instrument Landing System (ILS)

Major equipment configuration and installation location for ILS are described below.

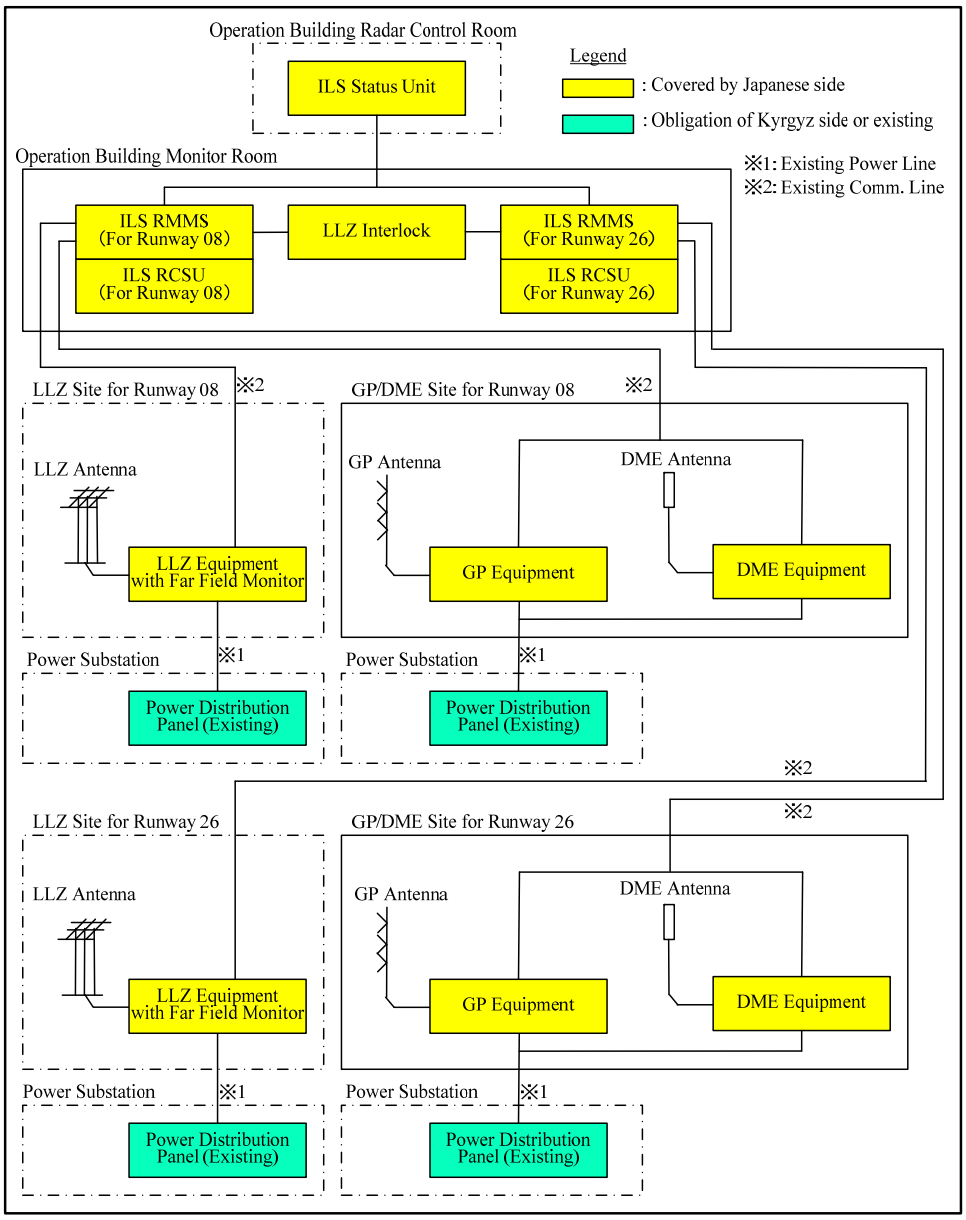
Table 2-2.2 List of Major Equipment for ILS

Place	Name of Equipment	Q'ty	Remarks
Localizer site (Runway 08, 26)	Localizer Equipment	2 sets	2-frequency type, hot-standby
	Localizer Antenna with monitor antenna	2 sets	16 or 20 elements
	Localizer Far Field Monitor	2 sets	
	Wireless System (radio link)	2 sets	
	DC Power Supply Equipment with batteries	2 sets	
	Automatic Voltage Regulator	2 sets	5kVA
	Equipment Shelter (metallic shelter)	2 sets	With air conditioners, power supply panel
GP/DME site (Runway 08, 26)	GP Equipment	2 sets	2-frequency type, hot-standby
	GP Antenna with monitor antenna	2 sets	3 elements
	DME Equipment	2 sets	100W, hot-standby
	DME Antenna	2 sets	
	Wireless System (radio link)	2 sets	
	DC Power Supply Equipment with batteries	2 sets	
	Automatic Voltage Regulator	2 sets	5kVA
	Equipment Shelter (metallic shelter)	2 sets	With air conditioners, power supply panel
Operation Building Monitor Room	ILS Remote Maintenance Monitoring System	2 sets	
	Remote Control Status Unit (RCSU)	2 sets	
	Localizer Interlock System	1 set	
	Wireless System (radio link)	4 sets	
Operation Building Radar Control Room	ILS Status Unit	2 sets	

Source: JICA Study Team

The outline of ILS system diagram is as shown in Figure 2-2.3. Careful attention should be given to the following design and installation requirements:

- ✈ The existing antenna foundation and mast for the GP antenna, which are in structurally sound conditions and without significant damage, rust or crack upon inspection, should be utilized for installation of the new ILS equipment due to cost savings and schedule control reasons.
- ✈ As power supply and remote control communication lines are to be prepared by the Kyrgyz side, careful coordination is required for equipment cabling.
- ✈ ILS remote maintenance and monitoring system and remote control and status unit, as well as LLZ interlock system will be installed in the monitor room of the operations building. ILS status unit will be installed in the radar control room of the operations building. The spaces for the equipment and the power supply are to be undertaken by the Kyrgyz side. Careful coordination is required.



Source: JICA Study Team

Figure 2-2.3 ILS System Diagram

Major equipment specifications of ILS are shown below.

1. System Configuration:
The configuration of Instrument Landing System (ILS) is as follows.
(1) Localizer (LLZ) – Category III : 2 set
(2) Glide Path (GP) – Category III : 2 set
(3) Distance Measuring Equipment (DME) : 2 set
(4) Far Field Monitor (FFM) : 2 set
(5) Remote Control & Monitoring System : 2 set
(6) Remote Control Wireless System : 4 pairs

2. Specifications:
The ILS complies with ICAO Annex 10. Facility performance is category III.
(1) LLZ
(a) Transmitter : Dual configuration (Two frequency system)
Frequency 111.7 MHz
(b) Dual configuration Monitors with Hot Stand-by Monitoring
(c) Remote control interface : RS232 or Ethernet
(d) DC power supply : Redundant configuration with battery
(e) Automatic Voltage Regulator : 5kVA or more
(f) Uninterruptible power supply : Operable for over 3 hours, DC 24V lead-acid
(g) Battery
(2) Glide Path
(a) Transmitter : Dual configuration (Two frequency system)
Frequency 333.5 MHz
(b) Dual configuration Monitors with Hot Stand-by Monitoring
(c) Remote control interface : RS232 or Ethernet
(d) DC power supply : Redundant configuration with battery
(e) Automatic Voltage Regulator : 5kVA or more
(f) Uninterruptible power supply : Operable for over 3 hours, DC 24V lead-acid
(g) battery
(3) DME
1) Transponder : Dual configuration
: Output Power 100W
: Channel : 54X
2) Monitor : Dual configuration
3) Remote control interface : RS232 or Ethernet
4) DC power supply : Redundant configuration with battery
(4) Far Field Monitor System (FFMS)
1) FFMS shall monitor LLZ radiated signal in its operational environment at critical point in the final approach.
(5) Remote Control & Status Unit (RCSU)
1) Monitoring functions
(a) Transmitter ON/OFF status (b) Remote Control line alarm
(c) Total monitor alarm status (d) Buzzer stop status
(e) AC commercial power failure (f) Power ON/OFF status
(g) Battery voltage alarm (h) Others
2) Control functions
(a) Transmitter ON/OFF
(b) Buzzer stop
(c) Power ON/OFF
(d) Others
(6) Remote Control Wireless System
1) Frequency : 5 GHz band or proposed
2) Channel Spacing : Configurable on 5 MHz increments or proposed
3) Interface : Ethernet 10/100 Base T or RS232
4) Max. range : Base unit 5km

Source: JICA Study Team

2) VHF Omnidirectional Range／Distance Measuring Equipment (VOR/DME)

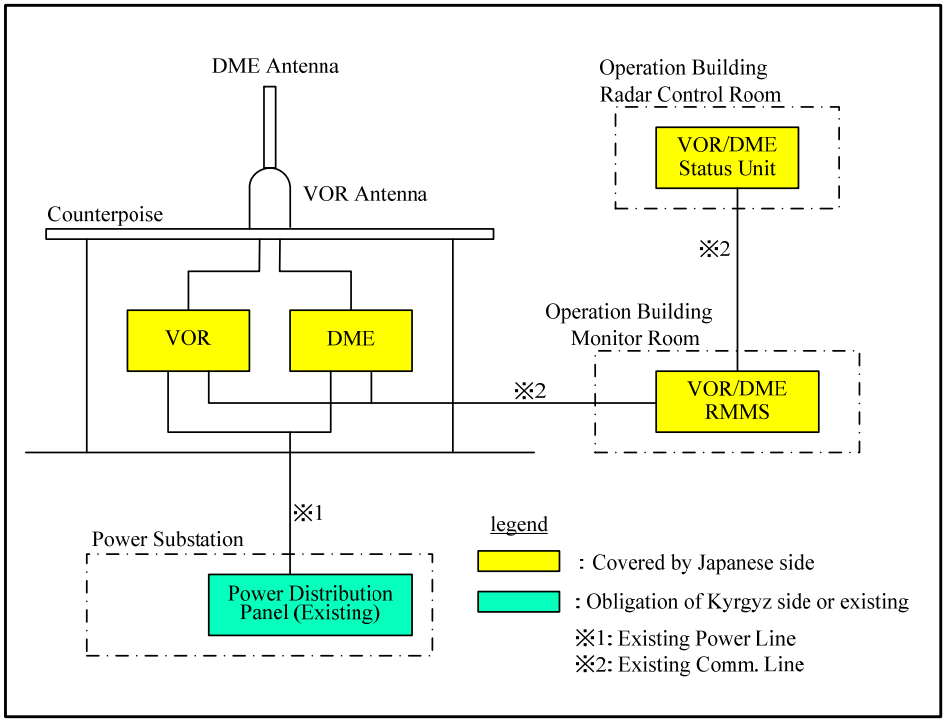
Major equipment configuration and installation location for VOR/DME are described in Table 2-2.3.

Table 2-2.3 List of Major Equipment for VOR/DME

Place	Name of Equipment	Q'ty	Remarks
VOR/DME site	VOR Equipment	1 set	
	VOR Antenna	1 set	
	DME Equipment	1 set	
	DME Antenna	1 set	
	DC Power Supply Equipment with batteries	1 set	
	Automatic Voltage Regulator	1 set	5kVA
	Equipment shelter with counterpoise	1 set	With air conditioners, power supply panel
Operation Building Monitor Room	VOR/DME Remote Maintenance Monitoring System	1 set	
	Remote Control Status Unit (RCSU)	1 set	
Operation Building Radar Control Room	VOR/DME Status Unit	1 set	

Source: JICA Study Team

The outline of VOR/DME system diagram is as shown below.



Source: JICA Study Team

Figure 2-2.4 VOR/DME System Diagram

Careful attention should be given to the following design and installation requirements:

- ✈ The power supply and remote control communication lines are to be prepared by the Kyrgyz side. Careful coordination is required for equipment cabling.
- ✈ VOR/DME remote maintenance and monitoring system will be installed in the monitor room

of the operations building. A VOR/DME status unit will be installed in the radar control room of the operations building. The spaces for the equipment and the power supply are to be undertaken by the Kyrgyz side. Careful coordination is required.

Major equipment specifications of VOR/DME are shown below;

1. System Configuration:
The configuration of VHF Omni-directional Radio Range and Distance Measuring Equipmen (VOR/DME) is as follows.
(1)VHF Omni-directional Radio Range (VOR) : 1 set
(2)Distance Measuring Equipment (DME) : 1 set
(3)Remote Control & Monitoring System : 1 set

2. Specifications:
The VOR/DME complies with ICAO Annex 10. VOR performance is Conventional type.
(1) VOR
1) Transmitter : Dual configuration
: Output Power 100W
: Frequency 113.4 MHz
2) Monitor : Dual configuration
3) Remote control interface : Dedicated line via modem, RS232
4) DC power supply : Redundant configuration with battery provides
5) more than 6.0 hours of operation.
6) Automatic Voltage Regulator : 5kVA or more
(2) DME
1) Transponder : Dual configuration
: Output Power 1kW
: Channel : 81X
2) Monitor : Dual configuration
3) Remote control interface : Dedicated line via modem, RS232
4) DC power supply : Redundant configuration with battery provides more than 6.0 hours of operation.
(3) Remote Control & Status Unit (RCSU)
1) Monitoring functions
(a) Transmitter ON/OFF status (b) Remote Control line alarm
(c) Total monitor alarm status (d) Buzzer stop status
(e) AC commercial power failure (f) Power ON/OFF status
(g) Battery voltage alarm (h) Others
2) Control functions
(a) Transmitter ON/OFF
(b) Buzzer stop
(c) Power ON/OFF
(d) Others

Source: JICA Study Team

(3) Fire Fighting Vehicles

The renewal of old airport firefighting vehicles shall be conducted to maintain the security standard set by ICAO. Currently, MIA owns six airport firefighting vehicles. These firefighting vehicles, excluding two that were procured in 2010, are more than 13 years old and can work

efficiently. Furthermore, 36,400 L of water is required as the total amount of water according to ICAO standards. However, two existing firefighting vehicles can hold only 24,400 L of water. The missing 12,000 L of water shall be ensured.

1) Criteria for Equipment Selection

Selection for firefighting vehicles shall be conducted based on the following:

- ✈ The equipment shall be adopted according to ICAO standards.
- ✈ The equipment shall be matched with fire-fighting activities.
- ✈ Maintenance of operation shall not be hard after the provision.

a) Airport Category

Airport category for rescue and firefighting is determined by the size (body length and width) of the largest equipment used in the airport. The largest equipment used in MIA is a B-747 freighter and airport category is nine. Since MIA is still operated as an airport under category 9, the plan in the Project shall be conducted with that premise.

b) Amount of Water

The size of the Fire Fighting Vehicle is decided by the water tank volume.In case of category 9, ICAO requirement is more then 3 vehicles with 36,400 L water in total with Level A agent. And by requirement of the ICAO Airport Sevice Manual, Fire Fighting vehicle which has water tank lager than 4,500L are requested to have performance as shown in Table 2-2.4.

Table 2-2.4 Existing two FireFighting vehicle and requirement for the planning Fire Fighiting Vehicle.

	ICAO requiremen (Category-9)	Vehicle 73	Vehicle 74	Planning
Water Volume (L)	36,400	12,200	12,200	Over 12,000
Discharge rate (L/min)	13,500	3,600	3,600	Over 6,300
Foarm Tank (kg)	-—	800	800	Over 720
Complementary agents	Powder 450 kg CO_2, 900 kg	CO_2, 80 L	CO_2, 80 L	Powder More than 250 kg

Source: JICA Study Team

Table 2-2.5 Performance requirement

Spec	requirement
Monitor	Required
Handlines	Required
Under truck nozzles	Required
Accelation	80km/h within 40s
Top speed	At least100km/h
All whieel drive capability	Required
Automatic or semi-aoutomatic transmission	Required
Single rear wheel configuration	Required
Minimum angle of approach and depature	30 degree
Minimun angle of tilt (staic)	28 degree

Source：ICAO Airport Service Manual

c) Chemical Fire Extinguishing Agent

An 800 kg of chemical fire extinguishing agent is mounted to the two existing firefighting vehicles. These firefighting vehicles to be procured in the Project shall be mounted, which is satisfactory according to ICAO standards.

d) Equipment to be mounted to the Firefighting Vehicles

The equipment to be mounted to the firefighting vehicles shall be procured based on ICAO standards.

e) Spare Parts

Spare parts for Fire Fighting Vehicle are to be by Kyrgyz side, but manufacturer will supply spaerparts during liabirity term; 1 year after pecocurement.

2) Equipment Procurement Plan

The specifications of equipment to be procured in the Project are as shown in Table 2-2.6 and Equipment to be mounted to Fire-fighting Vehicle are as shown in Table 2-2.7.

Table 2-2.6 Outline of Specification of fire-fighting vehicle

Item	Specification	Amount
Airport fire-fighting vehicle	Aproaching angle 30 degree Working angle 30 degree 0-80km/h Acceleration Less than 40 seconds Brake performance 32-0 km/ｈ Less than 12m, 64-0 km/ｈ Less than 46m Seating capacity More than 3 persons Water tank More than 12,000L Foam tank More than 720L Chassis 6 x 6 All-wheel drive Transmission Automatic Tires 16R20 or the same level Engine More than 700HP Water pump capacity More than 6,000L/min Dual output roof monitor 4,500L/min Operating pressure More than 13Bar Range straight stream full output More than 70m Flow of bumper turret More than 1,000L/min Range, straight stream More than 40m Under truck protection nozzles More than 40L/min 6 units Side lines More than 450L/min More than 65mm x 30m Hose More than 120L/min More than 25～32mm x 30m Powder unit capacity 250kg 1 unit Hose reel attached	1
Equipment to be mounted to fire-fighting vehicle (ICAO standard)	Described in Table 2-2.7	1

Source: JICA Study Team

Table 2-2.7 Equipment to be mounted to Fire-fighting Vehicle (ICAO Standard)

No.	Item	Amount	Use
1	Adjustable wrench	1	General tool, to maintenance.
2	Axe, large type	1	Fire fighting and rescue: destroying obstacles to carve out for approach path.
3	Axe, small type	4	Fire fighting and rescue: destroying obstacles to carve out for approach path.
4	Cutter bolt (61cm)	1	Cutting bolt steel wire and reinforcing steel
5	Crowbar (95cm)	1	Fire fighting and rescue: destroying obstacles to carve out for approach path.
6	Chisel (2.5 c m)	1	Destroying works.
7	Flashlight/hand lamp	8	Illumination
8	Hammer (1.8kg)	1	Fire fighting and rescue: destroying obstacles to carve out for approach path.
9	Hook (Grab or salving)	1	Pulling up object or person
10	Saw (Metal cutting, spare blades attached)	1	Cutting bolt steel wire and reinforcing steel
11	Blanket (Fire resisting)	3	Rescue and transportation of person who needs rescue
12	ladder (over-all length)	3	Moving to higher place
13	Rope (15m)	3	Various purpose for rescue
14	Rope (30m)	3	Various purpose for rescue
15	Pliers (Measurement:17.8cm)	1	General tool, to maintenance.
16	Pliers (Slip joint, 25cm)	1	General tool, to maintenance.
17	Screwdriver (Plus & minus)	1	General tool, to maintenance.
18	Snipers (Tin)	1	Fire fighting and rescue: destroying obstacles to carve out for approach path.
19	Chocks (Height: 60cm)	1	Tire chock
20	Powered rescue saw (dia:300mm)	2	Cutting bolt steel wire and reinforcing steel
21	Harness sutting tool	4	Cutting seat belt
22	Gloves (Flame resistant)	8	Secure rescue activity for fire-fighter
23	Breathing apparatus and apare cylinder	4	Fire-fighting and rescue activity with getting close to burning aircraft
24	Oxygen rebreather	1	Fire-fighting and rescue activity with getting close to burning aircraft (It gets empty after 20 to 30 minutes)
25	Forcing toos	1	Destroying concrete and cutting steel plate
26	Tarpaulin	3	Working in rainy weather
27	Fan for ventilation and cooling	3	Ventilation and cooling
28	Stretcher	2	Transportation of person who needs rescue
29	Fire-fighting clothing	-	Fire-fighting and rescue activity with getting close to burning aircraft (recorded as a separated item)
30	Medical first aid kit	-	Medical treatment for person who need rescue (Recipient country shall be bear the cost)

Source: JICA Study Team

(4) Ground Supprt Equipment

The requested equipments are confirmed and selected through the site survey and discussions based on the above basic policies. It is reasonable to procure the requested equipment

but additional study for the selection of each equipment has been conducted again in Japan including setting the selection standard.

1) Criteria for Equipment Selection

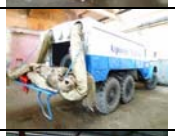
- ✈ The equipment shall be matched with fire-fighting activities..
- ✈ Maintenance of operations shall not be hard after the provision.
- ✈ The equipment shall not be specified for bidding (such as brand)

As a result of the study, reasonability of the requested equipment is realized but some equipment, including those with changed plans and those to be newly procured, need more careful study. The results of the study of these equipment are as shown below.

a) Equipment Procurement Plan

The comparison of the requested equipment with the equipment procurement plan is as shown in Table 2-2.8.

Table 2-2.8 Comparison the Request for Equipment Procurement to the Plan (GSE)

Requested equipment	Reference Photo	Requested amount	Planned amount
Airport Runway Sweepers for Snow Removal		2	2
Airport Runway Snow Blower		2	2
Aircraft De/Anti-Icing Vehicle		2	It is excluded because necessary number of vehicle is ensured.
Aircraft Bulk Cargo and Container High Loader		2	2
Aircraft Tow Tractor		2	1
Aircraft Air Conditioning Unit		2	2
Aircraft Air Start Unit (ASU)		1	1
Passenger Stair		2	It is excluded because necessary number of vehicle is ensured.

Requested equipment	Reference Photo	Requested amount	Planned amount
Aircraft Lavatory Service Truck		2	1
Aircraft Water Service Truck		2	2
Aircraft Ground Power Unit		2	2
Tow tractor (Power Hybrid Type) for Baggage Carts & Container dollies		4	5
Baggage Carts		8	13
Container Dollies		8	12
Belt loaders (for loading and unloading of baggage)		2	2
Airport Security Baggage X-Ray units		4	It is excluded because the airport has its own development plan.
Airport Security Walk-Through Metal Detectors		4	

Source: JICA Study Team

The equipment which is decided as necessary to the Project, although there is no equipment in the request, is as shown in Table 2-2.9.

Table 2-2.9 Equipment with Necessity of addition

Equipment	Reference Photo	Request	Planned amount
Glycol spraying vehicle		No	1

Source: JICA Study Team

The outline of the equipment planned to be developed in the Project is as shown in Table 2-2.10.

Table 2-2.10 GSE (Land-based use)

Requested equipment	Amount	Planned amount
Airport Runway Sweepers for Snow Removal	2	Widt of broom: 5m + snowplow
Airport Runway Snow Blower	2	Working speed: 40km/h and more, working width: 2m and more
Glycol spraying vehicle	1	Capacity of tank: 10KLclass, ability of spraying riquid and powder to the width of 27.5m

Source: JICA Study Team

Table 2-2.11 Equipment Lisy of GSE

Requested equipment	Amount	Planned amount
Lower deck Container /Pallet Loader	2	Compliant with IATA AHM 931. 7t / 14t capacity respectively
Self-propelled conveyor Belt Loader	2	Compliant with IATA AHM 925. Width of belt: 600mm
Aircraft Nose Gear Tow bar tractor	1	Compliant with IATA AHM 955. Weight of vehicle: 60t, GPU with the capacity of 90KVA attached
Aircraft Air Start Unit (ASU)	1	Compliant with IATA AHM 976. Suitable for 250PPM class
Aircraft Lavatory Service Truck	1	Compliant with IATA AHM 971 Self-propelled type mounting water tank with about 2,000L capacity
Aircraft Water Service Truck	2	Compliant with IATA AHM 970. Self-propelled type mounting water tank with about 3,000L capacity
Battery Powered Ramp Equipment Tractor	5	Compliant with IATA AHM 968. Diesel or Hybrid vehicle
Baggage Carts	13	Compliant with IATA AHM 963 Same size classes the existing equipment
Aircraft Ground Power Unit	2	Compliant with IATA AHM 972. Towing 180 KVA class, unnecessary for DC
Aircraft Air Conditioning Unit	2	Compliant with IATA AHM 974. Towing type air conditioner unit suitable for wide body type aircraft
Container Dollies	12	Compliant with IATA AHM 965. Capacity of weight: 1,600kg

Source: JICA Study Team

2-2-3 Outline Design Drawing

(1) Air Navigation Safety Equipment

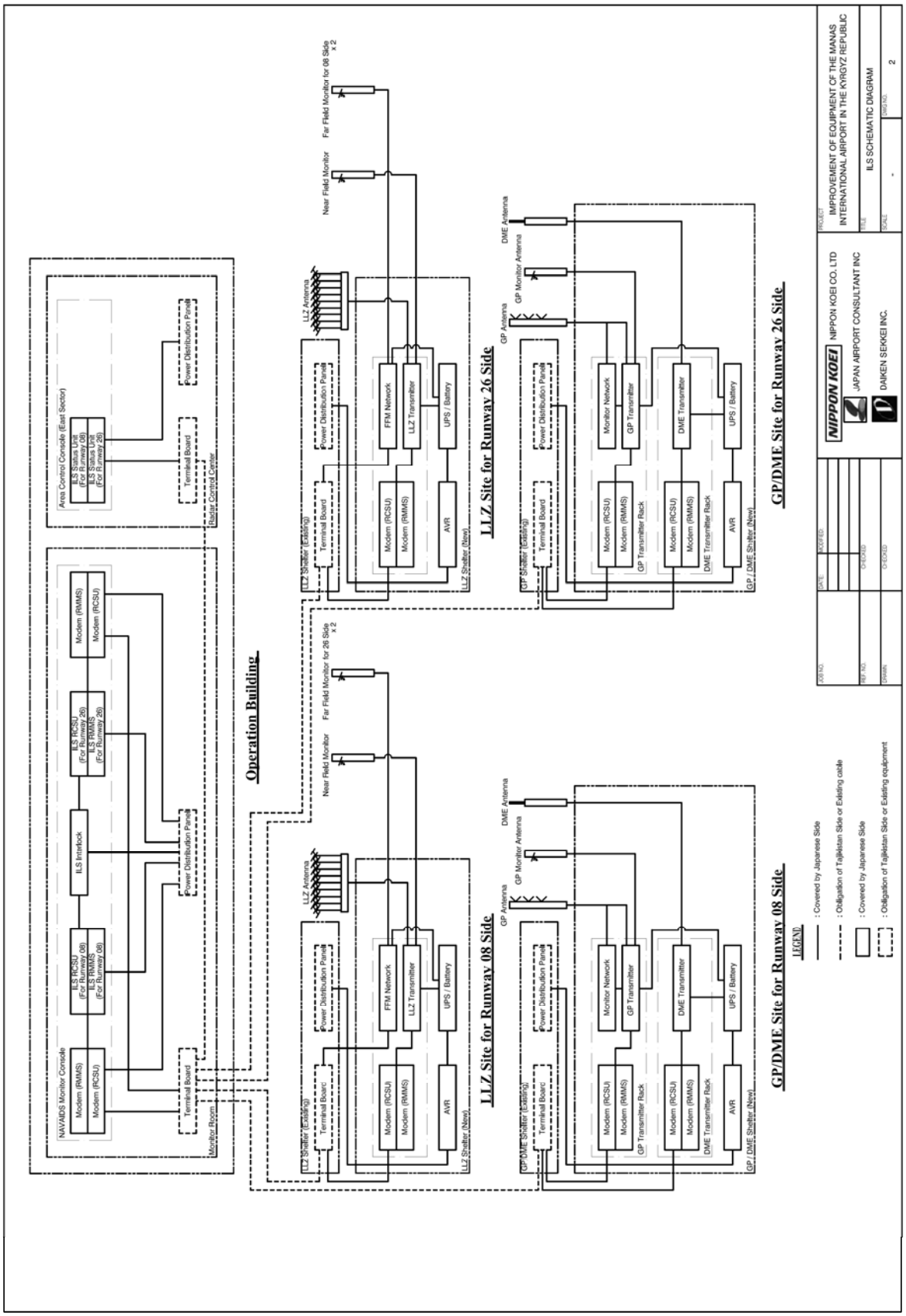
The outline design drawings for the air navigation safety equipment are shown in Table 2-2.12 and Figure 2-2.5 to Figure 2-2.19.

Table 2-2.12 List of Outline Design Drawing

No.	Sheet Contents
1	Location Map
2	ILS Schematic Diagram
3	LLZ Facility Layout Plan for Runway 08 Side
4	LLZ Facility Layout Plan for Runway 26 Side
5	LLZ Equipment Layout Plan
6	LLZ Antenna Layout Plan
7	GP and DME Facility Layout Plan for Runway 08 Side
8	GP and DME Facility Layout Plan for Runway 26 Side
9	GP and DME Equipment Layout Plan
10	GP and DME Antenna Layout Plan

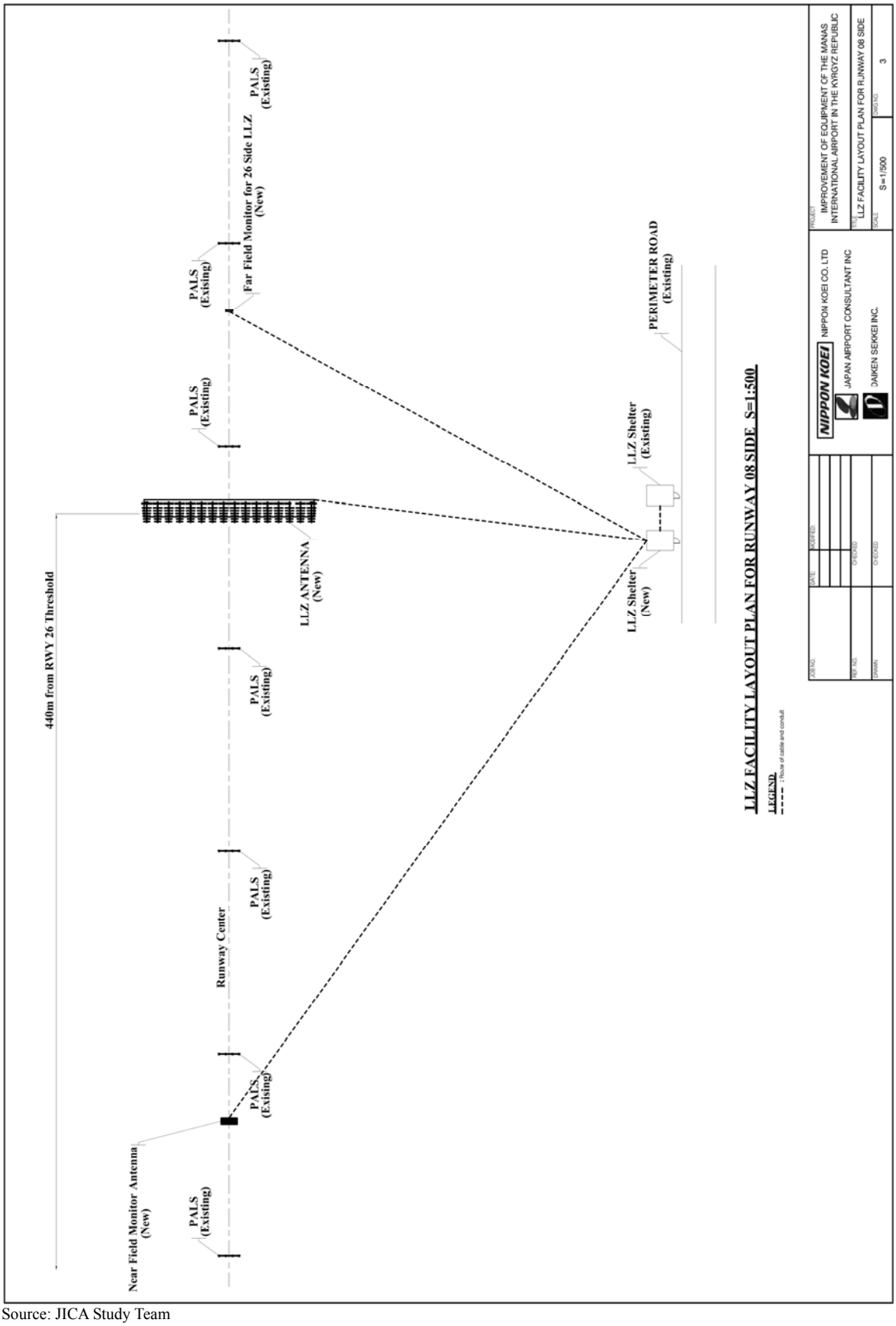
No.	Sheet Contents
11	RCSU and RMMS Equipment Layout Plan
12	ILS and VOR DME Status Monitor Layout Plan
13	VOR DME System Schematic Diagram
14	VOR DME Facilities Layout Plan
15	VOR DME Equipment Layout Plan

Source: JICA Study Team



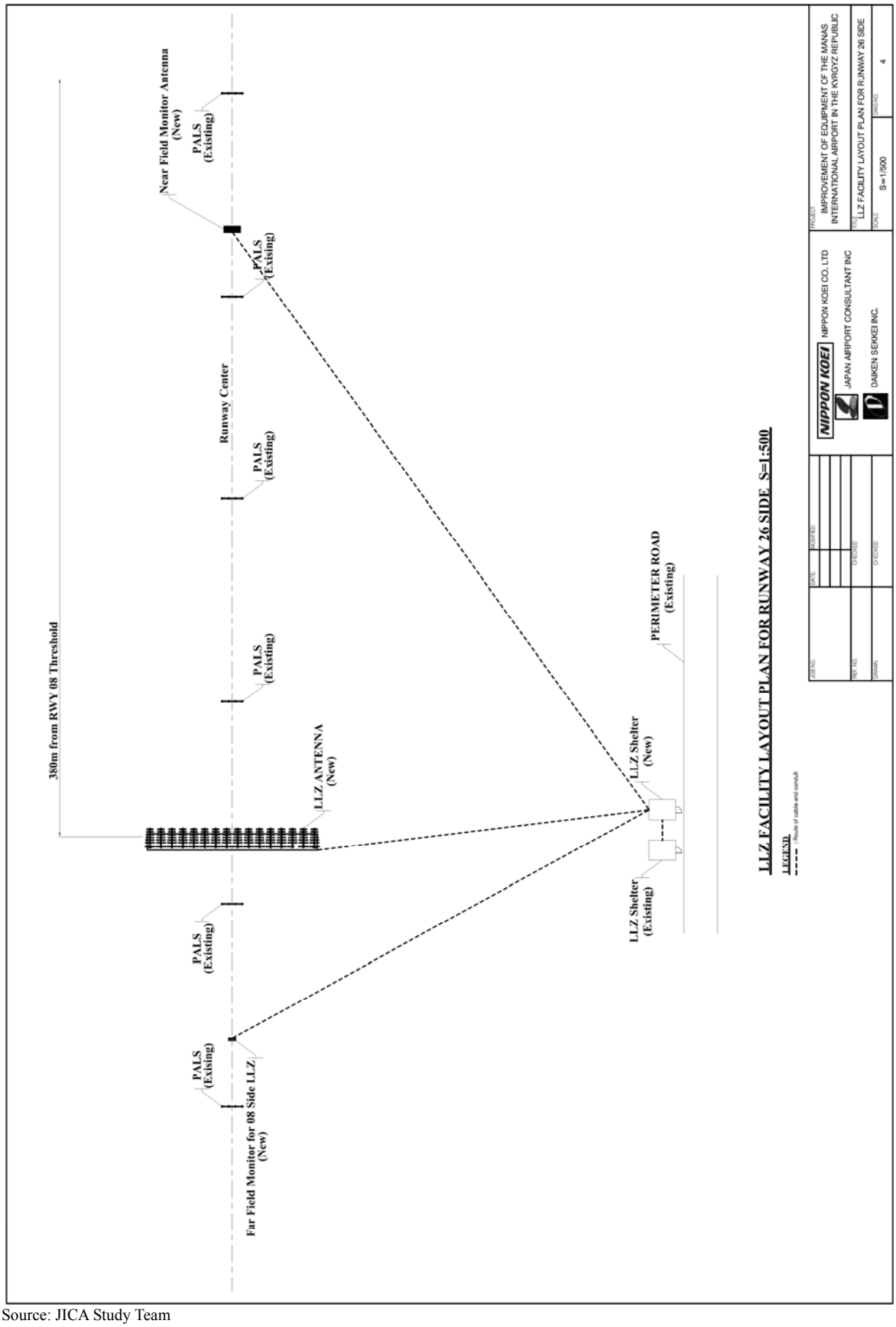
Source: JICA Study Team

Figure 2-2.6 ILS Schematic Diagram



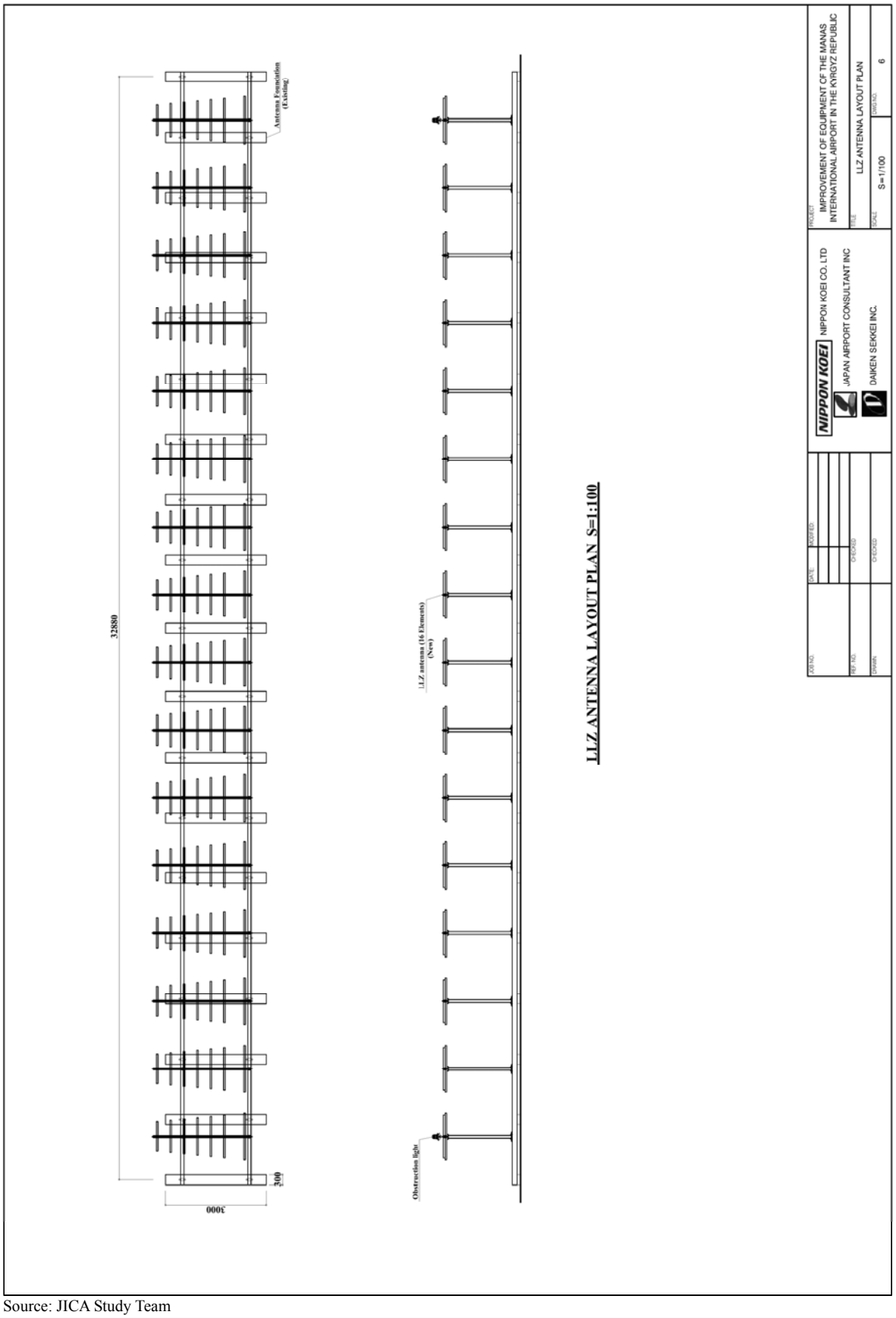
Source: JICA Study Team

Figure 2-2.7 LLZ Facility Layout Plan for Runway 08 Side



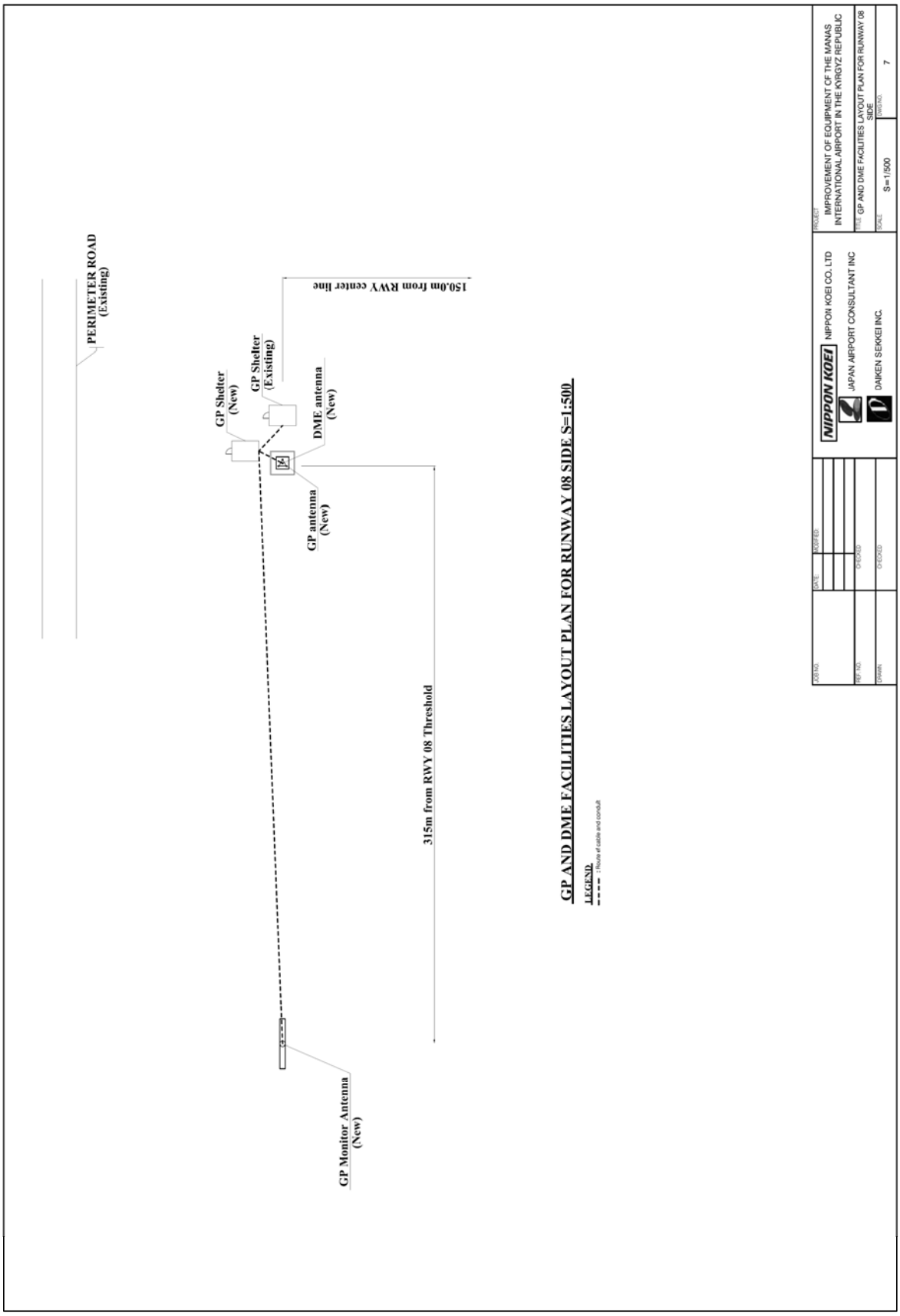
Source: JICA Study Team

Figure 2-2.8 LLZ Facility Layout Plan for Runway 26 Side



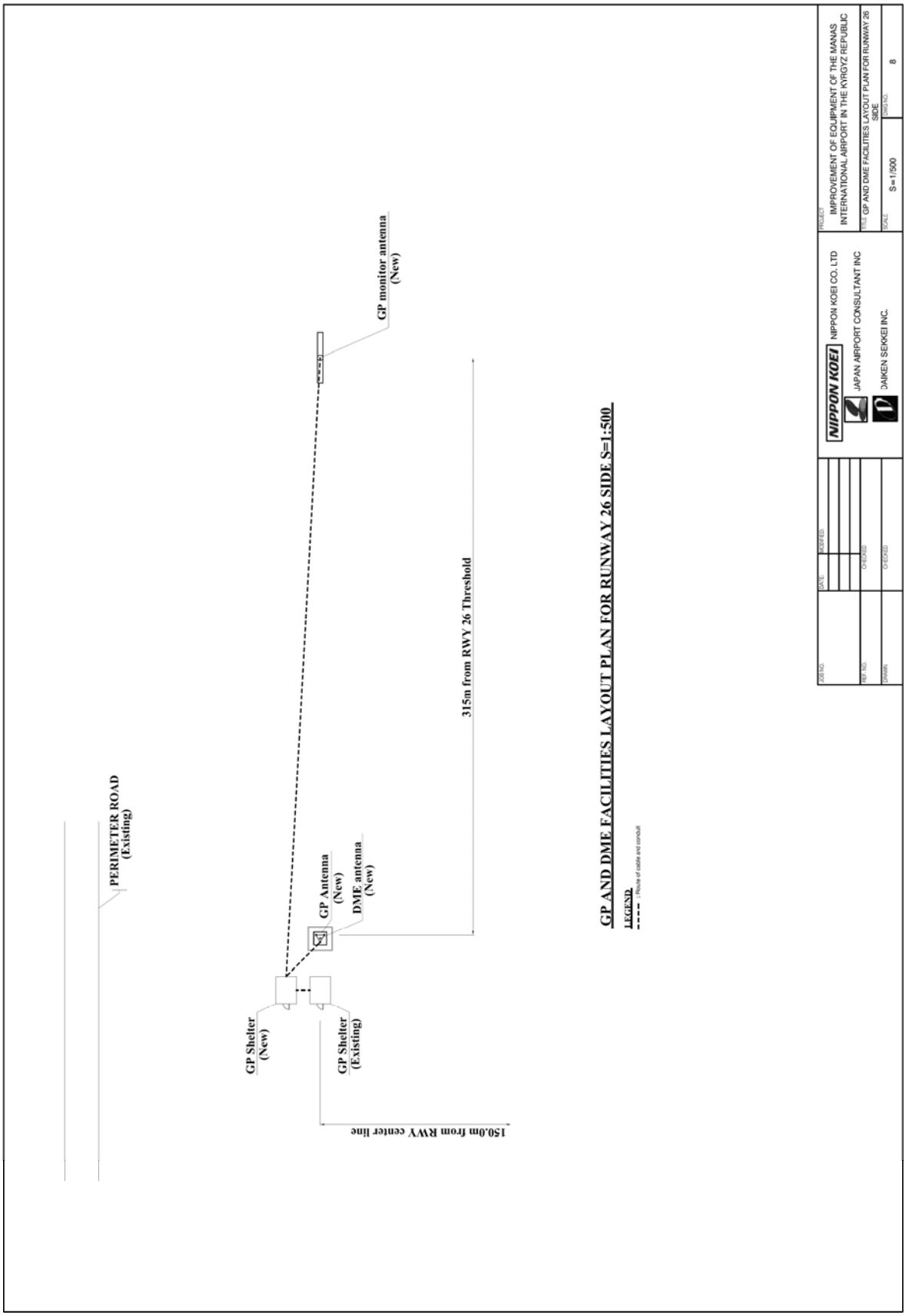
Source: JICA Study Team

Figure 2-2.10 LLZ Equipment Layout Plan



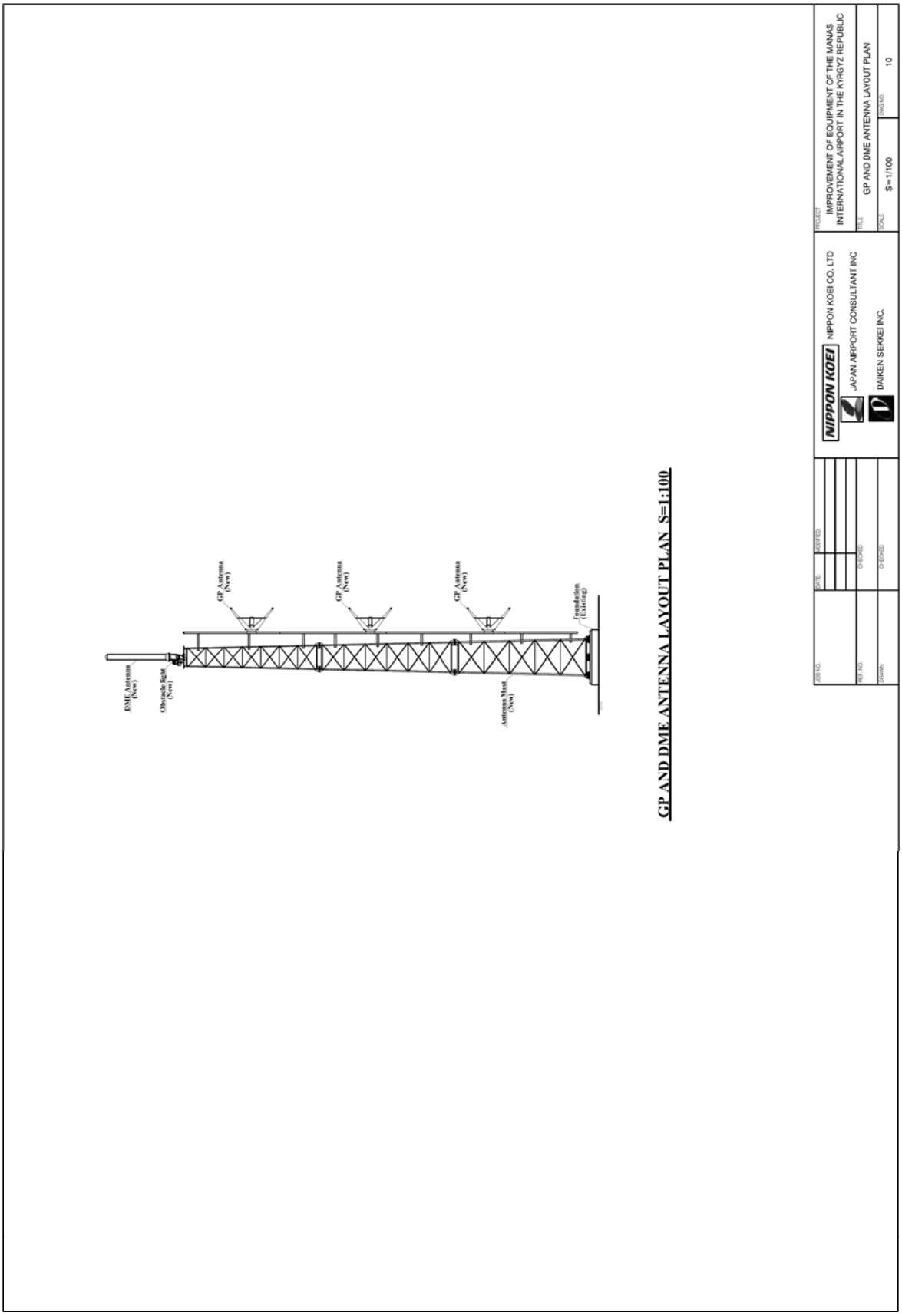
Source: JICA Study Team

Figure 2-2.11 GP and DME Facility Layout Plan for Runway 08 Side



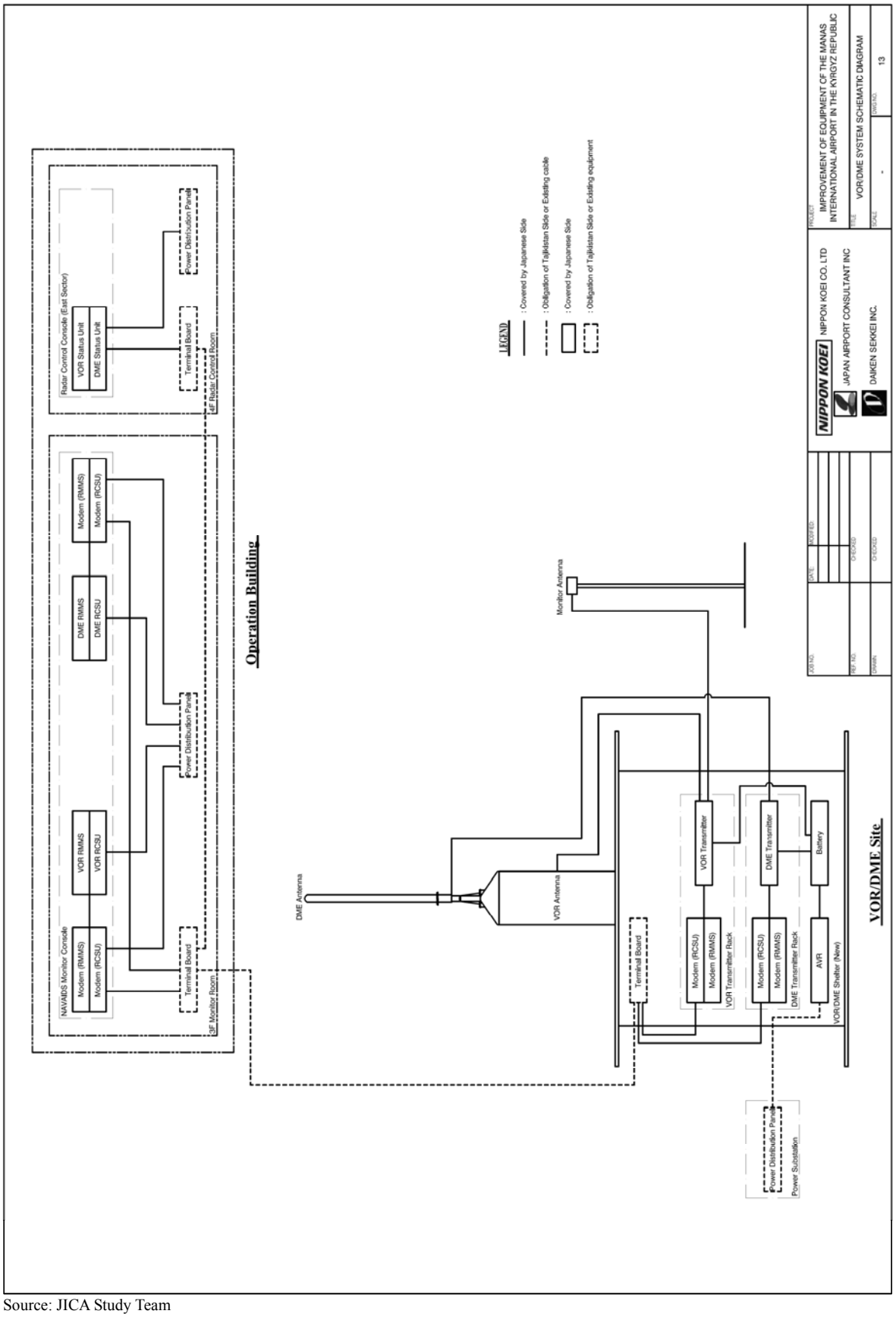
Source: JICA Study Team

Figure 2-2.12 GP and DME Facility Layout Plan for Runway 26 Side



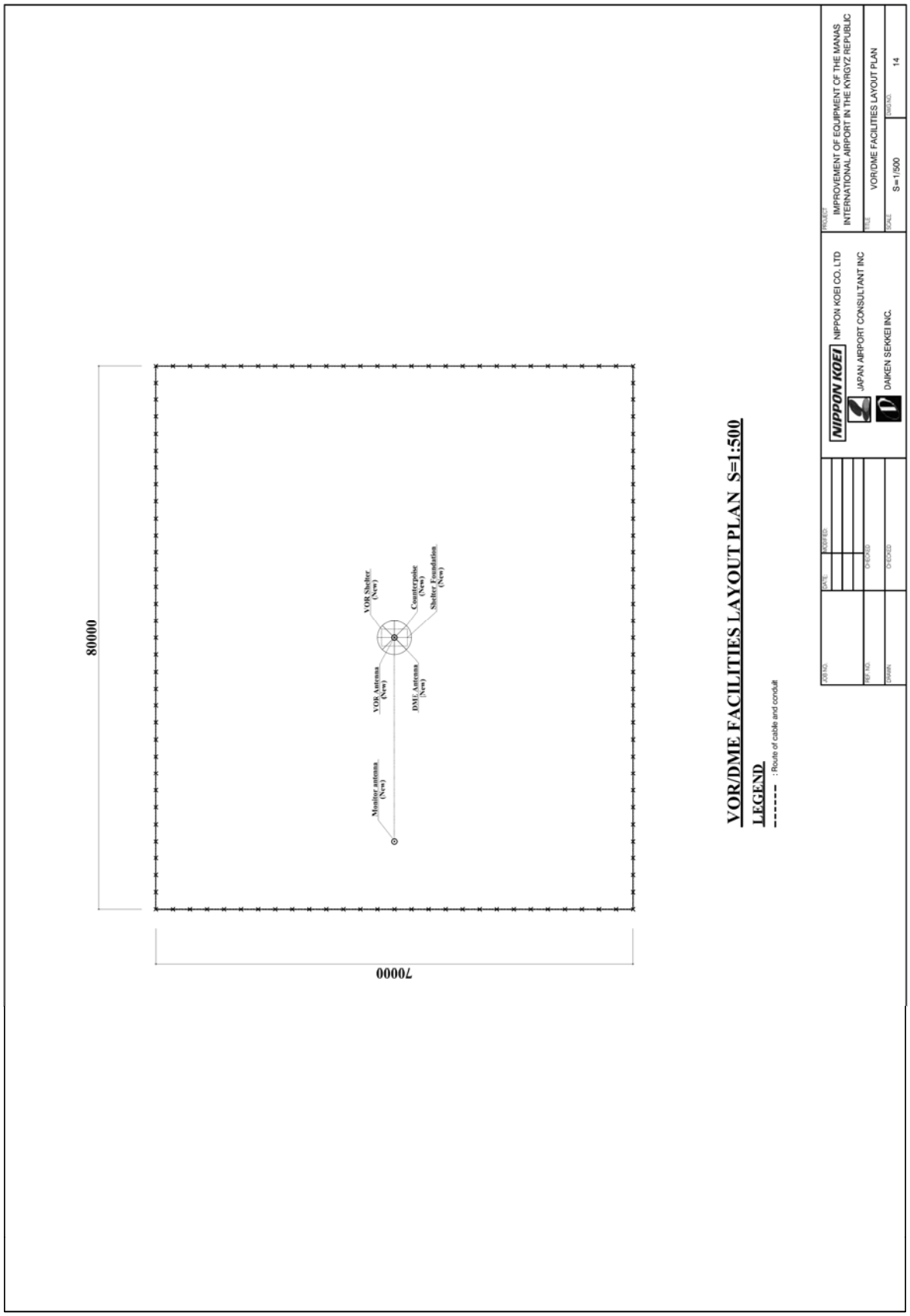
Source: JICA Study Team

Figure 2-2.14 GP and DME Antenna Layout Plan



Source: JICA Study Team

Figure 2-2.17 VOR DME System Schematic Diagram



Source: JICA Study Team

Figure 2-2.18 VOR DME Facilities Layout Plan

2-2-4 Implementation Plan

(1) Implementation Policy

1) Installation Policy

The Project will be implemented within the framework of a Japanese grant aid program. The following issues need to be recognized as the basic requirements for equipment installation works:

- Engineers/specialists dispatched from the equipment manufacturers should utilize and supervise local communication work subcontractors for wiring and fixing equipment so that the local economy would be fostered, employment opportunities enhanced, and technology transferred.
- Working time is to be from 8 to 17. No night work unless ther is areasonable reason such as the delay caoused by by rain etc.
- The work shall be done without disturbing the airport operation.

2) Procurement Plan

- The contractor for the Project is to be selected through a competitive bidding procedure among qualified Japanese companies. The bidder that will submit the lowest priced bid will in principle be selected as the successful bidder, and after negotiations, the contract for the Project is to be concluded between the selected bidder and the Kyrgyz side.
- The equipment under the Project will not be manufactured in Kyrgyzstan and therefore, only Japanese products should be procured in principle. However, in case procurement of Japanese products is not practicable, procurement from a third country may be considered.
- The contractor for the Project shall supply, transport, and install the equipment and provide training for equipment operation as well as repair and maintenance to the personnel of the Kyrgyz side in accordance with the contract. The contractor shall also ensure that the equipment manufacturers and local agents would be able to supply spare parts and consumables necessary for continuous operation of the equipment after completion of the Project. The contractor shall also ensure that the obligation of the contractor during the warranty period of the Project will be fulfilled and the maintenance and repair services after completion of the Project should be available.
- MIA and KAN are the executing agencies for implementation of the Project.

(2) Implementation Conditions

There is no specific requirement inherent to rationality and the legal system of Kyrgyz which would affect procurement of the equipment under the Project.

1) Considerations for Equipment Installation

Considerations for the equipment installation are as follows;

a) Compliance with Labor Law

The contractor shall ensure compliance with the labor law and other relevant laws and regulations upon employment of local laborers, and should observe appropriate working conditions and local customs so that any disputes are avoided and a safe working environment can be maintained.

b) Convenient Access for Contractor's Personnel and Vehicles to the Site

Convenient access for the contractor's personnel and vehicles to the site should be ensured. The contractor's personnel who should have access to the site should always hold their appropriate identification (ID) issued by MIA, and the contractor's equipment should be identified by adhesive labels with the logo of Japanese ODA.

c) Safety Measures during Installation Works

In order to maintain normal airport operations, installation of the new equipment should be carried out while the existing equipment continues to be operational as usual.

2) Consideration for Equipment Procurement

It is extremely important to transfer the appropriate methods of equipment operation as well as repair and maintenance services to the relevant personnel of the executing agencies so that the equipment can be properly and continuously operated and the safety and security conditions of the airport can be enhanced. Accordingly, the contractor should appoint qualified engineers for the equipment installation who will provide training for the equipment operation, repair and maintenance, and testing to the operation/maintenance personnel of the executing agencies. The qualified engineers from the contractor should ensure that the operation/maintenance personnel have achieved an appropriate level of understanding thereof.

(3) Scope of Works

1) Construction

Table 2-2.13 shows the demarcation of the Project scope between the Japanese side and the Kyrgyz side on procurement and installation under the Project.

Table 2-2.13 Demarcation of the Scope of Works

Project to be covered by Japan's Grant Aid	Project to be covered by the Kyrgyz
1. Air Navigation Safety Equipment (1) procurement, Installation/Adjustment for Equipment 1) ILS 2) VOR/DME (2) Maintenance Education & Training for Equipment (3) Marin and Inland Transportation for Equipment	1. Air Navigation Safety Equipment (1) Site Preparation, Design and Construction of Building 1) Preparation of power and remote control communication lines for ILS 2) Installation space and power for ILS remote control equipment 3) Preparation of power and remote control communication lines VOR/DME 4) Installation space and power for VOR/DME remote control equipment 5) Dismantle and replacement of existing equipment, installation of power & communication lines for new equipment, etc. (2) Coordination, application formalities with relevant organization 1) Tax exemption and customs clearance of the Equipment 2) Application formalities for establishment of radio station (4) Transportation, storage, recycle and disposal of dismantled equipment (5) Allocation of counterpart personnel (6) Participation of equipment installation and equipment calibration including trial operation and site acceptance test

Project to be covered by Japan's Grant Aid	Project to be covered by the Kyrgyz
2. Fire-Fighting Vehicle (1) Provision of more than 12000L of water volume (2) Training for operation/maintenance (3) Marine/inland transportation	2. Fire-Fighting Vehicle (1) Adjustment and application procedures with related organizations 1) Tax exemption and customs clearance (2) Allocation of counterpart personnel for the training
3. GSE (1) Provision of GSE (2) Training for operation/maintenance (3) Marine/inland transportation	3. GSE (1) Adjustment and application procedures with related organizations 1) Tax exemption and customs clearance (2) Allocation of counterpart personnel for the training

Source: JICA Study Team

2) Procurement/installation

The Japanese side shall implement the following consultation sevices and works for equipment procurement/installation:

a) Consultation

- Preparation for equipment specifications and tender conditions of the Project.
- Selection of the company for equipment procurement/installation as well as cooperation work for the contract.
- Supervision for the equipment delivery, installation, operation, and maintenance training.

b) Equipment Procurement/installation

- Equipment procurement, loading and transportation to the facility.
- Training for equipment installation, test run, and adjustment
- Training for operation, maintenance and repair method of the equipment.
- On the other hand, the Kyrgyz side shall bear and implement the following operations regarding removal of the existing equipment and tax exemption:
- Removal of existing security equipment and firefighting equipment.
- Purchase of equipment to be procured by the Kyrgyz side.
- Convenience provision for the rapid procedure of inland transportation and customs clearance of equipment imported from Japan and other countries based on the approval contract.
- Convenience provision for Japanese staffs to enter/stay in Kyrgyzstan for the purpose of conducting the Project.
- Burden of all necessary expenses excluding those borne by Japanese side.

(4) Consultant Suppervision

1) Suppervision Plan

a) Scope of Consultant Supervision

Following verification of the construction contract by the Japanese government, the consultant will issue a notice to proceed to the contractor and will commence its supervision services. The consultant will, as a part of the supervision services, monitor the progress of the contractor's work and report it to the executing agencies of the Kyrgyz side as well as JICA. The consultant will carry out managerial and technical services related to project scheduling, quality, safety issues, and payment to the contractor, as well as make recommendations for improvements. The consultant will also report to the Embassy of Japan in Kyrgyzstan as required and as appropriate. One year after the final inspection for equipment taking-over from the contractor to the Kyrgyz side, the warranty period service inspection is to be conducted, followed by completion of the consulting services.

The main scope of supervision services by the consultant is as follows:

- ✈ Review and Approval of Equipment Specifications and Work Execution Plans
- ✈ The contractor shall submit equipment specifications and drawings to the consultant prior to the start of manufacturing. The contractor shall also submit working drawings as well as work execution plans and schedules to the consultant. The consultant will approve or reject the drawings/plans in accordance with the contract.
- ✈ Testing and Inspection of the Manufactured Equipment
- ✈ The consultant will inspect that the equipment has been manufactured by the contractor in accordance with the contract by witnessing factory testing or inspecting test reports and other related documents submitted by the contractor after the manufactured equipment is completed.
- ✈ Prior Confirmation and Coordination for the Equipment Storage Yard
- ✈ The consultant will confirm the status of each site and coordinate with the Kyrgyz government on the preparations done for an equipment/material storage yard. Before the procured equipment arrives in the site, the consultant shall secure the equipment/material storage yard.
- ✈ Installation Supervision
- ✈ The consultant will supervise the quality, safety, schedule, and control of the equipment installation works including transportation of the contractor.
- ✈ Testing and Inspection of Equipment Installation
- ✈ The consultant will witness tests and approve the conditions of equipment installation of the manufacturer, and will conduct the inspection of test data.
- ✈ Inspection Tests on Completion and Issuance of Taking-over Certificate
- ✈ The consultant will witness and inspect the tests on completion to be carried out by the contractor in order to approve or reject the works in accordance with the contract. When all of the works have been completed and have satisfactorily passed any tests on completion, the taking-over certificate will be issued by the consultant. The consultant will also coordinate with KAN and MIA for the due process of taking-over the equipment from the contractor to KAN and MIA, which is the implementing agency of the Kyrgyz side.

b) Role of Consultant's Personnel

The work and the terms of each personnel engaged in the procurement supervision project are shown in Table 2-2.14.

Table 2-2.14 Work and the Terms of Consultant

Assignment	Period	Role
Japanese Engineer		
Procurement Supervision Engineer (Test on completion and taking-over)	Temporary onsite as required	・ Supervision for test on completion and taking-over
Procurement Supervision Engineer for ILS	Temporary onsite as required	・ Overall supervision of project quality and schedule ・ Adjustment of the Kyrgyz side and contractor ・ Supervision for installation, adjustment and testing ・ Completion check of the whole system and handover ・ Evaluation and approval of ILS equipment specification for manufacturing ・ Supervision of equipment installation and testing, quality and schedule control
Procurement Supervision Engineer for VOR/DME	Temporary onsite as required	・ Evaluation and approval of VOR/DME equipment specification for manufacturing ・ Supervision of equipment installation and testing, quality and schedule control

Assignment	Period	Role
Procurement Supervision Engineer for Firefighting vehicle, GSE	Temporary onsite as required	・ Evaluation and approval of Firefighting vehicle and GSE specification for manufacturing ・ Supervision of equipment installation and testing, quality and schedule control
Inspector (Inspection)	Temporary in Japan	・ Observe testing at manufacturing at factory
Local Staff		
Air-Nav Engineer 1	Temporary onsite as required	・ coordination between scope of Kyrgyz side and Japanese side ・ Supervision of equipment installation and testing, quality and schedule control
Air-Nav Engineer 2	Temporary onsite as required	
Assistant of Procurement Supervision for Firefighting vehicle, GSE	Temporary onsite as required	・ coordination between scope of Kyrgyz side and Japanese side ・ Supervision of equipment installation and testing, quality and schedule control

Source: JICA Study Team

2) Procurement Supervision Plan

Based on the policies of the grant aid implemented by the Japanese government, the consultant shall implement the Project smoothly by carrying on the basic design and forming a consistent project team as well for detailed design. The policies for the procurement supervision plan of the Project are as follows:

- ✈ The development of equipment shall be completed without delay by making close contact with the person of related organizations in charge of the Project from both countries.
- ✈ The consultant shall give appropriate advice and provide guidance to the equipment procurement and installation personnel of the related organizations.
- ✈ The consultant shall give appropriate advice and provide guidance regarding the appropriate layout/adjustment and operation/maintenance after delivery of the equipment.
- ✈ The consultant shall witness the delivery of equipment and gain approval of the Kyrgyz side after confirmation of the fulfillment of contract conditions.

(5) Quality Control Plan

1) Compliance with ICAO Standards

Specifications and function of the system and equipment shall comply in principle with the applicable ICAO standards.

2) Approval of Shop Drawings for the Equipment Manufacturer

The contractor will be required to prepare and submit equipment specifications, work schedule and work execution plan. The consultant will review and ensure that equipment performance and installation will comply with the contract documents.

3) Factory Inspection

The consultant will conduct factory inspections to review and confirm that the major systems and equipment manufactured by the contractor comply with the contractual requirements. The consultant may alternatively require the contractor to submit the test data for review and confirmation of its compliance with the contractual requirements. The major systems and equipment will only be approved for transportation and shipment to the sites after the consultant's confirmations.

4) Quantity Inspection Prior to Packing

Prior to packing of the procured items, the consultant together with the contractor will carry out inspections of the manufacturers' packaging factory to confirm that quantities of such items are in compliance with the contract.

5) Quantity Inspection Prior to Shipping

The consultant together with the contractor will carry out the final inspection of the equipment for which adjustment for individual and group of equipment after connection is completed. During the final inspection, engineers dispatched by the manufacturers will operate the equipment in order to collect testing data for the final acceptance as well as to confirm the number and performance of the equipment.

6) Final Inspection

The consultant together with the contractor will carry out final inspection on equipment or a group of equipment for which adjustment for individual and a group of equipment after connection is completed. During the final inspection, engineers dispatched from manufactures will operate the equipment in order to collect testing data for final acceptance as well as to confirm number and performance of the equipment or group of equipment.

7) Flight Check

The consultant together with authorized representatives of MIA and KAN will entrust a qualified organization to carry out flight checks to confirm that the procured systems meet the performance requirements stipulated in the contract.

8) Tests on Completion and Taking-Over

After completion of the installation and adjustment of the systems and equipment as well as the initial training for equipment operations and maintenance provided by the contractor, the consultant and the contractor as well as authorized representatives of MIA and KAN will jointly conduct a final inspection on the results of the tests on completion and any other test results as applicable, and if found as satisfactory, all of the equipment and systems procured and installed under the Project will be accepted by MIA and KAN, and a taking-over certificate will be issued by the consultant.

(6) Procurement Plan

1) Equipment to be procured

During the one year defects liability period, the contractor shall be responsible for the repair of the systems and equipment at its own cost.

The number of spare parts and units of the major systems and equipment should be computed based on the mean time between failures (MTBF) data of the manufactures for a two year period.

Air navigation equipment, GSE, and thermometer airport fire trucks, shall be procured from Japan, Kyrgyzstan, and countries that are part of the Development Assistance Committee (DAC) in consideration of cost, property of specifications, and availability of equipment.

Materials and equipment in the project, which are tansported from Japan and from other countries, are unloaded in Mersin Port, facing the Mediterranean Sea in southern Turkey and transported by land to MIA in Kyrgyzstan. Since Mersin Port is separated by about 4,800 km from

the site, it is assumed that it takes two months for transportation of the items to the site passing through Armenia, Iran, Turkmenistan, Uzbekistan, and Kazakhstan, including the customs clearance period. Transportation costs for construction equipment procured from Japan and third countries are included in the cost of construction.

Table 2-2.15 Procurement Countries for Construction Material

Item	Country			Remark
	Kyrgyz	Japan	The Third Countries	
Construction Material for ILS & VOR/DME such as Cement, Aggregate, Iron bar, Fuel	○			
Cable for ILS & VOR/DME	○	○		
Plumbing	○			

Source: JICA Study Team

Table 2-2.16 Procurement Countries for Equipments

Item	Country			Remark
	Kyrgyz	Japan	The Third Countries	
ILS		○		
VOR/DME			○	USA
Fire Fighting Vehicle			○	Italiy
Airport Runway Sweepers for Snow Removal			○	Switzerland
Airport Runway Snow Blower			○	Switzerland
Glycol spraying vehicle			○	Italy
Aircraft Bulk Cargo and Container High Loader		○		
Belt loaders (for loading and unloading of baggage)			○	Germany
Aircraft Tow Tractor			○	Sweden
Aircraft Air Start Unit (ASU)			○	France
Aircraft Lavatory Service Truck		○		
Aircraft Water Service Truck			○	Turkey
Tow tractor (Power Hybrid Type) for Baggage Carts & Container dollies		○		
Baggage Carts			○	Netherlands
Aircraft Ground Power Unit			○	France
Aircraft Air Conditioning Unit			○	France
Container Dollies			○	Netherlands

Source: JICA Study Team

2) Procurement Lot

In consideration to the equipment character and feature, the tender will be executed by following Lot division.

Table 2-2.17 Lot division

Lot 1	Air navigation Safety Equipment (ILS VOR/DME)
Lot 2	FireFighting Vehicle, Ground Support Equipment

Source：JICAStudy Team

(7) Operational Guidance Plan

1) Air Navigation Safety Equipment

The procured equipment has in principle the same functions as the existing equipment; however, initial training for the operation, maintenance, and repair of the equipment as well as for new functions specific to the new systems is essential for MIA and KAN personnel. The initial training will be provided by engineers, who have conducted the adjustments for the systems and equipment, dispatched by the equipment/system manufactures in Japan or elsewhere. The training will be in the form of OJT of MIA personnel for several days.

2) Firefighting Vehicles and Ground Support Equipment

In order to use and maintain the procured equipment, trainings as shown in Table 2-2.18 shall be provided by the supplier. Technical data and operation and maintenance manuals shall be developed for the equipment that need regular maintenance and repair. In addition, it is necessary that the manuals for the firefighting vehicles shall be translated into the Russian language.

- ✈ Operation method (overview of equipment, procedure and confirmation matters)
- ✈ Periodic maintenance management method (e.g., cleaning)

Table 2-2.18 Plan for initinal operation Training

Equipment	Training method/content	Personnel	Period of imprementation
Fire-fighting vehicle	Introduction by manufacturer	Engineer of manufacturer	Delivery, 7 days
GSE	Introduction by manufacturer	Engineer of manufacturer	Delivery, 7 days

Source: JICA Study Team

Because this ptoject aim to replace exisiting Air navigation, Airport Fire Fightihg Vehicle and Ground support equipment are replacement of existing equipment, therefore acutual operational trainings are not nesssary.

(8) Soft Component (Technical Assistance) Plan

Because Equipment, Air Navigation, Fire Fightihg Vehicle and Ground support equipment which are procured by this project are replacement of existing equipment, threrfore Soft compornet is not necessary.

(9) Implementation Schedule

1) Consultation

After conclusion of the Exchange of Note (E/N) and the Grant Agreement (G/A) of the Project, consulting services for detailed design, assistance in bidding, and installation supervision will be concluded by the Kyrgyz side and the consultant; the consultant will commence the detailed design work immediately. The consultant will collect information on installation and cost estimation for detailed design, and will then prepare the detailed design and bidding documents in Japan accordingly. The period for detailed design including the site survey will be two months.

After completion of the detailed design, the services for assistance in bidding and bid evaluation will be completed by the consultant in about 3.5 months. Such services will include preparation for the bid announcement and public announcement, preparation of bid evaluation report for selection of the successful bidder, and assistance in concluding the construction/installation contract. Following the bidding process, the successful bidder will conclude the construction/installation contract with Kyrgyz side. The contractor will commence the works following the issuance of the notice to proceed by the consultant.

2) Air Navigation Safety Equipment

The duration for procurement and installation of air navigation safety equipment includes nine months for preparation of the necessary drawings and for manufacturing, one month for testing, three months for transportation, and nine months for installation, adjustment, trial operation, training of operation/maintenance personnel as well as commissioning test and handing over of the equipment to the Kyrgyz side.

3) Firefighting Vehicles and Ground Support Equipment

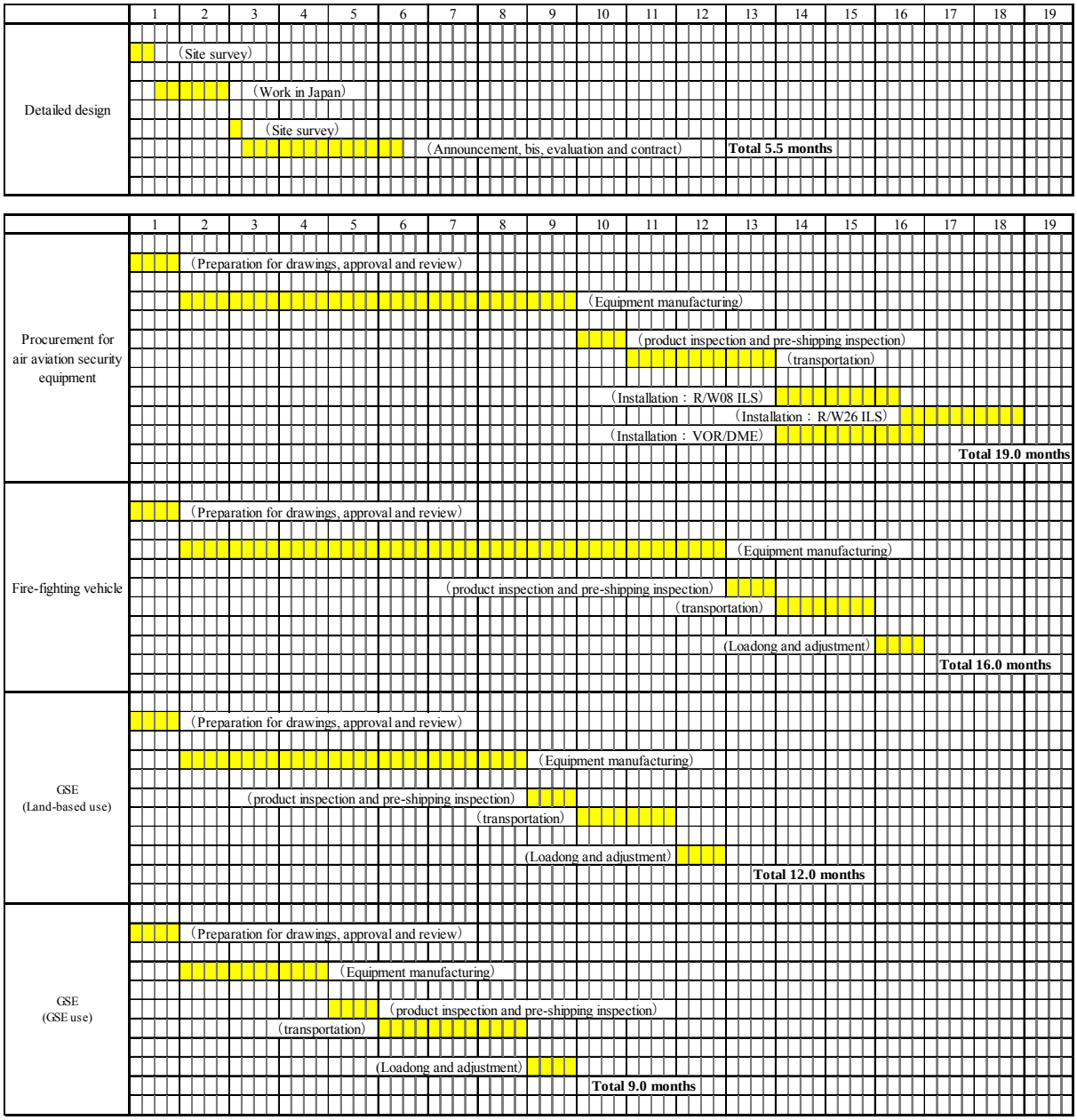
The procument period for Fire Fighting Veicle, it is requiewd to 5month for equipment and 12 month for Fire fighting vehicle. In total it is required to 15 month.

For GSE procrurement 5month for equipment, 12 month for manufacturing and for inspection toransportion, installation , adjestoment, it is required to 3 moth. In total 15 motth is required.

Totally the implementaion period is from 24 month to 26 month.

The implementation schedule of the Project is as shown in Table 2-2.19.

Table 2-2.19 Implementation Schedule



Source: JICA Study Team

2-3 Obligation of the Recipient Country

2-3-1 General Matters in Grant Aid Implemented by Japan

For the implementation of grant aid, the general obligations of the recipient country are as follows:

- Provision of data and information necessary for the implementation of the plan.
- A site necessary for the implementation of the plan (a working site and a site for equipment storage).
- Land leveling of each construction site before the start of construction.
- The recipient country shall open a Japanese bank account under its name and issue an authorization to pay.
- The recipient country shall implement rapid loading/unloading on the drop point of Kyrgyzstan, exemption of taxes, and duties of custom.
- With respect to the approved contract, the recipient country shall ensure the exemption of taxes levied in Kyrgyzstan, such as domestic taxes and other taxes regarding the provision of products and services, for Japanese personnel and instill cooperation for the Project.
- With respect to the approved contract, the recipient country shall give entry and working permission and other permissions regarding the provision of sevices for Japanese personnel.
- The recipient country shall give permission for the implementation of the Project and provide other authorizations.
- The recipient country shall maintain, manage, and repair the facilities constructed in the Project, appropriately and effectively.
- The recipient country shall bear expenses of the Project other than those borne by the Japan Grant Aid.

2-3-2 Specific Matters in the Project

For the implementation of the Project, the scope of work borne by the recipient country is as follows:

(1) Entrance to the Site and Construction Permits

KAN and MIA shall obtain entrance and construction permits in order to let the contractor execute the works.

(2) Removal of Existing Equipment for Installation of New Equipment

The Kyrgyz side shall remove the existing equipment to secure the space necessary for the installation of the new equipment.

(3) Taxes and Fiscal Levies for Procurement of Materials and Services

The Government of Kyrgyz shall bear the internal taxes and other fiscal levies which may be imposed with respect to the purchase of the products and services without using the grant.

(4) Temporary Yard

The Kyrgyz side shall provide, at its own expense, the adequate space at the sites necessary for the contractor to temporarily store materials and equipment.

(5) Securing Commercial Power on Site

The Kyrgyz side shall provide commercial power to each site which is required for the operations after handing over the equipment.

(6) Provision of Existing Main Power Distribution Network

The Kyrgyz side shall provide the power distribution system and line to the sites at its own expense.

2-3-3 Responsibility of the Works to be implemented by the Kyrgyz Side

The list of specific obligations of the Kyrgyz side is shown below.

Table 2-3.1 Specific Obligations of Kyrgyz Side

Site	Equipment	Obligations of Kyrgyz Side
ILS site	ILS Equipment	Provision of power supply and remote control lines for ILS Dismantle of existing ILS equipment including antennas
VOR/DME site	VOR/DME Equipment	Provision of power supply and remote control lines for VOR/DME Dismantle of existing VOR/DME equipment including antennas
Monitor room & Radar Control room in the Operation Building	ILS & VOR/DME Remote Control and Monitoring System	Temporarily replace the equipment as necessary to allow spaces for new equipment installation. Provision of commercial power supply available for new equipment

Source: JICA Study Team

2-4 Project Operation Plan

MIA and KAN are responsible for the operation and maintenance of the airport facilities. Some of the facilities and equipment are being maintained and repaired by MIA and KAN directly while maintenance and repair of the others are contracted out. Some of the maintenance and repair services are regularly conducted every year while some are conducted every several years. The issues that follow should be properly taken into account.

2-4-1 Air Navigation Safety Equipment

(1) Organization for Operation and Maintenance Services

The ILS is owned by MIA but its operation, maintenance, and repair services are entrusted to KAN. The aeronautical ground lights are owned, operated, maintained, and repaired by MIA. VOR/DME, NDB, and weather observation equipment are owned, operated, maintained, and repaired by KAN. KAN is also providing air traffic control services for MIA as well as en-route air traffic control (ATC) services to the aircraft flying within the Kyrgyz FIR, and is responsible for the installation, operation, and maintenance of the ATC equipment.

For the purpose of operation, maintenance, and repair of the equipment, the number of available relevant personnel from MIA and KAN is shown in Table 2-4.1.

Table 2-4.1 Operation and Maintenance Staff

Category	Chief Engineer	Shift Engineer	Full-time Engineer	Operation Engineer	Elec. & Mech. Engineer	Shift per day
Navigation (ILS, NDB)	1	6				2 (day & night)
Communication (VHF, HF, AFTN)	1	5				2 (day & night)
Surveillance (Radar, WAM)	2	10				2 (day & night)
Building Facility	1	5				2 (day & night)
AGL & Power Supply (MIA)	1	4	1	1	10	2 (day & night)

Source: JICA Study Team

The operation, maintenance, and repair service personnel are required in principle to be graduates of technical colleges or universities. After being employed as technical staff and subjected to special training courses provided by MIA and KAN, they are stationed at the airport or ATC facilities. The air navigation facility and aeronautical ground lights facility need to be operational 24 hours a day; the relevant personnel have been working in day and night shifts to achieve this.

Operation and maintenance staff have been trained through refresher training courses as well as periodical operational and technical training every year so as to further upgrade their skills, experiences, and maintain their international standards skills. Furthermore, OJT is being provided to the operation and maintenance staff at the actual sites. It can be concluded that the staff already possessed basic technical capability necessary to maintain and repair the systems.

Since the Project involves the replacement and renewal of the existing equipment, and does not include the increase of the number of equipment, the existing workforce for operation, maintenance, and repair services should suffice.

(2) Procedure for Operation and Maintenance Services

The operation and maintenance manual of individual air navigation safety equipment is to be supplied by the manufacturer. The maintenance repair works have been conducted based on such manuals and summarized as follows:

- ✈ System Operation Procedure Including Measures in Case of Emergency
- ✈ Equipment Testing Method and Checklist
- ✈ Standard Repair Procedure
- ✈ Standard Method for Testing
- ✈ Standard Procedure for Test Data Recording

Based on the above procedures, maintenance services have been carried out with five steps of periodical maintenance services following international standards. The suitable time intervals for maintenance services are shown in Table 2-4.2.

Table 2-4.2 Schedule of Maintenance Services

Period	Maintenance Services
Daily	Cleaning, observation of equipment parameters and adjustment, if necessary.
Weekly	Cleaning, observation of equipment parameters and adjustment, if necessary.
Monthly	Check parameters of each equipment and adjust them to its standard parameters.
3 months	Check parameters of each equipment and adjust them to its standard parameters.
6 months	Check parameters of each equipment and adjust them to the standard parameters by flight calibration and field inspection.

Source: JICA Study Team

2-4-2 Firefighting Vehicles

Firefighting at the airport is under the jurisdiction of the Department of Aviation Emergency, Lifesaving and Firefighting. In this department, the fire rescue team of registered airports and branches and the MIA emergency team are under the manager. These teams consist of 53 fire emergency crews and 12 personnel including a dispatcher and firefighting instructor. A three shift system is applied. Training for firefighting and rescue activities is regularly conducted. In addition, the crews regularly participate in training for operation and maintenance of firefighting vehicles; thus, they have sufficient ability for operation and maintenance.

(1) Operation and Maintenance Method

Regular inspection and replacement of components for the firefighting vehicles are conducted according to the maintenance manual.

2-4-3 Ground Support Equipment

(1) Organization

GSE is under the jurisdiction of “Special Vehicle Section.”In Special Vehicle Section, special vehicle depot division (60 personnel), special equipment storage division (88 personnel) and maintenance and repair department (25 personnel) are set under the managerSpecial vehicle depot division is in chaege of vehicles in the apron and consists of 24 aircraft service vehicle drivers, 8 sanitation vehicle drivers and so on.Special equipment storage division is in chaege of general

vehicles and heavy equipments and consists of 24 shift bus drivers, 3 crane truck drivers, 9 tractor drivers, forklift driver and so on. Maintenance and repair department in sharge of maintenance, management and repair of vehicles and consists of 16 workshop workers such as vehicle mechanic, paint engineering and electrician and 9 other skilled workers.

Regular training program and course of safety is conducted for drivers and skilled workers and they have sufficient knowledge and ability of operation and maintenance of the vehicles.

(2) Operation and Maintenabce Method

Regular inspection and replacement of the components for each GSE are conducted according to the maintenance manual.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Condition of Cost Estimate

- Time of cost estimate: February, 2014
- Exchange rate:
  KGS 1＝JPY 2.080
  US$ 1＝JPY 103.45
  EUR 1＝JPY 140.81
- The average exchange rate from November 1, 2013 to January 31, 2014 is applied as the exchange conversion rate. The local currency is KGS (Som).
- Construction and procurement period: Total period of detailed design, construction, and procurement is 24 ~ 26 months as shown in Table 2-2.19.

(2) Cost of Recipient Country

Table 2-5.1 Cost Borne by Recipient Country

Category	Content	Cost (million KGS)
Cost for relocation and removal of the existing aviation security equipment, power supply cost	Relocation and removal of VOR / DME and ILS existing facilities and ensureing power supply	0.35
Cost for opening bank account	Bank commission charge (Procedure for account opening (B/A) and written authorization of payment (A / P))	0.75
Total		1.10

Source: JICA Study Team

2-5-2 Operation and Maintenance Cost

(1) Air navigation

The budget for operation, maintenance, and repair of KAN consists of salaries, equipment maintenance and repair, procurement of spare parts, and subcontract costs. The annual budget of KAN is systematically formulated and distributed to each of the departments and sections. In case replacement of an existing equipment or the installation of new equipment becomes necessary, a new budget will be requested and approved separately from the annual budget. Therefore, it can be

expected that the budget necessary in order to properly operate, maintain, and repair the equipment installed under the Project will be secured.

Table 2-5.2 Budget for Operation and Maintenance Services of Air Navigation Safety Equipment

Item	Outline Budget (US$)
Personnel expenses Salary, Overtime, Welfare	3,500,000
Maintenance and repair cost	254,000
Equipment Procurement	2,660,000
Outsource service charge (Flight Inspection, etc.)	290,000
Telephone, Communication fee	340,000
Water & Electricity	244,000
Quest visiting, participating seminar	280,000
Others	532,000
Total of Annual budget in FY 2014	8,100,000

Source: JICA Study Team

(2) Airport Fire Fighting Vehicle

MIA assures budget for the Airport Fire Fighting station. The budjet consist of personnel expense, operating expense, fuel for vehicle etc. as shown on the Table 2-5.1 Because all equipment which is provided by this project is replacement of existing ecuipment, any of additional expense is not incurred. The operation cost of Airport Fire Figthting station will be fully covered by current budget in the future.

(3) Ground Support Equipment

In the breakdown of the MIA's expence, expence for Ground support for Aircraft movement ,Ground support for Parking Aircraft and Fire and Rescue is shown in the Table 2-5.2. The total of the expence is 22.7% of the MIA's total expence 1,787. 2 million som. Because the equipment of snow remover etc. which is procured by this project is replace of the existing equipment, and other equipment such as hight lift loader is not need large expence, those operation is able to be covered by current MIA's budget.

The Budjet of KAN which operate Air Navigation is as shown on the Table 2-5.3. Becaouse Air navigation equipment is also replacement of existing equipment, any additional expence is not occer in the futre. It is expected that the operation cost can be coverd by KAN's current budget.

Table 2-5.3 MIA's Maintenance cost of the Fire and Rescue and Ground support (2012)

(Unit：Million Som)

Item	Ground support for Aircraft movement	Ground support for Parking Aircraft	Fire and Rescue	Total
Personnel expense	77.8	29.0	26.6	133.4
Social welfare,income tax	14.0	5.2	4.8	24.0
Outlay cost	0.1	0.0	0.0	0.1
Operationg expense	45.8	7.9	2.9	56.6
Anti freeze material ,Aviation fuel	9.2	0.0	0.0	9.2
Fuel for vehicle	20.3	1.8	0.5	22.6
Building, Equipment, maintenance cost	6.1	2.7	2.1	10.9
Reparing cost for special vehicle	10.2	3.4	0.3	13.9
Airport facility maintenance cost.	0.6	1.4	0.6	2.6
Communication cost	0.0	0.1	0.0	0.1
Clothing expence	0.5	0.2	0.4	1.1
Intial training and education cost	0.1	0.5	0.0	0.6
Over head	4.6	1.8	1.5	7.9
Food expense	4.0	1.3	1.3	6.6
Depreciation cost	79.6	30.6	0.5	110.7
Total	272.9	85.9	41.5	400.3

Source：MIA

CHAPTER 3
Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

To implement this project, the following activities will be executed by the Manas International Airport (MIA):

- ✈ Provide necessary land area to install air navigation facilities.
- ✈ Execute necessary procedure to move the VOR/DME and power installation.
- ✈ Provide the consultant's and contractor's personnel access to enter on the airfield.

3-2 Necessary Inputs by Recipient Country

To produce an effect and be able to maintain it, the following activities will be executed by MOTC and the Manas International Airport.

(1) Secure sustainable maintenance budget

Since new equipment will be procured by this project as replacement of the existing equipment of the Manas International Airport, no additional maintenance cost will occur; also it is not necessary to establish a new organization. Therefore, it is required to keep the current maintenance budget.

(2) Upgrade awareness and capacity to ensure safety of MIA as an international airport.

It is important that MOTC sees to it that MIA complies with the international air navigation standards. To realize it, it is necessary to keep upgrading MIA's technique and capacity in order to maintain and upgrade safety awareness on site.

(3) Upgrade awareness on airport fire and rescue.

Continuous upgrade of the technique and capacity is required to maintain awareness on fire and rescue at MIA.

3-3 Important Assumptions

External conditions necessary to produce an effect and be able to maintain the results, are shown below.

- ✈ MIA and KAN would continuously make necessary funding and human resources available, and counterpart personnel of the project would be involved in upgrading aviation safety.
- ✈ MIA and KAN would continuously improve their air navigation safety equipment infrastructure based on their future plans.
- ✈ Airlines would continue to improve their aviation safety under the oversight of the Civil Aviation Agency (CAA).
- ✈ Personnel involved in aviation safety would continue to improve the airport security and safety situation.

3-4 Project Evaluation

In view of the above, it is judged that the project is appropriate for technical assistance project, by using Japanese grant aid.

3-4-1 Relevance

(1) Project suitability

This project aims to contribute in the upgrade of airport and aircraft safety and reliability by securing flight safety at low visibility condition and effective airport operation by improving the air navigation facilities and ground support equipment

This project is appropriate because; flight safety at low visibility condition is secured by air navigation facilities improvement, safety level of fire fighting of MIA is satisfied by the airport fire fighting vehicle's improvement and upgrade flight operation reliability by improving ground support equipment.

(2) Benefit target

MIA is a capital airport and one of the two international airports in Kyrgyz. The results in the upgrade of airport and aircraft safety will provide benefits to all 5.66 million Kyrgyz nationals, both directly and indirectly.

(3) Purpose of the project

Bad weather poses possible danger when low cloud ceiling/visibility occurs causing problem in flight operation. Due to VOR/DME's continuous operation and introduction of further PBN flight method as the current movement among ICAO member countries, upgrading air navigation facilities is an urgent issue in view of securing safety, in-service-rate, and on-time operation.

Existing fire fighting vehicles are aged more than 21 years except for two vehicles which were purchased in 2010. Among the six vehicles, four vehicles are over 13 years which is the lifetime of the fire fighting vehicles. Although ICAO's requirement of total water tank volume is 36,400 L, the total volume of the two water tank vehicles which were purchased in 2010 is 24,000 L, therefore, there is 12,000 L shortage to meet ICAO's requirement. In case the fire fighting vehicle is not provided by this project, the condition which does not satisfy ICAO requirement will practically continue. If this condition will continue, fire and rescue operation will not be adequately executed in the airport despite the current water volume is formally fulfilled. Therefore, replacement of the fire fighting vehicles is an urgent issue in view of securing airport safety.

MIA has eight runway snow sweepers but five of these are aged and have decrease snow removal performance. Continuing with such conditions, runway closing time will be longer in winter, which may disturb on-time flights. Therefore, aircraft takeoff/landing safety can be upgraded by disposing adequate snow sweepers.

It is expected that existing ground support equipment would not able to handle middle or larger size aircrafts, which are expected to be increased in the future, because the existing equipment can only handle small size aircrafts. When airport traffic is congested, the shortage in number of equipment will cause problem to on-time flight. Therefore, it is appropriate to provide ground support equipment.

(4) Mid- and long-term development policy

Kyrgyz government states that there is an urgent necessity for the implementation and modernization of the airport as stated in the "Medium Term Development Program of the Kyrgyz Republic for 2012-14" (formulated in 2012). Also the "Strategy of the Kyrgyz Republic Civil Aviation Development for 2013-2020" (formulated in 2013) states the upgrading of air navigation

and the strength of airport security are the two of important targets, because efficient development of the airport sector ensures sustainable economic development in Kyrgyz. This project corresponds to these policies.

Traffic infrastructure maintenance and reducing the disparity among the regions are designed under the "Country Assistance Policy to Kyrgyz". The "JICA Country Analysis Paper to Kyrgyz" analyzed that "Implementation of Transportation" is the priority target too. Therefore, the project meets the analysis and policy.

3-4-2 Effectiveness

(1) Quantitative Effect Indicators

The quantitative effect indicators' target year is settled in 2019; three years after the completion of the project in 2016. By the social, economic, and technical results of this survey, the quantitative effect indicators are shown in Table 3-4.1.

Table 3-4.1 Quantitative Effect Indicators

Indicator	Basis (year 2013)	Target (year 2019) [3 years after project completion]
Weather condition when aircrafts are able for landing. (visible distance at runway)	More than350 m	More than200 m
Percentage of landing/take off aircraft under the condition which satisfy international requirements on fire and rescue at MIA. (%)	0	100

(2) Qualitative Effect Indicators

Qualitative effect indicators by implementation of the project are as follows:

- ✈ By improvement of air navigation facilities, safety and reliability to aircrafts which have route to Russia-Turkey, Asian, and other countries is upgraded.
- ✈ Enable to correspond to increasing air transport demand by using adequate ground support equipment.

Appendices

A-1 Member List of the Study Team

(1)	Mr. Hiroyuki UEDA	:	Leader JICA Advisor
(2)	Ms. Aya Shimada	:	Coordinator (JICA)
(3)	Mr. Hajime USUKURA	:	Coordinator (JICA)
(4)	Mr. Satoshi HATAYAMA	:	Team Leader of the Consultants (Nippon Koei Co., Ltd)
(5)	Mr. Yoshifumi HOSHIAI	:	Deputy Team Leader / Building (Nippon Koei Co., Ltd)
(6)	Mr. Yukimi TAJIMA	:	Equipment for Air Navigation (Japan Airport Consultants, Inc)
(7)	Mr. Seiji NAKAZATO	:	Installation / Procurement/ Cost (Nippon Koei Co., Ltd)
(8)	Mr. Masanobu ISHIGURO	:	Natural Condition Survey (Nippon Koei Co., Ltd)
(9)	Ms. Hiromi WATANABE	:	Interpreter

A-2 Study Schedule

Table A-2-1 Schedule of the First Site Survey

Accumulated Day	January 2014	Week	Leader (JICA)	Coordinator (JICA)	Team Leader of the Consultants	Deputy Team Leader	Equipment for Air Navigation	Installation/ Procurement/ Cost	Natural Condition Survey
			Mr. Hiroyuki UEDA	Mr. Aya Shimada	Mr. Satoshi HATAYAMA	Mr. Yoshifumi HOSHIAI	Mr. Yukimi TAJIMA	Mr. Seiji NAKAZATO	Mr. Masanobu ISHIGURO
1	12	Sun.	Narita → Istanbul → Bishkek						
2	13	Mon.	Arrive at Bishkek/Discussion of Inception Report						
3	14	Tue.	Discussion of Inception Report/Discussion with MOTC & MIA						
4	15	Wed.	Discussion with MOTC & MIA			Site Survey			Site Survey
5	16	Thu.	Discussion with MOTC & MIA			Site Survey			Site Survey
6	17	Fri.	Discussion Preparation of MoD			Site Survey			Site Survey
7	18	Sat.	Site Survey			Site Survey			Site Survey
8	19	Sun.	Data collection and analysis			Data collection and analysis			Site Survey
9	20	Mon.	MOD Signing			MOD Signing			Site Survey
10	21	Tue.	Bishkek→Narfita		Equipment & Facility Survey				Site Survey
11	22	Wed.	Arrive Narita		Equipment & Facility Survey				Site Survey
12	23	Thu.			Equipment & Facility Survey				Site Survey
13	24	Fri.			Equipment & Facility Survey				Site Survey
14	25	Sat.			Equipment & Facility Survey				Site Survey
15	26	Sun.			Data collection and analysis			Bishkek→Narita	Site Survey
16	27	Mon.			Equipment & Facility Survey			Arrive Narita	Site Survey
17	28	Tue.			Equipment & Facility Survey				Site Survey
18	29	Wed.			Equipment & Facility Survey				Finalize report
19	30	Thu.			Technical Memorandum Signing				Finalize report
20	31	Fri.			Bishkek → Narita				Bishkek → Narita
21	2/1	Sat			Arrive Narita				Arrive Narita

Source: JICA Study Team

Table A-2-2 Schedule of the Second Site Survey

Accumulated Day	2014	Week	Leader (JICA)	Coordinator (JICA)	Team Leader of the Consultants	Deputy Team Leader of the Consultants	Equipment for Air Navigation
			Mr. Hiroyuki UEDA	Mr. Hajime USUKURA	Mr. Satoshi HATAYAMA	Mr. Yoshifumi HOSHIAI	Mr. Yukimi TAJIMA
1	5/27	Tue.			Narita → Istanbul → Bishkek		
2	28	Wed.			Explanation and Discussion of Draft Final Report		
3	29	Thu.	Narita → Istanbul → Bishkek		Explanation and Discussion of Draft Final Report		
4	30	Fri.	Discussion of Draft Final Report, MOD Signing				
5	31	Sat.	Document preparation				
6	6/1	Sun.	Move to Kyrgyz				

A-3 List of Parties Concerned in the Recipient Country

Table A-3 List of Parties Concerned in the Recipient Country

Occupation	Title	Name
Ministry of Transport and Communication (MOTC)	Permanent Secretary	Mr. Dyikanov Maksat Dyikanovich
	Chief of Division of Strategic development and Investment	Ms. Asankulova Marina Sagynalievna
	Head specialist of Division of Strategic development and investment	Mr. Atabekov Mirlan
	Chief of Division of International Relation	Ms. Elena Vladimirovna Narovina
Civil aviation Agency (CAA)	Deputy director	Mr. Toktobekov Murataly Toktobekovich
	Chief of division	Mr. Tursunbaev Bahtijar
	Chief of Division	Mr. Satarov Meder Toktomuratovich
Manas International Airport (MIA)	Vice president of JVC	Mr. Busurmankulov Abdimalik Burkanbetovich
	Chief Specialist on Airdrome maintenance and airport equipment	Mr. Bekbacha Bakytbek
	Airport Terminal Maintenance service	Mr. Usubakunov Alymjan
	IT and Communication Service	Mr. Baktemirov
	Aviation Security Service	Mr. Talaibek Djaktambaev
	Airport Maintenance Department	Mr. Ulan Shakir
	Aircraft Ground handling Service Department	Mr. Nasyrov Rashid
	Transportation and Special Vehicles Department	Mr. Sergei Grigorievich Sberlik
	Transportation and Special Vehicles Department	Mr. Nurlan Kudoiberganov
	Airport Emergency, Aircraft Rescue and Firefighting Department	Mr. Seidaliev Zainidin
	Passenger Service Department	Mr. Narbaev Sobyr
	Passenger Service Department	Ms. Bekboeva Jyldyz
Kyrgyzaeronavigation (KAN)	General Director	Mr. Rakhmanov Ulukbek
	Deputy Director	Mr. Jakipbaev Mamatnasar Abdinasanarovich
	Deputy Director	Mr. Iripaev Kemjibai
	Head Engineer	Mr. Bobkov Aleksander Dmitrievich
	Chief Engineer of ILS	Mr. Djakytbekov Bakyt
	Chief Engineer	Mr. Khurshudov Fizudin Farmanovich
	Head of ATC Department	Mr. Chetvertok Dmitriy

A-4 Minutes of Discussions 1

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT OF EQUIPMENT
OF THE MANAS INTERNATIONAL AIRPORT
IN THE KYRGYZ REPUBLIC

In response to a request from the Government of the Kyrgyz Republic, Japan International Cooperation Agency (hereinafter referred to as "JICA") in consultation with the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Improvement of Equipment of the Manas International Airport (hereinafter referred to as "the Project").

JICA sent a Preparatory Survey Team (hereinafter referred to as "the Team") to the Kyrgyz Republic, headed by Mr. Hiroyuki UEDA, Senior Advisor of JICA, and was scheduled to stay in the country from January 13th to January 21st, 2014.

The Team held a series of discussions with officials concerned of the Government of the Kyrgyz Republic and conducted a field survey in the study area.

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

Bishkek, January 20th, 2014

Hiroyuki UEDA
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Maksatbek D. DYIKANOV
State Secretary
Ministry of Transport and Communications
the Kyrgyz Republic

ATTACHMENT

1. Objective of the Project

   Both Japanese and Kyrgyz sides confirmed that the objective of the Project is to improve the safety and efficiency of aircraft operations at Manas International Airport.

2. Project Site

   Both sides confirmed that the site of the Project is shown in Annex-1.

3. Objective of the Survey

   Both sides confirmed the objective of the Survey as follows:

   3-1. To understand the background and objective of the Project and examine its impacts and appropriateness.

   3-2. To consider the components, outline design and cost estimation of the Project based on the data and information collected through the Survey and the results of meetings between the Japanese and the Kyrgyz sides.

4. Responsible and Implementing Organizations

   Both sides confirmed the responsible and implementing organizations as follows:

   4-1. The responsible organization is Ministry of Transport and Communications (MOTC) and Civil Aviation Agency (CAA).

   4-2. The implementing organizations are Manas International Airport OJSC (MIA) and Kyrgyzaeronavigatsiya SE (KAN).

   4-3. The organization charts of MOTC and CAA are as shown in Annex-2.

   4-4. The organization charts of MIA and KAN are as shown in Annex-3.

5. Items Requested by the Government of the Kyrgyz Republic

   5-1. As a result of discussions, both sides confirmed that the items requested by the Government of the Kyrgyz Republic are as follows:

   (1) Procurement of the following equipment and facilities for Manas International Airport

Items	Qty
Priority 1	
Air Navigation Safety Equipment	
1) Instrument Landing System (ILS) (ICAO Precision Approach Category II or higher for Runway 08/26)	2
2) Distance Measuring Equipment (DME) (Co-located with ILS GP)	2
3) VHF Omni-directional Radio Range/DME (VOR/DME)	1
Airport Emergency Safety Equipment	
4) Rescue and Fire Fighting Vehicle (Maintain ICAO RFF Category 9)	1 or 2
All Weather Runway Safety Equipment	
5) Runway Sweeper for Snow Removal (Blade Width: 4.5m class)	2
6) Runway Snow Blower	2
7) Aircraft Deicing/Anti-icing Vehicle	1
8) Runway Anti-Icing Liquid Sprayer	1
Priority 2	
Ground Support Equipment (GSE) for Efficient and Reliable Aircraft Ground Handling	
1) Aircraft Tow Tractor (Weight: 60 tons class)	1
2) High Lift Loader	2
3) Aircraft Ground Power Unit (Capacity: 180KVA for Cargo Aircraft)	2
4) Aircraft Air Start Unit (Air Flow Rate: 250 ppm class)	1
5) Tow Tractor for Baggage Cart and Container Dolly	5
6) Belt Loader	2
7) Aircraft Water Service Truck	1
8) Aircraft Lavatory Service Truck	1
9) Baggage Cart	13
10) Aircraft Air Conditioning Unit	2
11) Container Dolly	12

(2) The number of equipment mentioned in (1) may be modified in consideration of equipment to be transferred from the Government of the United States of America for Manas International Airport. The number and specifications of the equipment of this Project will be assessed in the Technical Memorandum to be agreed between the Japanese and Kyrgyz sides by the end of January 2014.

(3) Trainings for operation and maintenance of equipment mentioned in (1) will be included in the equipment supply contract.

5-2. JICA will assess the appropriateness of the request and will report the findings to the Government of Japan. The final specifications and quantities of the equipment shall be decided by the Japanese side and be described in the draft Preparatory Survey Report, which will be prepared in May 2014, in consideration of necessity, technical

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

6. Japan's Grant Aid Scheme

6-1. The Kyrgyz side understands the Japan's Grant Aid scheme explained by the Team, as described in Annex-4.

6-2. The Kyrgyz side will take the necessary measures, as described in Annex-5, 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 the Kyrgyz Republic.

7. Tentative Schedule of the Study

Both sides confirmed the tentative schedule of the Survey as follows:

7-1. The Team will continue the field survey in the Kyrgyz Republic until January 31st, 2014.

7-2. JICA will prepare the draft Preparatory Survey Report in English and explain its contents including the final components and cost estimation of the Project to the Kyrgyz side in late May 2014.

7-3. JICA will complete the final report and send it to the Government of the Kyrgyz Republic around September 2014.

7-4. The above schedule is tentative and subject to change.

8. Other Relevant Issues

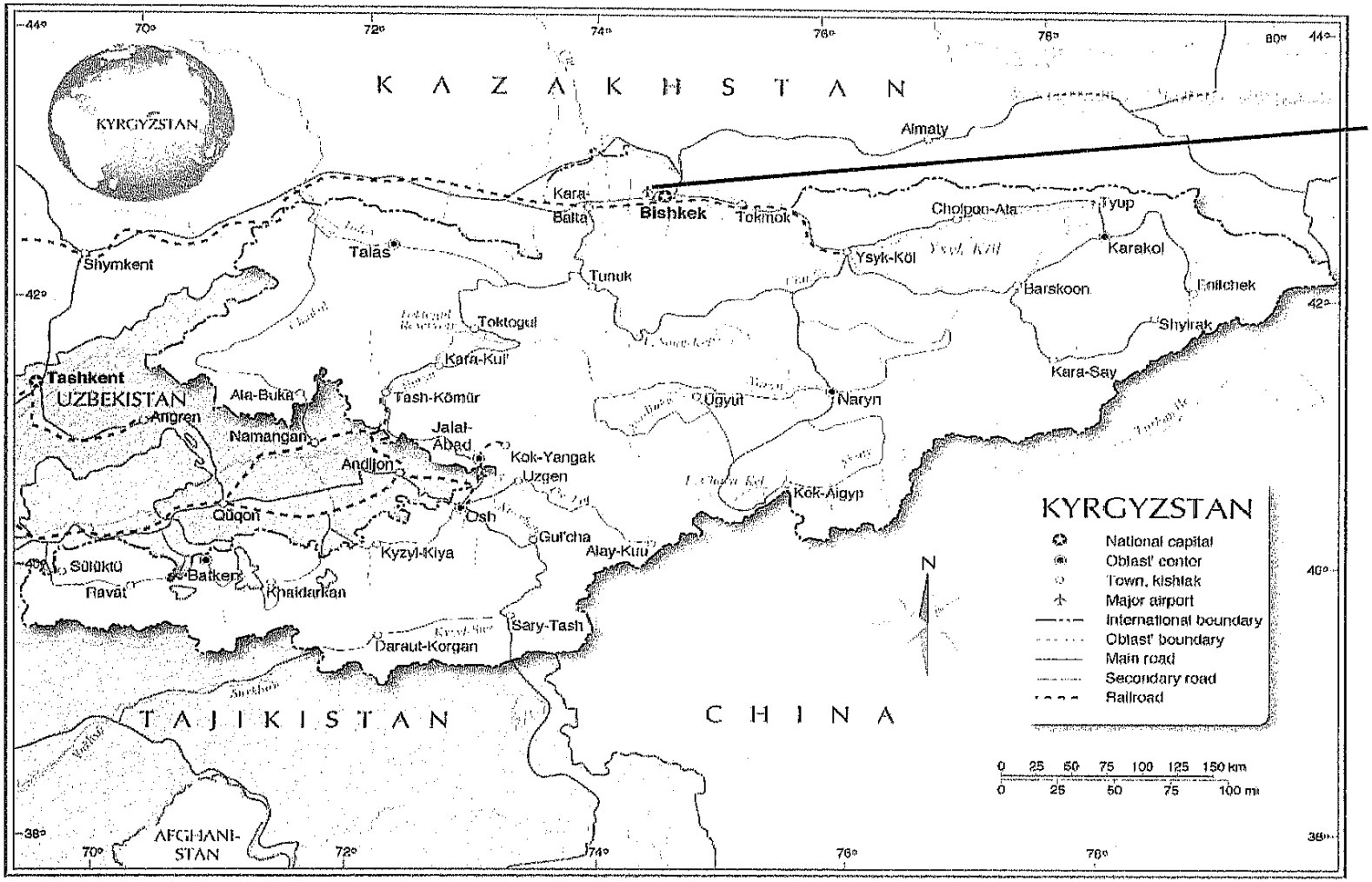
8-1. The Kyrgyz side understands the principle of the Japan's Official Development Assistance (ODA) Charter, which stresses that ODA must not be utilized for military purposes or promoting international conflicts, and agrees to ensure that the equipment and facilities to be procured in the Project shall never be utilized for any military purposes.

8-2. The Kyrgyz side agreed that MIA and KAN shall secure enough budget and personnel necessary for operation and maintenance of the equipment and facilities to be procured after the completion of the Project.

8-3. The Kyrgyz side shall provide security measures for all concerned Japanese nationals working for the Project, if deemed necessary.

Annex-1: Project Site
Annex-2: Organization Charts of MOTC and CAA
Annex-3: Organization Charts of MIA and KAN
Annex-4: Japan's Grant Aid Scheme
Annex-5: Major Undertakings to be Taken by Each Government

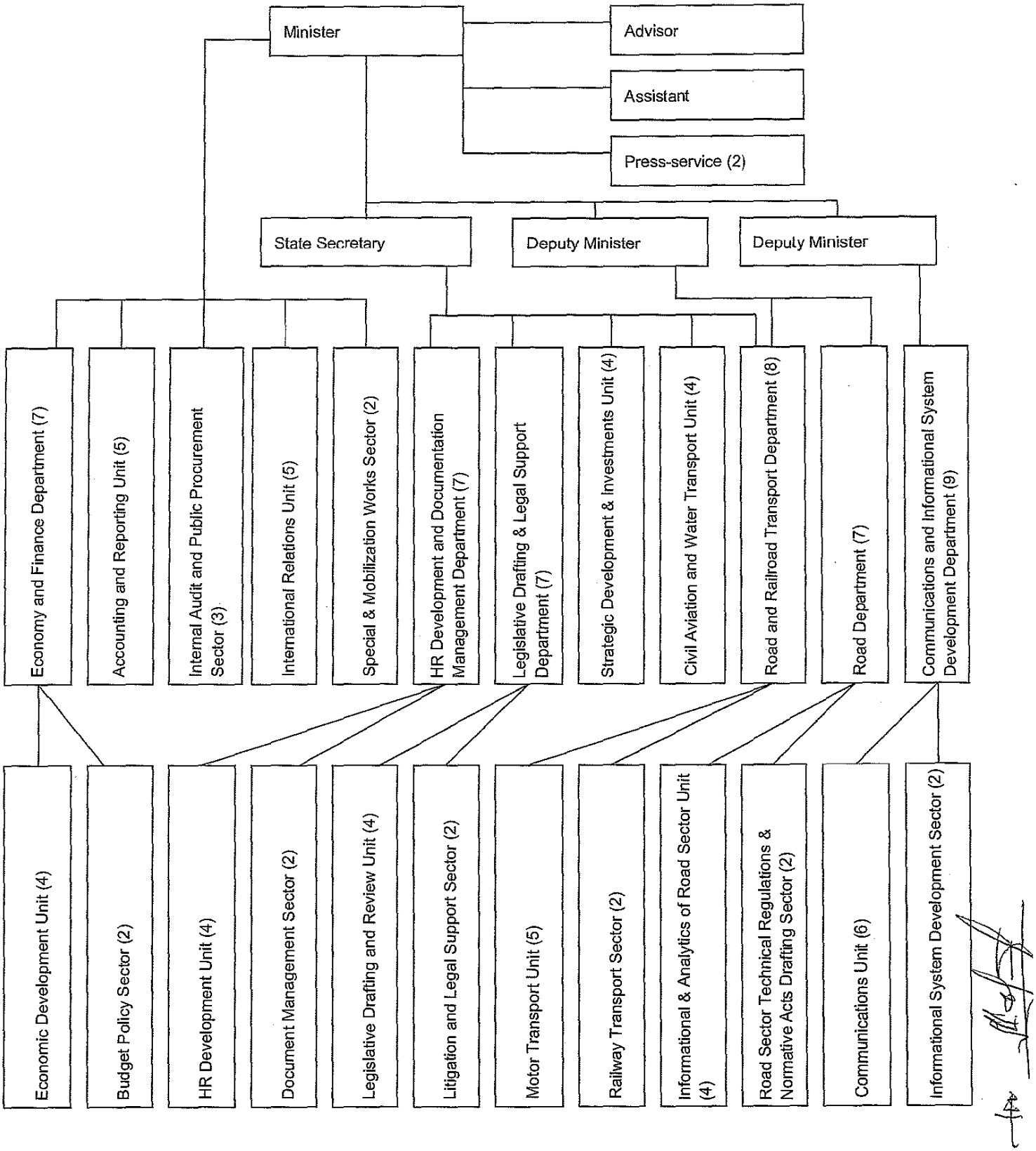
PROJECT SITE



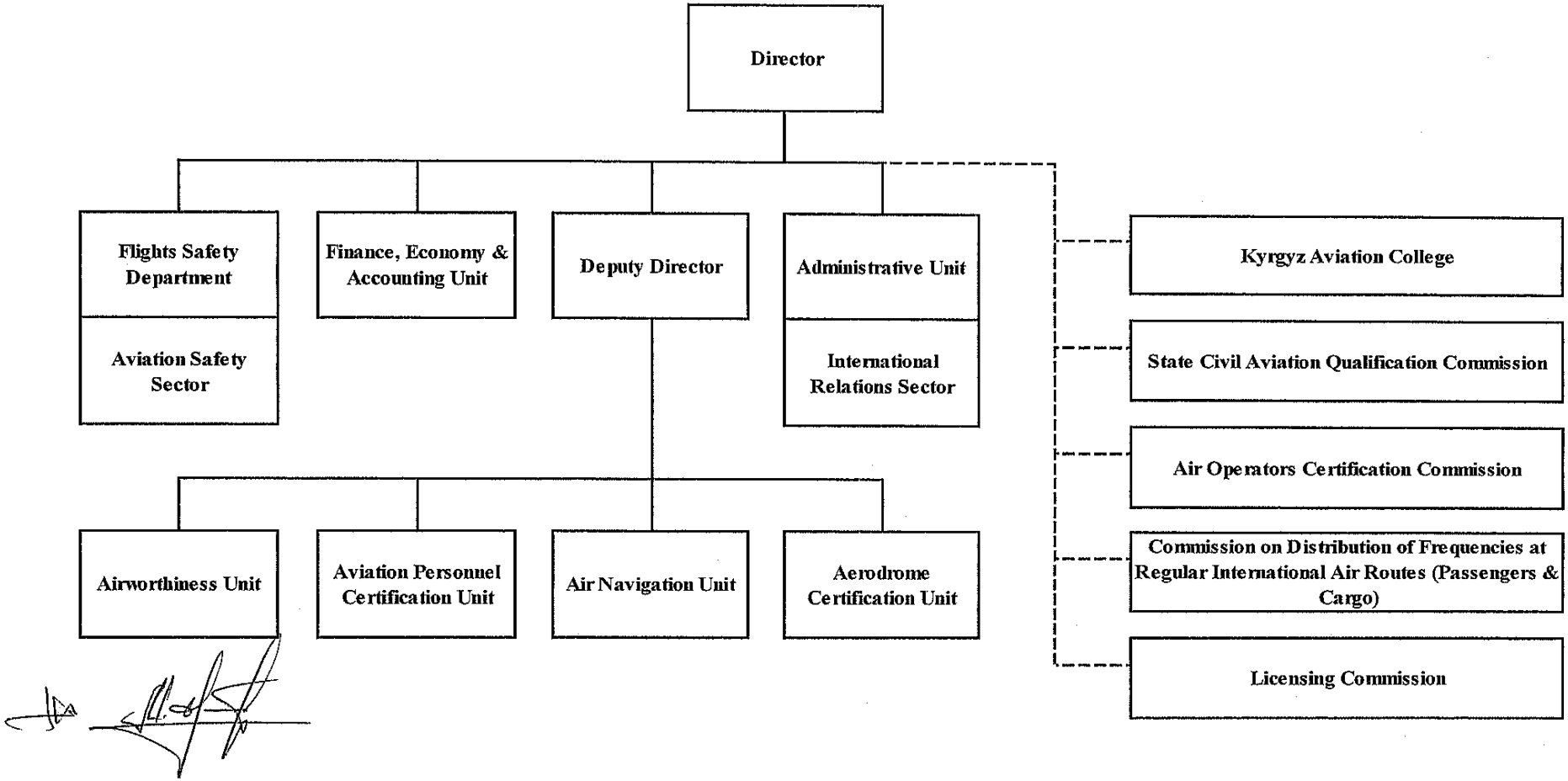
Manas International Airport

ORGANIZATION CHARTS OF MOTC AND CAA

[Ministry of Transport and Communications]

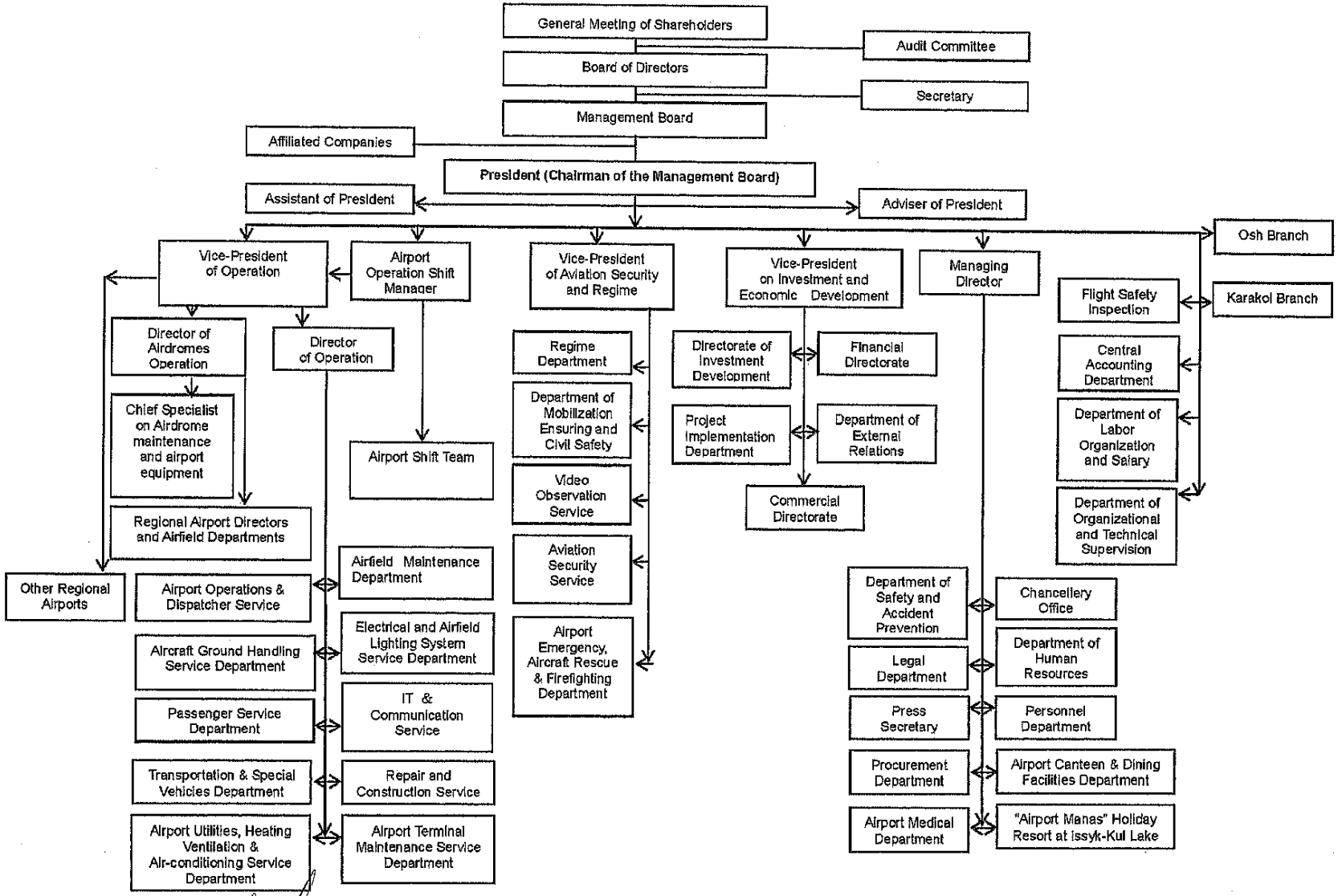


[Civil Aviation Agency]

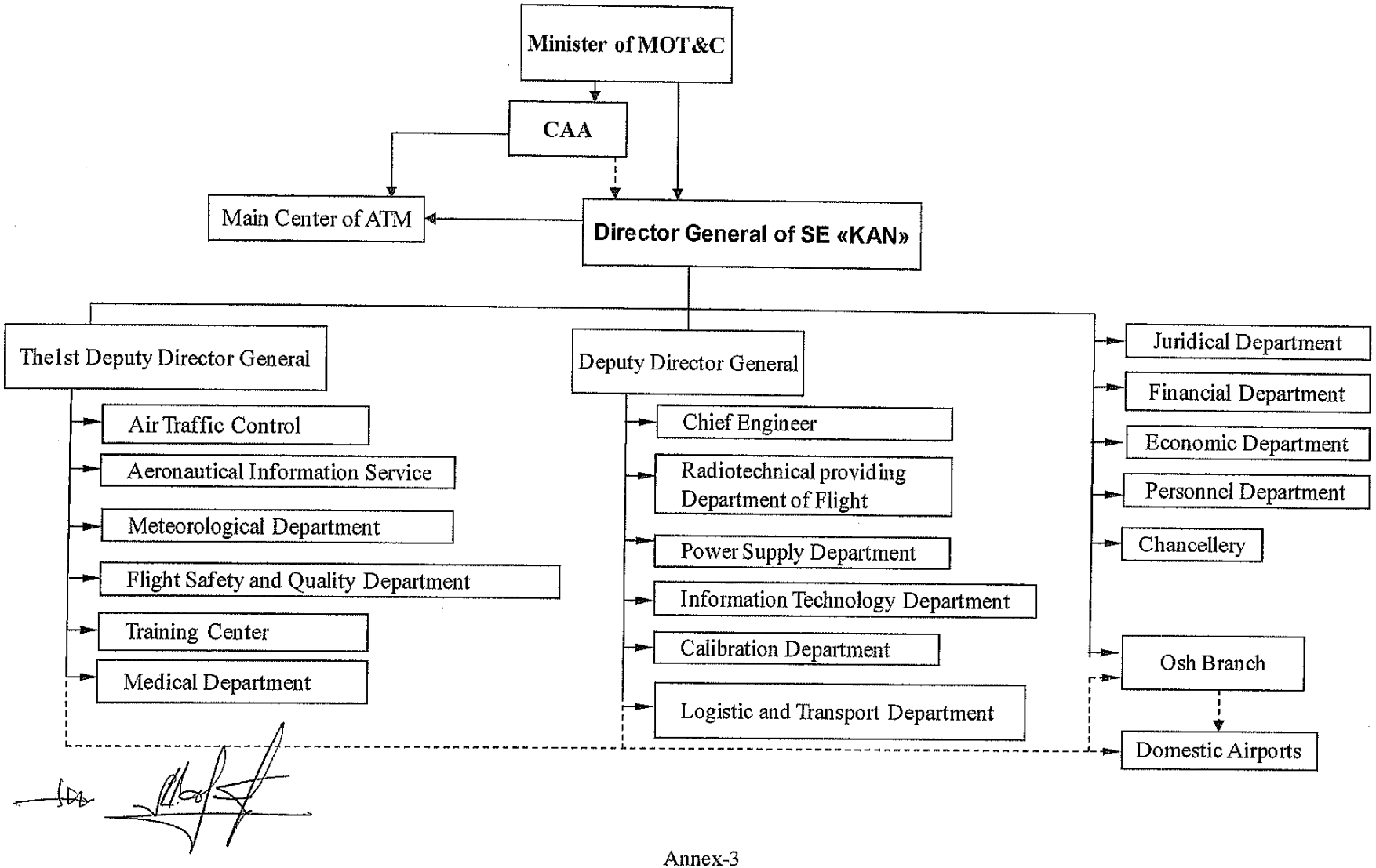


ORGANIZATION CHARTS OF MIA and KAN

[Manas International Airport OJSC]



[Kyrgyzaeronavigatsiya SE]



JAPAN'S GRANT AID SCHEME

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 :

・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.
- 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 a 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.

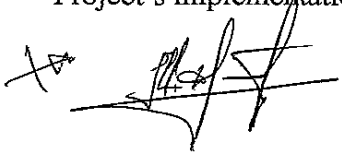
3. Japan's Grant Aid Scheme

(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-5.

(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 Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid 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"). 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.

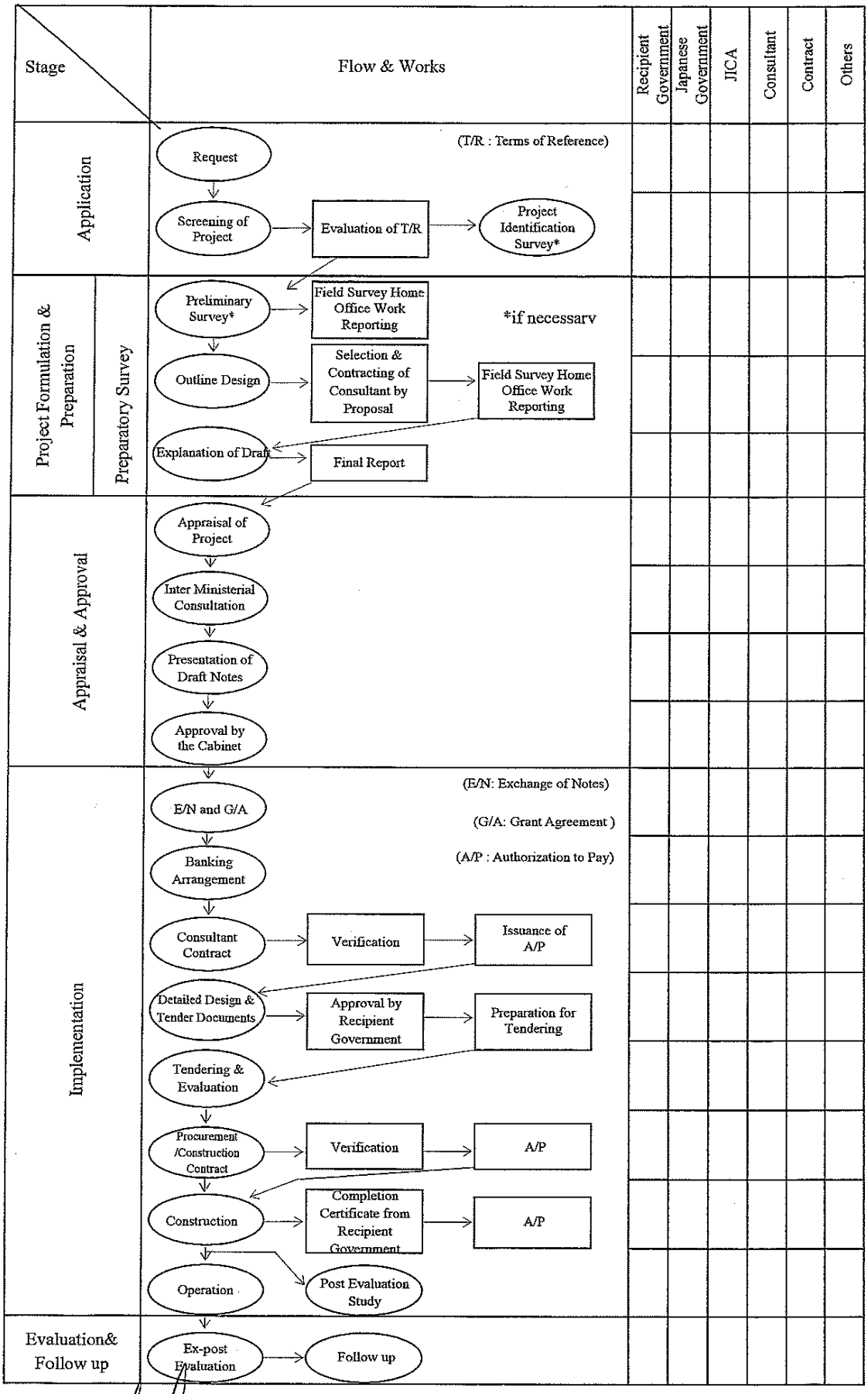
(9) Authorization to Pay (A/P)

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

(10) 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



MAJOR UNDERTAKINGS TO BE TAKEN BY EACH GOVERNMENT

No.	Items	To be covered by Grant Aid	To be covered by Recipient
1	To procure, deliver and install the equipment	●	
2	To provide training for operation and maintenance of the equipment	●	
3	To conduct preparatory works for installation of the equipment including site preparation, removal of existing structures/equipment, supply of electric power and others as required, prior to installation of the equipment		●
4	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1) Transportation of the Products from Japan to the recipient country	●	
	2) Customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
5	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		●
6	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		●
7	To ensure that the products be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	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		●
10	To give due environmental and social consideration in the implementation of the Project.		●

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

A-5 Technical Memorandum

TECHNICAL MEMORANDUM
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT OF EQUIPMENT
OF THE MANAS INTERNATIONAL AIRPORT
IN THE KYRGYZ REPUBLIC

Following the signing of Minutes of Discussion on the Project for Improvement of Equipment of the Manas International Airport (the Project) between the Kyrgyz side represented by Mr. Maksatbek D. DYIKANOV, the State Secretary, Ministry of Transport and Communications of the Kyrgyz Republic and the Japanese side represented by Mr. Hiroyuki UEDA, Leader of Preparatory Survey Team (the Survey Team) of Japan International Cooperation Agency (JICA), the consultant members of the Survey Team continued the field survey and held a series of technical discussions on the Project with officials concerned of Manas International Airport and Kyrgyz Aeronavigatsiya.

As a result of the technical discussions and field survey of the Project, both Japanese and Kyrgyz sides confirmed the main items described in the attached sheets. It is noted that the result of discussions between the consultant members of the Survey Team and the Kyrgyz side is not final and binding, and that issues stated in this Technical Memorandum will be brought to Japan for further examination by the Japanese side.

Bishkek, January 29, 2014

Abdimalik B. Busurmankulov
Vice President
Manas International Airport

Mamatnazar Zhakypbaev
Kyrgyz Aeronavigatsia
Deputy Director General

Satoshi Hatayama
Leader of the Consultants
JICA Preparatory Survey Team

ATTACHMENT

1. Air Navigation Safety Equipment

1.1 Basic Technical Requirements of the Systems

The detailed system configuration of each project component will be designed with the following basic technical requirements:

- The system equipment characteristics will follow and conform to any relevant ICAO Standards and Recommended Practices (SARPs), and other related national or international regulations and practices.
- The designs for the system will take into account human engineering considerations; for example, Human-Machine Interface (HMI) of the operational and technical position will be of window type, multi-color and user-friendly graphical environment.
- The hardware of ILS and VOR/DME systems should be as much as practicable Commercial Off-The-Shelf (COTS) products with state-of-the-art technology.

1.2 Equipment Configuration of the Systems

System equipment configuration for each system based on the basic technical requirements is shown in Table 1.2.1 and Table 1.2.2.

Note: Further analysis for equipment configuration of each system will be implemented during the works for the preparation of Draft Final Report & Equipment Specifications by the Survey Team.

1.2.1 Instrument Landing System

Table 1.2.1 ILS Equipment Configuration

Place	Name of Equipment	Q'ty	Remarks
Localizer site (Runway 08, 26)	Localizer Equipment	2 sets	2-frequency type, hot-standby
	Localizer Antenna with monitor antenna	2 sets	16 or 20 elements
	Localizer Far Field Monitor	2 sets	
	Wireless System (radio link)	2 sets	
	DC Power Supply Equipment with batteries	2 sets	
	Automatic Voltage Regulator	2 sets	5kVA
	Equipment Shelter (metallic shelter)	2 sets	With air conditioners, power supply panel
GP/DME site (Runway 08, 26)	GP Equipment	2 sets	2-frequency type, hot-standby
	GP Antenna with monitor antenna	2 sets	3 elements
	DME Equipment	2 sets	100W, hot-standby
	DME Antenna	2 sets	
	Wireless System (radio link)	2 sets	
	DC Power Supply Equipment with batteries	2 sets	
	Automatic Voltage Regulator	2 sets	5kVA
	Equipment Shelter (metallic shelter)	2 sets	With air conditioners, power supply panel
Operation Building Monitor Room	ILS Remote Maintenance Monitoring System	2 sets	

	Remote Control Status Unit (RCSU)	2 sets	
	Localizer Interlock System	1 set	
	Wireless System (radio link)	4 sets	
Operation Building Radar Control Room	ILS Status Unit	2 sets	

Outline of each system diagram is as shown below:

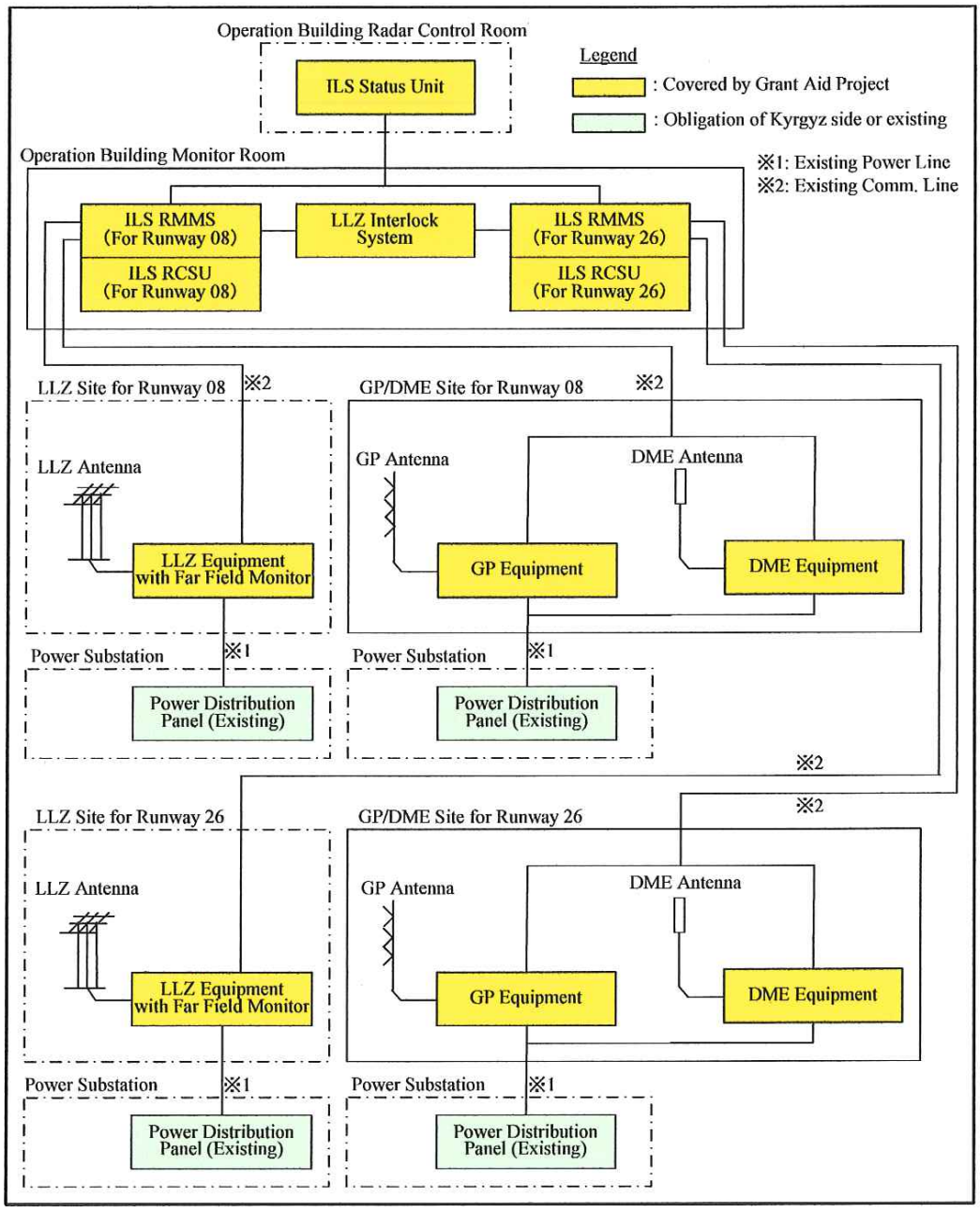


Figure 1.2.1 Figure I-1 ILS System Diagram

1.2.2 VHF Omnidirectional Radio Range and Distance measuring Equipment (VOR/DME)

Table 1.2.2 VOR/DME Equipment Configuration

Place	Name of Equipment	Q'ty	Remarks
VOR/DME site	VOR Equipment	1 set	
	VOR Antenna	1 set	
	DME Equipment	1 set	
	DME Antenna	1 set	
	DC Power Supply Equipment with batteries	1 set	
	Automatic Voltage Regulator	1 set	5kVA
	Equipment shelter with counterpoise	1 set	With air conditioners, power supply panel
Operation Building Monitor Room	VOR/DME Remote Maintenance Monitoring System	1 set	
	Remote Control Status Unit (RCSU)	1 set	
Operation Building Radar Control Room	VOR/DME Status Unit	1 set	

Outline of the system diagram is as shown below:

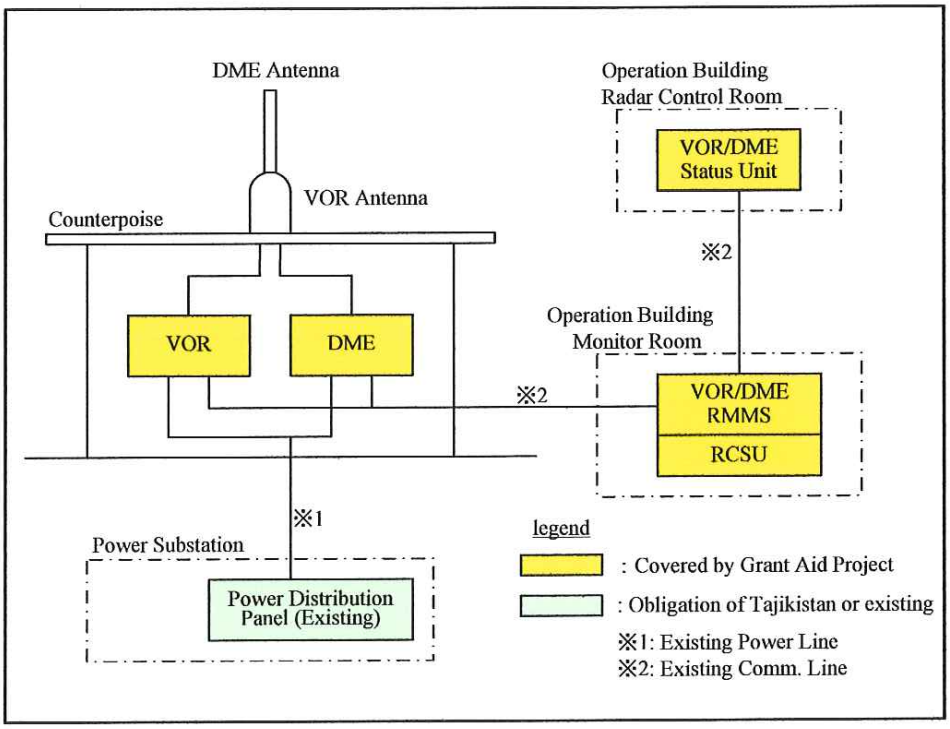


Figure 1.2.2 VOR/DME System Diagram

1.3 Responsibility of the works to be implemented by the Kyrgyz Republic and under Grant Aid Project.

- Provision of electric power supply including cable connection for the ILS and VOR/DME equipment by the Kyrgyz side.
- Provision of remote control line and installation of remote control cable for ILS and VOR/DME equipment by the Kyrgyz side. Cable connection will be carried out under Grant Aid Project.
- Remote Maintenance Monitoring System and Remote Control Status Unit will be installed at Monitor Room (3rd floor) in the Operation Building. Installation space and power supply for the

remote control will be provided by the Kyrgyz side.

- ILS and VOR/DME Status Units will be installed at Radar Control Room (4th floor) in the Operation Building. Installation space and cable for status units will be provided by the Kyrgyz side.
- Removal of existing ILS and VOR/DME will be implemented by the Kyrgyz side.
- Spare parts for ILS and VOR/DME for 2 years normal operation will be covered by Grant Aid Project
- .
- Test & measuring equipment for ILS and VOR/DME including field tester will be provided by Grant Aid Project.

1.4 Technical Confirmation

- Remote control for ILS as a stand-by, which will be installed under Grant Aid Project, will be done by wireless system.
- ILS will consist of Localizer, Glide Path and DME. Facility performance will be category III.
- ILS and VOR/DME will be replaced at the same sites
- VOR will be conventional type.
- Existing foundation for Localizer and Glide Path antennas will be used for new antennas.
- Existing Glide Path antenna masts will be used for new antennas.
- Remote control & monitoring system for ILS and VOR/DME will consist of;
  a) Remote Maintenance Monitoring System (RMMS) – PC type
  b) Remote Control & Status Unit (RCSU) – Panel type
  c) Status Unit (SU) – Panel type
- ILS and VOR/DME shelter will be equipped with fire extinguisher, door sensor and air conditioner.

2. Airport Emergency Safety Equipment (Rescue and Fire Fighting Vehicle)

Preconditions are as follows:

Maintain ICAO RFF Category 9. The ICAO requirement will be covered together with existing two new RFF vehicles.

Table 1.4 Airport Emergency Safety Equipment (Rescue and Fire Fighting Vehicle)

Number	Priority by Minutes of Discussion (M/D)	Name of Equipment	Quantities	Remarks
1	Priority 1 4)	Rescue and Fire Fighting Vehicle	1	Water Tank volume more than 12.2 kl.

3. All Weather Runway Safety Equipment

Preconditions are as follows:

Snow removal for 4,200m by 55m runway area will be completed in around 60 minutes with return operation together with existing equipment. The header number represents the priorities.

Table 3.1 All Weather Runway Safety Equipment

Number	Priority by M/D	Name of Equipment	Quantities	Remarks
1	Priority 1 5)	Runway Sweeper for Snow Removal	2	Sweeper Bloom Width 5m class + Snow Plow
2	Priority 1 6)	Runway Snow Blower	2	Speed >40km/h Blowing width >2m
3	Priority 1 7)	Aircraft Deicing/Anti-icing Vehicle (Self-Propelled Aircraft Deicing/Anti-icing Unit)	1	Based on IATA AHM* 975 Proportional mix, 3 Tanks with Enclosed Cabin .Total Tank Volume min 6,000L
4	Priority 1 8)	Runway Anti-Icing Liquid Sprayer	1	Tank Volume 10KL class Liquid and Powder Combination Type.

Note*: AHM: IATA Airport Handling Manual 34th edition

4. Ground Support Equipment (GSE) for Efficient and Reliable Aircraft Ground Handling

Preconditions are as follows:

- Simultaneous service for 2 wide body medium class passenger aircraft
- Requirement will be covered together with existing equipment

The following items are confirmed as the request from the Kyrgyz side. The header number represents the priorities.

Table 4.1 Ground Support Equipment (GSE) for Efficient and Reliable Aircraft Ground Handling

Number	Priority by M/D	Name of Equipment	Quantities	Remarks
1	Priority 2 1)	Aircraft Tow Tractor (Aircraft Nose Gear Tow bar Tractor)	1	Based on IATA AHM 955 Total Weight 60 tons class with GPU
2	Priority 2 2)	High Lift Loader (Lower Deck Containers/Pallet Loader)	2	Based on IATA AHM 931 Capacity 7,000kg and 14,000kg
3	Priority 2 3)	Aircraft Ground Power Unit (Ground Power Unit)	2	Based on IATA AHM 972 Output Capacity 180KVA class
4	Priority 2 4)	Aircraft Air Start Unit (Air Start Unit)	1	Based on IATA AHM 976 Air Flow 250PPM class
5	Priority 2 5)	Tow Tractor for Baggage Cart and Container Dolly (RAMP Equipment Tractor)	5	Based on IATA AHM 968 Diesel or Electric Powered
6	Priority 2 6)	Belt Loader (Self –propelled Conveyer-Belt Loader)	2	Based on IATA AHM 925 Belt Width 600mm
7	Priority 2 7)	Aircraft Water Service Truck (Self–propelled Portable Water Vehicle with Rear or Front Servicing)	1	Based on IATA AHM 970 Tank Capacity for Waste 2,000L class
8	Priority 2 8)	Aircraft Lavatory Service Truck (Self–propelled Lavatory Service Vehicle with Rear or Front Servicing)	1	Based on IATA AHM 971 Tank Capacity 3,000L class
9	Priority 2 9)	Baggage Cart (Baggage/Cargo Cart)	13	Based on IATA AHM 963 Platform Size 2400mm × 1400mm class

10	Priority 2 10)	Aircraft Air Conditioning Unit (Aircraft Air Conditioning (cooling) Unit)	2	Based on IATA AHM 974 Capable for Wide Body Aircraft
11	Priority 2 11)	Container Dolly (Lower Deck Container Turntable Dolly)	12	Based on IATA AHM 965 Calling Capacity 1,600Kg

Note: Electrical chargers for the electric powered Tow Tractor for Baggage Carts and Container Dollies will be covered by Grant Aid Project. However, if they are provided under Grant Aid Project, necessary electrical power supply works to the chargers should be conducted by the Kyrgyz side.

5. Items Removed from the Original Request from the Kyrgyz Side

The following items in the original request form the Kyrgyz side will be out of the scope of the Project.

Table 5.1 Items Removed from the Original Request

Number	Name of Equipment	Reasons
1	Passenger Stair (Self –propelled Telescopic Passenger Stairs)	Manas International Airport have enough number of Steers to cover 2 wide body medium class Aircrafts of passenger flights. (6 Self–propelled Passenger Stairs and 2 fixed Passenger Boarding Bridges)
2	Airport Security Baggage X-Ray units	Manas International Airport has an improvement plan of the Airport securities including in-line checking measures.
3	Airport Security Walk-Through Metal Detectors	

6. Equipment that the United State of America will transfer to the Kyrgyz Republic

A List of equipment which the United State of America will transfer to the Kyrgyz Republic when the US withdraws from Manas International Airport will be available by the end of February 2014. Manas International Airport should provide JICA with this equipment list immediately after it is available. Manas International Airport should offer JICA to cancel the equipment requested to the Japanese side if such equipment is provided by the US to avoid duplication..

7. Clarification of Collected Data and Information

The Survey Team requested further collaboration with Manas International Airport for clarification of data and information collected as well as for collection of additional data and information if such necessity arises. The Kyrgyz side accepted the request.

8. Confidentiality

Since this Technical Memorandum includes outline specifications of the equipment to be provided by the Project, both Japanese and Kyrgyz sides confirmed that this Technical Memorandum should be treated as confidential, taking into consideration a fair and transparent competition for the supply of the equipment.

A-6 Minutes of Discussions 2

MINUTES OF DISCUSSION ON
THE PREPARATORY STUDY FOR
THE PROJECT FOR IMPROVEMENT OF EQUIPMENT OF
THE MANAS INTERNATIONAL AIRPORT
IN THE KYRGYZ REPUBLIC
(EXPLANATION OF THE DRAFT PREPARATORY SURVEY REPORT)

On the basis of the field study in the Kyrgyz Republic in January 2014 and the technical examination in Japan, Japan International Cooperation Agency (hereinafter referred to as 'JICA') prepared the Draft Preparatory Survey Report (hereinafter referred to as the 'Report') on the Project for Improvement of Equipment of the Manas International Airport (hereinafter referred to as the 'Project').

JICA's Preparatory Survey Team (hereinafter referred to as the 'Team') headed by Mr. Hiroyuki Ueda, Senior Advisor of JICA, stayed in Bishkek from May 28th to June 1st, 2014. The Team explained to and consulted with the officials concerned of the government of the Kyrgyz Republic about the Report. As a result of discussions, both Japanese and Kyrgyz sides confirmed the items in the attachment.

It should be noted that the implementation of the Preparatory Survey does not imply any decision or commitment by JICA to extend its grant for the project at this stage.

Bishkek, May 30th, 2014

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Leader
Preparatory Study Team
Japan International Cooperation Agency

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State Secretary
Ministry of Transport and Communications
Kyrgyz Republic

Abdimalik B. Busurmankulov
Member of the Board
JSC "Manas International Airport"

Ulukbek A. Rahmanov
Director General
Kyrgyzaeronavigatsiya SE

ATTACHMENT

1. Contents of the Report

The Kyrgyz side in principle agreed and accepted the contents of the Report and draft technical specifications of the equipment. The list of the equipment to be procured is shown in Annex 1.

2. Confidentiality of the Cost Estimation and Specifications

Both sides agreed that the project cost estimation attached in Annex 2 and technical specifications of the equipment in the Report should never be disclosed to any third parties until all the contracts of the Project are concluded.

3. Executing Agency

The Executing Agency will be the Ministry of Transport and Communications (hereinafter referred to as the 'MOTC') for the implementation of the Project.

4. Undertaking by the Government of Japan

The Grant Aid will cover the costs for the following:

- Procurement, delivery and installation of the equipment by the supplier;
- Training for operation and maintenance of the equipment by the supplier; and
- Detailed design, assistance in tendering and installation supervision by the consultant, in accordance with Annex 5 of the Minutes of Discussions signed between JICA and the MOTC on January 20th, 2014.

5. Undertaking by the Government of the Kyrgyz Republic

The Kyrgyz side will take the following undertakings for the smooth implementation of the Project at its own expenses in accordance with Annex 5 of the Minutes of Discussions signed between JICA and the MOTC on January 20th, 2014.

5-1. Preparatory Works prior to Installation of ILS and VOR/DME

- To provide power supply and remote control lines for ILS equipment of runway 08 and runway 26;
- To dismantle existing ILS equipment including antennas of runway 08 and runway 26;
- To provide power supply and remote control lines for VOR/DME equipment;
- To dismantle existing VOR/DME equipment including an antenna;
- To temporarily replace the equipment as necessary to allow spaces for new equipment installation at the monitor room and the radar control room in the operation building; and
- To provide commercial power supply available for new equipment in the operation

building.

5-2. Administrative Undertakings

- To ensure prompt customs clearance of the equipment at the port of disembarkation;
- To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Kyrgyz Republic with respect to the purchase of the equipment and the services be exempted;
- To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the equipment and the services such facilities as may be necessary for their entry into the Kyrgyz Republic and stay therein for the performance of their work;
- To bear the commissions paid to the Japanese bank for banking services based upon the Banking Arrangement (B/A) including advising commission of Authorization to Pay (A/P) and payment commission;
- To bear all the expenses, other than those covered by the Grant Aid, necessary for the implementation of the Project; and
- To give due environmental and social consideration in the implementation of the Project.

6. No Duplication of Equipment with the Government of United States of America

Both sides confirmed that the equipment to be procured by the Project will be used for operation and maintenance of Manas International Airport, and that there will be no duplication of equipment between those to be procured by the Project and those to be transferred from the Government of the United States of America for Manas International Airport.

7. Operation and Maintenance of the Equipment

The Kyrgyz side will secure sufficient personnel and budget necessary for proper operation and maintenance of the equipment procured by the Project. The estimated costs are indicated in the Report.

8. Japan's Grant Aid Scheme

The Kyrgyz side fully understood the scheme of the Japan's Grant Aid and the necessary measures to be undertaken by the Kyrgyz side, which was explained by the Team and described in Annexes 4 and 5 of the Minutes of Discussions signed between JICA and the MOTC on January 20th, 2014.

9. Schedule of the Survey

JICA will complete the final report in English in accordance with the confirmed items

and send it to the Kyrgyz side around September 2014. The schedule is tentative and subject to change.

10. Disclosure of Information

Both sides confirmed that the survey results excluding the project cost estimation and technical specifications of the equipment will be disclosed to the public after the completion of the Preparatory Survey. All the survey results including the project cost estimation and technical specifications of the equipment will be disclosed to the public after all the contracts of the Project are concluded.

11. Other Issue

The Kyrgyz side agreed to promptly inform JICA of any plans of the changes of the legal character, ownership, or control of the implementing organizations, namely JSC "Manas International Airport" and Kyrgyzaeronavigatsiya SE.

Annex 1: List of the Equipment to be Procured
Annex 2: Cost Estimation

Annex 1: List of the Equipment to be Procured

Items	Qty.
1. Instrument Landing System (ILS)	
(1) Localizer site (Runway 08, 26)	
1) Localizer Equipment	2
2) Localizer Antenna with monitor antenna	2
3) Localizer Far Field Monitor	2
4) Wireless System (radio link)	2
5) DC Power Supply Equipment with batteries	2
6) Automatic Voltage Regulator	2
7) Equipment Shelter (metallic shelter)	2
(2) GP/DME site (Runway 08, 26)	
1) GP Equipment	2
2) GP Antenna with monitor antenna	2
3) DME Equipment	2
4) DME Antenna	2
5) Wireless System (radio link)	2
6) DC Power Supply Equipment with batteries	2
7) Automatic Voltage Regulator	2
8) Equipment Shelter (metallic shelter)	2
(3) Operation Building Monitor Room	
1) ILS Remote Maintenance Monitoring System	2
2) Remote Control Status Unit (RCSU)	2
3) Localizer Interlock System	1
4) Wireless System (radio link)	4
(4) Operation Building Radar Control Room	
1) ILS Status Unit	2
2. VOR/DME	
(1) VOR/DME site	
1) VOR Equipment	1
2) VOR Antenna	1
3) DME Equipment	1
4) DME Antenna	1
5) DC Power Supply Equipment with batteries	1
6) Automatic Voltage Regulator	1

7) Equipment Shelter with counterpoise	1
(2) Operation Building Monitor Room	
1) VOR/DME Remote Maintenance Monitoring System	1
2) Remote Control Status Unit (RCSU)	1
(3) Operation Building Radar Control Room	
1) VOR/DME Status Unit	1
3. Fire Fighting Vehicle	1
4. Ground Support Equipment for Runway	
1) Airport Runway Sweepers for Snow Removal	2
2) Airport Runway Snow Blower	2
3) Airport Runway Sprayer	1
5. Ground Support Equipment for Aircraft	
1) Lower Deck Container/Pallet Loader	2
2) Belt loaders (for loading and unloading of baggage)	2
3) Tow Tractor	1
4) Air Start Unit (ASU)	1
5) Lavatory Service Truck	1
6) Water Service Truck	2
7) Tow Tractor (Power Hybrid Type) for Baggage Carts & Container dollies	5
8) Baggage Carts	13
9) Aircraft Ground Power Unit	2
10) Air Conditioning Unit	2
11) Container Dollies	12

Annex 2: Cost Estimation (Confidential)

This Page is closed due to the confidentiality.