Outline of China ATM Automation system

ICAO ASIA/PACIFIC REGIONAL
ATM AUTOMATION SYSTEM SYMPOSIUM
Nanjing, China, 22-23 November 2018

Li Xin
Air Traffic Management Bureau, CAAC

Outline

- The Status and Characteristic
- The Challenge and Problem
- The Solution and Vision

Characteristic

- **Support the rapid and tremendous on-going growth of Air Transportation of China**
- **Various in system configuration，capacity and scale**
- **Needed to synchronize with on-going development and modification of ATC control area，ATC center and operation requirement**

The CAAC ATM Automation System is the DEVELOPING system

Airspace & Control Area

FIR	11
Sum of Control Airspace	1081 Km^2
Upper Control Area	16
Middle/Low Control Area	28
APP Control Area	41
Terminal Control Area	1
large-scale ATC control Center	8

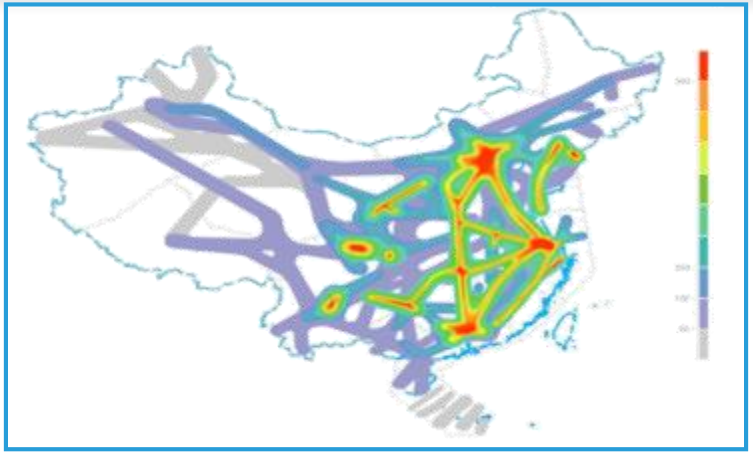
Traffic Volume and Flows

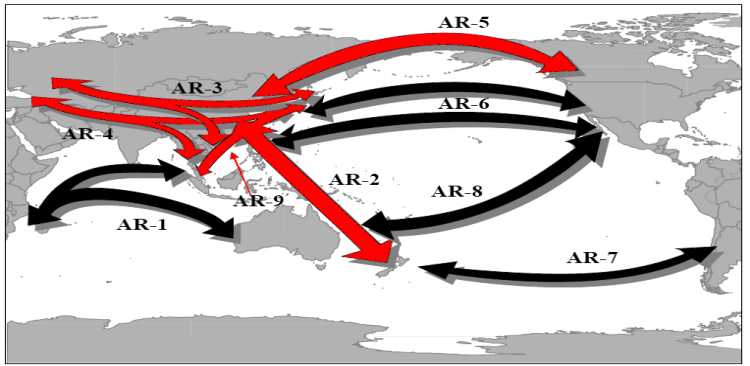
Traffic volume in 2017： 9.3 million and most is demotic traffic, The proportion of international traffic is increasing

Very congested in eastern China, Nearly 40% of traffic distribute in Bohai Bay, PRD and YRD.

Traffic in Southwest China is expected to grow rapidly in future

China is involved in most of the major traffic flows of APAC region





History

1970s
Beijing & Shanghai Airport
Thomson-CSF
Radar Data Display Terminal

1990s
Beijing ATC Center
Raytheon system

2004.5
Sanya ACC
Telephonic system

11
Beijing ACC
Thales system

2005.5
Shanghai ACC
Thales system

11
Guangzhou ACC
Thales system

2013.8
Chengdu ACC
Indra system

11
Xi'an ACC
Indra system

2015.10
Shenyang ACC
LES system

2016.12
Urumqi ACC
LES system

Deploy Status

Legend

- LES
- No.2 Institute
- THALES
- BEST
- INDRA
- ATC3000
- Chuanda
- Telephonics
- Lockheed MARTIN

- Due to the localized, distributed, minimum requirement based, maximum economical concerned principle and approach
- 9 vendors, 80 set ATM automation systems

Example of change and growth

Year 2000 Landing/takeoff Movement

Beijing ACC	Shanghai ACC	Guangzhou ACC
0.25M	0.41M	0.38M

Original performance goal of Automation system:

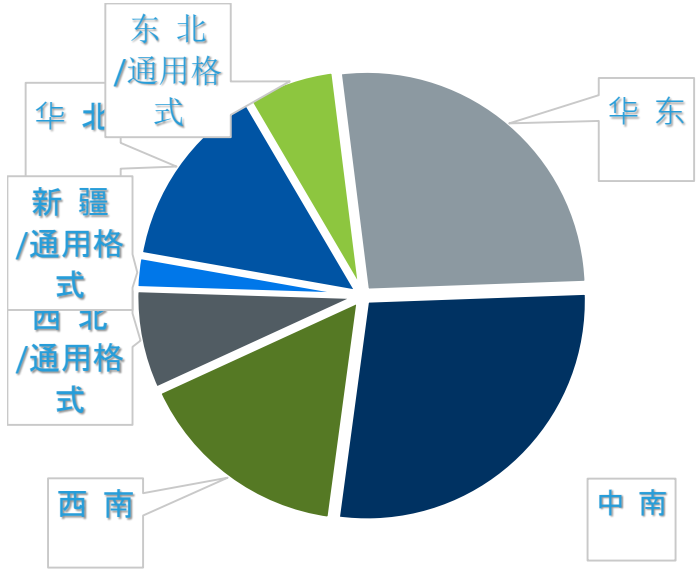
RDP for 24 Radars and FDP for 15000 messages

Year 2017

Beijing ACC	Shanghai ACC	Guangzhou ACC
1.37M	2.67M	2.14M

After V5 upgrading, current performance:

RDP for 32 Radars and FDP for 20000 messages



10. 59%

36.52M

Total ATC service flights

Outline

- The Status and Characteristic
- The Challenge and Problem
- The Solution and Vision

Challenge

- **Capacity:**
  - The requirement for amount, scale, ability of ATM automation systems raised by future growth of air transportation and ATC workload
- **technology:**
  - The requirement for supporting or integrating new ATM operation concept, procedure and function, such as AMAN/DMAN, Ground Safety Network and TBO.
- **Other:**
  - Higher cost-benefit and maintenance performance requirement
  - Higher reliability, flexibility, Integratability and security requirement

Fleet growth prediction

2017

2016
2933架

11.8%

2017
3261架

2035

COMAC 5.5% 8139架

Boeing 7705架

Airbus 8000架左右

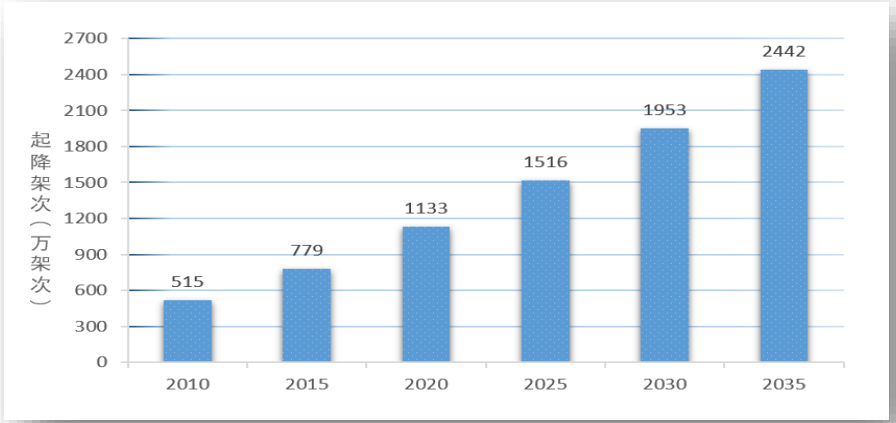
2035

Fleet Sum
2035
8000架

Average daily flight
2035
37670航班/日
2017
14583航班/日

ATC service volume prediction

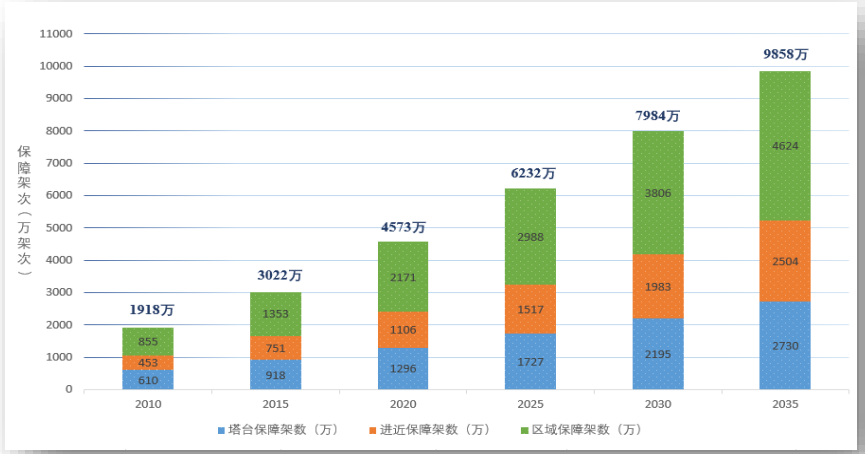
ATC service takeoff/landing movement



2017
9.28M

2035
24.42M

ATC service flight



2017
36.52M

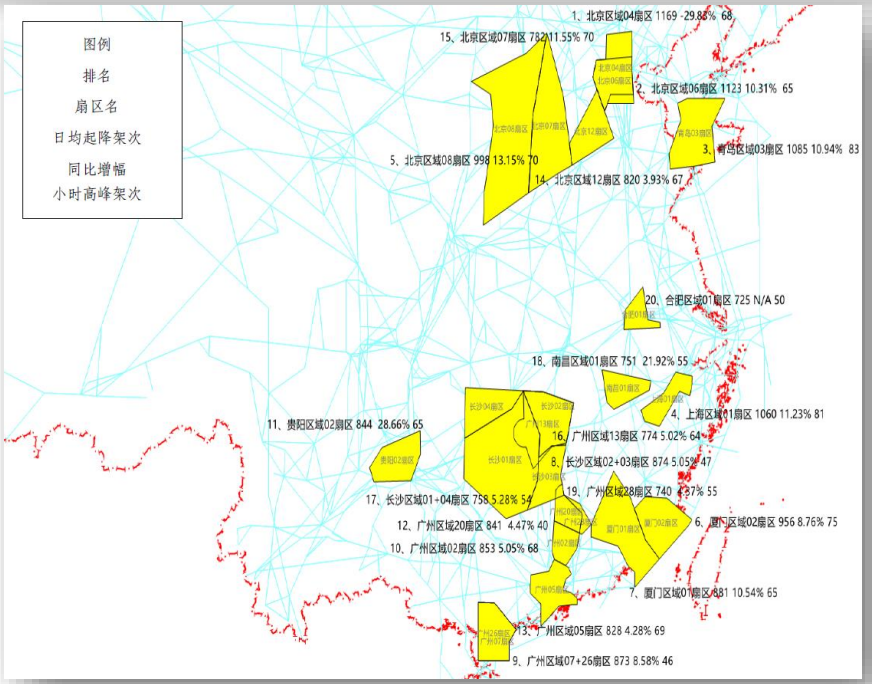
2035
98.57M

Congestion and unbalance of airspace

About 90% of the busiest sectors have peak hour traffic volume beyond the threshold

The highest average daily volume is 1169, achieved in Sector 04 of Beijing ACC

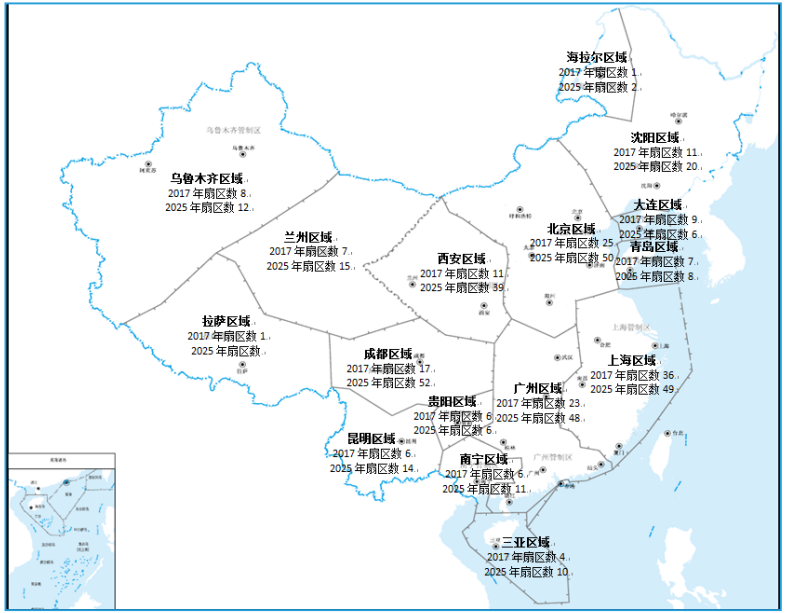
The highest peak hour volume is 83，achieved in sector 03 in Qingdao ACC



The busiest 20 sectors in 2017

Airspace requirement prediction

	2017	2025	2035
All Sectors	360	752	
En Route Sectors	223	439	620
Approach Sectors	137	313	



Larger scale ATM Auto system or more ATM Auto system

Problem

- **Diversity:**
  - So many different type, different configuration, different scale and different age of the ATM Auto system, it makes big problems for information/data exchange, overall system operation and maintenance efficiency, etc.
- **Localized and distributed approach:**
  - This approach has caused the diversity problem we suffering now, it’s not the way to build next generation ATM Auto system.

Outline

- The Status and Characteristic
- The Challenge and Problem
- The Solution and Vision

Short-term solution

- **Enhance software version and requirement management:**
  - Do best effort to keep the consistency of major ATM Auto system.
  - Establish complete and systematic procedure and mechanism for collecting, assessing and confirming the software upgrade/modify requirement, for verification and approval software patch/version.
- **Realize data synchronization between main and backup system:**
  - Improve the utilization of backup ATM Auto system and enhance the overall reliability and performance.
- **Limited upgrade and modification to adopt new function requirement**
  - processing the ADS-B and Mode-S data
  - Integrating and coordinating with A-SMGCS, CDM, AMAN/DMAN

long-term solution for future

- **Adopt Top-down approach to develop and deploy next generation ATM Auto system uniformly**
  - Determine the number and scale based on the prediction of national wide Air Transportation growth and ATC service requirement
  - Develop the technical specification with detailed function and performance requirement
  - Develop the prototype system for evaluation, verification and optimization
  - Frozen the technical specification and function requirement
  - Purchase and deploy the new ATM Auto system nation widely or regionally

The Next Generation ATM Auto system should be customized, relative unified system supporting seamless ATM services

ICAO


North American Central American and Caribbean (NACC) Office
Mexico City
South American (SAM) Office
Lima
ICAO Headquarters
Montréal
Western and Central African (WACAF) Office
Dakar
European and North Atlantic (EUR/NAT) Office
Paris
Middle East (MID) Office
Cairo
Eastern and Southern African (ESAF) Office
Nairobi
Asia and Pacific (APAC) Sub-office
Beijing
Asia and Pacific (APAC) Office
Bangkok
THANK YOU