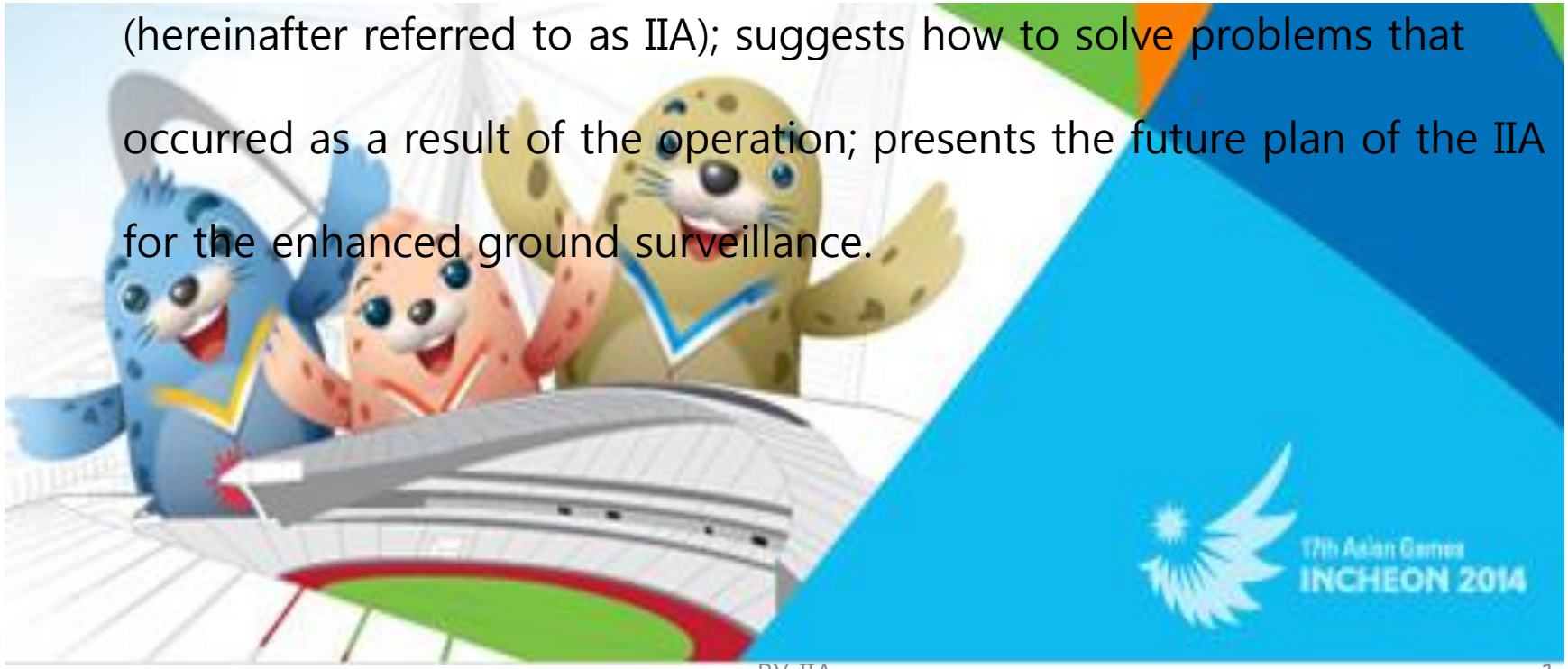
SUMMARY

This briefing paper describes the current state of the ground surveillance facilities installed in Incheon International Airport (hereinafter referred to as IIA); suggests how to solve problems that occurred as a result of the operation; presents the future plan of the IIA for the enhanced ground surveillance.

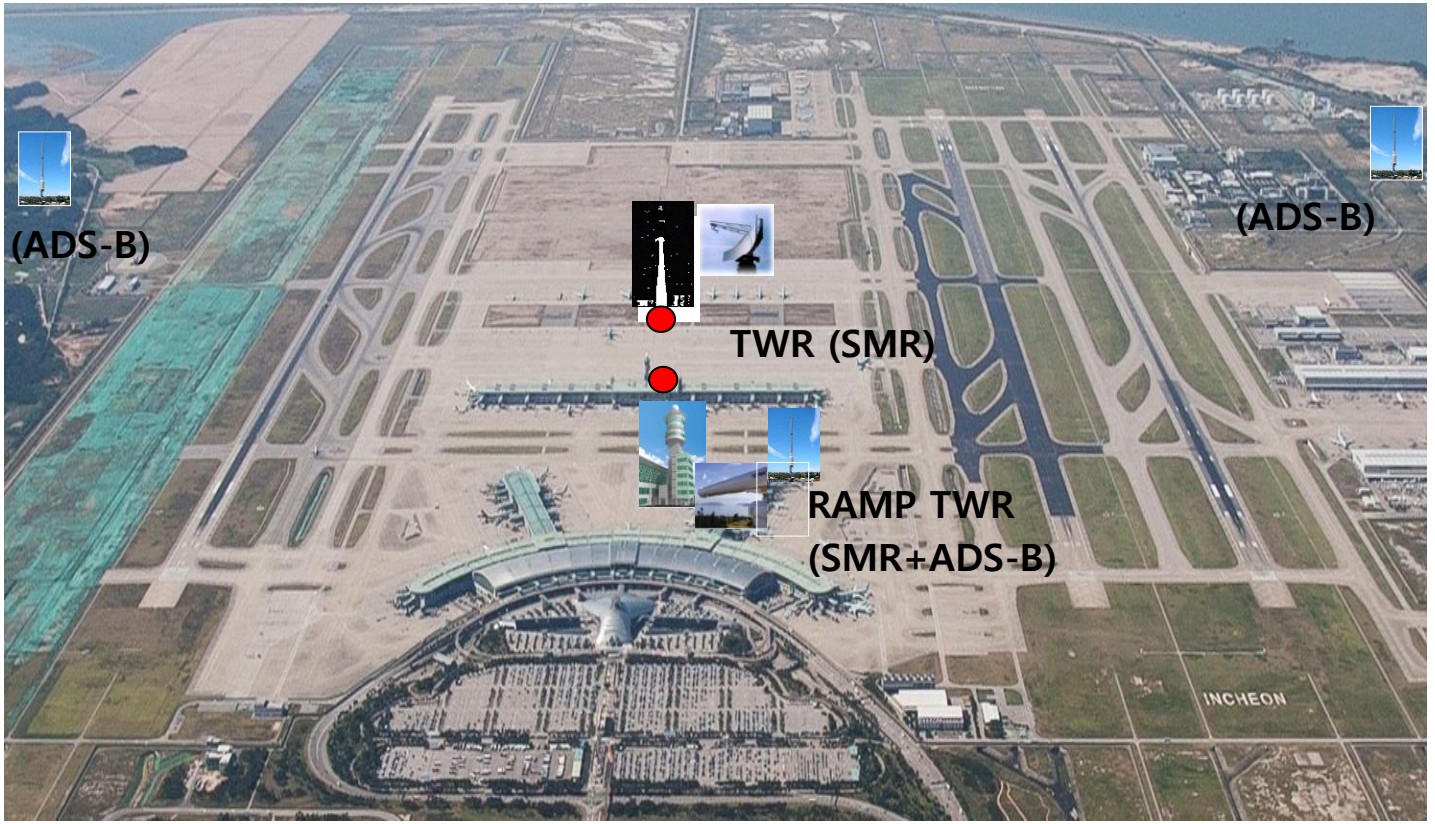


1. INTRODUCTION

- Currently, IIA is operating Ku-band (since 2000), X-band and ADS-B (since 2008) as ground surveillance facilities.
- IIA plans to operate and manage systems such as SMR(2 sets) , ADS-B(1 set) and MLAT(1 set) in an integrated way in order to address the coupling errors caused by the ASR and ASDE target differences as well as a false target produced by snowfall and rainfall.
- IIA will change its operating system into the next generation air navigation system such as precision approach surveillance that enables simultaneous landings and takeoffs. In addition, it will strengthen the support for ground control service even under ***low-visibility*** conditions (with visibility minimum of ***75 m)*** as a CATIIIb airport to achieve 400,000 times of aircraft landings and takeoffs by 2020.

2. DISCUSSION

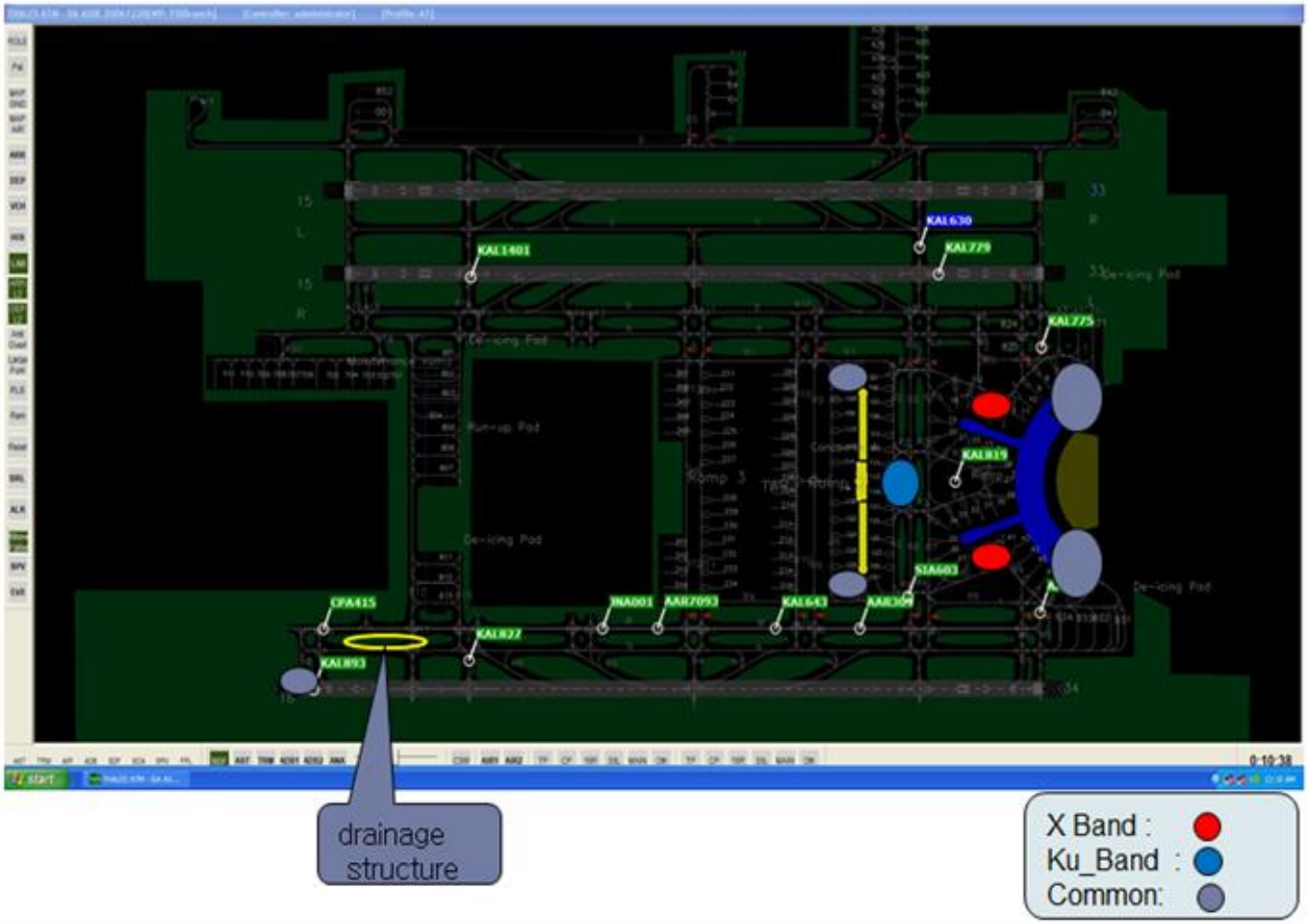
- 2.1 The Current State and Operation Features of the IIA



Classification	Installation Year	Operation Features
Ku-Band SMR (TWR)	2000	• Performance under rainfall : occurrence of false target (at 16 mm/hr or more) • Performance under snowfall : occurrence of False target • Shadow zone : Terminal
X-Band SMR (RAMP TWR)	2008	• Performance under rainfall: Usable (at 40mm/hr or under) • Performance under snowfall: occurrence of False target • Shadow zone : Terminal area
ADS-B	2008	• ADS-B installation rate on aircrafts : about 40% • No auto-labeling that distinguishes landings from takeoffs • Transmission of the data that indicates a coupling error for some uncertified aircrafts
Fusion processer	2008	• De-couplings for some aircrafts • Position errors caused by differences between the ASR and ASDE targets

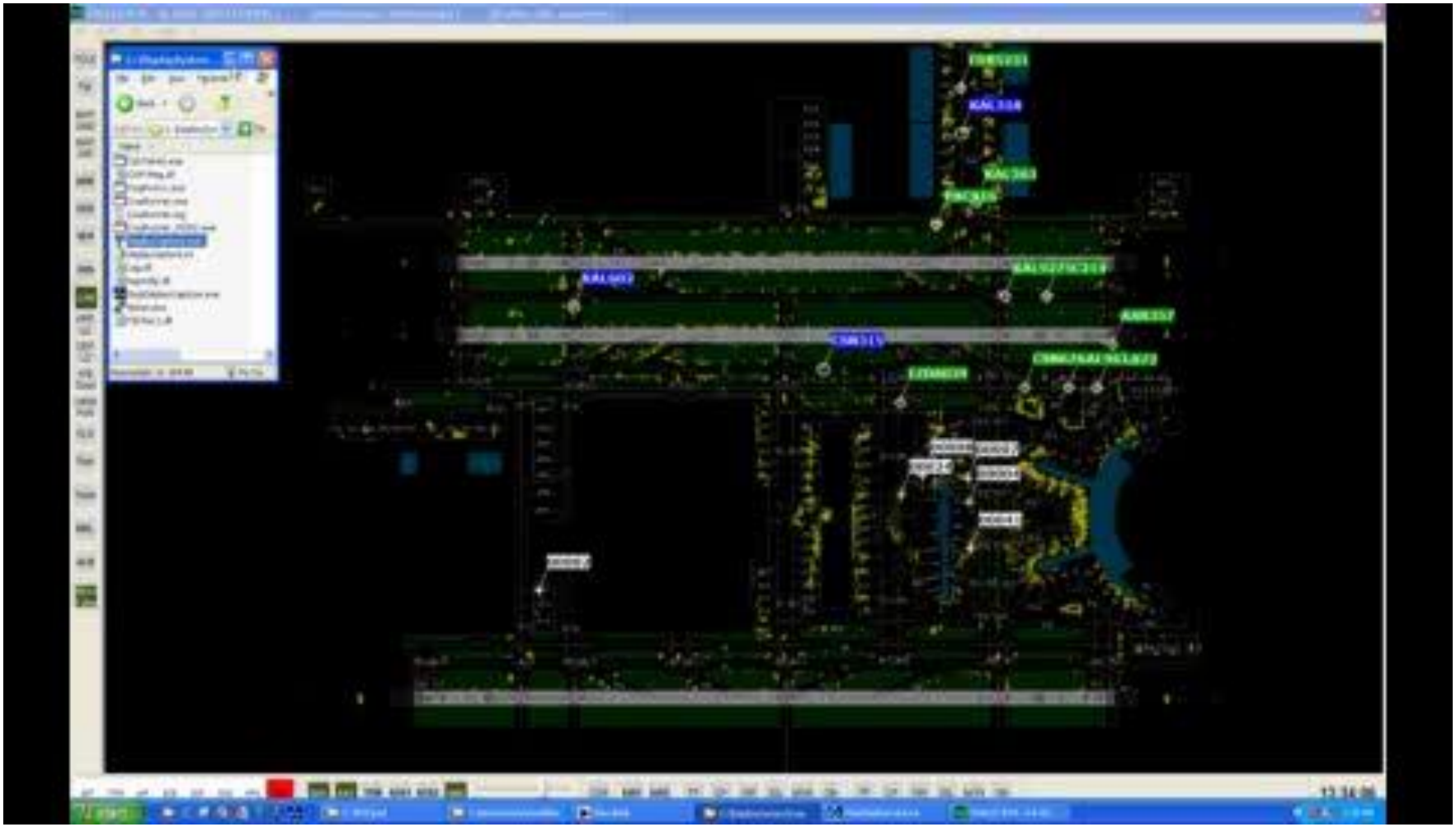
problems that occurred
as a result of the operation

Shadow zone Created by limited line of sight



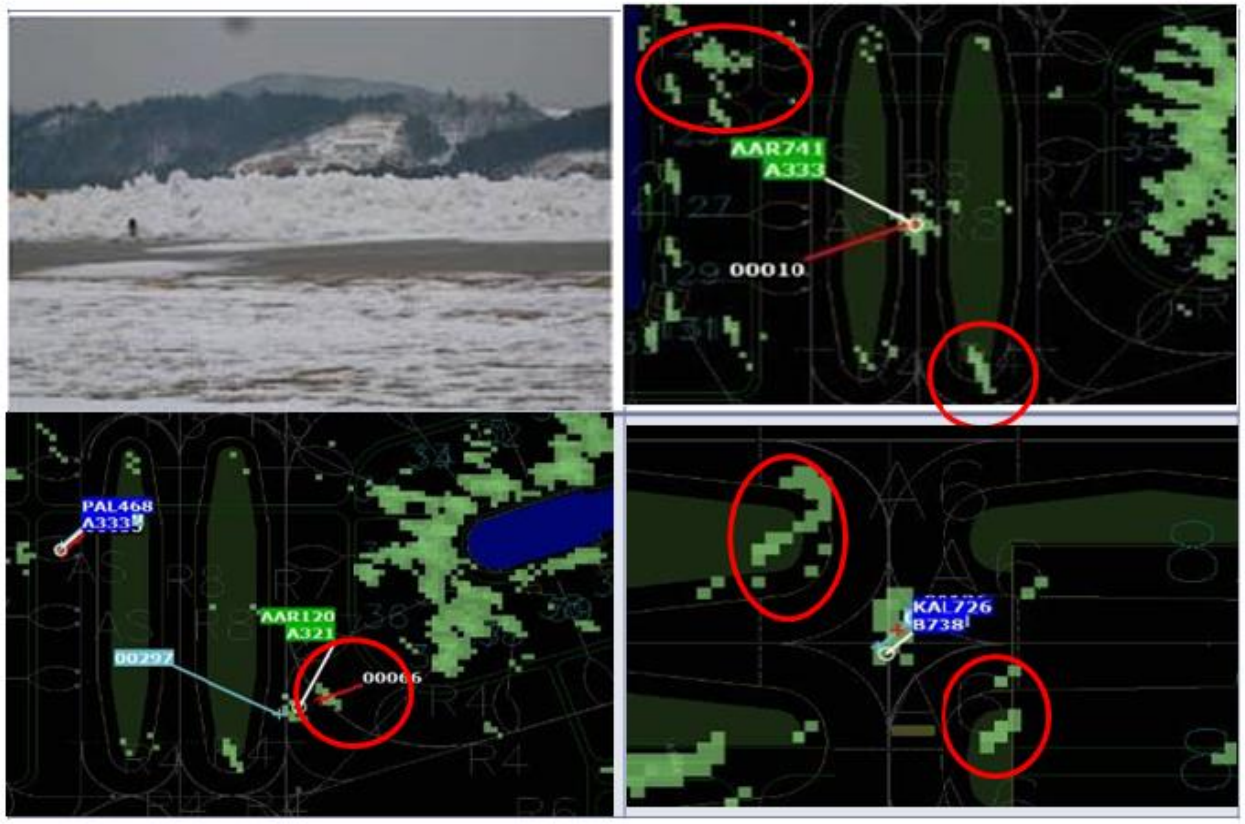
problems that occurred
as a result of the operation

False target produced by rainfall / Label drop caused by threshold level increase



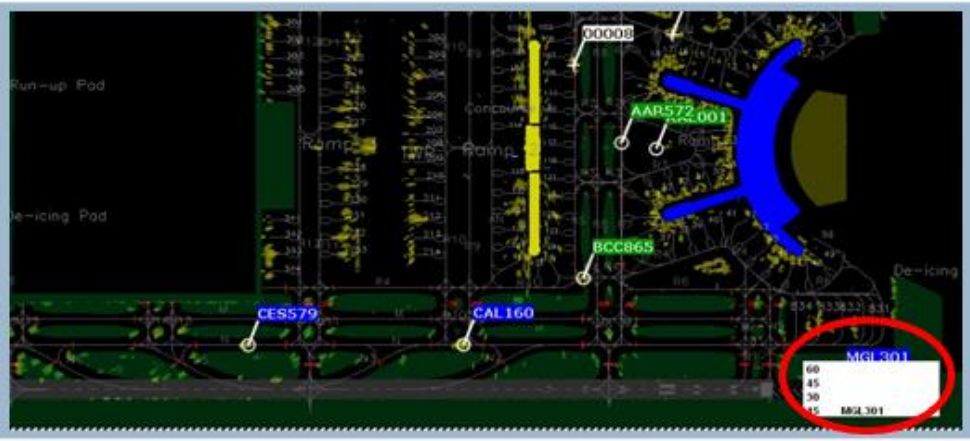
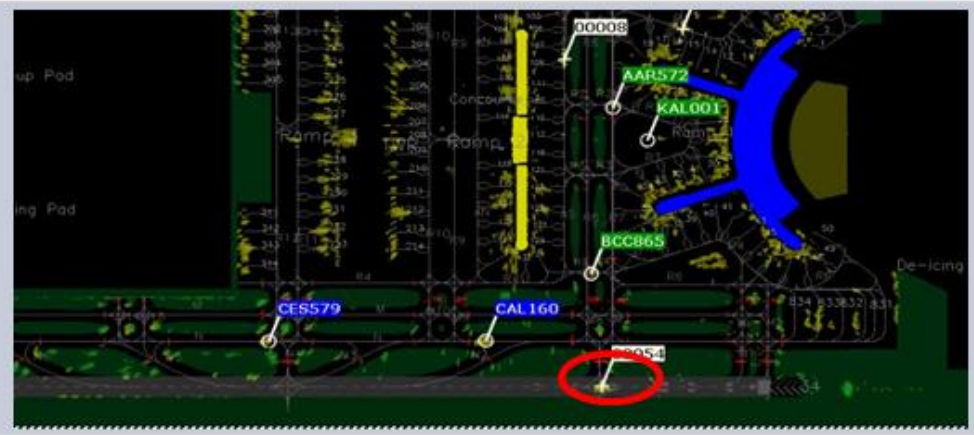
problems that occurred
as a result of the operation

False target produced by the reflection of snowbanks and ice formation



problems that occurred
as a result of the operation

Label Drop caused by different position reports between ASR and SMR targets

Lable keep	
Lable Drop	

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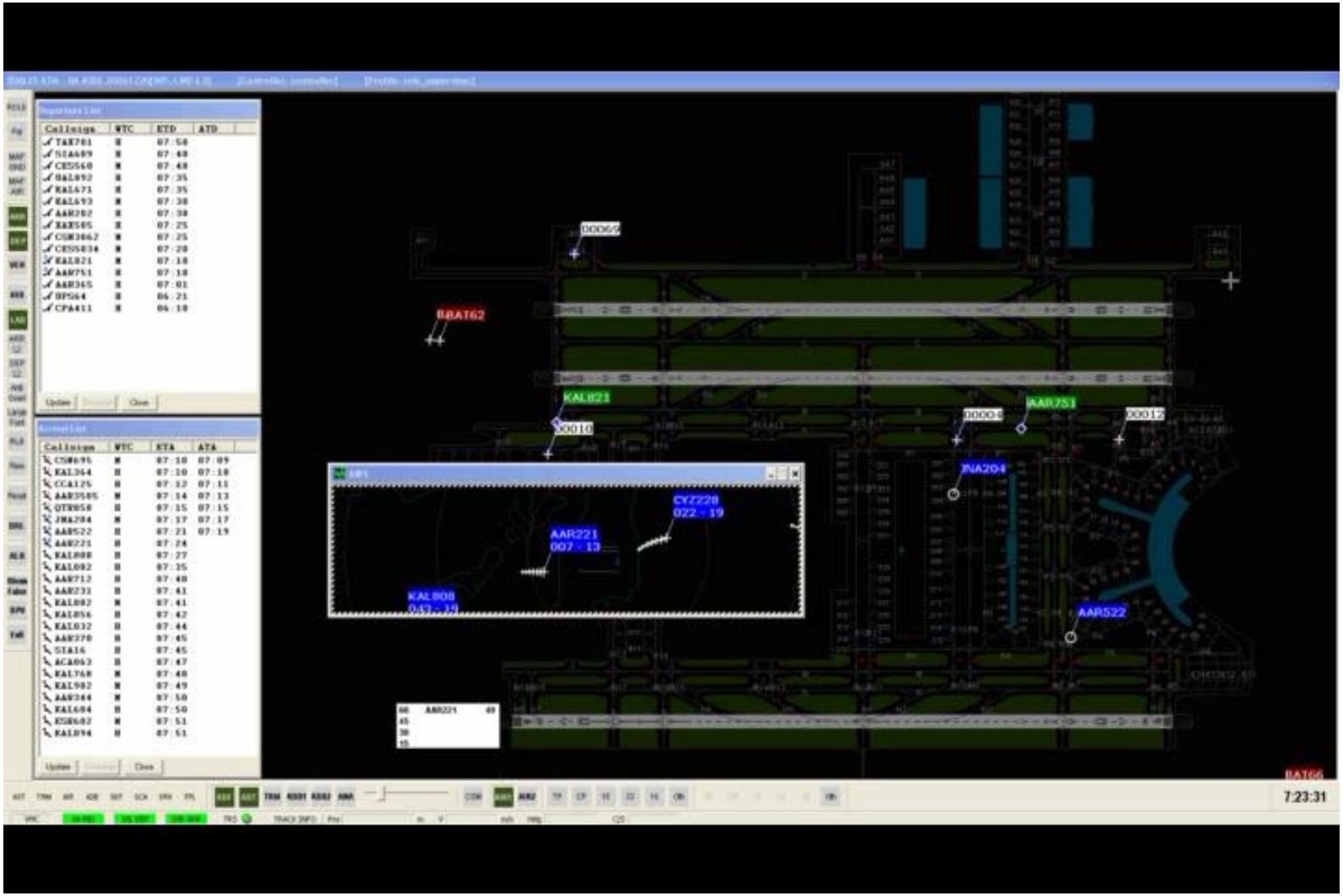
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problems that occurred
as a result of the operation

Differences between SMR and ADS-B position report

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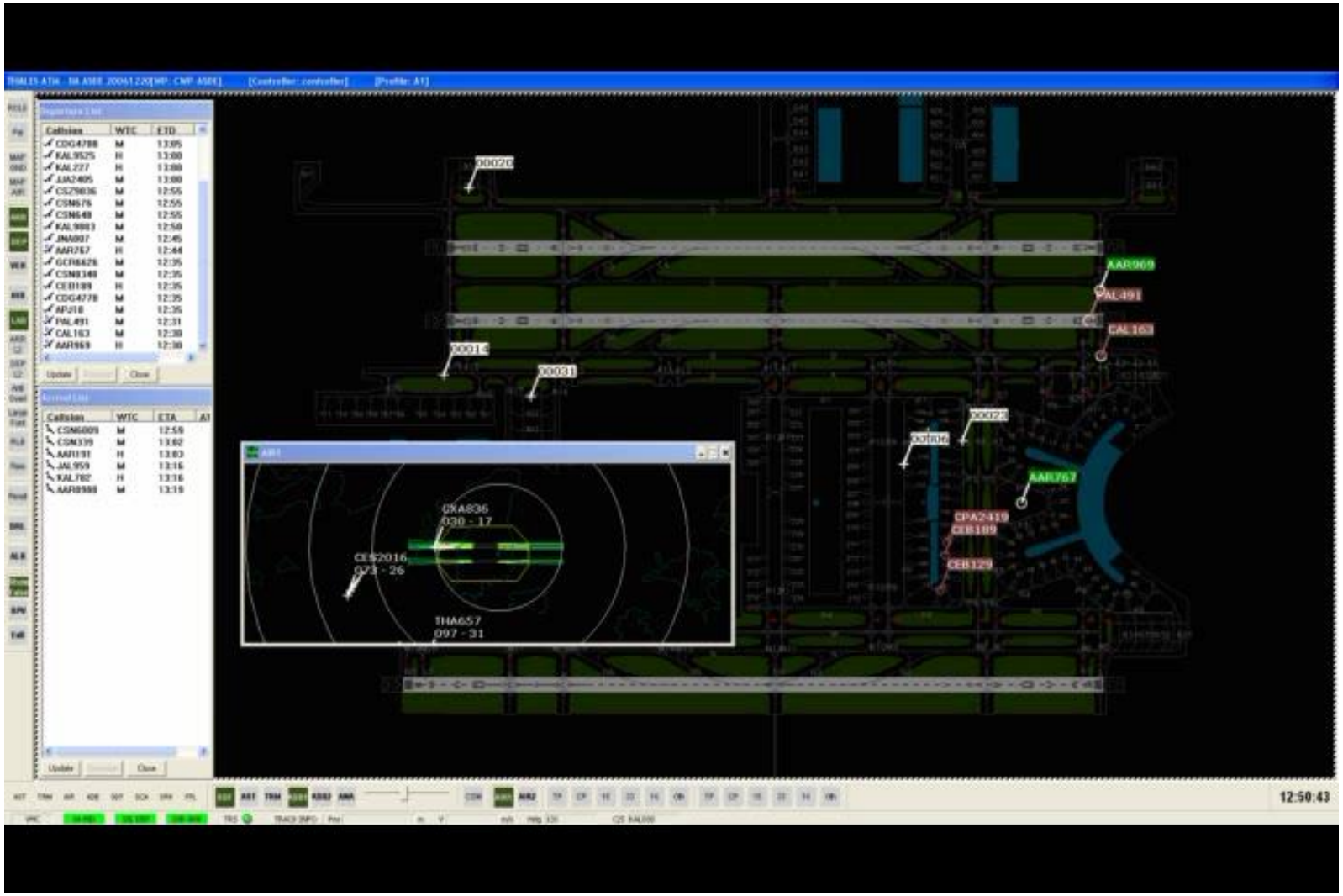
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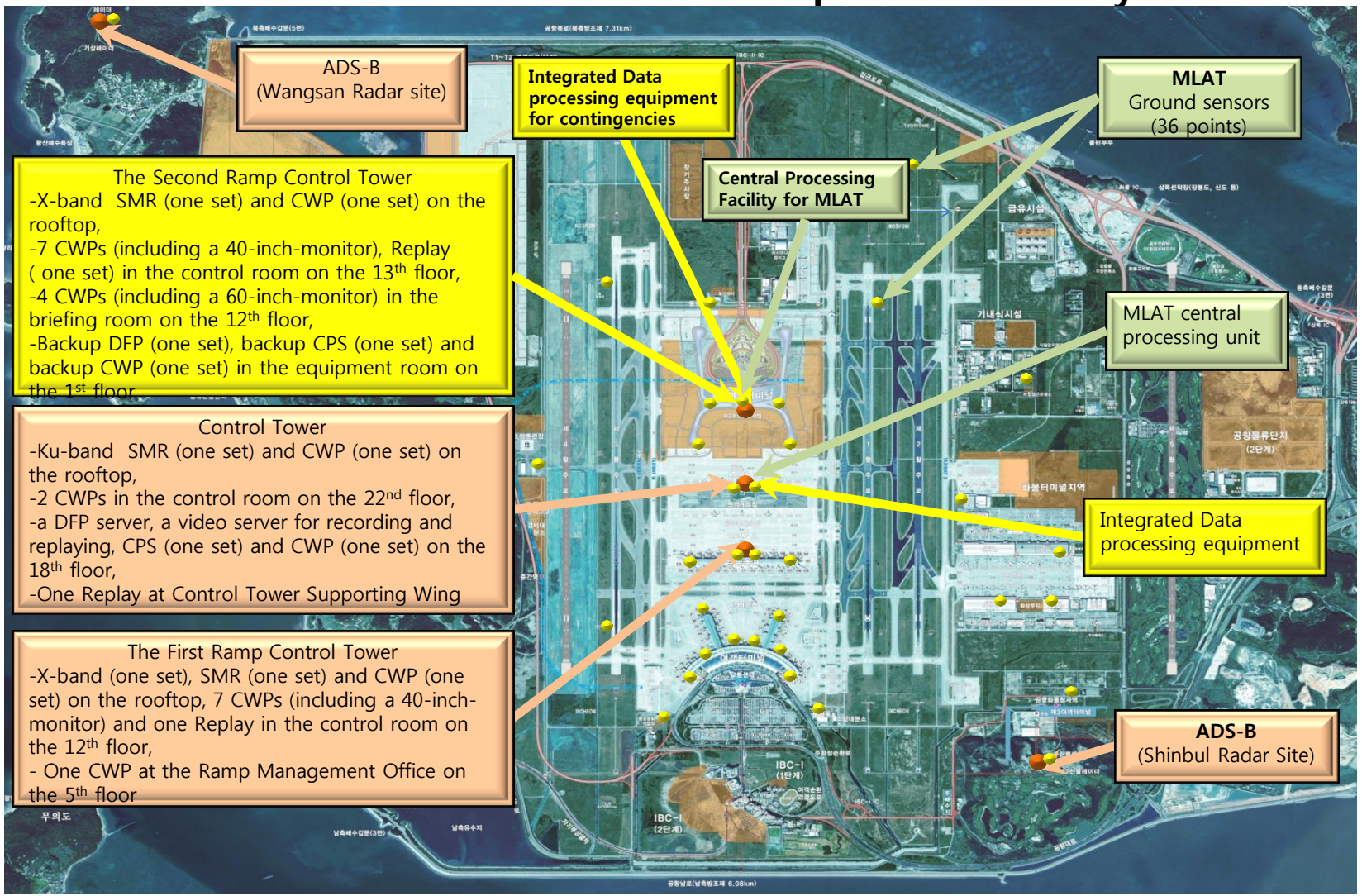
2.2 How to Develop and Improve ground surveillance facilities

- **System realization regardless of meteorological conditions such as rainfall and snowfall**
- **System realization that is easy to extend detection zones**
- **Backup system realization that enables a single operation *(operate independently)***
- **Enhancement of the existing ground surveillance facilities by diversifying detection facilities**
- **Changeover to the next generation air navigation system (FINAL GOAL)**

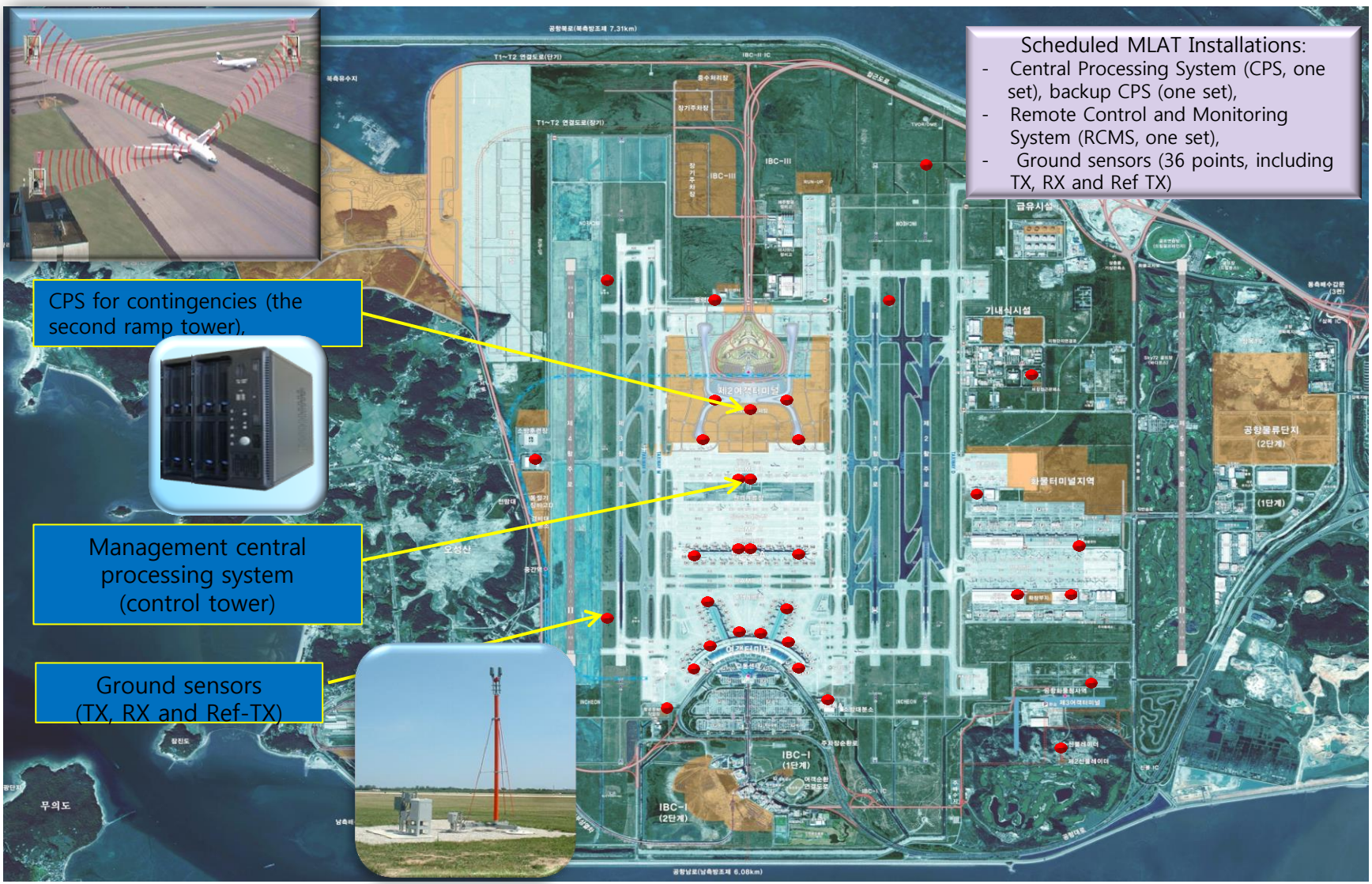
MLAT(Multilateration) Concept

Transponder signal reception from more than 3 ground sensors
Aircraft position identification by using TDOA (different time of arrivals)
Mode A/C and Mode S availability

The 3rd Phase Incheon International Airport Facilities layout



The 3rd Phase Incheon International Airport Facilities layout



Comparison between the Existing and the Improved Systems after the System Enhancement

Classification	The existing system	The improved system
Detection facilities diversification	SMR (2 sets)+ADS-B (1set)	SMR (2 sets) +ADS-B (1 set) +MLAT (1 set)
Meteorological Conditions	Related	Unrelated
Back-up system	None	possible
Wake detection	Some Label Drops	100% detection
Shadow zone	many	None
Auto-Labelling	Departure(manual),Arrival(Automatic)	Automatic
Resolution	24m	7.5m

Promotion plan

Facilities	Installation plan	Budget	Note
MLAT	2017	5 billion (KRW)	The Third Phase Construction Project
X-band	2017	3 billion (KRW)	The First Phase Improvement Project (in Replacement of Ku-Band, including the Data Fusion Processor)