

*INTERGRATE THE RESOURCES
TO HANDLE THE TURBULENCE RISK*

CAAC AVIATION ACCIDENT INVESTIGATION CENTER
TURBULENCE HAZARD PREVENTION TEAM



MAIN CONTENT

- Turbulence events in China and the analysis
- Turbulence hazard prevention theory
- Test flights data review
- Conclusion coming from the research



TURBULENCE HAZARD IN CHINA

- The main cause of inflight personal injury
- Cabin crew has more danger.
 - Based on flight attendant / passenger ratio of 1:30
 - Risk of cabin crew member 18 times higher than passenger!

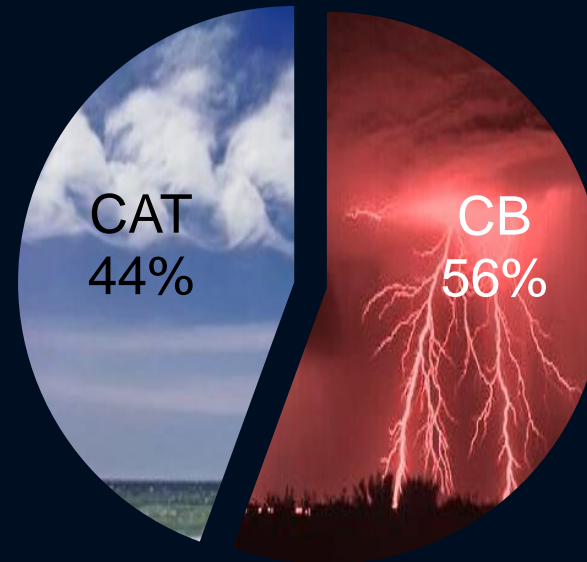
TURBULENCE EVENTS IN 2014 -2016

Number of events	Injured person	Injured passenger	Injured cabin crew
23	82	51	31

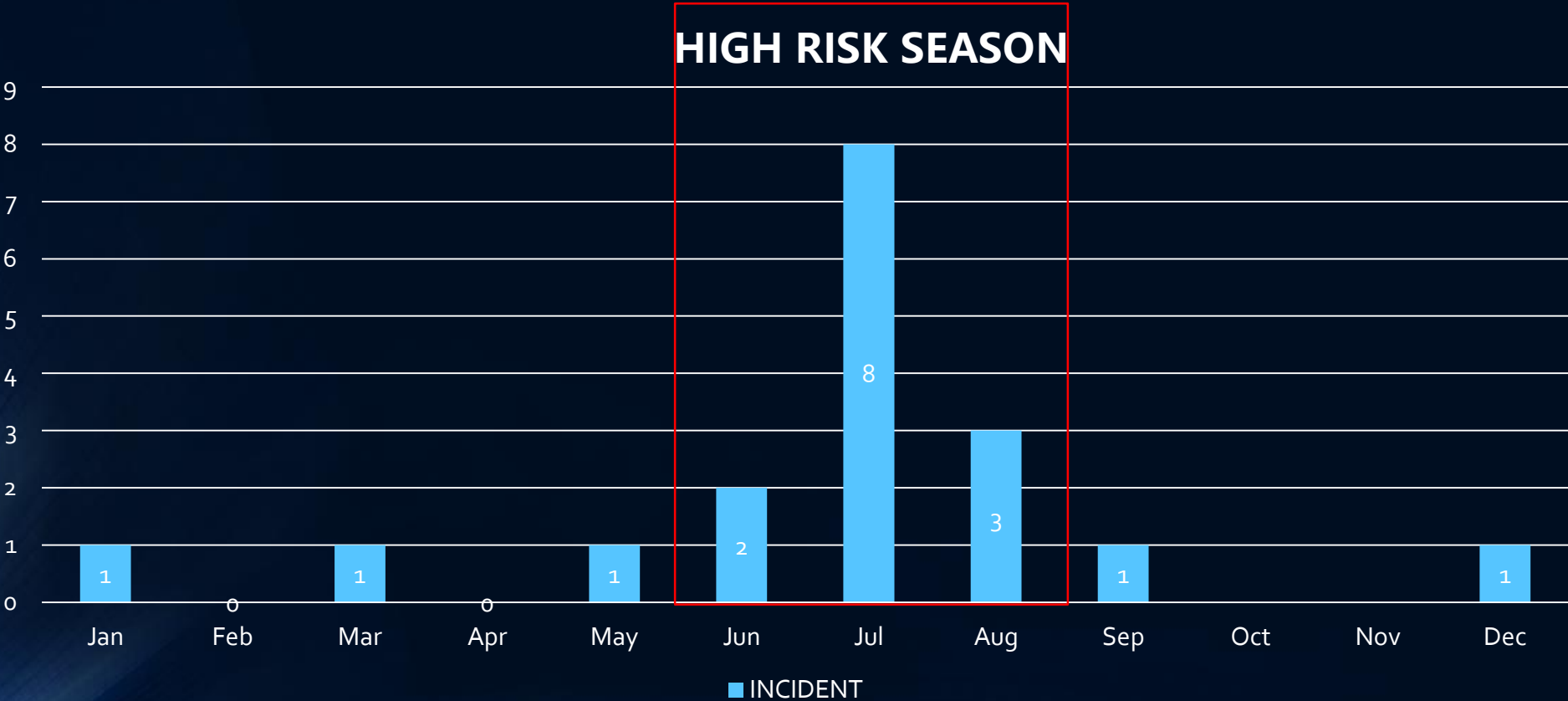


CAUSES OF EVENTS

- Two main sources of turbulence risks
- Clear Air Turbulence: 44%
- Convectonal weather 56%



EVENTS Vs SEASON



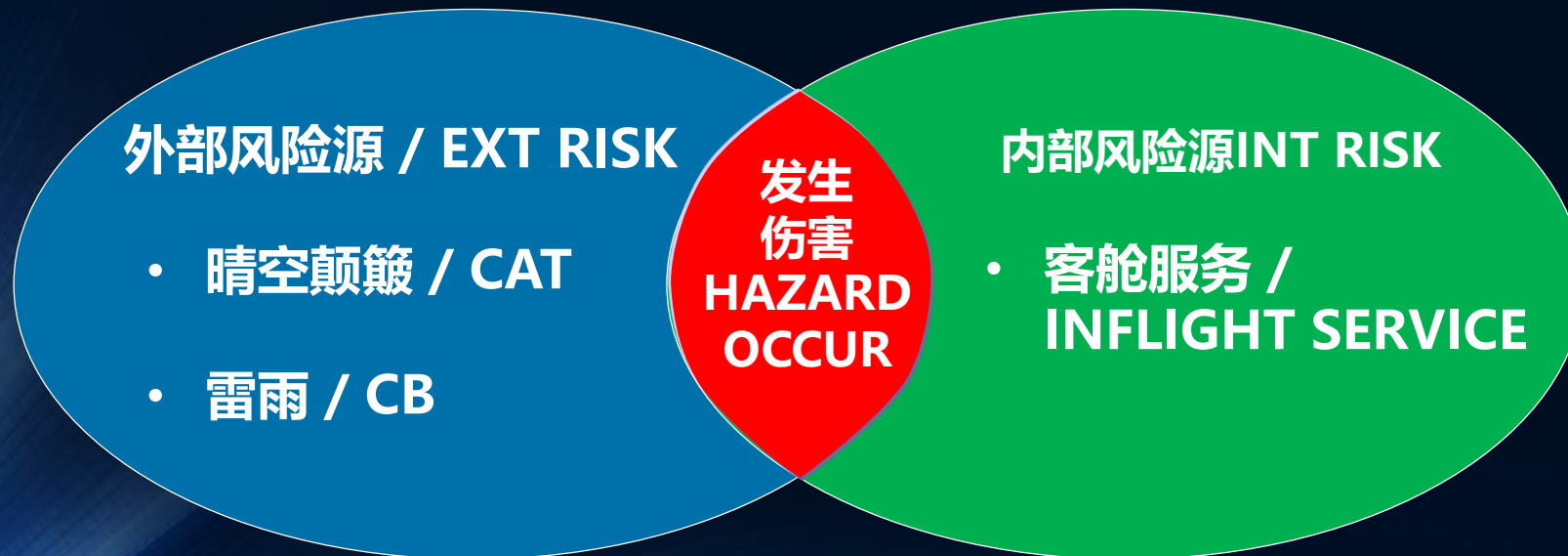
ISSUES TO BE CONSIDERED

- 50% of events happened in the area which the SIGMET clearly marked as risk . Why pilots and flight attendant fail to put correct action?
- Fasten seatbelts as a general rule, why it can' t stop the injury.



ROOT CAUSES OF TURB HAZARD

- The joint impact of internal and external risks triggers the occurrence of turbulence injuries



FACTORS INDUCE THE TURB HAZARD

- Fail to identify the environment risk
- Fail to identify internal risk
- Poor communication between SOC, flight crew and cabin crew
- Fail to apply the safety procedure
- Poor forecast accuracy

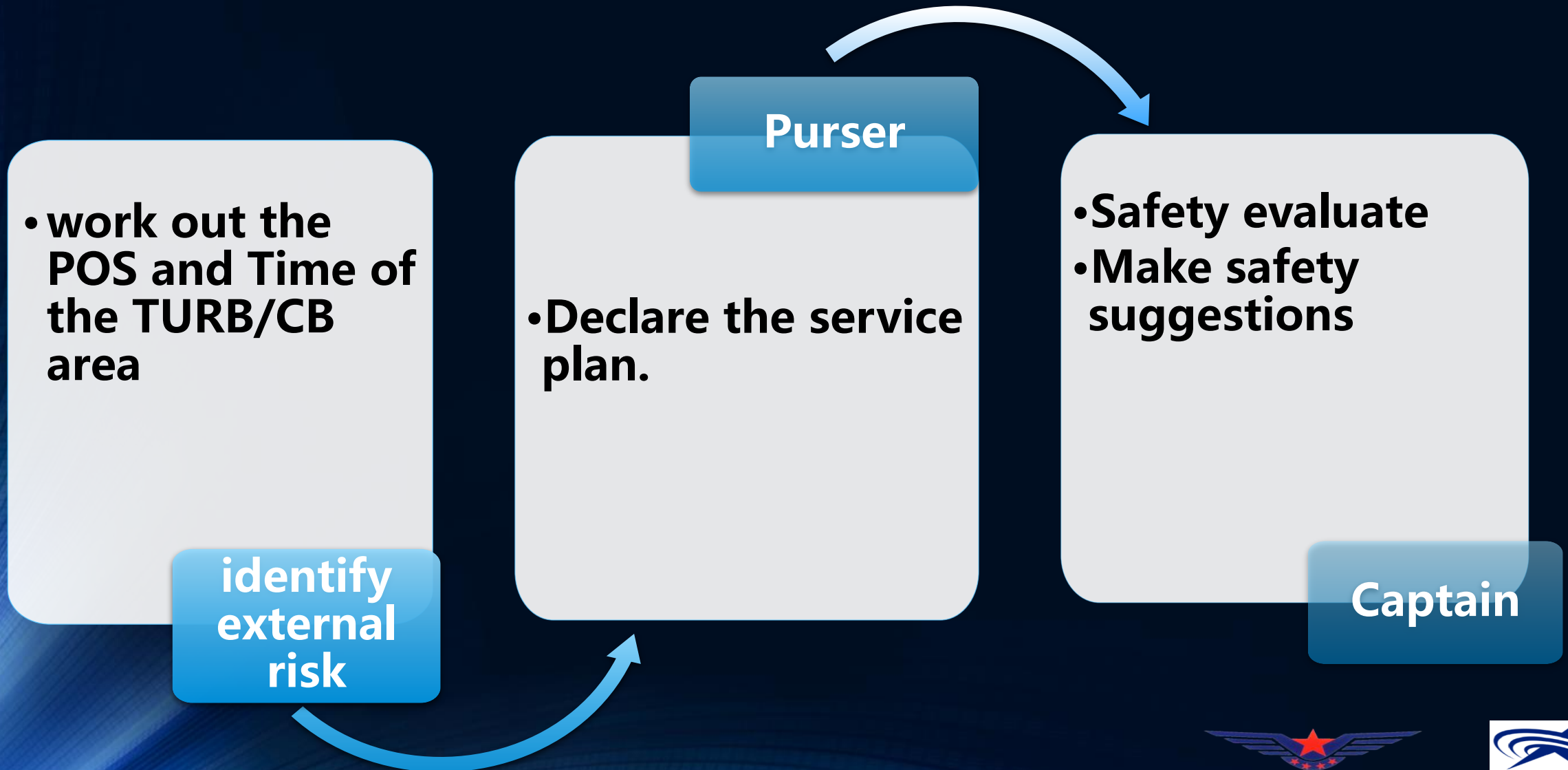


HOW TO PREVENT TURB HAZARD

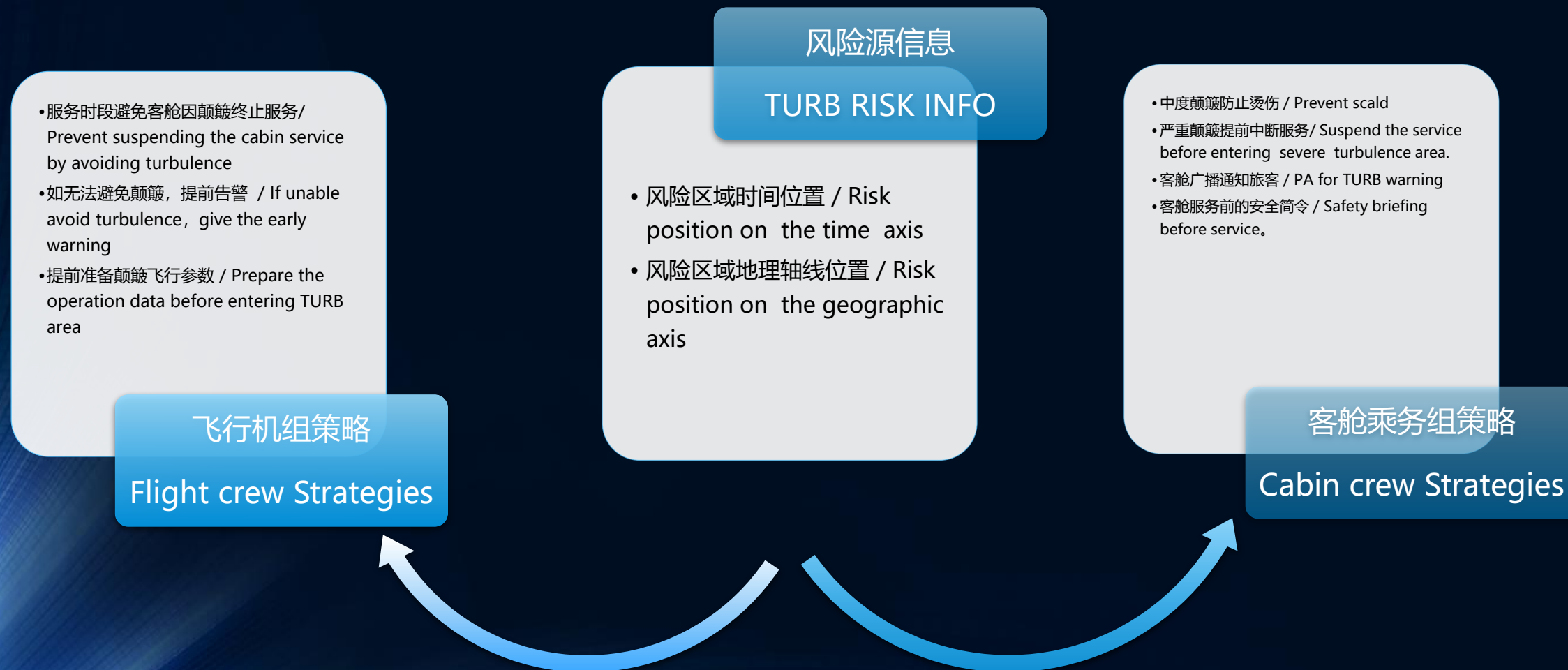
- Identify both internal and external risks
- Shear the risk information between the cockpit and the cabin, and keep it synchronized.
- Both fight crew and cabin crew evaluate the risk and put the correct action.
- Improve the accuracy of TURB forecasts.



STRATEGIES BEFORE THE FLIGHT



STRATEGIES IN THE FLIGHT



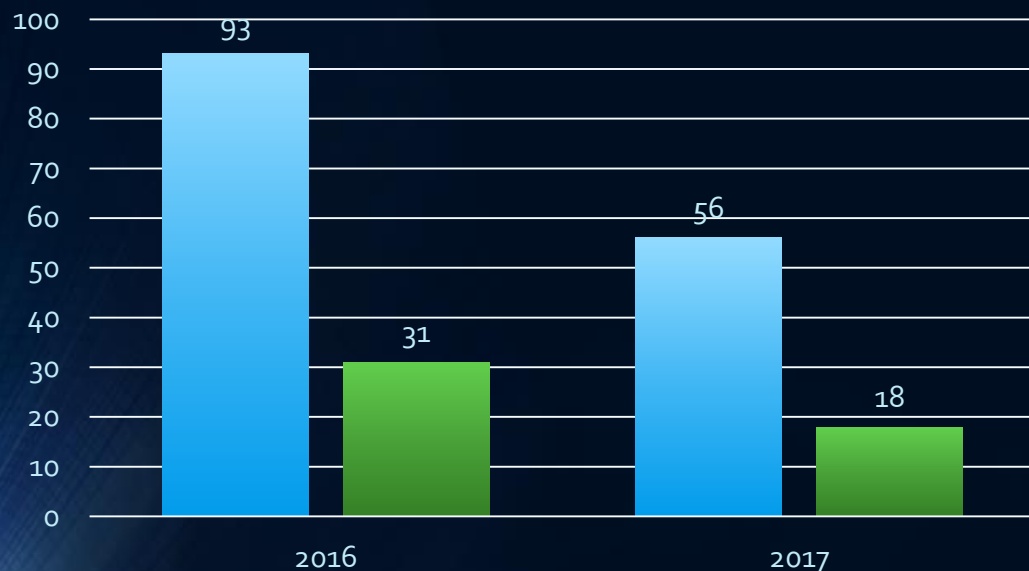
TEST FLIGHT

- In 2016
- Test flights : 1069
(JUL 1st – OCT 31st)
- Handle risks sources : 2,085
- No one injured
- 2017 - 2018
- Test flights : 13,741
(JUL 12th 2017 – APR 10th 2018)
- Handle risks sources : 440,078 units.
(1unit = 30nm X 30nm)
- No one injured



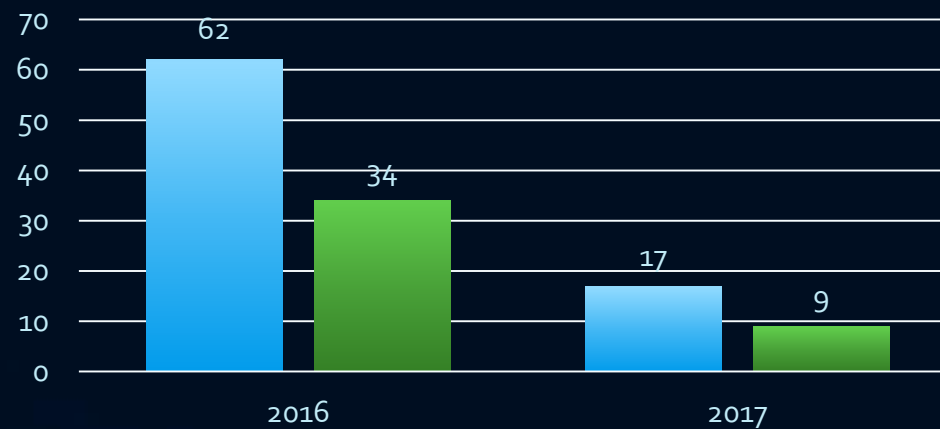
TEST FLIGHTS DATA REVIEW - 2016 vs 2017

中度颠簸 MOD TURB



- 平均每个国际发生航段持续时长 (分钟)
- 优化服务安排后客舱服务颠簸时长 (分钟)

严重颠簸 SERV TURB



- TOTAL EFF TIME / FLIGHT (MINs)
- EFF TIME IN SVC AFT OPTIMIZED / FLIGHT (MINS)



TURBLENCE DESCRIPTION

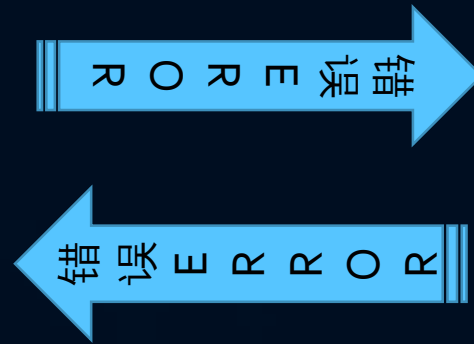
- Currently we use the light, moderate, severe to describe the severity of turbulence
- Different meaning in different domain
 - In meteorological domain, TURB is a characteristic of atmosphere.
 - In flight domain, TURB is the aircraft's response to the turbulent air
- Unclear description Reduces accuracy of TURB forecast



SYSTEMATIC ERROR IN TURB DEFINITION

TURB IN MET DOMAIN

- The state of the atmosphere
- Air data calculation results



TURB IN FLT DOMAIN

- The state of the aircraft
- G load of the aircraft

ABOUT EDR

- EDR: Eddy Dissipation Rate ,
- The magnitude of atmospheric turbulent eddies by international agreement (ICAO 2013) should be described quantitatively by EDR.
- Road map of 2018-2023: Implement turbulence type forecasts (e.g. convection, jet-stream shear, terrain) utilizing EDR (DOC 10045)



SUMMARY

- Identifying the risks and putting correct action to achieve a stable safety.
- To prevent the hazards of turbulence needs proper tools
- Utilization of EDR improves the TURB forecast quality
- EDR should be applied to flight safety to reduce turbulence hazards



LOOKING FOR YOUR CONTACT

THANKS !

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