Airlines Operational Risk Control System in China

Flight Standards Department of CAAC

2018

CONTENTS

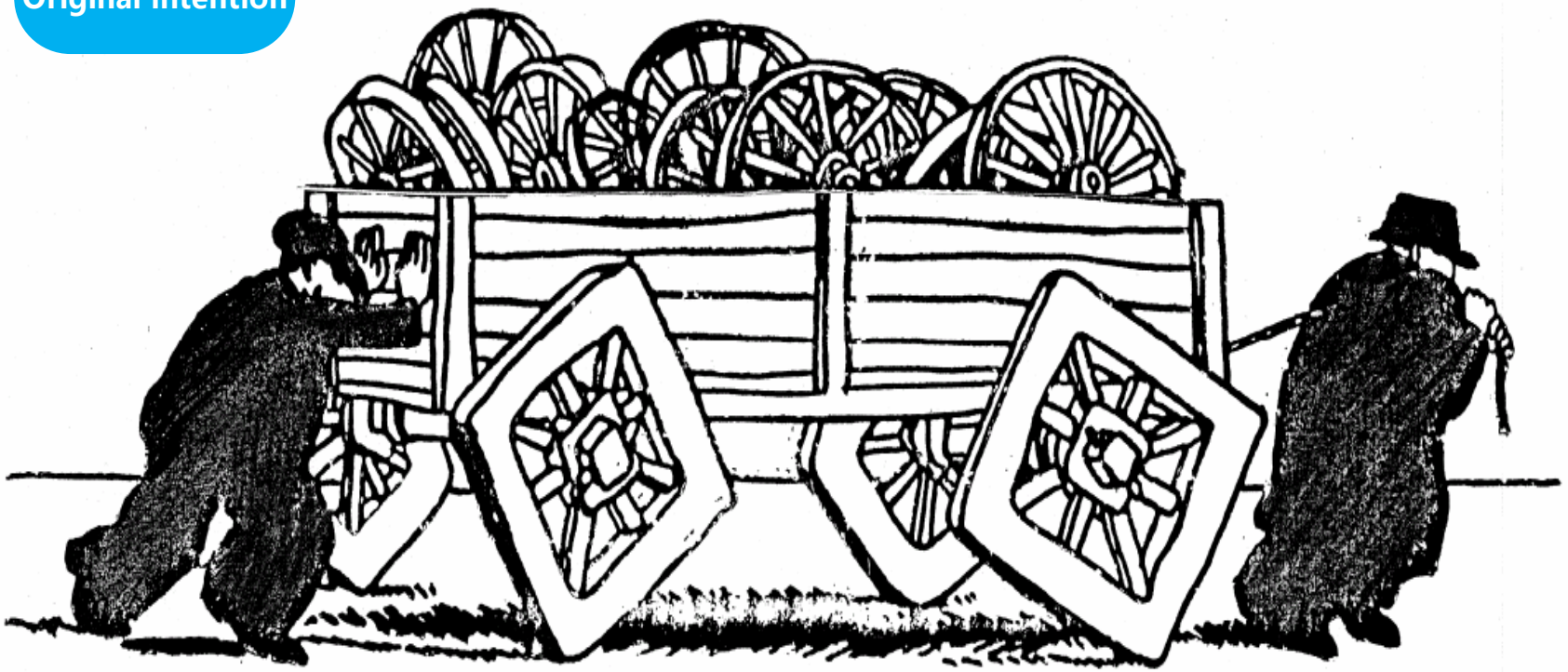
Industry Experience

"We have to find new tools. The idea of using regulations to ensure safety is wearing thin. It is time for industry to think hard about how safe it wants to be, and establish the standards by which it can be measured "

William R Voss
President and CEO
Flight Safety Foundation
Aero Safety World June 2010

FLIGHT SAFETY FOUNDATION

Original intention

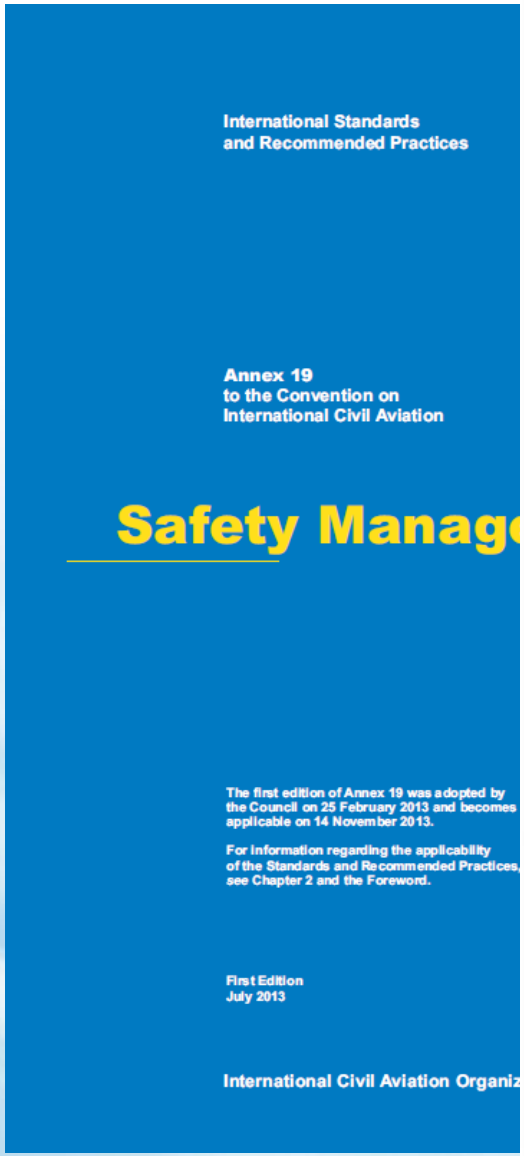


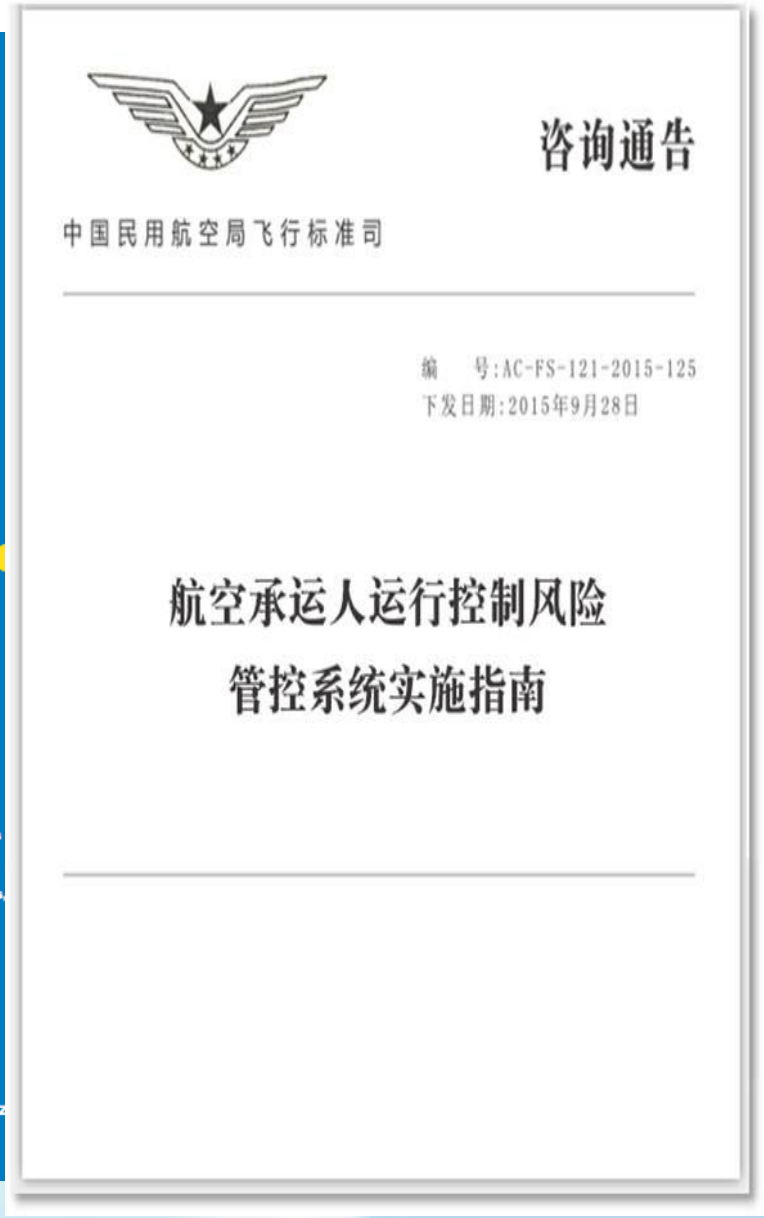
- The traditional laboring relying on manpower can not meet the needs of the time .
- Higher standards for dispatcher license + company intensive training≠ Operation control ability

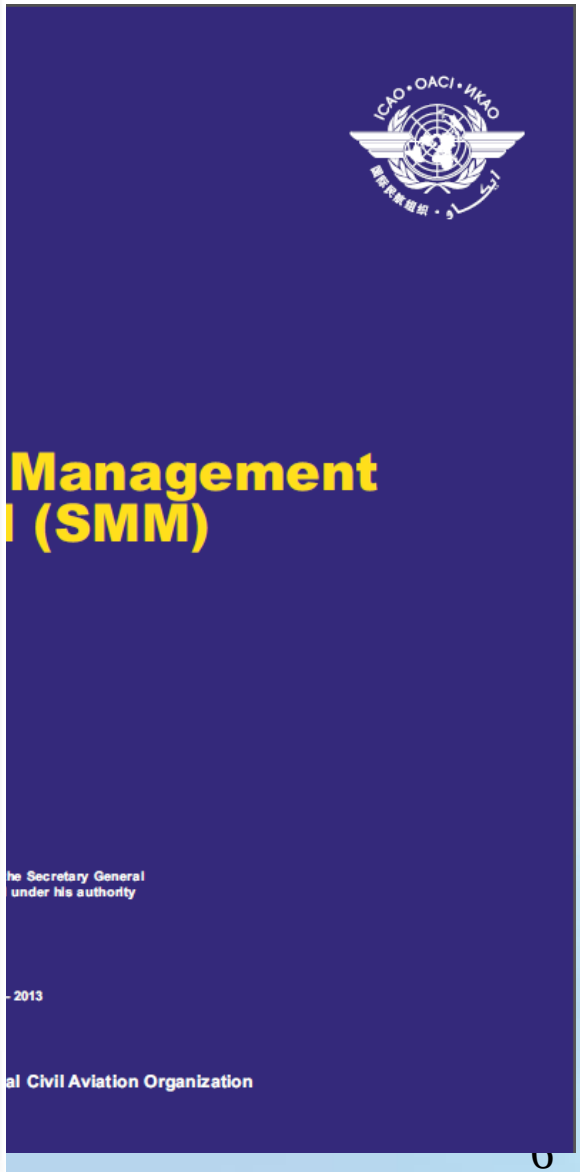
✓Operational statistics +valuable expert opinion

Regulation basis

Regulation	Chapter	Title
《Convention on International Civil Aviation 》Annex 6《Operation of Aircraft》	Chapter 3 Article 3.2	Accident prevention and flight safety programme
《Convention on International Civil Aviation 》Annex19《Safety Management》	Chapter 5	Safety data collection, Analysis and exchange
ICAO Doc9859 《Safety Management Manual》	Chapter3、4、5、7、9	ICAO Safety Management SARPS, State Safety Programme
CCAR-121	121.42	Safety management system
AC-121-FS-2011-004R1《AOC Policies and Standards 》	7.4	Risk Management
AC-121/135-FS-2008-26《Requirements for aviation operator safety management system》	Chapter9.2、10.1、10.2、10.3、10.4	Security management architecture and functions

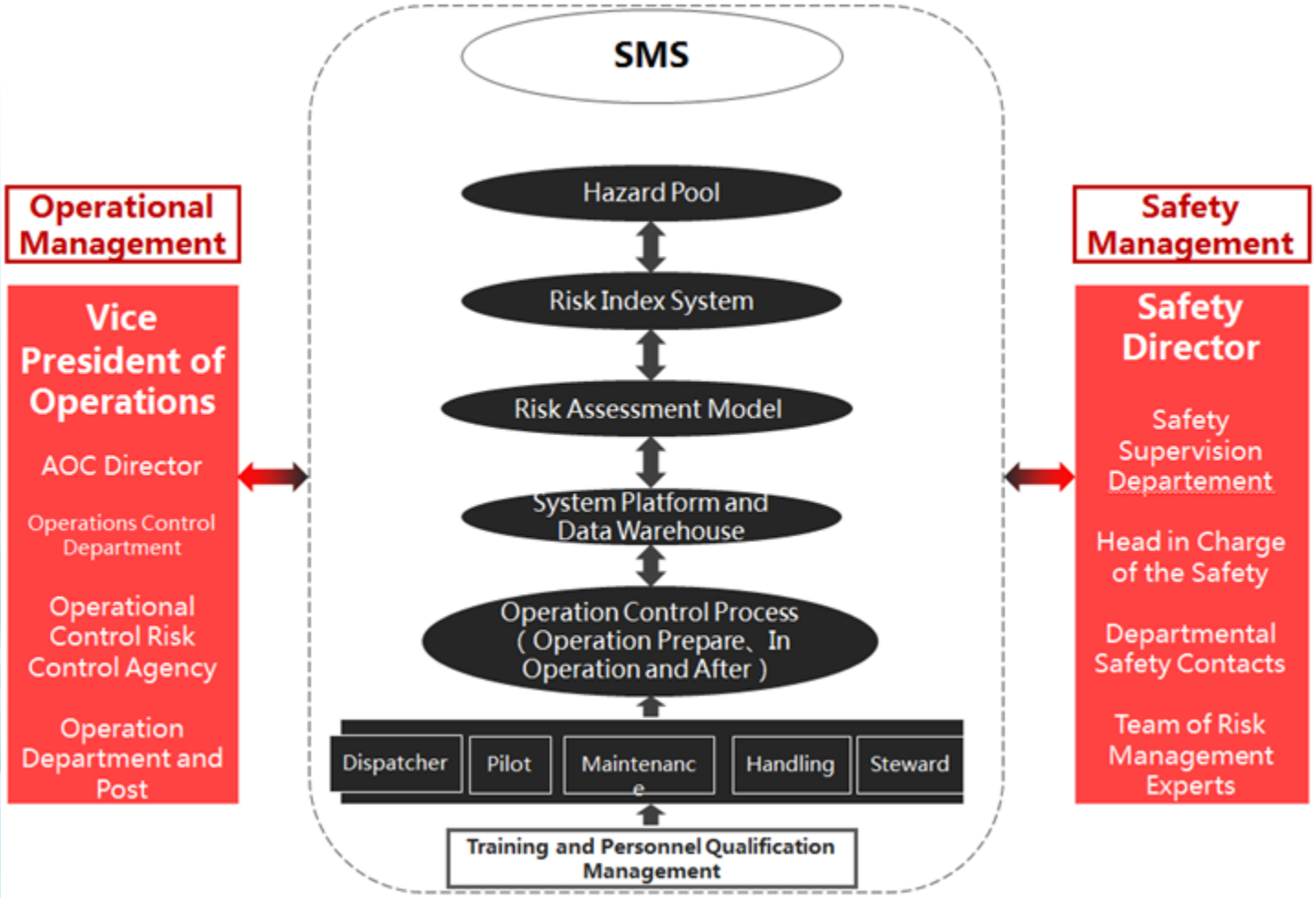

International Standards
and Recommended Practices
Annex 19
to the Convention on
International Civil Aviation
Safety Manag
The first edition of Annex 19 was adopted by the Council on 25 February 2013 and becomes applicable on 14 November 2013.
For information regarding the applicability of the Standards and Recommended Practices, see Chapter 2 and the Foreword.
First Edition
July 2013
International Civil Aviation Organiz


咨询通告
中国民用航空局飞行标准司
编　　号:AC-FS-121-2015-125
下发日期:2015年9月28日
航空承运人运行控制风险
管控系统实施指南


ICAO • OACI • ИКАО
Management
l (SMM)
he Secretary General
under his authority
- 2013
al Civil Aviation Organization

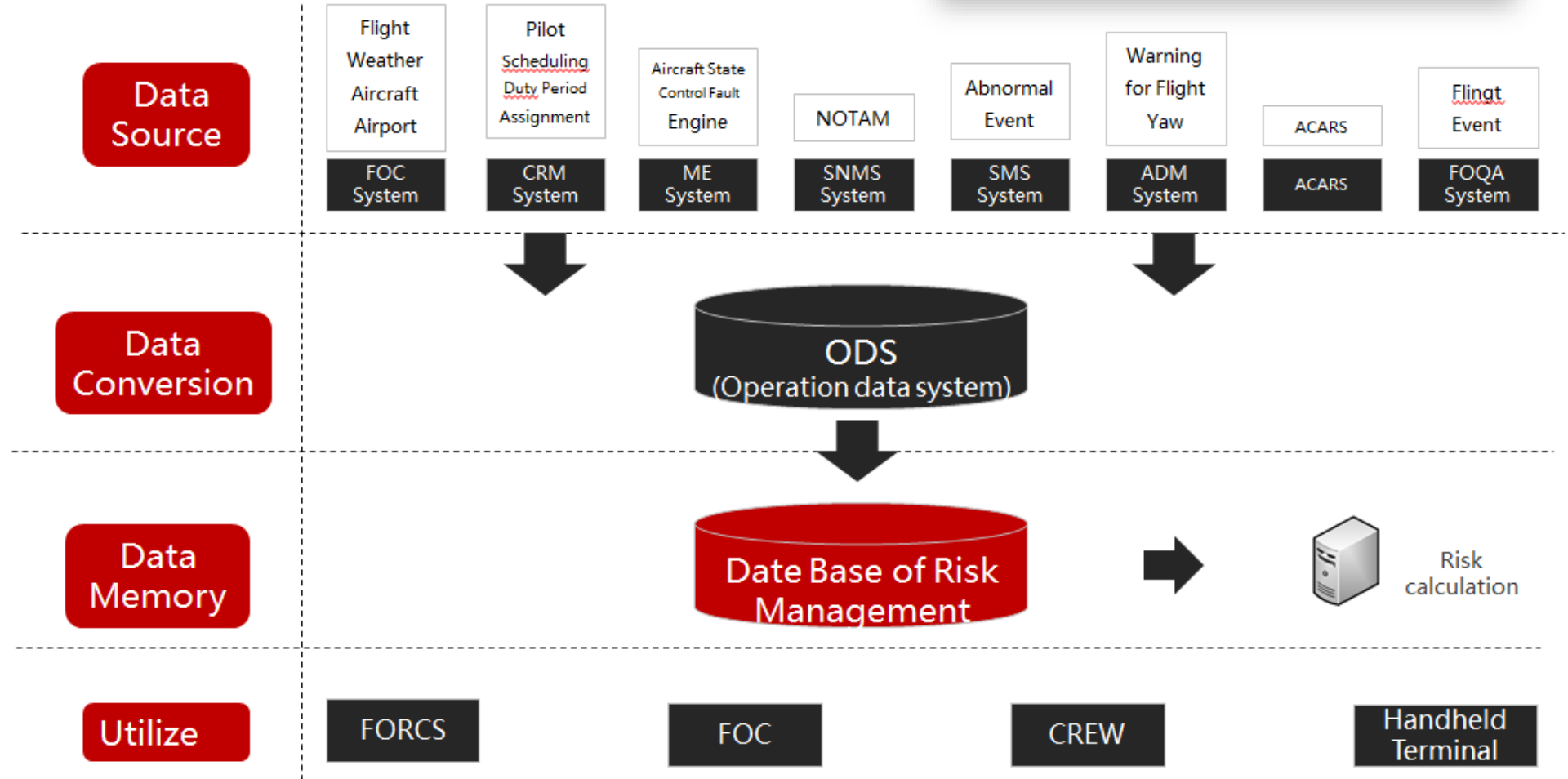
Connection with SMS

Flight operational risk control is an integral part of airline safety management system. The construction of risk control system is the demonstration and application of operation control risk management.



ORCS and OCS Integration

Change operation control from event driven to data-driven management



Risk Control for Operation Control

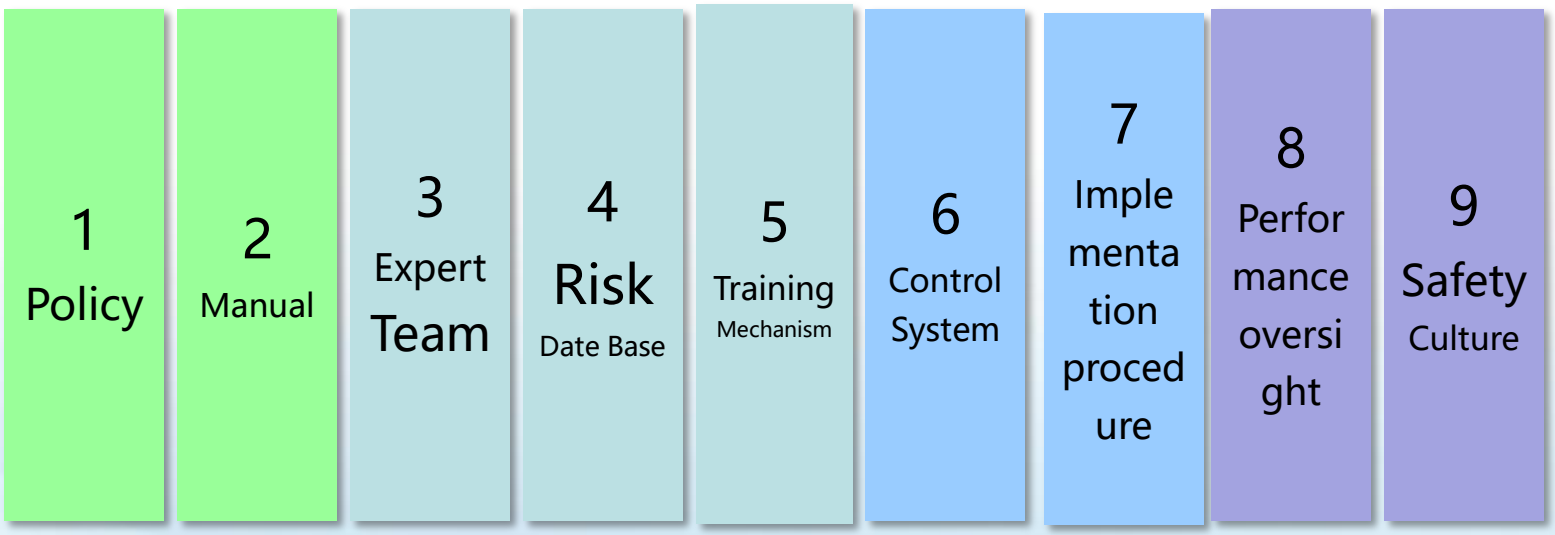
1	2	3	4	5	6	7	8	9
Policy	Manual	Expert Team	Risk Date Base	Training Mechanism	Control System	Implementation procedure	Performance oversight	Safety Culture

ORCS

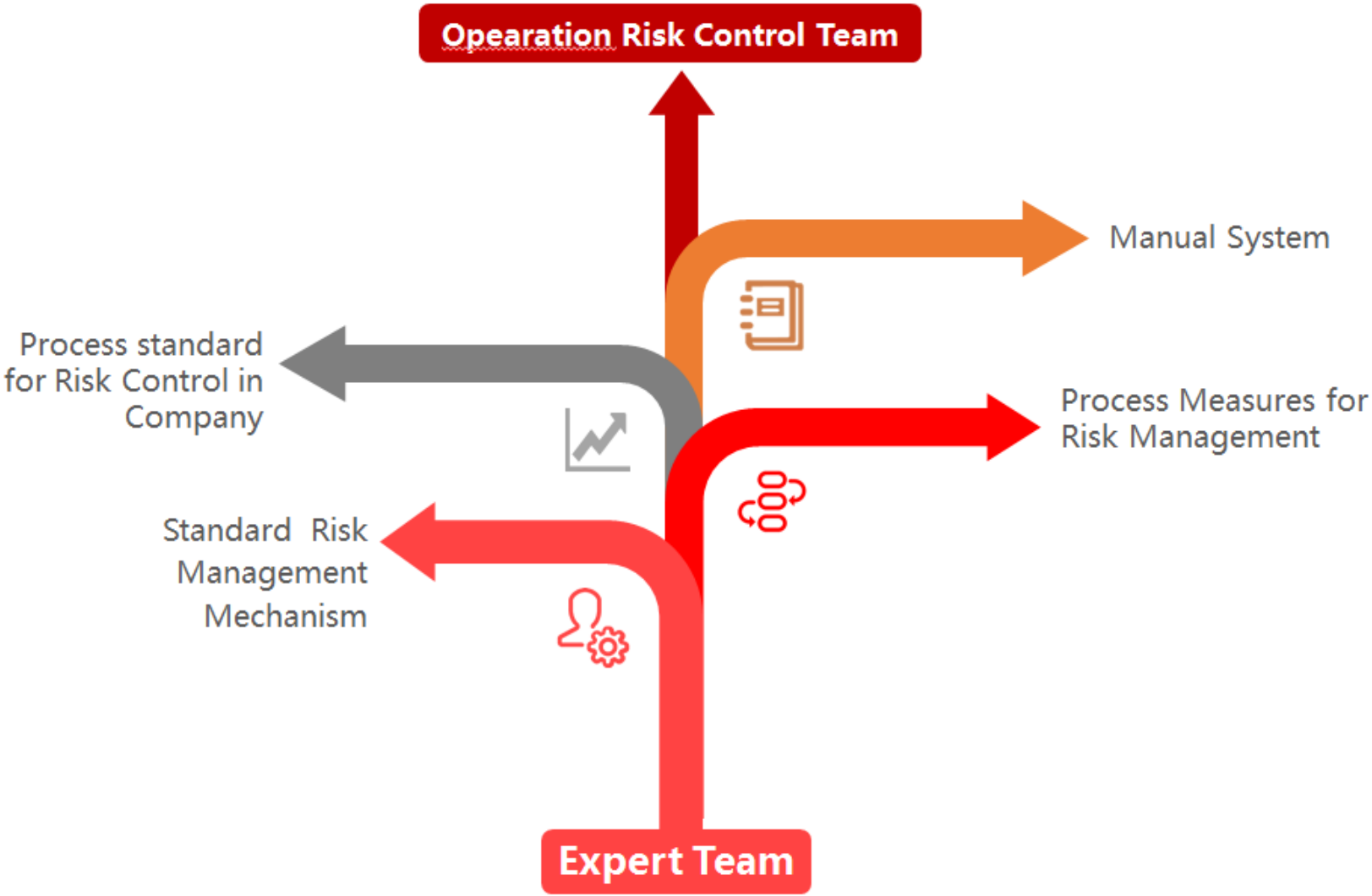
Operations Risk Control System

10

Risk Control for Operation Control

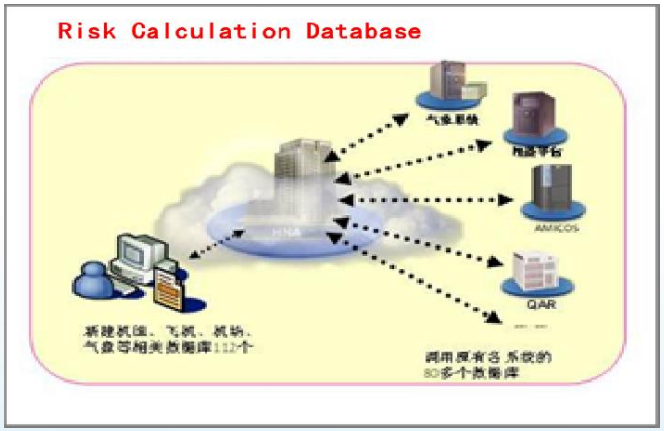


Create Operation Risk Control Team



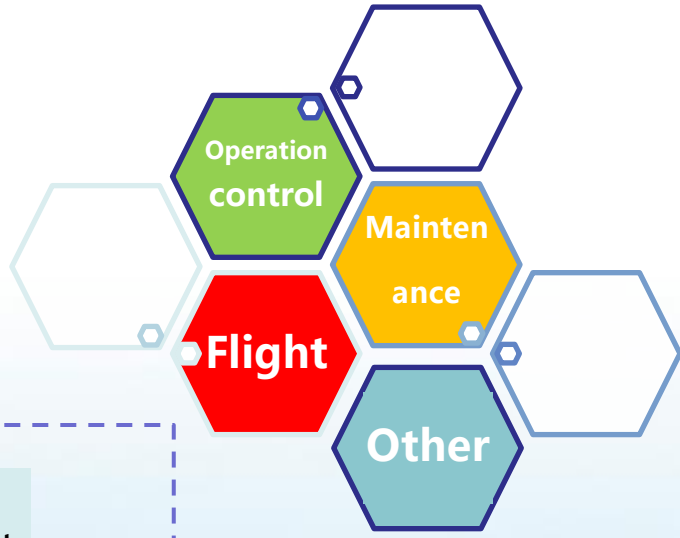
System Construction

5. System Development and Evaluation Model adjustment
4. Evaluation Model construction
3. Quantization of Risk Factors
2. Flight Operation Database construction
1. Operational Risk Index System construction



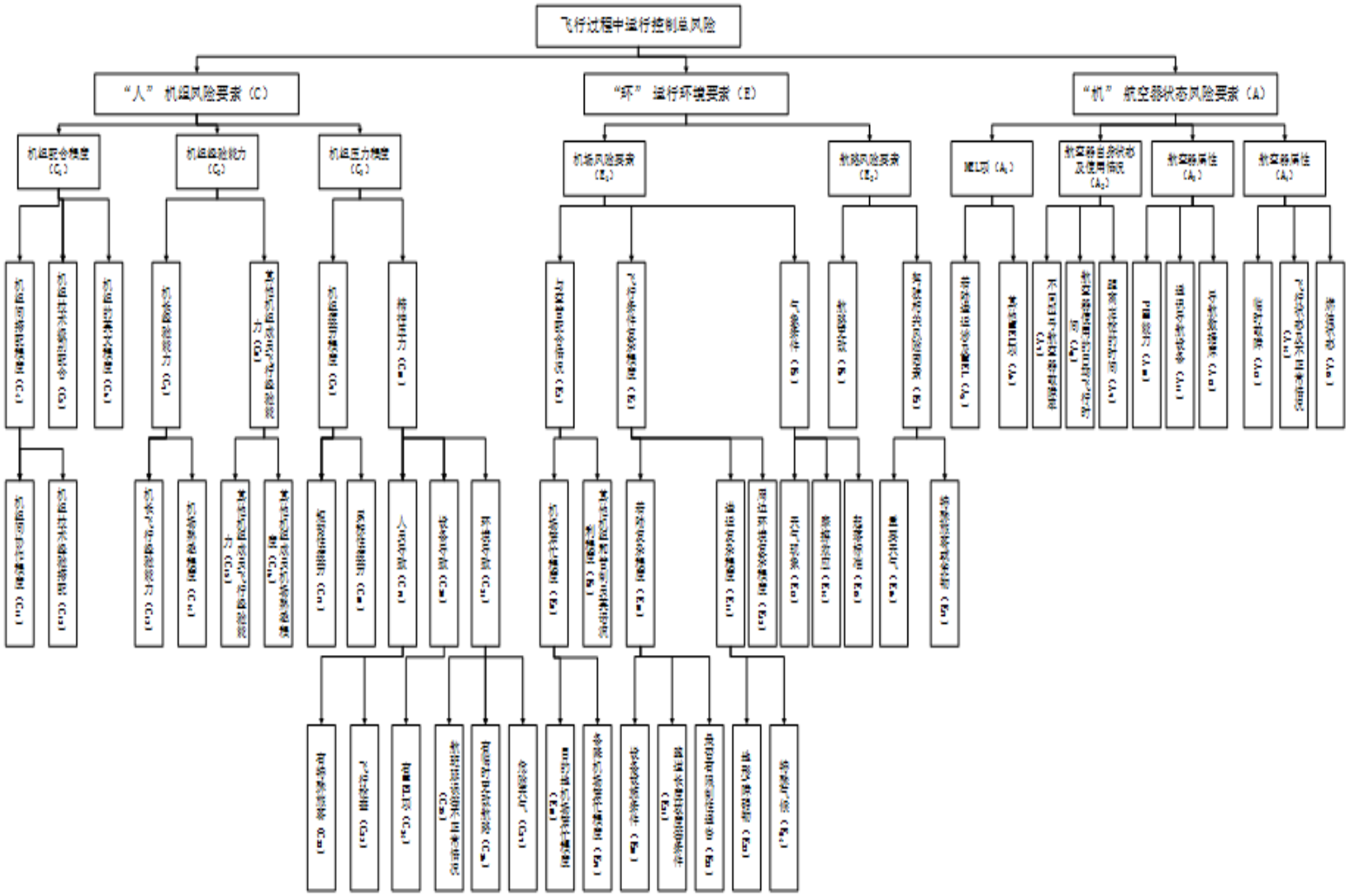
Index System

Operational Risk Index System



Human	Aircraft	Environment
Risk of the flight crew	Risk of the aircraft	Risk of the operational environment
Pilot	Maintenance	Operation control center

Risk Tree



飞行过程中运行控制风险要素图

Risk Classification

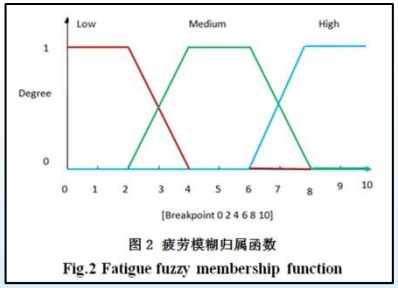
A few operational conditions at the edge of minimum standards or with uncertainty can become acceptable with the new measures taken or changes of operational conditions.

Acceptable 5 **Acceptable after mitigation** 8 **Unacceptable** → **Risk Warning**

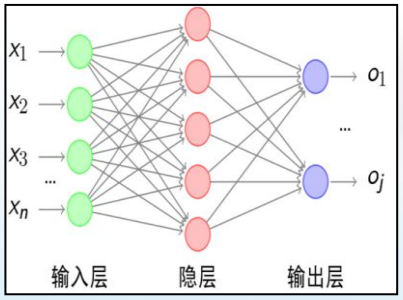
All affecting factors to operation control are comply with the civil aviation regulations and operators' operational policies.

With the comprehensive judgment of all the affecting factors, operational safety is deemed threatened.

Machine Learning Algorithm

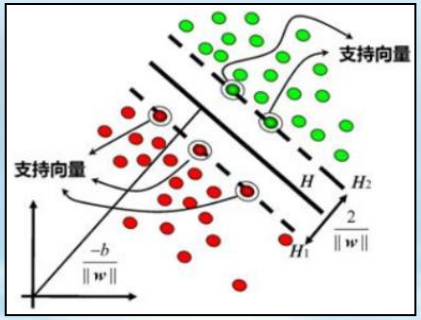


Fuzzy Membership Function

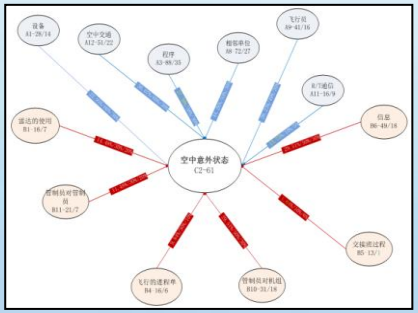


Neural Network

Support Vector Machine



Bayesian Network



CONTENTS

Implement Operation Risk Control

Operation safety closed-loop

Pre-flight: prediction

To take precaution by risk prediction in the support of data analysis and figures.

- Flight risk prediction
- Significant risk prediction
- Airport risk prediction
- Remind of due qualification

In-flight: surveillance

To ensure the safe operations by surveillance of operational procedures (AOC, flight, maintenance) and checking of human, aircraft and environment.

- Check of flight scheduling
- Release checking
- Quality surveillance
- In-flight surveillance

Post-flight: analysis

To provide the basis for prediction by data analysis, improvement of safety level.

- SMS safety information analysis
- QAR data analysis
- Safety audition
- Route safety audition

Pre-flight Prediction

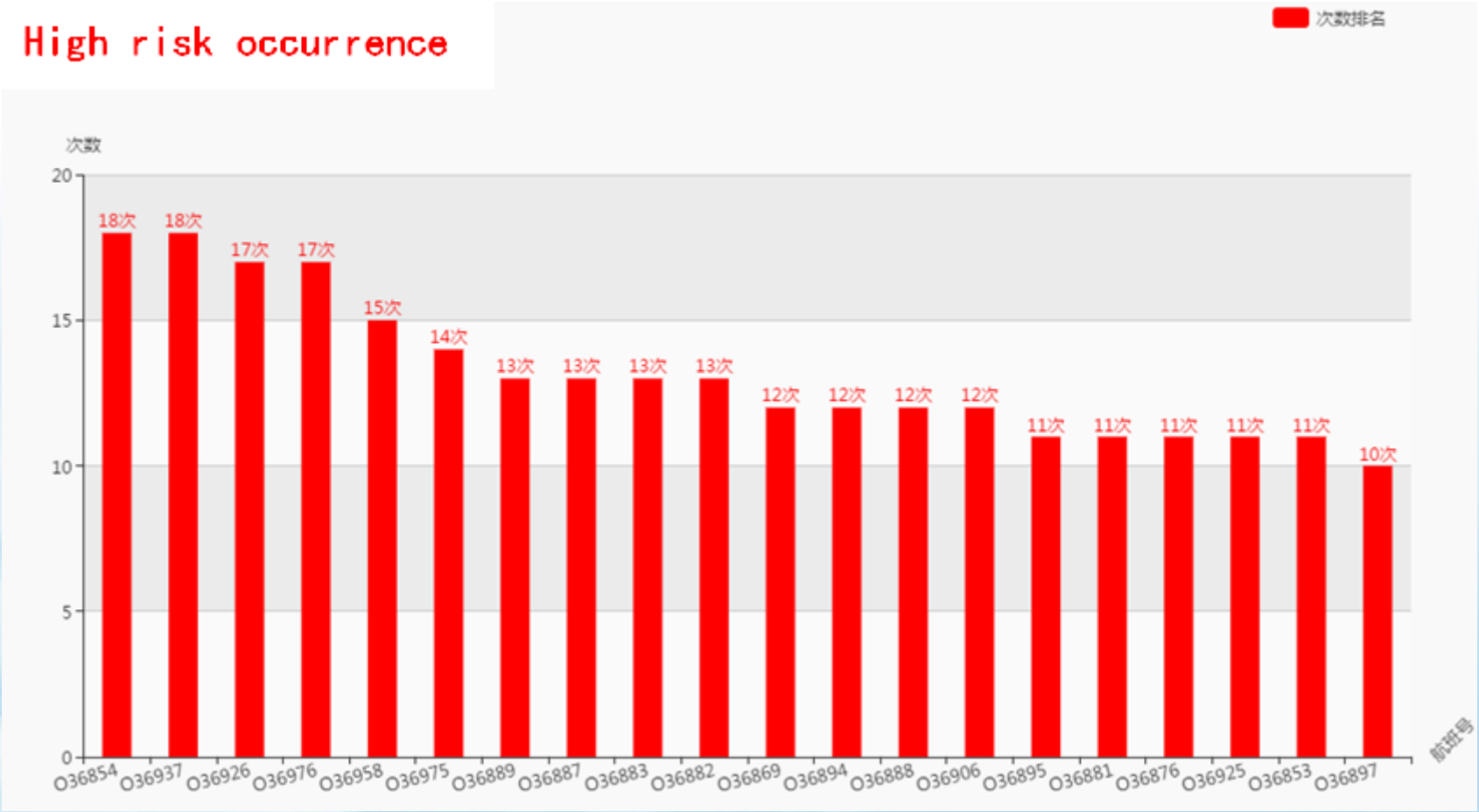
序	准备	计划	起飞	巡航	着陆	检查提醒	航班	时效	性质	机型	机号	起飞	到达
55	2.68	4.46	3.66	2.01	2.75	无检查项	O36944		正班	B733	B2969	杭州	昆明
56	2.45	3.71	3.27	1.97	2.62	无检查项	O36860		正班	B734	B2506	泉州	杭州
57	2.52	3.43	3.04	1.95	2.56	无检查项	O36898		正班	B752	B2817	深圳	南通
58	2.56	3.92	3.23	1.9	2.65	需检查	O36977		正班	B733	B2981	杭州	深圳
59	2.51	3.86	3.18	1.9	2.59	无检查项	O36897		正班	B752	B2845	杭州	深圳
60	2.61	4.29	3.52	1.97	2.7	无检查项	O36975		正班	B763	B1576	杭州	成都
61	2.38	3.68	3.21	1.97	2.53	无检查项	O36855		正班	B733	B2956	深圳	宁波
62	5.34	6.7	7.22	1.97	2.68	无检查项	O36987		正班	B733	B2988	济南	杭州
63	2.41	3.74	3.23	1.97	2.57	无检查项	O36885		正班	B752	B7689	深圳	成都
64	2.42	3.75	3.24	1.97	2.58	无检查项	O36894		正班	B733	B2966	深圳	合肥
65	2.45	3.78	3.28	1.97	2.62	无检查项	O36910		正班	B734	B2883	深圳	杭州
66	2.51	3.36	3.06	1.9	2.58	无检查项	O36948		正班	B733	B2598	泉州	深圳
67	2.53	4.15	3.38	1.94	2.61	无检查项	O36915		正班	B733	B2958	宁波	台北
68	2.54	4.14	3.42	2.01	2.56	无检查项	O36908		正班	B733	B2924	石家庄	杭州
69	2.44	3.72	3.11	1.95	2.48	需检查	O36870		正班	B752	B1578	无锡	深圳
70	2.47	3.4	3.03	1.9	2.55	无检查项	O36872		正班	B752	B6150	广州	北京
71	2.71	4.1	3.42	1.9	2.82	无检查项	O36914		正班	B763	B7593	杭州	北京
72	2.45	3.77	3.09	1.9	2.51	无检查项	O36971		正班	B752	B2829	杭州	天津

In-flight Risk Monitoring

Real-time Monitoring

By using the ADM and FORCS system during the flight, the dispatcher can make immediate decision through real-time monitoring of flight path, airport alarm, flight risk index and ACARS warning.

Quality Analysis after Flight



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Supplementary Validation

Pay special attention to 8 crucial steps in the system construction to push the airlines to "hand in homework" in the right time and quality.

- Pay special attention to the standards and strictly perform.

Confirm the validation model	Perfect the Validation work list	Solidify the Validation steps	Strictly perform the Validation standards
•Centered on the administration •With the participation of various operations units •led by the leaders in charge •operations, security, flight standard and airworthiness	•Document inspection work-list •Demonstration work-list •15 items of application document	•Document inspection •Post observation •Records inspection •Case inference	• Strictly perform the standards • Result verification

Document inspection

Post observation

Records inspection

Case inference

System Implementation

✓ 50 transport airlines have achieved the construction and validation of the operational risk control system;

✓ It marks that China civil aviation airlines operational risk control has come to a new era of quantization, systematization and automation.

未来工作方向

ORCS

Level-1

Reject Defense Mode

Role：Mask overrun or illegal operations

Level-2

Quantitative Evaluation Protect Mode

Role：Offers a variety of options for comparison

Level-3

Artificial Intelligence Tend Mode

Role：Select the optimal solution

Have courage to innovate and be realistic and pragmatic to steadily promote the construction of risk control system.

Thanks!