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# Application of AMAN technology in busy terminal area

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East ATMB of CHINA, 2020/10

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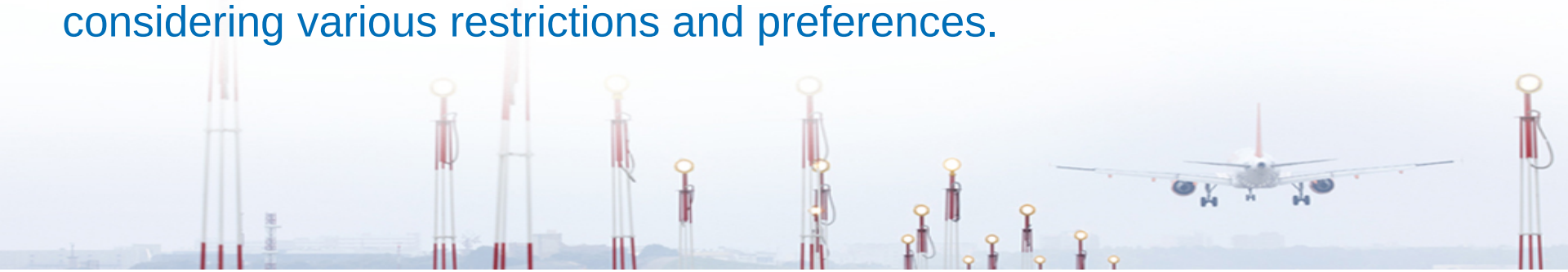
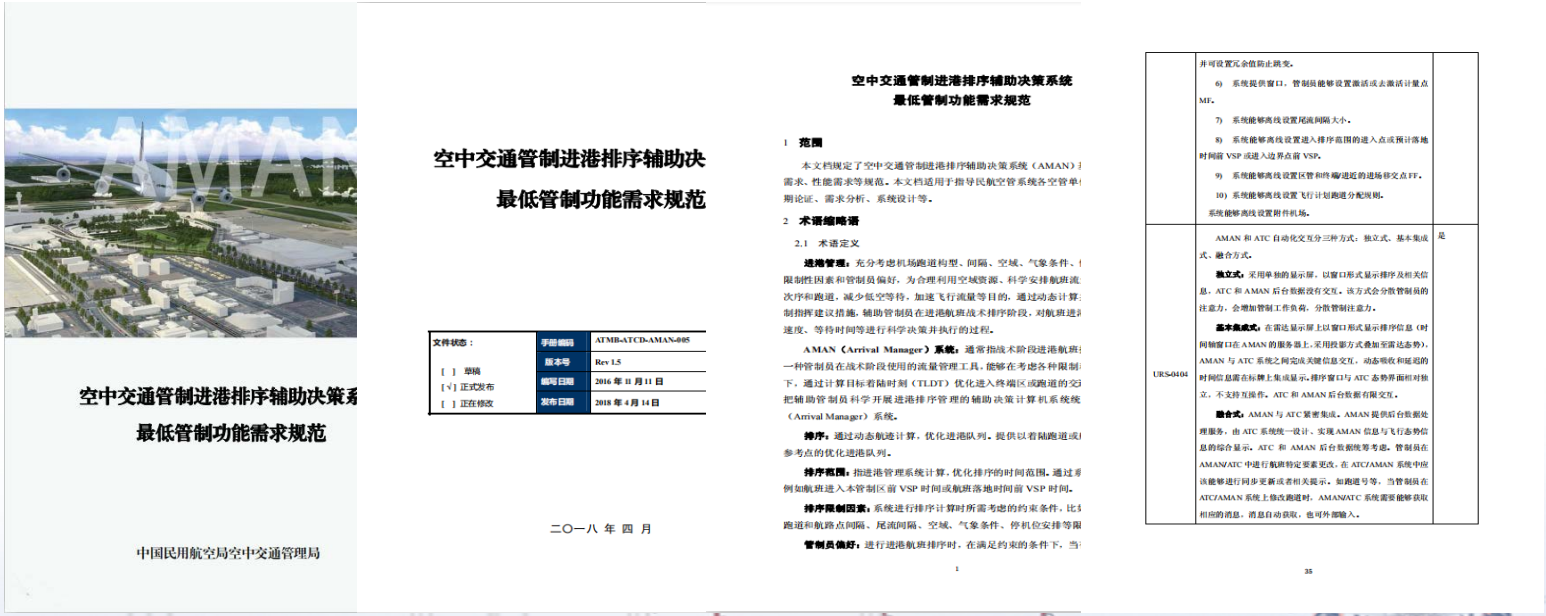
- AMAN concept

The arrival sequencing assistant decision function (AMAN) usually refers to the arrival flight scheduling tool in the tactical phase.
It is a traffic management tool used by controllers in the tactical phase. It can optimize the traffic flow entering the terminal area or runway by calculating the target landing time (TLDT) under the premise of considering various restrictions and preferences.



# Introduction

- national deployment



空中交通管制进港排序辅助决策系
最低管制功能需求规范

中国民用航空局空中交通管理局

空中交通管制进港排序辅助决
最低管制功能需求规范

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空中交通管制进港排序辅助决策系统
最低管制功能需求规范

1 范围

本文档规定了空中交通管制进港排序辅助决策系统（AMAN）
需求、性能需求等规范。本文档适用于指导民航空管系统各空管单
期论证、需求分析、系统设计等。

2 术语缩略语

2.1 术语定义

**进港管理：**充分考虑机场跑道构型、间隔、空域、气象条件、
限制性因素和管制员偏好，为合理利用空域资源、科学安排航班流
次序和跑道，减少低空等待，加速飞行流量等目的，通过动态计算
制指挥建议措施，辅助管制员在进港航班战术排序阶段，对航班进
速度、等待时间等进行科学决策并执行的过程。

**AMAN（Arrival Manager）系统：**通常指战术阶段进港航班
一种管制员在战术阶段使用的流量管理工具，能够在考虑各种限制
下，通过计算目标着陆时刻（TLDT）优化进入终端区或跑道的交
把辅助管制员科学开展进港排序管理的辅助决策计算机系统统
（Arrival Manager）系统。

**排序：**通过动态航迹计算，优化进港队列。提供以着陆跑道或
参考点的优化进港队列。

**排序范围：**指进港管理系统计算，优化排序的时间范围。通过
例如航班进入本管制区前 VSP 时间或航班落地时间前 VSP 时间。

**排序限制因素：**系统进行排序计算时所需考虑的约束条件，比
跑道和航路点间隔、尾流间隔、空域、气象条件、停机位安排等限

**管制员偏好：**进行进港航班排序时，在满足约束的条件下，当

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| | | |
|---|---|---|
| | 并可设置冗余值防止跳变。<br>6） 系统提供窗口，管制员能够设置激活或去激活计量点 MF。<br>7） 系统能够离线设置尾流间隔大小。<br>8） 系统能够离线设置进入排序范围的进入点或预计落地时间前 VSP 或进入边界点前 VSP。<br>9） 系统能够离线设置区管和终端/进近的进场移交点 FF。<br>10）系统能够离线设置 飞行计划跑道分配规则。<br>系统能够离线设置附件机场。 | |
| URS-0404 | AMAN 和 ATC 自动化交互分三种方式：独立式、基本集成式、融合方式。<br>**独立式：**采用单独的显示屏，以窗口形式显示排序及相关信息，ATC 和 AMAN 后台数据没有交互。该方式会分散管制员的注意力，会增加管制工作负荷，分散管制注意力。<br>**基本集成式：**在雷达显示屏上以窗口形式显示排序信息（时间轴窗口在 AMAN 的服务器上，采用投影方式叠加至雷达态势），AMAN 与 ATC 系统之间完成关键信息交互，动态响应和延迟的时间信息需在标牌上集成显示，排序窗口与 ATC 态势界面相对独立，不支持互操作。ATC 和 AMAN 后台数据有限交互。<br>**融合式：**AMAN 与 ATC 紧密集成。AMAN 提供后台数据处理服务，由 ATC 系统统一设计、实现 AMAN 信息与飞行态势信息的综合显示。ATC 和 AMAN 后台数据统筹考虑。管制员在 AMAN/ATC 中进行航班特定要素更改，在 ATC/AMAN 系统中应该能够进行同步更新或者相关提示。如跑道号等，当管制员在 ATC/AMAN 系统上修改跑道时，AMAN/ATC 系统需要能够获取相应的消息，消息自动获取，也可外部输入。 | 是 |

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# Introduction

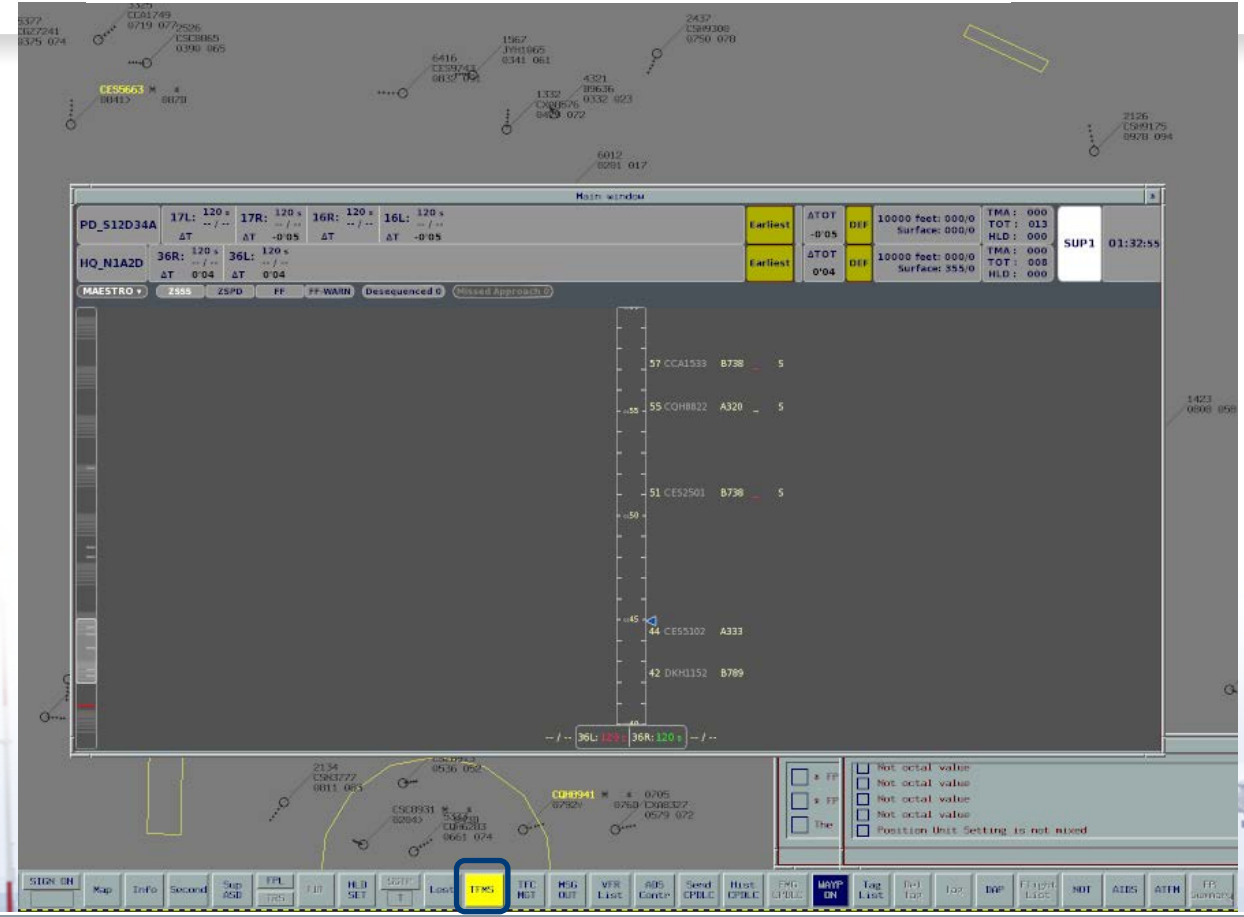


- national deployment
  - As one of the busiest terminal areas in East China and even in China, Shanghai terminal area is preparing to construct the Shanghai terminal control center project in 2015, which includes AMAN system of Thales company in France.
  - With the completion of the construction of Beijing Daxing airport, it has become the second site to use AMAN . On March 15th, 2020, Beijing Daxing International Airport started the AMAN trial operation, and at present, it focuses on the experimental operation at the entry point of DUMAP、 AVBOX、 BELAX in Beijing terminal area.

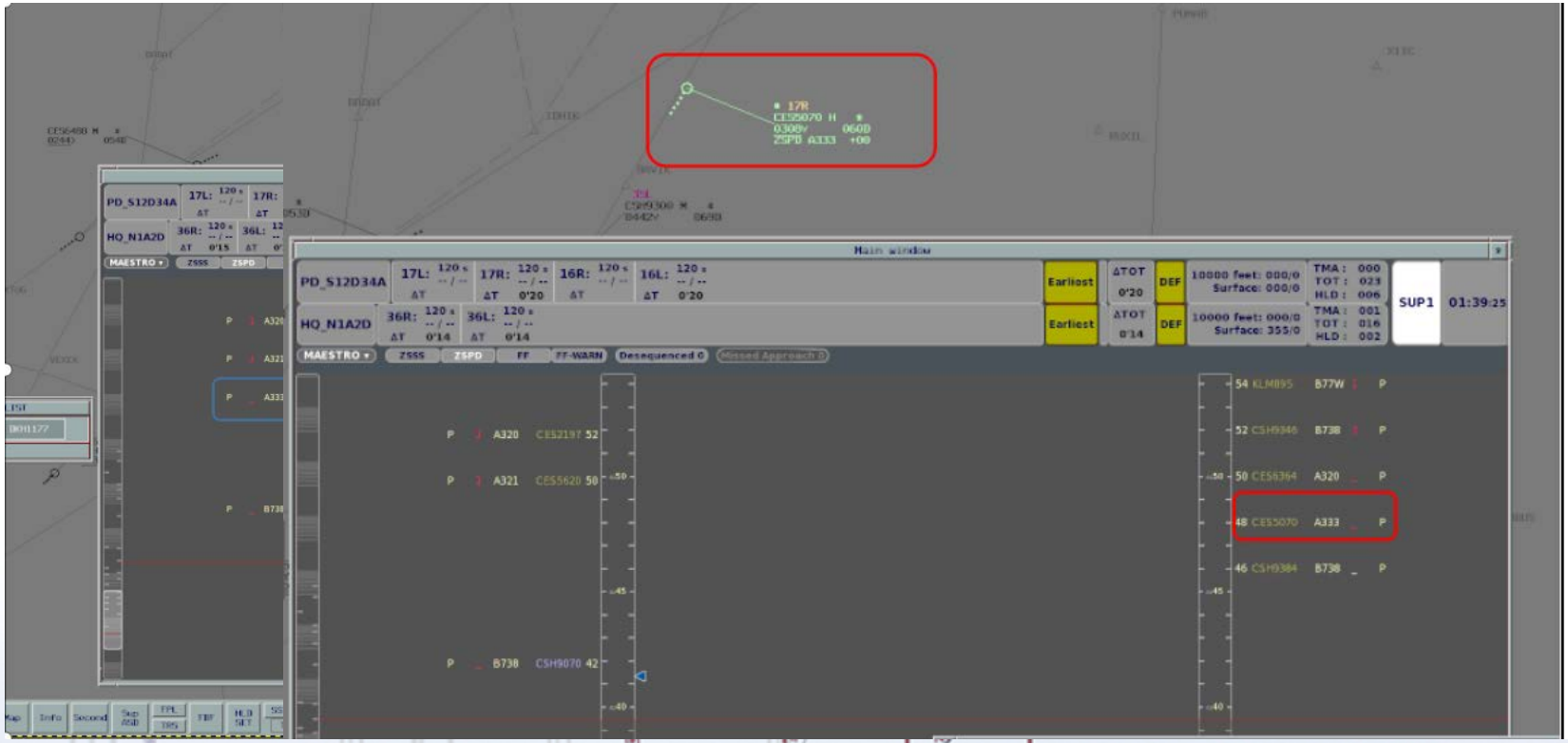
# shanghai AMAN technical solution

- Beijing and Shanghai AMAN systems adopt integration mode.
- Integrated AMAN system: AMAN is closely integrated with ATC. Aman provides background data processing services, and the integrated display of AMAN information and flight situation information is designed and realized by ATC system. ATC and AMAN background data should be considered as a whole.

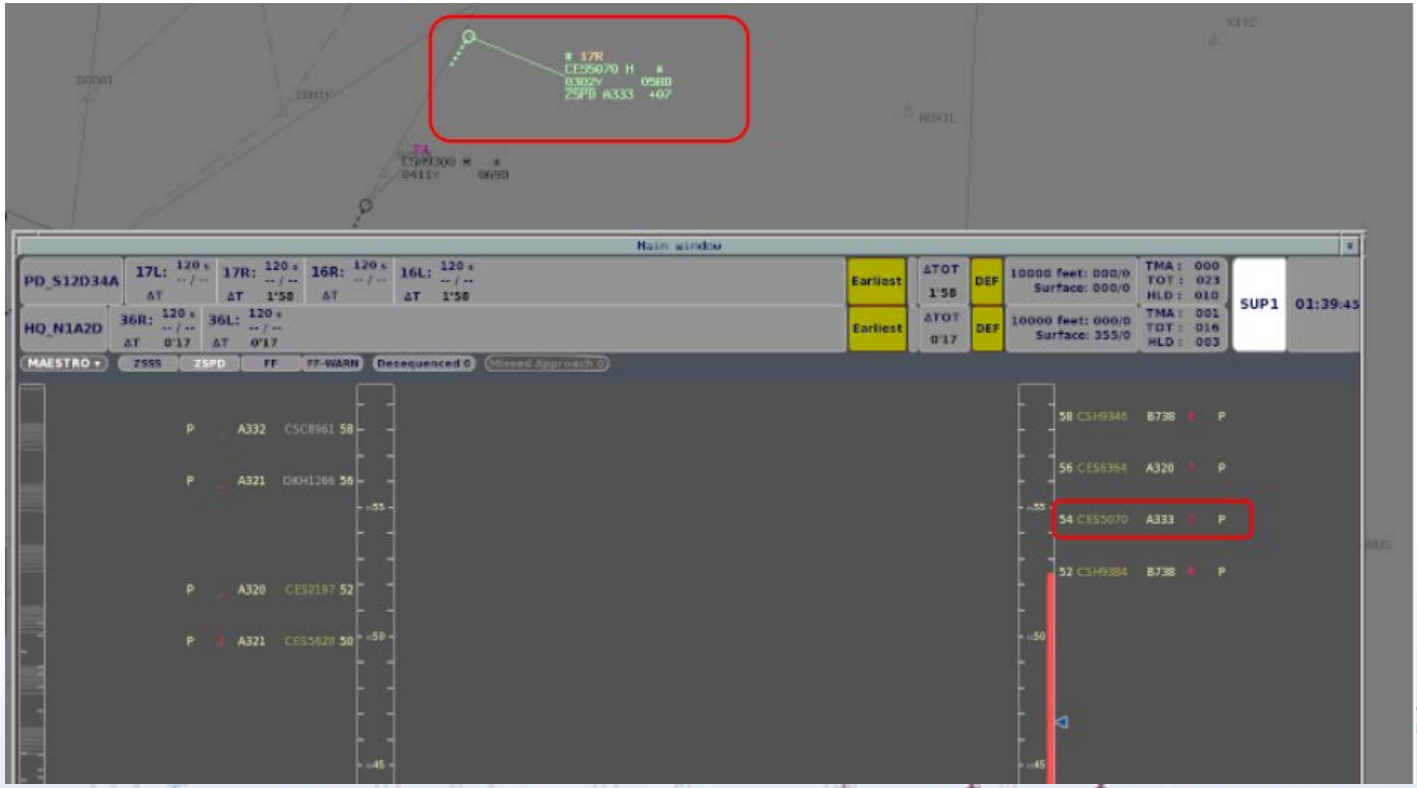
# How to open AMAN HMI



# Change Runway in AMAN HMI



# TLDT time in AMAN HMI and ATM automation system



# ICAO Avancing AMAN process

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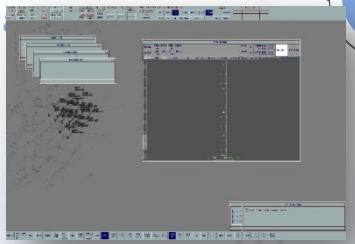
1

Eurocat V8 version with AMAN module launched



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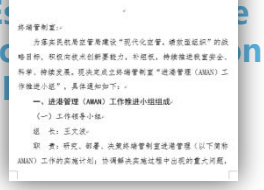


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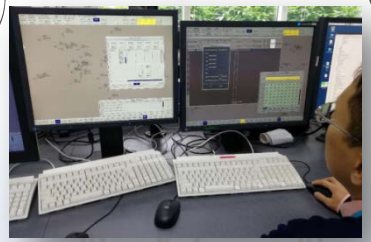
Modify key settings Data Entry



4

Verification by the test platform and ATC simulator

5

First online test on April 12, 2019

6

Exchanging the online test & trial operation

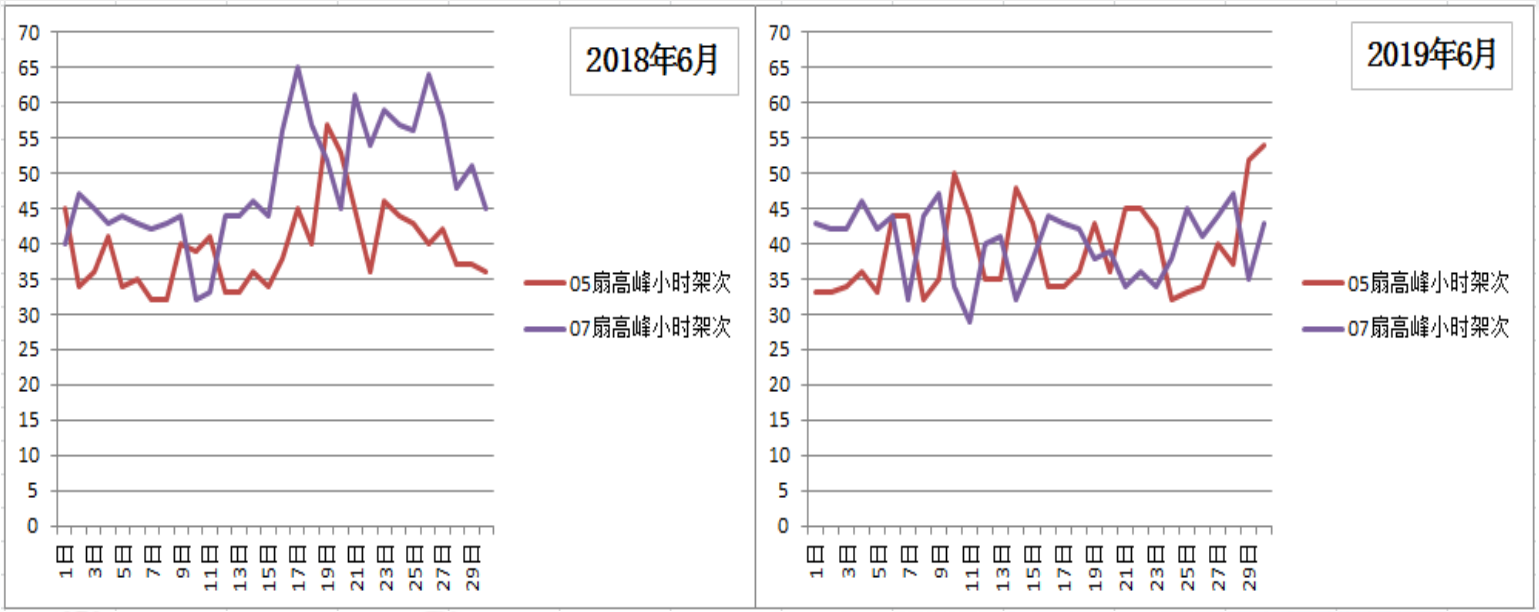
7

Hongqiao AMAN position started operation on May


8

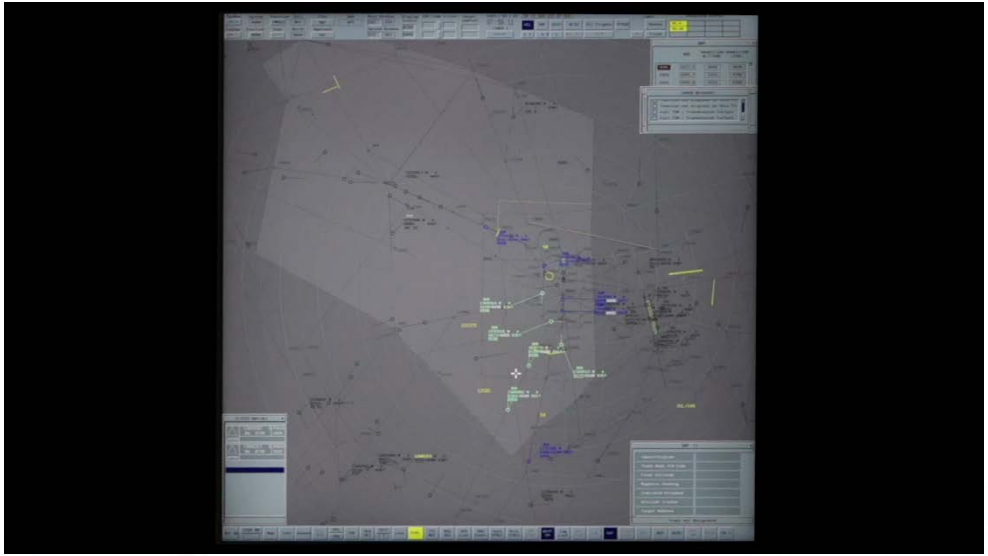
Summarizing the operational experiences

# application effect

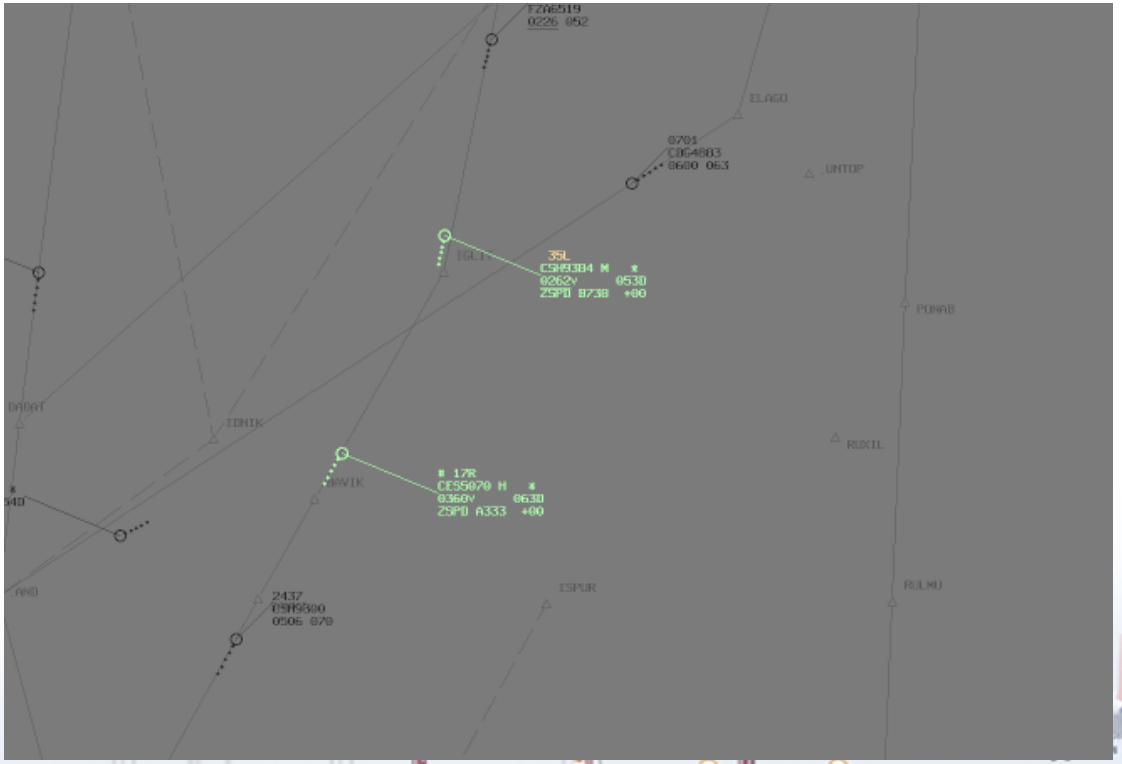



The change of daily peak hour sorties of 05 / 07 fan in approach room 1 in 2018 / 19 is shown

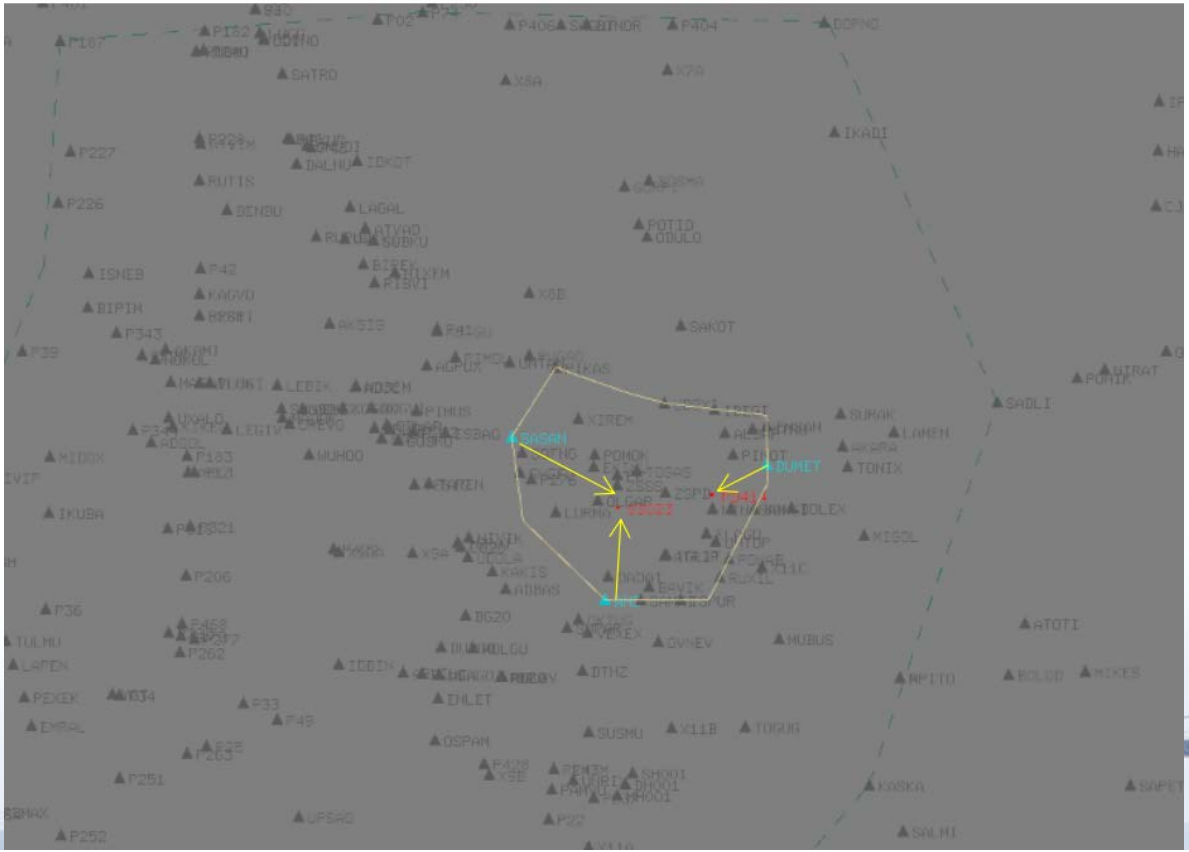
# The actual case of late peak hours at Hongqiao



# problems in using AMAN



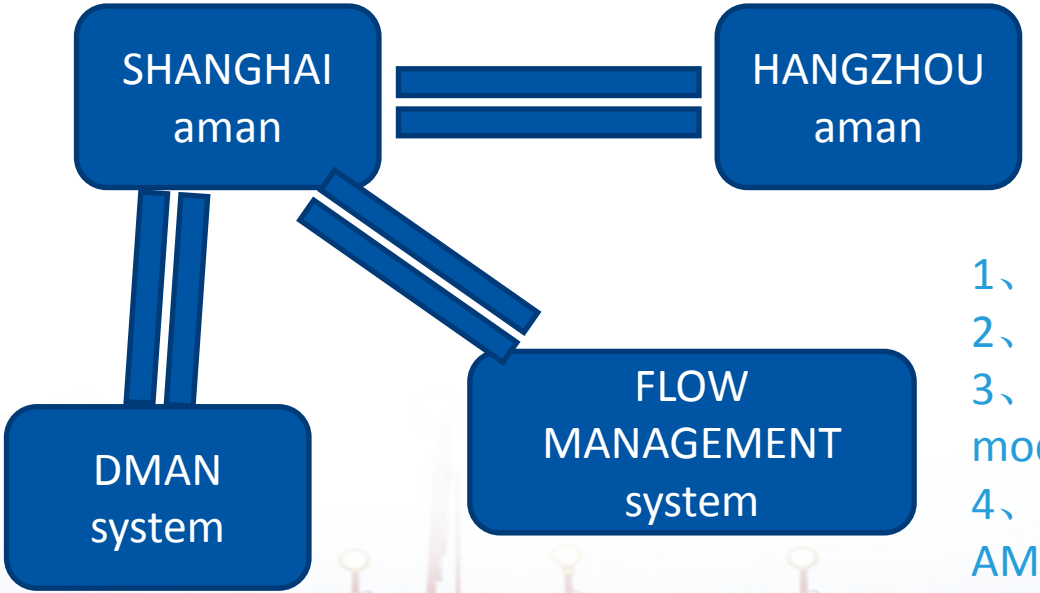
# problems in using AMAN



# conclusions

- After two years of hard work, the AMAN seat of Hongqiao airport has been running well since its official operation. At present, the control and equipment department is working hard to prepare for the AMAN seat in Pudong. Of course, the preparation period is longer because there are more runways in Pudong Airport and the allocation principle is more complicated.

# conclusions and suggestions




1、information sharing
2、interface standards
3、clarifies the operation mode
4、technical standards of AMAN

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# Thanks for Your Attention