Measuring Aviation System Performance in China

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- Air Traffic Operation Performance Analysis and Optimization

  —— 《2014 Flight Operation Efficiency White Paper》

- Aviation Safety Data Statistics and Analysis

  http://www.air-safety.com/

- Air Traffic System Simulation and Tools Development
- Controllers Education and Training

Civil Aviation University of China

ATFM Research Platform

Integrated Control Simulator

TWR ←→ Radar ←→ Non-Radar

Content
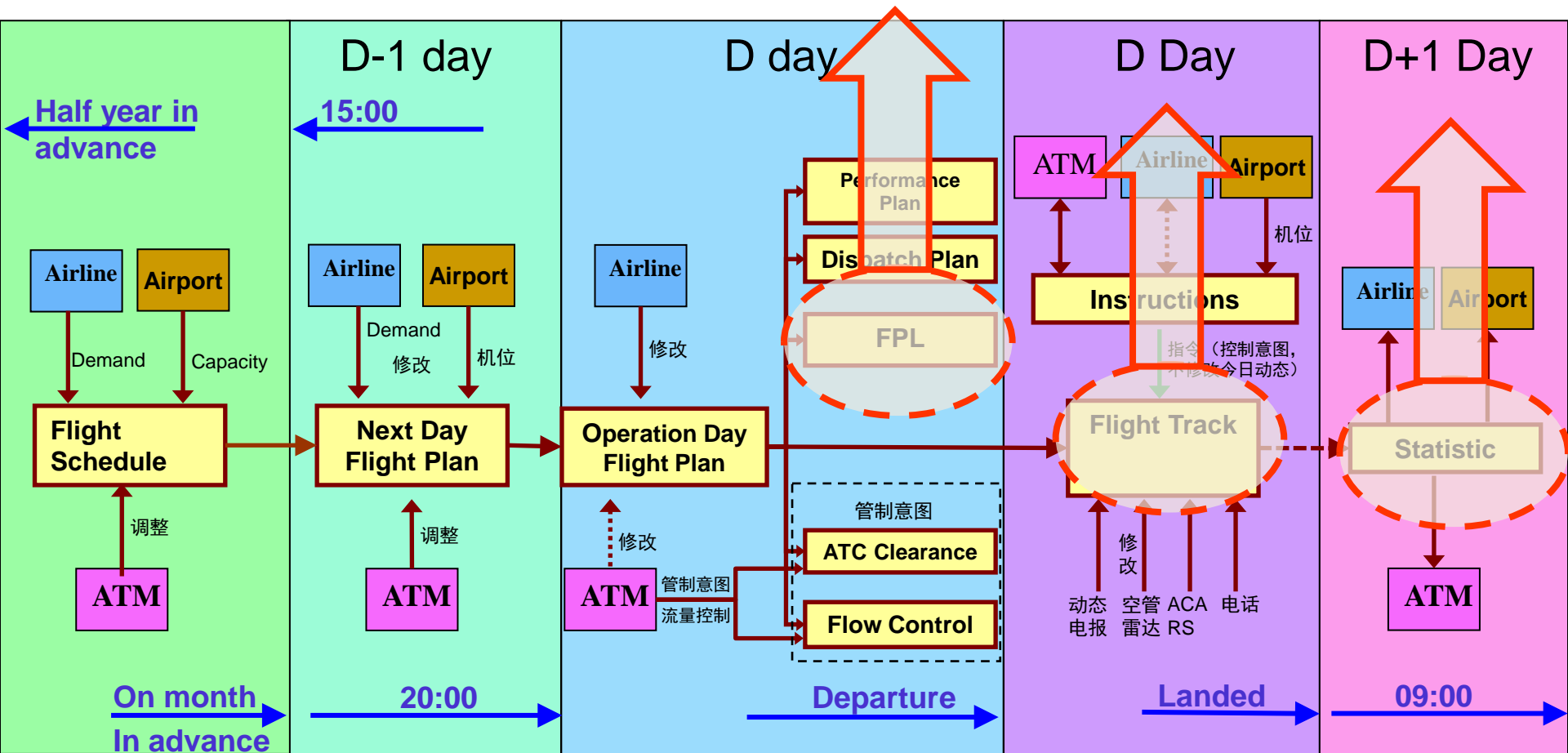
- 1. Performance review in China

- 2. Performance frameworks

- 3. Measuring performance in China

1.1 Data Collection

| D-1 day | D day | D Day | D+1 Day |

Half year in advance

15:00

Airline | Airport

Demand | Capacity

Flight Schedule

调整

ATM

On month In advance

Airline | Airport

Demand 修改 | 机位

Next Day Flight Plan

调整

ATM

20:00

Airline

修改

Operation Day Flight Plan

修改

ATM 管制意图 流量控制

管制意图

ATC Clearance

Flow Control

Departure

Performance Plan

Dispatch Plan

FPL

ATM | Airline | Airport

机位

Instructions

指令（控制意图，不修改今日动态）

Flight Track

修改

动态 空管 ACA 电话
电报 雷达 RS

Landed

Airline | Airport

机位

Statistic
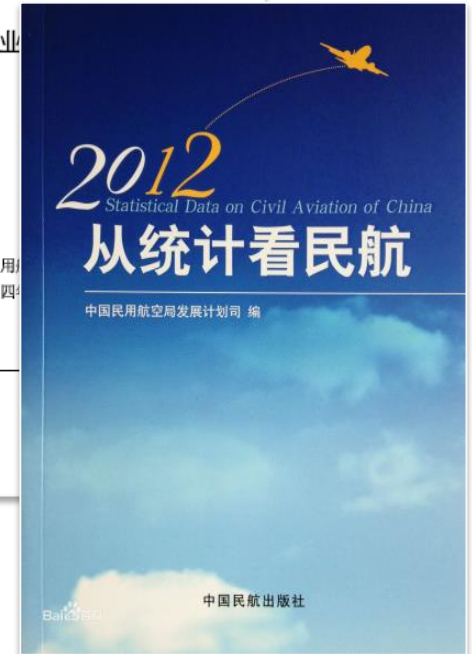
ATM

09:00

1.2 Report to Headquarter
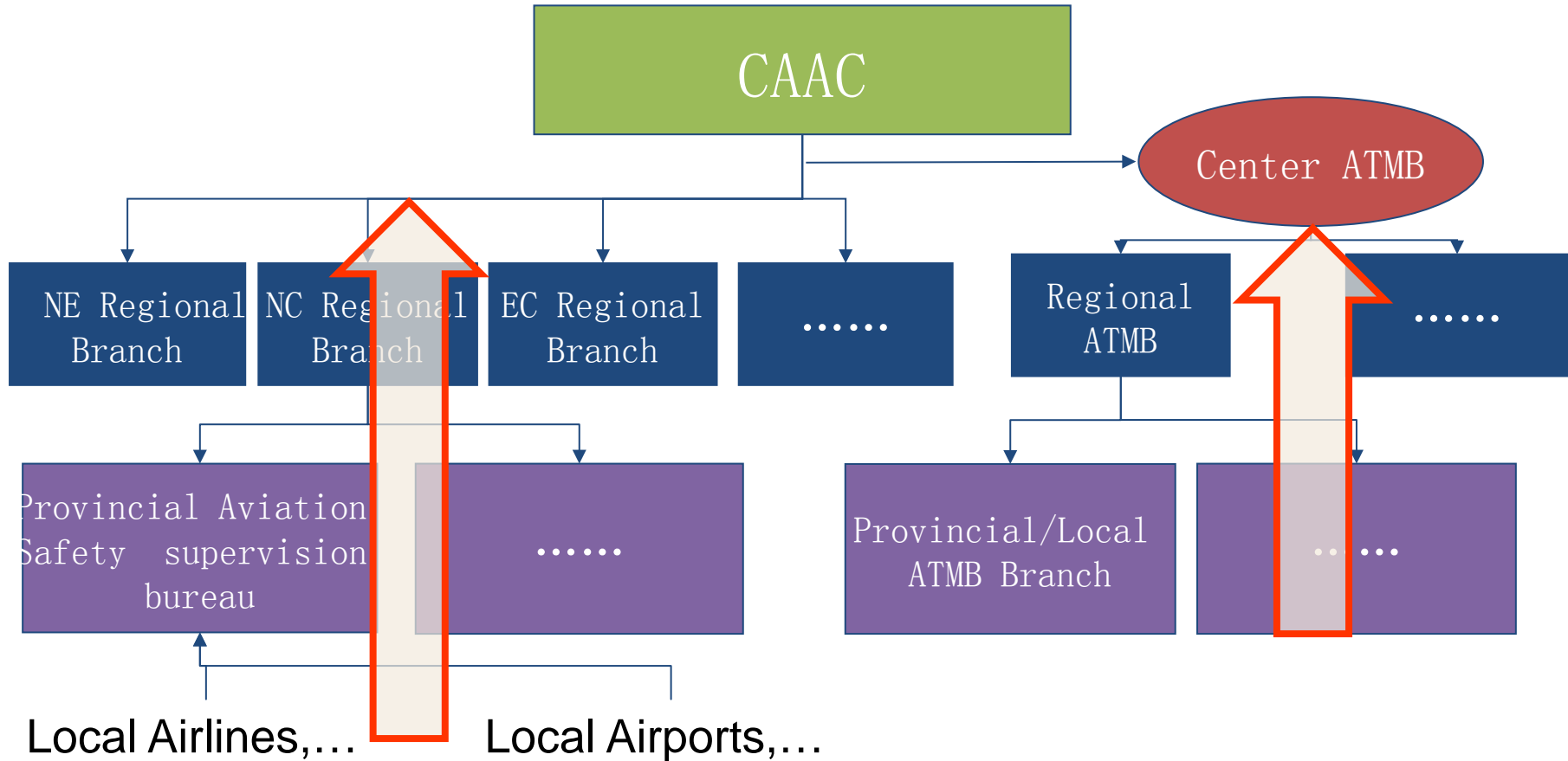
1.3 Public Reports

- ❑ Monthly Statistics
- ❑ Monthly Analysis Report
- ❑ Yearly Report
- ❑ Yearly Airport Report
- ❑ 《Statistic Data on Aviation of China》

http://www.caac.gov.cn/

1.4 Internal Reports

- ❑ Monthly Briefing Reports
- ❑ Monthly Operation Situation Analysis Reports
- ❑ Flight Delay Analysis Special report
- ❑ ……

空管简报

二〇一三年九月

2013 年 8 月空管业务统计简报

运行分析报告

2013 年 2 月

全国空管运行情况和态势分析报告

民航明传电报

签批盖章

| 等级 | 局发明电 | 号 |

关于 2013 年 8 月份航班正常情况的通报

1.5 Internet/Intranet Resources

Globe Flight Schedule Management System

www.sked.cn

Flight Punctuality Statistic System

www.flightontime.cn

Air Traffic Information Platform
https://pro.chinaatm.com.cn

1.6 Other Analysis

Focus on Flight Punctuality
Mainly used by Passengers

http://www.carnoc.com/

http://www.umetrip.com/

Airline Operation Analysis

Airport Operation KPI

- 1. Performance review in China

- 2. Performance frameworks

- 3. Measuring performance in China

2.1 CAAC Headquarter

- Air Transportation Turnover volume

- Passengers Transportation Volume

- Cargo Transportation Turnover Volume

- Passenger Load Factor

- Aircraft Utilization

- Number of accidents per million flight hours

- Flight Punctuality Rate

- Airport Movements

- ……

2.2 Target Performance in 2015

专栏2 "十二五"时期民航发展主要指标				
类别	指 标	2010年	2015年	年均增长
业务规模	航空运输总周转量（亿吨公里）	538	990	13%
	旅客运输量（亿人）	2.68	4.5	11%
	货邮运输量（万吨）	563	900	10%
	通用航空生产作业（万小时）	14	30	16%
	客运周转量在综合交通中的比重（%）	14.5	16	—
发展质量	运输飞行百万小时重大事故率	[0.05]	<[0.20]	—
	航班正常率（%）	81.5	>80	—
	载运率（%）	71.6	>70	—
	运输飞机日利用率（小时/天）	9.4	≥9.6	—
	吨公里燃油消耗（公斤）	[0.306]	<[0.294]	—
保障能力	保障起降架次（万）	605	1040	11%
	全国民用运输机场（个）	175	≥230	—
	运输机队规模（架）	1597	2750	11%
	通用机队规模（架）	1010	>2000	—
	航油供应（万吨）	1600	2850	12%
	飞行员数量（万人）	2.4	4	11%
	民航院校在校生（万人）	5.0	6.3	5%
注：带[ ]的数据为5年累计数。				

Number of major accidents per million flight hours

Flight Punctuality Rate

Load Factor

Fuel consumption per ton-kilometer
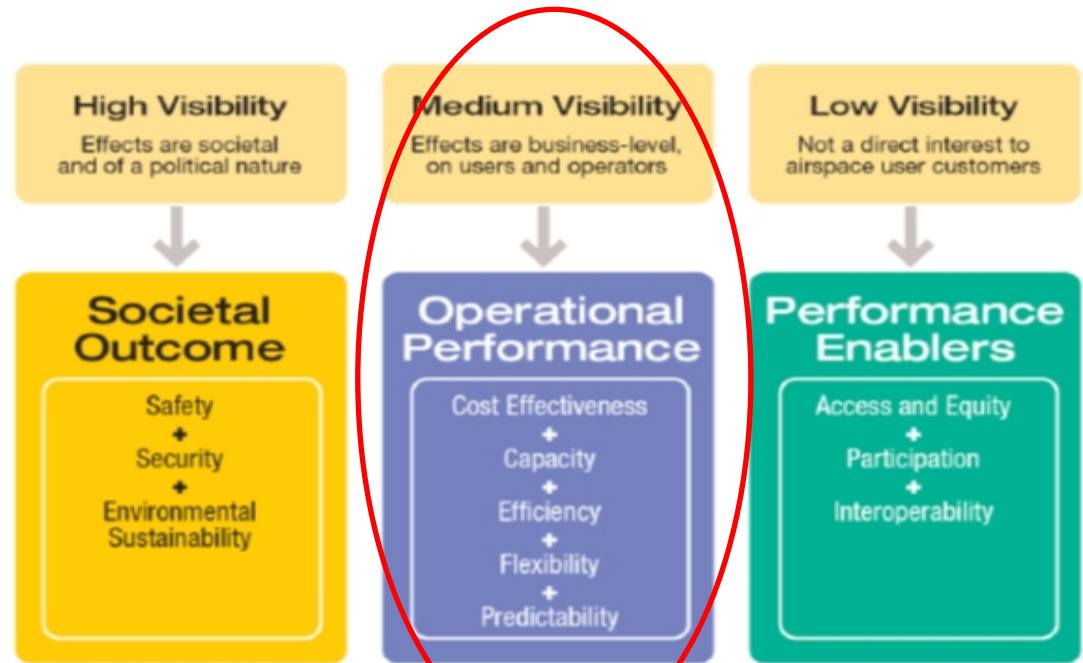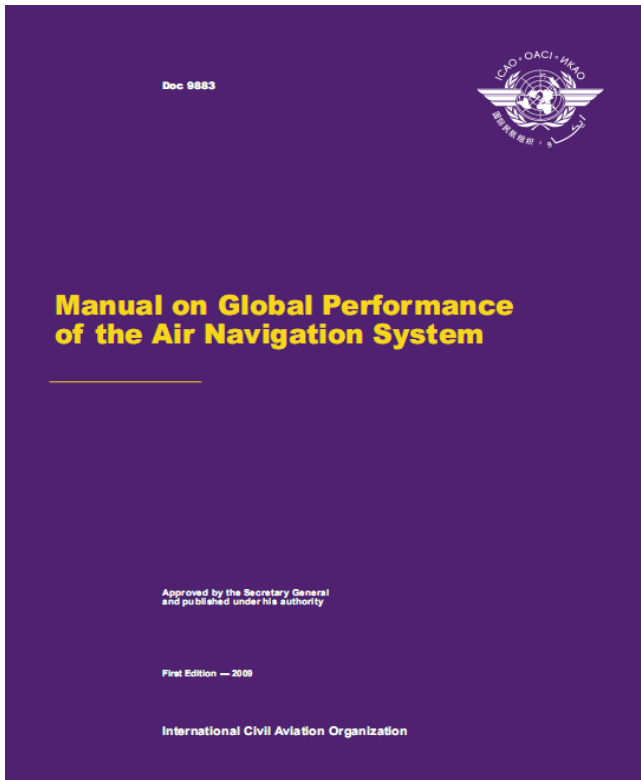
Airport Movement

2.3 Main Performance until 2013

ATC Facilities (2.95 Billion ,10.5%)
Investment

Number of major accidents

Number of Airline Aircrafts

Flight Punctuality (average 72.3%)
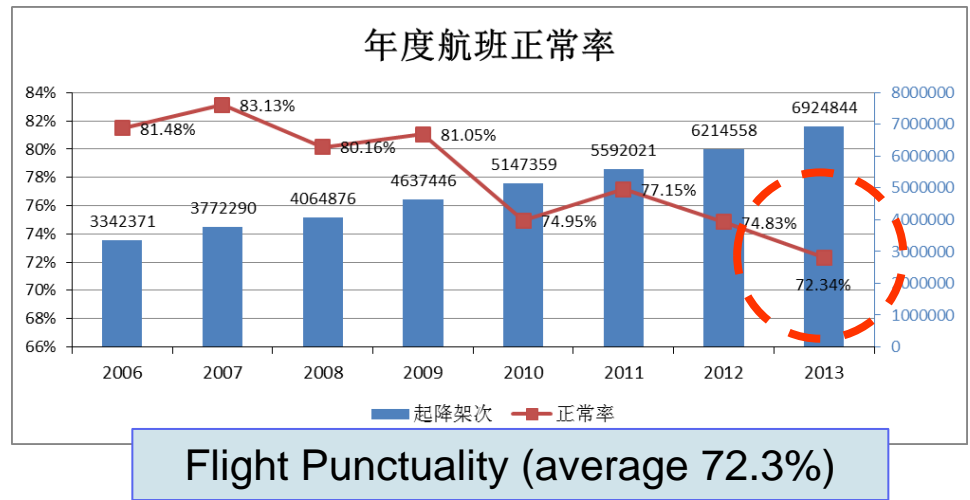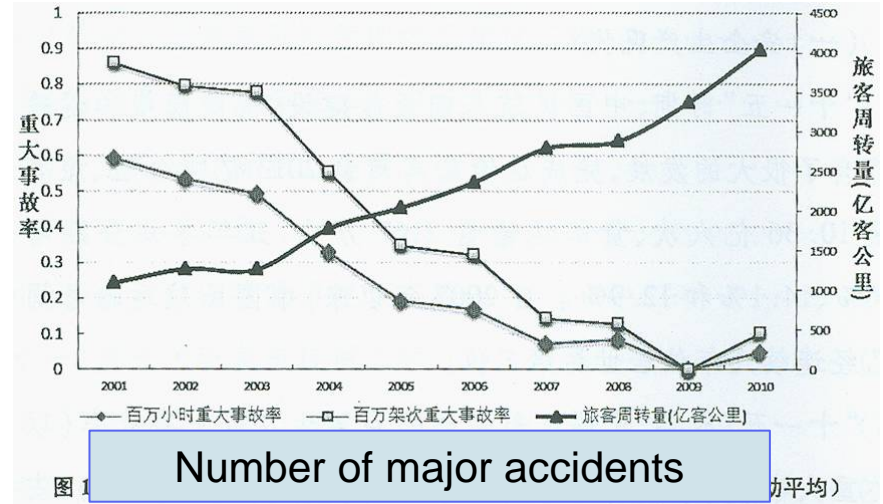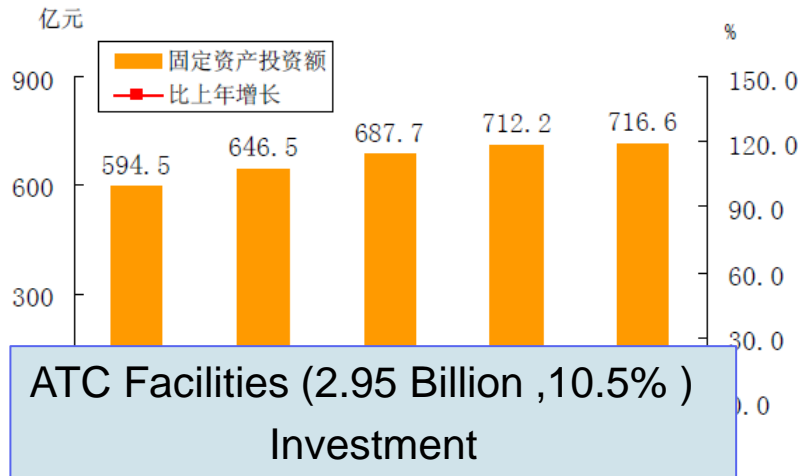
2.4 Operation performance have been concerned

Doc 9883

Manual on Global Performance of the Air Navigation System

Approved by the Secretary General and published under his authority

First Edition — 2009

International Civil Aviation Organization

High Visibility
Effects are societal and of a political nature

Medium Visibility
Effects are business-level, on users and operators

Low Visibility
Not a direct interest to airspace user customers

Societal Outcome
Safety
+
Security
+
Environmental Sustainability

Operational Performance
Cost Effectiveness
+
Capacity
+
Efficiency
+
Flexibility
+
Predictability

Performance Enablers
Access and Equity
+
Participation
+
Interoperability

Especially Airports and Sectors' Capacity

2.5 《Flight Operation Efficiency White Paper》

Traffic Volume

- Annual movements
- Average day movements
- Area traffic volume
- Fix points day traffic
- Terminal area traffic
- Airport traffic

Punctuality

- Annual
- Monthly
- Airline
- Airport departure
- Departure delay distribution

Efficiency

- Flight distance distribution
- Passenger Load Factor
- Aircraft Utilization
- Airport pairs transmit time

Cost-Efficiency

- In flight fuel consumption
- Temporary airways utilization

- 1. Performance review in China

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- **Main works**
  - Standardization data resource
  - Indicators definition
  - Air-route Network evaluation
  - Calculated ATFM delay
  - Compare to others countries
  - Performance based analysis and improvement
  - ……

3.1 Standardization data resource

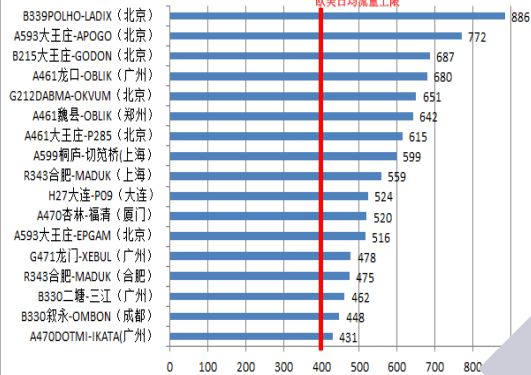| Current Operation Systems	→	Centerlized Data Verification System	→	Standard Performance Database

Data Set I	• Flight Schedule/Plan Data
Data Set II	• Flow Control Data
Data Set III	• Flight Trajectory Data
Data Set IV	• Operation Performance Data

3.2 Indicators definition

Traffic Volume

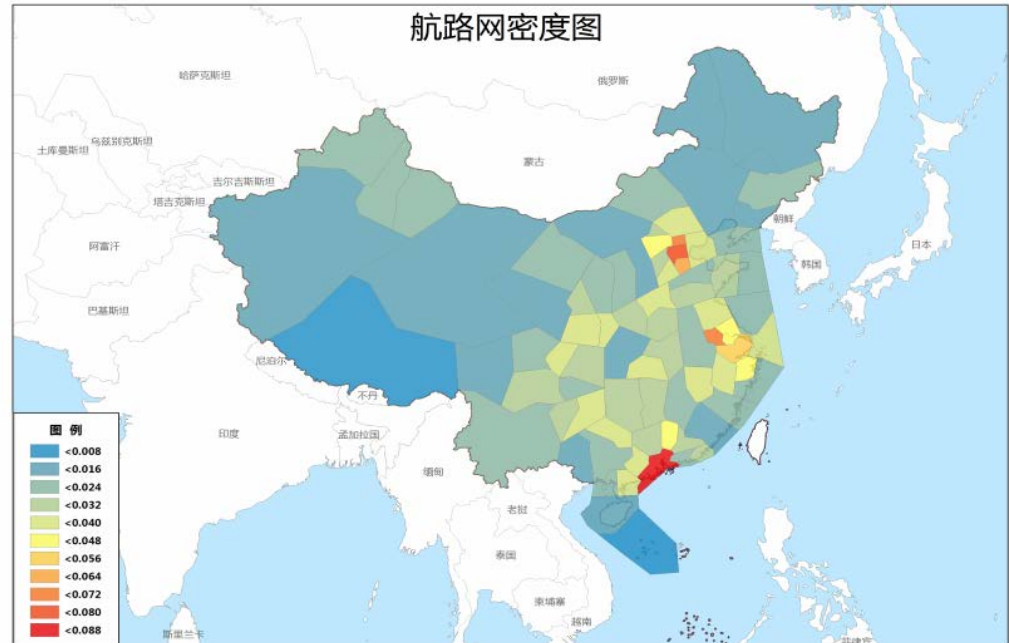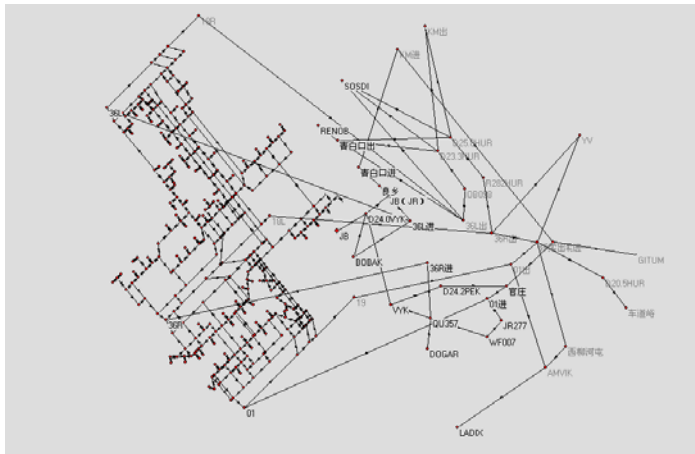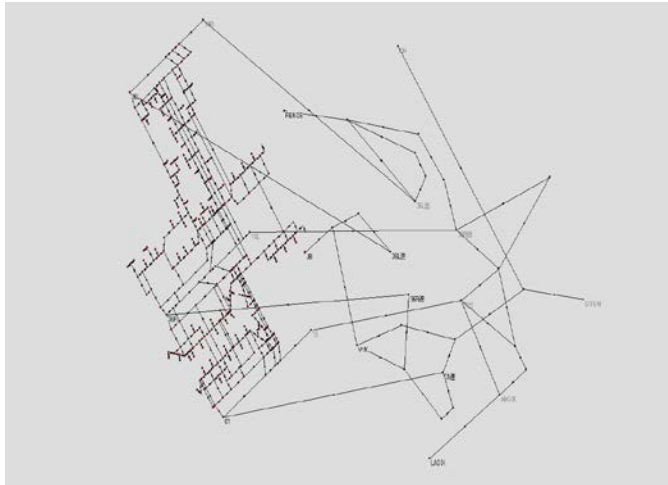**Punctuality**
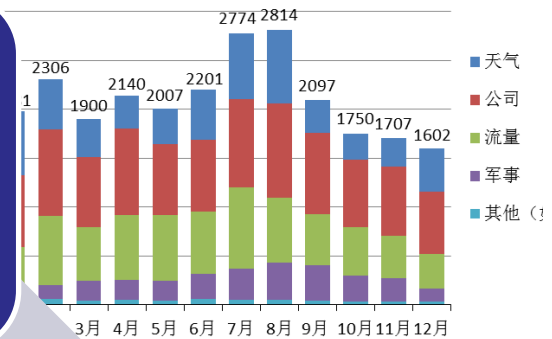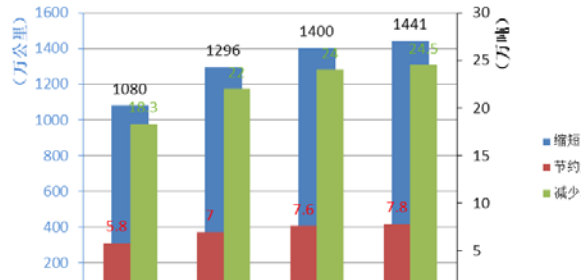
Cost-Efficiency

Efficiency
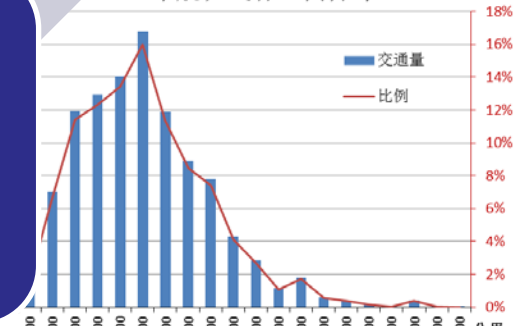
Follow new Regulations, such as departure time replace by off-block time in punctuality

Increase new comparing indicators, such as volume/capacity, planned/actual, ……

Identify performance benchmarks, form different operation situations, different facilities
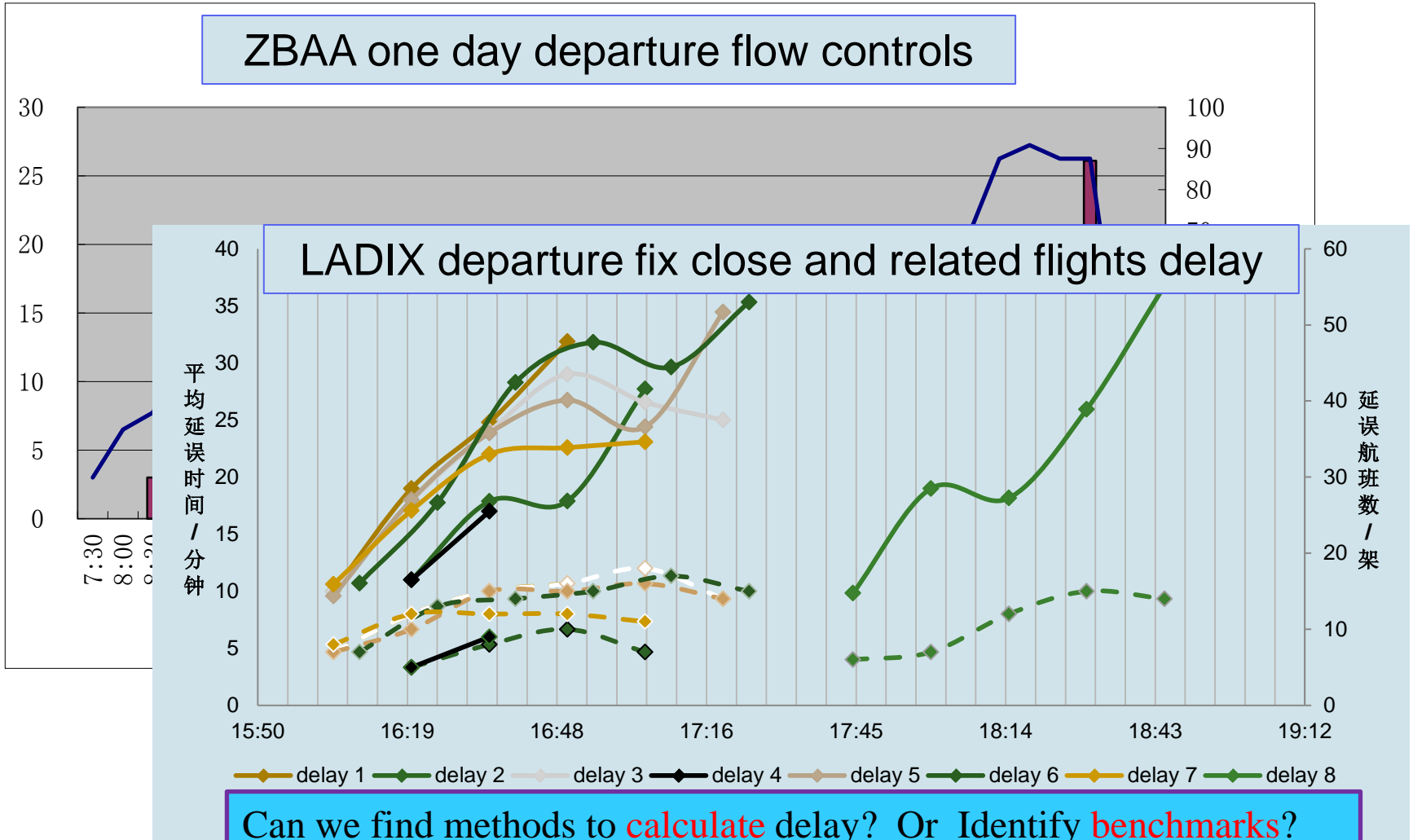
3.3 Air-route Network evaluation

航路网密度图

图 例
- <0.008
- <0.016
- <0.024
- <0.032
- <0.040
- <0.048
- <0.056
- <0.064
- <0.072
- <0.080
- <0.088

❑ Network connection degree
❑ OD non-linear coefficient
❑ Air-route/airway density

3.4 Calculated ATFM delay

ZBAA one day departure flow controls

LADIX departure fix close and related flights delay

Can we find methods to calculate delay? Or Identify benchmarks?

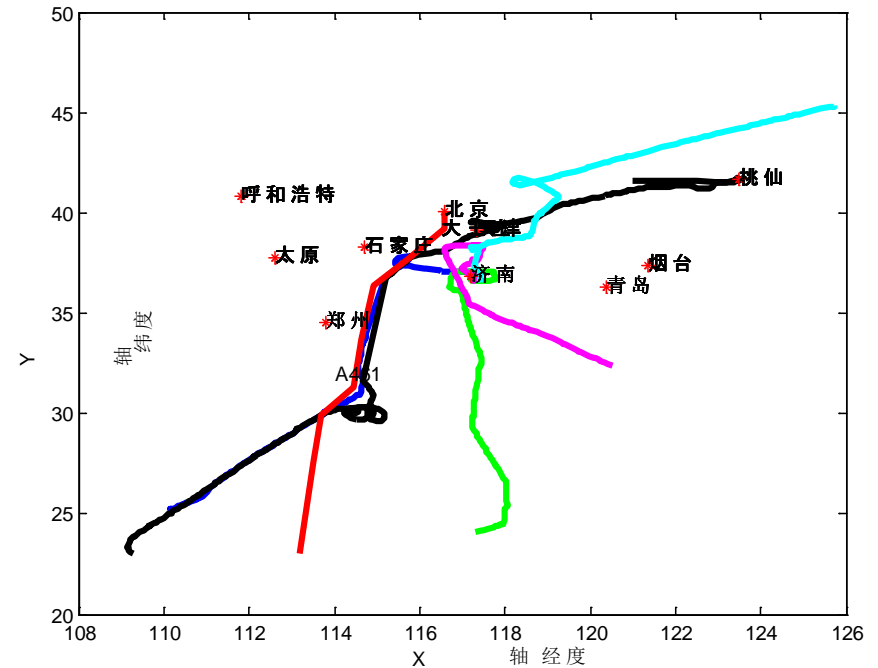## 3.5 Compare to others countries

Route Segment traffic volume
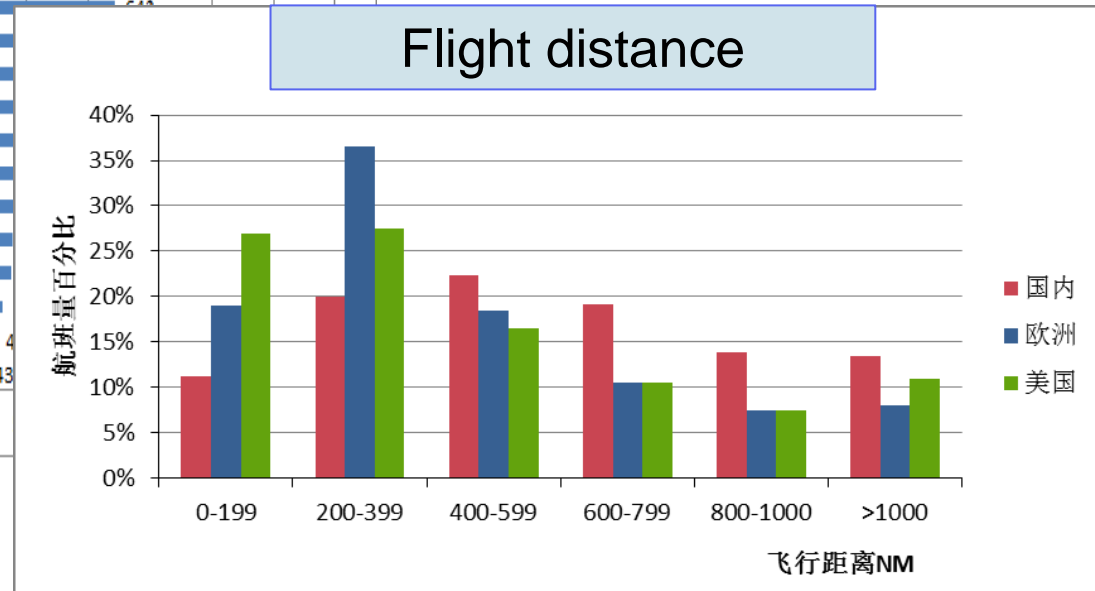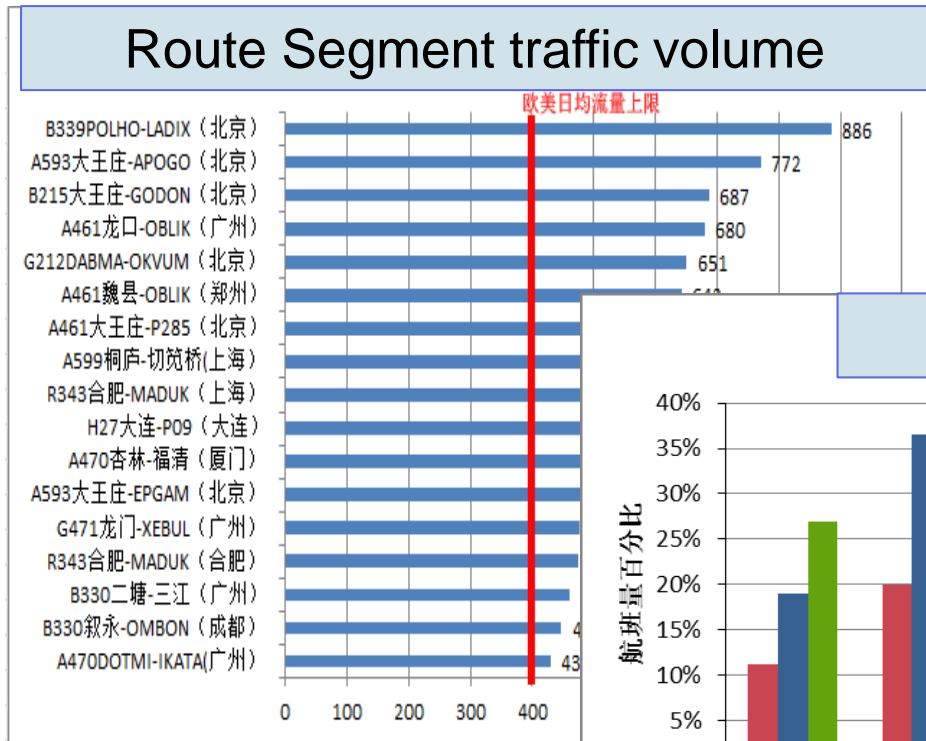
Flight distance
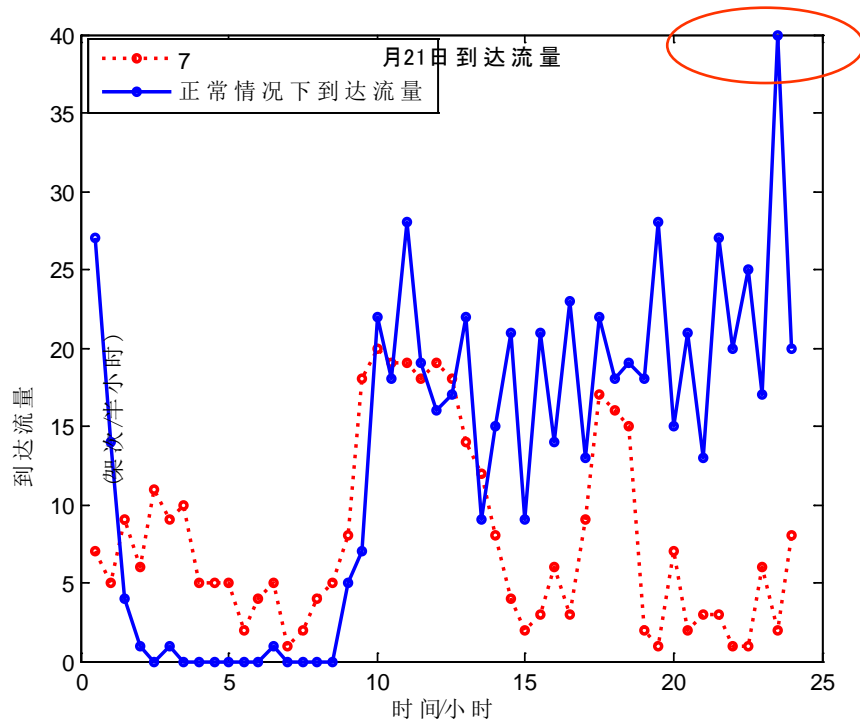
Efficiency, Cost-Benefit, ……

3.6 Performance based analysis and improvement

Beijing Capital Airport Diverting Analysis

2013.7.21 heavy rain in Beijing

Diverting Delay, Flight Distance, Time to issue diverting instructions, ……

Thanks

Question?