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

Overall System Design and Implementation of Main/Backup ATM Automation System

Wang Xiaowei

SWATMB

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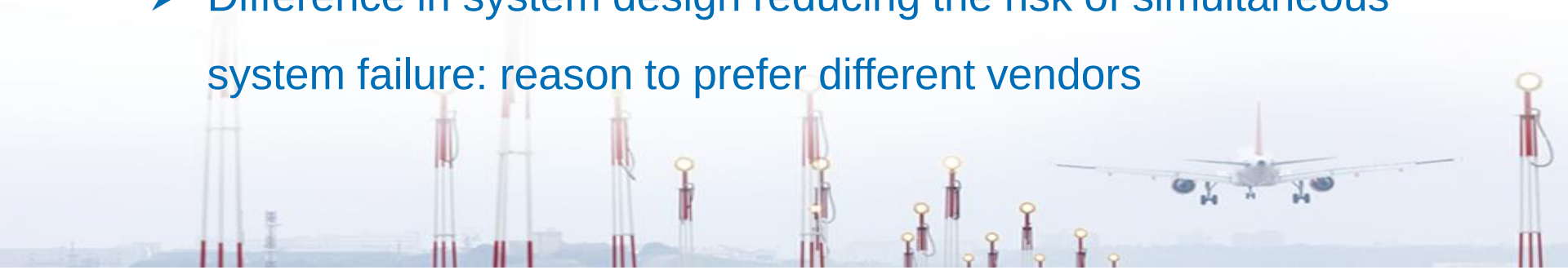
Overall System Design

- ***Two automation systems in one ATC centre***
  - Work as main/backup systems
  - Different vendors
  - Similar HMIs functions
  - Difference in system design reducing the risk of simultaneous system failure: reason to prefer different vendors

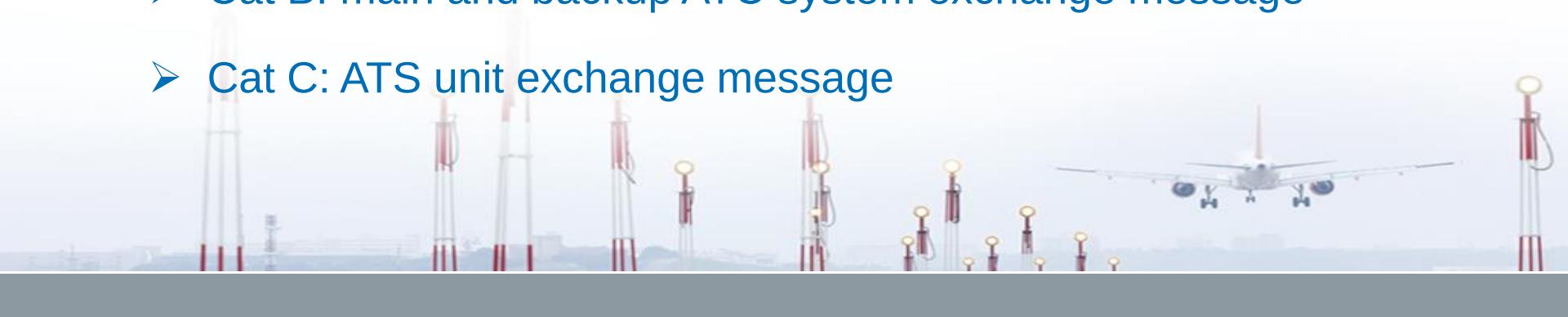


Overall System Design

- ***Final purpose: undegraded ATC services without interruption***
- ***Challenge: switchover process***
  - Reconfigure the backup system
  - Take time
  - May lead to mistakes
- ***Solution: real-time synchronization***

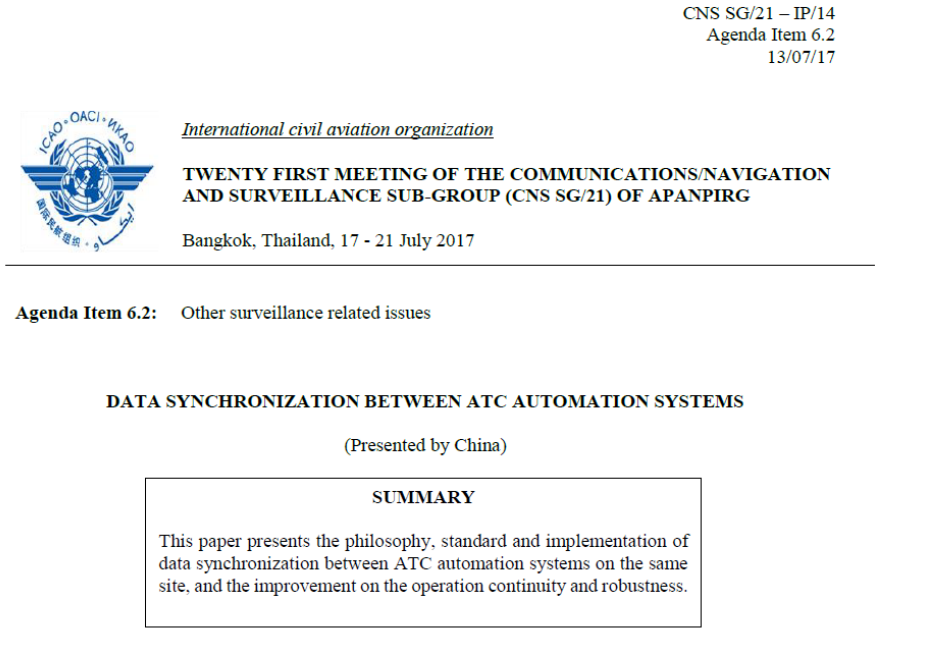
Implementation

- ***2012 : Research and test***
- ***2015 : MH/T 4029.3 Civil Aviation Air Traffic Control Automation System- Part 3: Flight Data Exchange***
  - Cat I: flight data exchange message
  - Cat B: main and backup ATC system exchange message
  - Cat C: ATS unit exchange message



2017 : CNS SG/21

- IP14_China AI. 6.2 - Data Synchronization between ATC automation systems
- Attract great interest from States in data synchronization



CNS SG/21 – IP/14
Agenda Item 6.2
13/07/17

International civil aviation organization

TWENTY FIRST MEETING OF THE COMMUNICATIONS/NAVIGATION AND SURVEILLANCE SUB-GROUP (CNS SG/21) OF APANPIRG

Bangkok, Thailand, 17 - 21 July 2017

Agenda Item 6.2: Other surveillance related issues

DATA SYNCHRONIZATION BETWEEN ATC AUTOMATION SYSTEMS

(Presented by China)

SUMMARY

This paper presents the philosophy, standard and implementation of data synchronization between ATC automation systems on the same site, and the improvement on the operation continuity and robustness.

- ***Real-time synchronization realized in 16 ATC centers so far***
  - Changchun/Changsha/Chengdu/Chongqing/Dalian/Guiyang/ Hailar/Harbin/Kunming/Lanzhou/Nanning/Nanchang/Shenyang/ Urumchi/Wenzhou/Zhengzhou
  - AirNet/NUMEN/SkyNet/ATC3000/INDRA
- ***Another 16 ATC centers by 2019/Total 47 ATC centers by 2023***
  - Eurocat/TELEPHONICS/CDZS-MH
- ***Improved safety and reliability of ATC services in China***

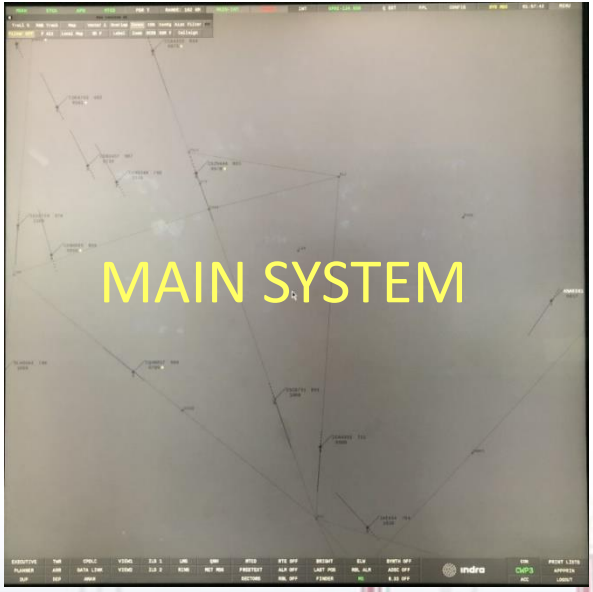
1 General Introduction

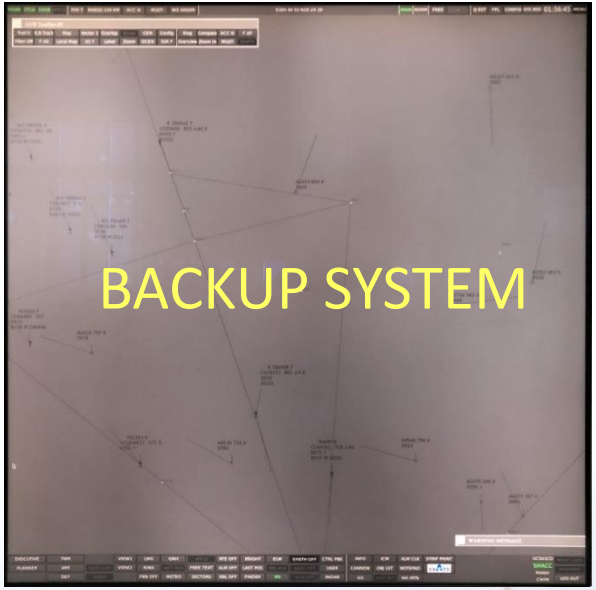
2 Synchronization in Chengdu ACC

3 Relevant operational Issues

Automation Systems in Chengdu ACC

- **Similar HMIs**





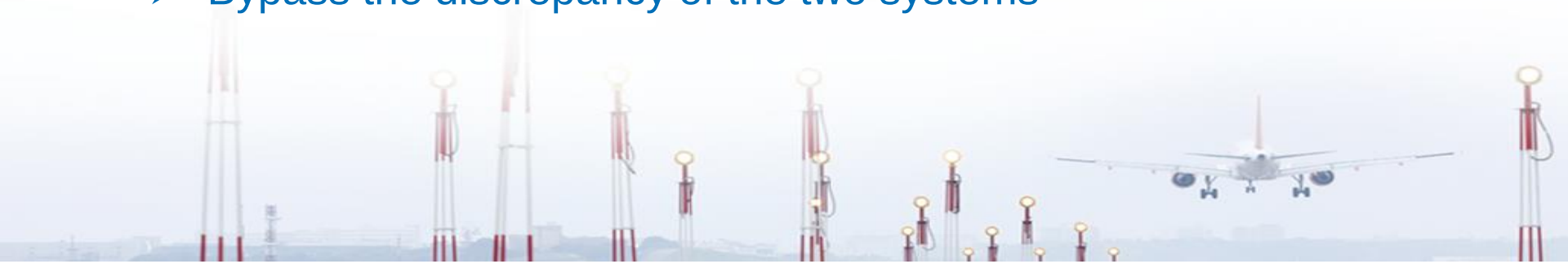
- **Discrepancy in system design**

Automation Systems in Chengdu ACC

- ***Synchronization operation since 2013***
  - Three synchronization design ideals
  - Three kind of data used in synchronization
  - Two kind of system working mode

Synchronization Design Ideals

- ***Core content of the synchronization***
  - Operations in the HMIs, including actions and configurations
- ***Benefit***
  - Save switchover time
  - Bypass the discrepancy of the two systems



Synchronization Design Ideals

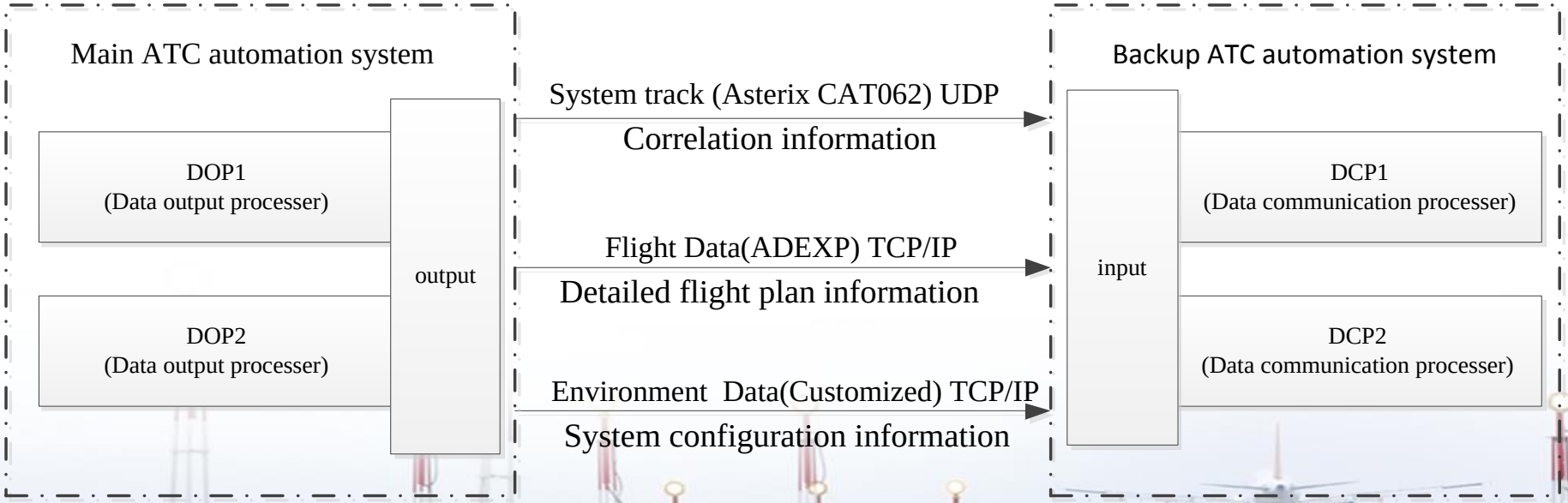
- ***Pattern of the synchronization***
  - Focus on the results
- ***Example***
  - For the flight handover operation: only the current jurisdiction of each flight
- ***Benefit***
  - Avoid complex system processing part

Synchronization Design Ideals

- ***Mapping function in the synchronization***
  - Different predefined data like flight plan status
  - Receive the flight plan status
  - Map it into one of its own status
  - Process it with its own logic
- ***Benefit***
  - Ensure the validity and stability of the synchronization

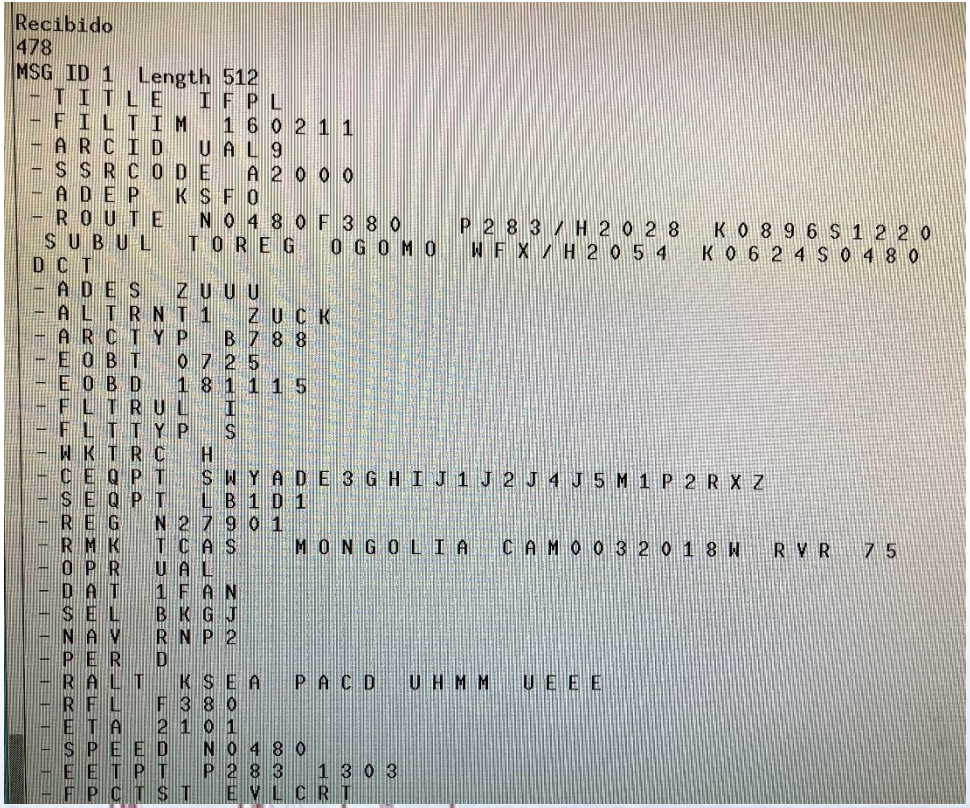
Data Used in Synchronization

Synchronization Structure



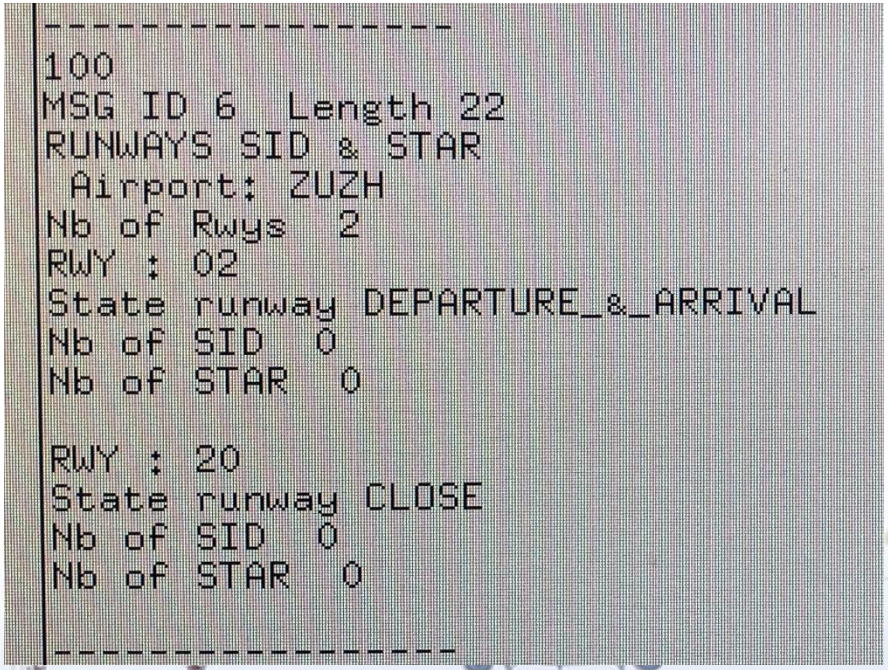
Data Used in Synchronization

- ***Flight data***
  - Flight plan data creation, modification, cancellation and deletion
  - Flight handover
  - CFL input, SSR code assignment/release
  - Runway/SID/STAR assignment of the flight plan and so on



Data Used in the Synchronization

- ***Environment data***
  - Sectorization of the whole system
  - Runway configuration
  - Restricted/other area status and so on
- ***System tracks***
  - Correlation information: manual correlation by the controllers



System Working Mode

- ***Fallback working mode, Disable:***
  - Auto SSR code assignment function
  - Auto runway/SID/STAR assignment function
  - Auto AFTN message sending function/AIDC function
  - Sound alerts in positions
  - Data link
- ***Operational working mode***
  - Enable the corresponding functionality
  - Stop receiving and processing the messages from the main system

Future Upgrade

- ***Application already realized in some other ATC centers***
  - HMIs config synchronization: Map centre/Display range
  - Bi-directional synchronization

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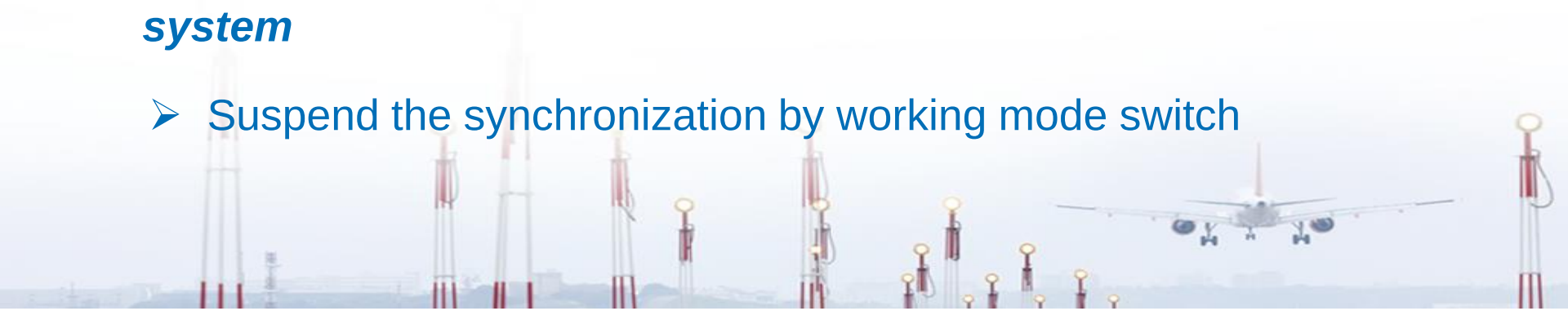
Prevention of System Failure Extension

- ***Independent internal processing***
  - Receive the input of surveillance data and flight data respectively
  - Process the data independently
- ***Quick measure when an unexpected failure happened in the main system***
  - Suspend the synchronization by working mode switch



Parameter Consistency

- ***Challenge in operation***
  - Hard to load the new offline parameter at the same time
  - Main/backup systems with different parameters
  - May cause synchronization failure
- ***Solution***
  - Assess the impact of parameter discrepancy in advance
  - Introduce relative protection measures

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