中国民用航空局
空中交通管理局
Air Traffic Management Bureau, CAAC

Experience Sharing of A-SMGCS Level IV Operation in Daxing International Airport

Presented by China

Chengdu, June 4,2024

Team Introduction

Xin Chai,

- Engineer & 8 Years Maintenance Experience
- Participation in A-SMGCS System Design and Construction
- Daily Maintenance & Updates
- Presenter

Yaodong Song,

- Engineer & 8 Years Maintenance Experience
- Participation in A-SMGCS System Design and Construction
- Daily Maintenance & Updates

Xiaoyu Chen,

- Senior Engineer & 15 Years Maintenance Experience
- A-SMGCS System Design & Construction in early stages
- Provide Experience & Knowledge in system construction and updates

- Part1: Background
- Part2: System Overview
- Part3: Implementation of A-SMGCS
- Part4: Summary and Outlook

Part1: Background

Part2: System Overview

Part3: Implementation of A-SMGCS

Part4: Summary and Outlook

Part1: Background

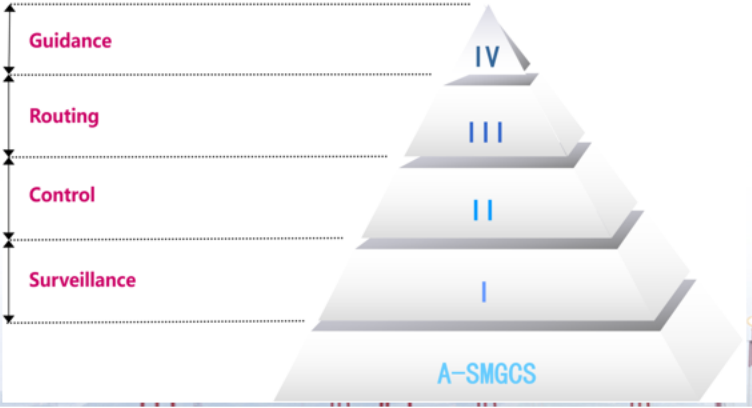
Beijing Daxing International Airport

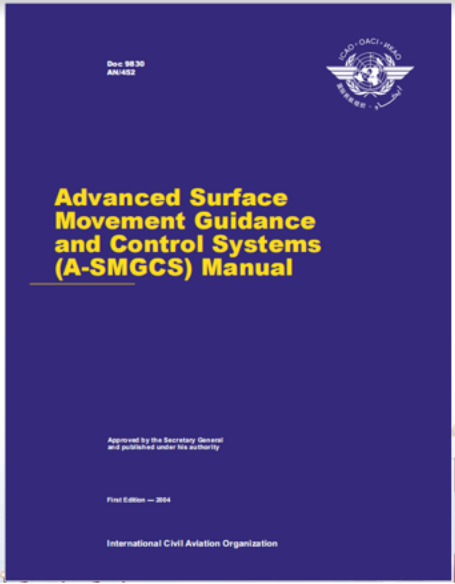
- Opened in Sep 25th 2019
- Four runways + Two control tower.
- Another hub airport in Beijing.

It is considered as a new power source for national development of China.

Part1: Background

The system functionalities meet the level IV operational standards as defined in ICAO Doc 9830





Part1: Background

Part2: System Overview

Part3: Implementation of A-SMGCS

Part4: Summary and Outlook

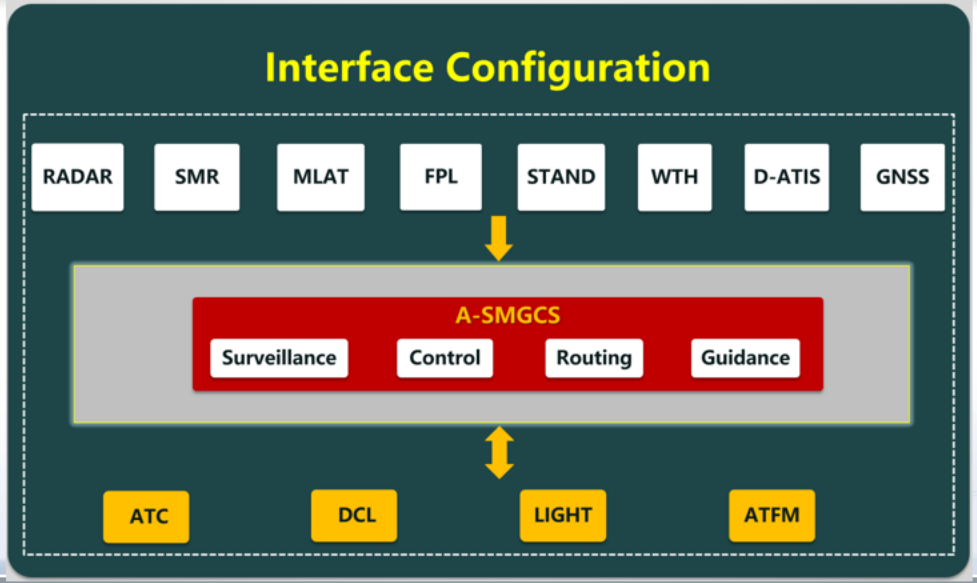
2.1 System Architecture:

Transmission of operational data (such as flight plans, surveillance data)

Transmission of maintenance and playback data

West Tower	East Tower	Technical
SUP	SUP	SMP
DLV	DLV	TSP
GND	GND	
TWR	TWR	
COR	COR	

2.2 Interface Configuration:



2.3 System Function:

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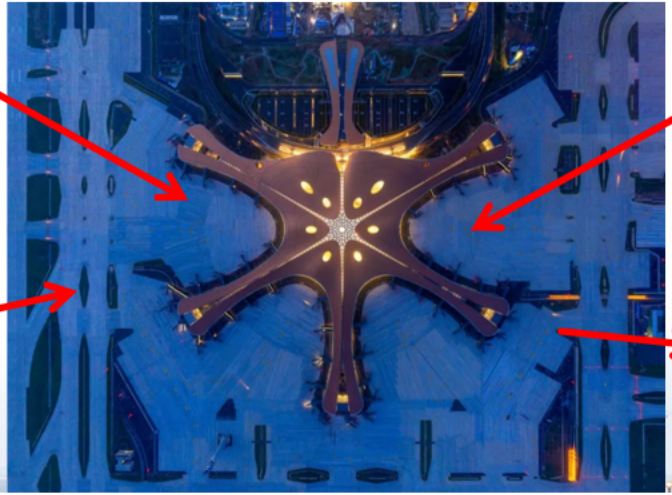
◆Surveillance Function :

SMR*3

RADAR*4



MLAT

Controller

2.3 System Function:

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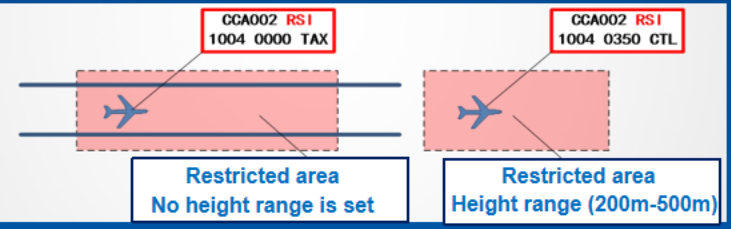
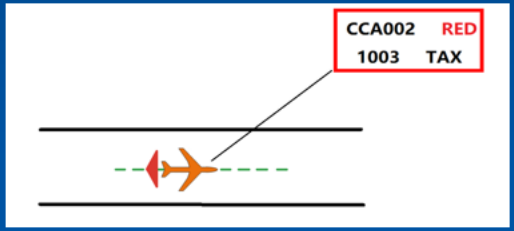
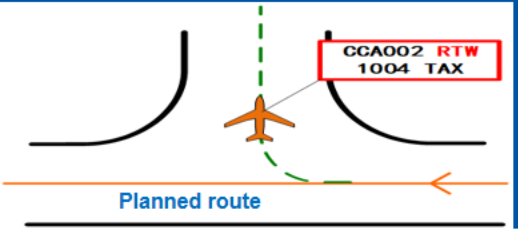
Control Function:

- Toggle on/off status (RSI, RTW, RED, RIW)
- Off-line configuration







2.3 System Function:

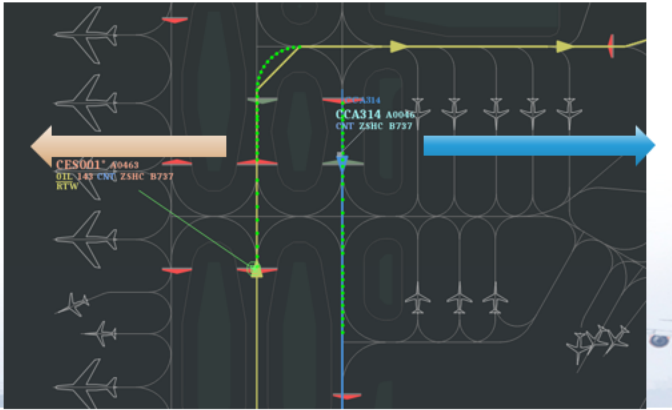
Routing Function :

- Automatic routing
- Default routing
- Manual routing

Arrival aircraft

Start:
Runway exit

End:
Stand



Departure aircraft

Start:
Stand

End:
Runway entrance

2.3 System Function:

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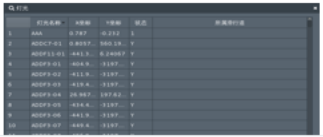
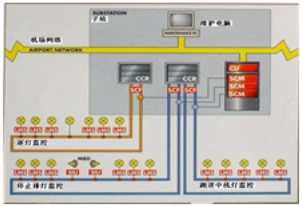
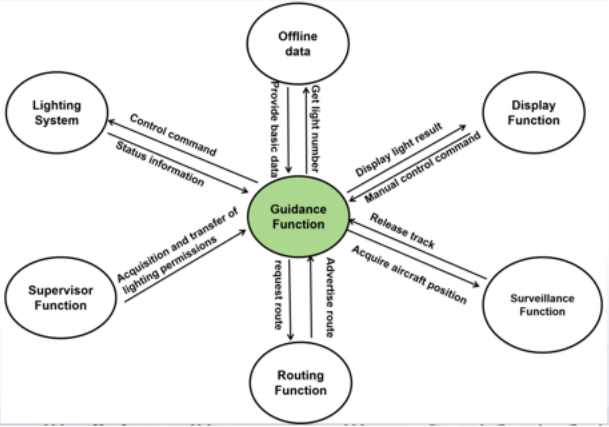
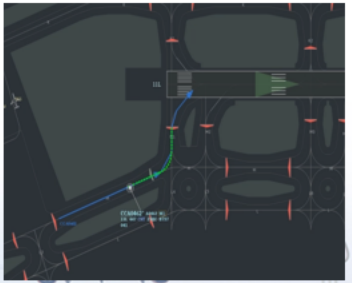
◆Guidance Function :







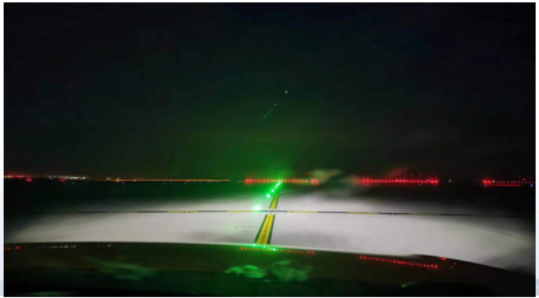


2.3 System Function:

More than 20,000 Stopbars and Centerline lights

More than 200 single lamp circuits available

More than 4200 segments



Part1: Background

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Part4: Summary and Outlook

3.1 Summary of Lecvel IV Operations

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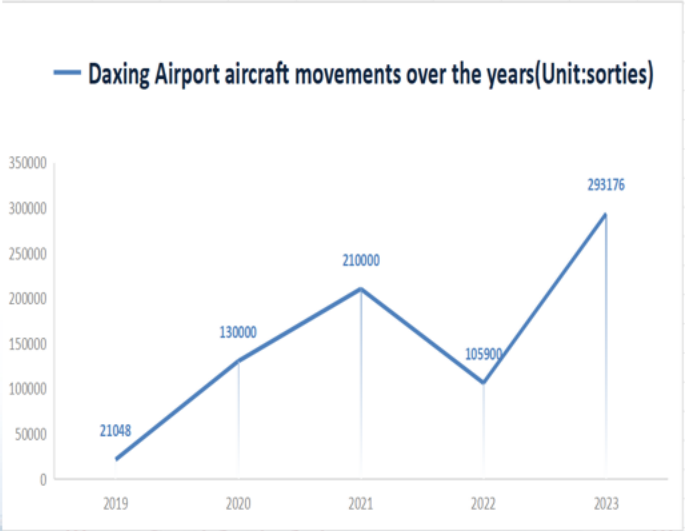
- Operation hours: 40000 +
- Low visibility operation:70 +
- Daily peak flights:900 +
- ARR and DEP flights:760,000 +
- Passengers: 92 million +



3.2 Advantages of Level IV Operation

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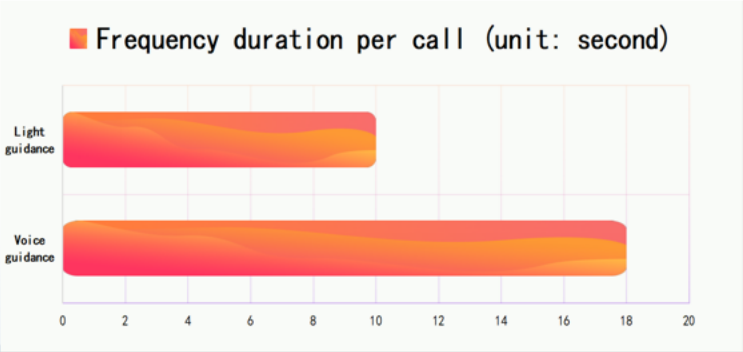
Reduced workload

- Lowering communication burden
- Enhance pilot concentration

Voice Guidance

Light Guidance



3.2 Advantages of Level IV Operation

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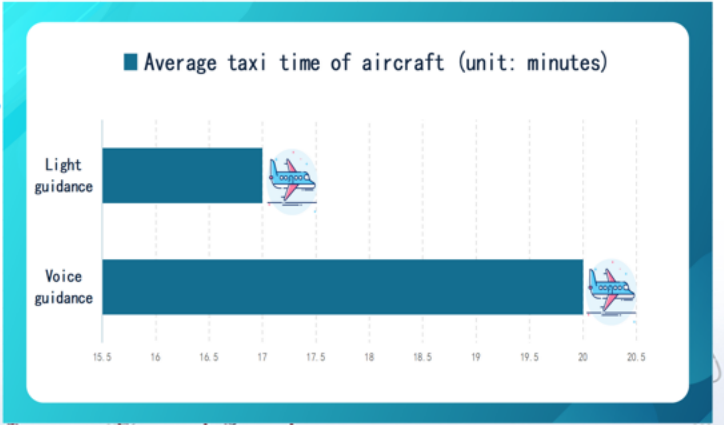
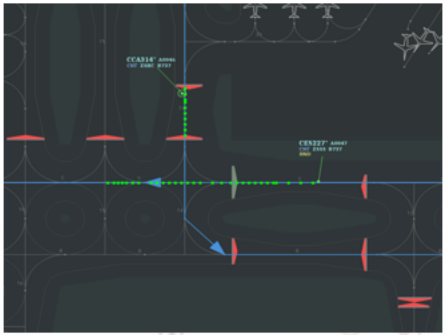
◆Improving Airport Operational Efficiency

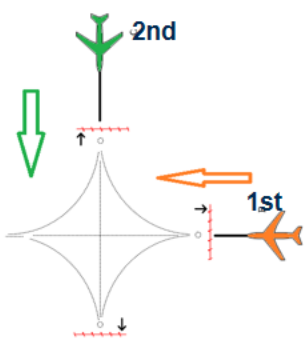
- Optimize taxi routes
- Allocation airport resources
- Reduced 20% average taxi time

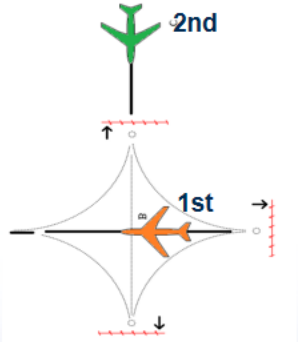


3.2 Advantages of Level IV Operation

Enhancing Conflict Resolution Capability of Aircraft at Taxiway Intersections







- First come, First served
- Considering position and speed

3.2 Advantages of Level IV Operation

◆Enhanced Safety Measures for Low Visibility Operations

- Category III B ILS
- HUD 75-meters takeoff

3.2 Advantages of Level IV Operation

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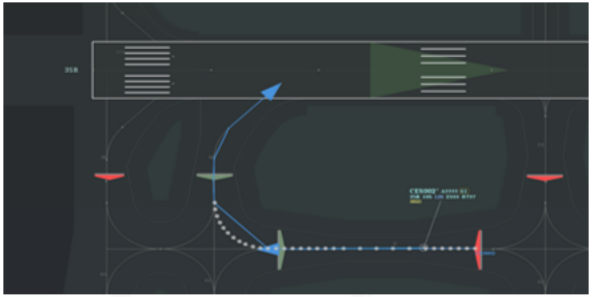
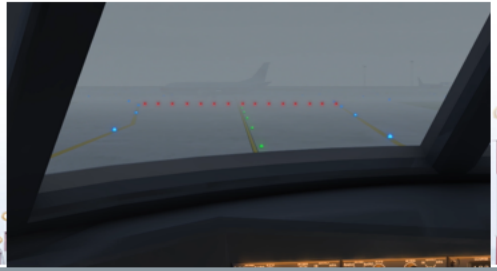
◆Prevention of Aircraft Runway Incursions





- Provides technical means
- Flight plan status restrictions
- Pass without permission triggers RED alert

3.3 Operational Challenges and Solutions:

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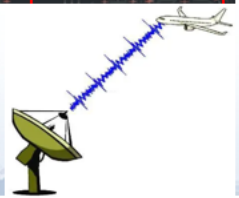
◆**Signal drift caused by SMR multipath reflections and MLAT anomalies:**

- **Issue**

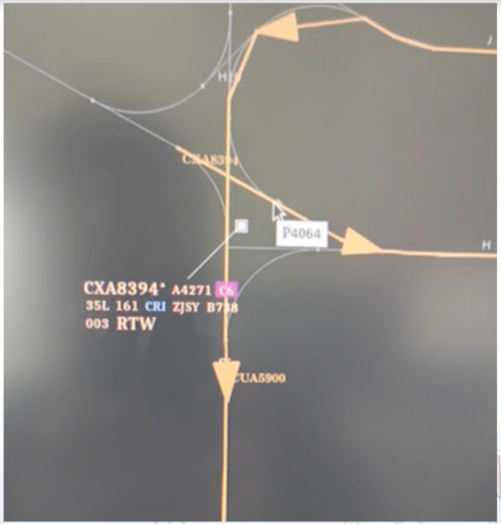
  Signal drift potentially trigger false alert

- **Solution**

  Establish offline specialized processing zones



3.3 Operational Challenges and Solutions:



◆ Anomalies Routing Planning Issues :

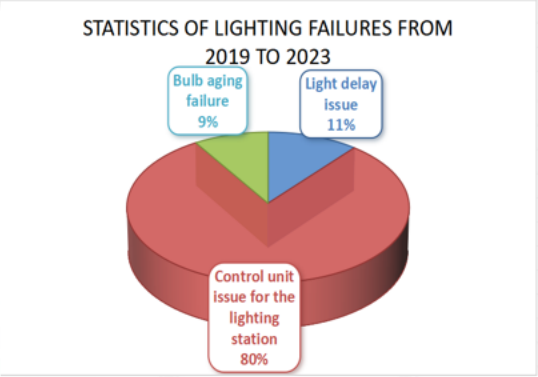
➢ **Issue**

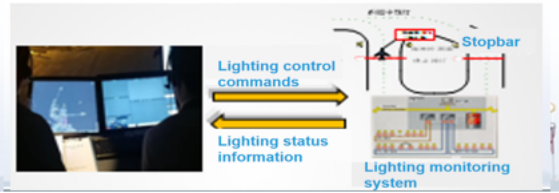
Flight routes became circular

➢ **Solution**

Optimizing the principles governing deviation calculations

3.3 Operational Challenges and Solutions:



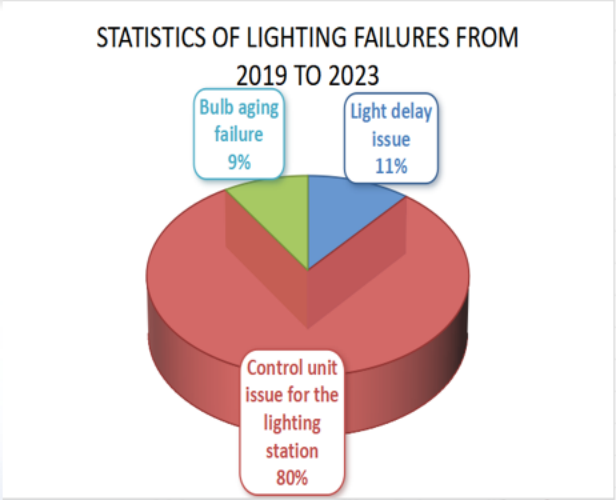


◆Lighting Status Display Issues:

- The transmission delay of lighting data reach up to 8s
- Solution
  - Optimizing lighting system processing software and parameter
  - Reduce useless messages exchange
- Improvement

Lighting delay reduced to 2s

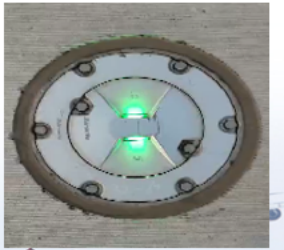
3.3 Operational Challenges and Solutions:



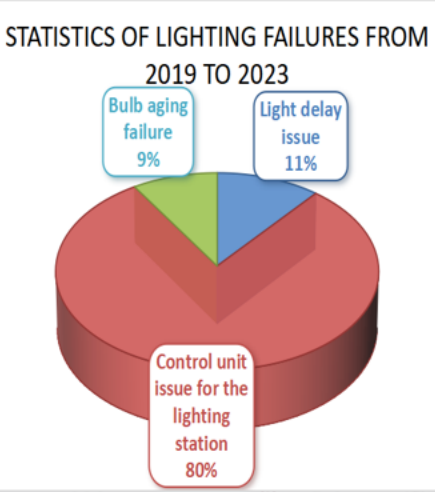
◆Bulb aging failure

➢ **Solution**

- **Replaces faulty bulbs**
- **Monitor closely**

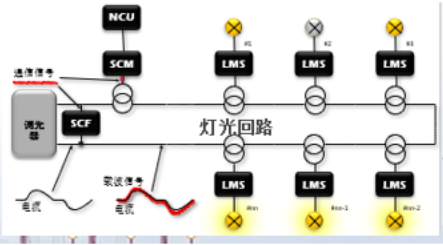


3.3 Operational Challenges and Solutions:



◆Individual lighting control units

- ➢ **Solution**
- **Continuous maintenance**
- **Optimization of the lighting system's status**



3.3 Operational Challenges and Solutions:

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- **Solving Problems in Cooperation with the Airport Department:**
  - **Regular Issue Reporting & Meeting**
  - **Designated Group**
  - **Optimization for Lighting Software & Reduce Unnecessary information**
  - **Continuous Feedback**

Part1: Background

Part2: System Overview

Part3: Operational Status

Part4: Summary and Outlook

4.1 Summary:

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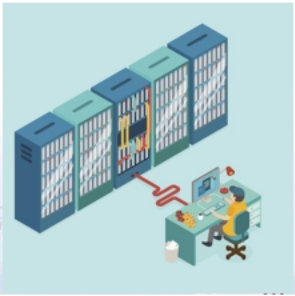
◆Work Summary and Key Focus

- Accuracy of surveillance data and lighting data delay
- Route planning algorithms
- Basic data maintenance group

AIRPORT



4.2 Outlook:

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◆Next Steps

- Continuous optimization of lighting guidance software
- Promote level IV operation functionality
- Continuously follow ICAO latest revisions regarding the Doc 9830 and EUROCONTROL standard to improve system
- Research for level V situational awareness


Thank You for attention!