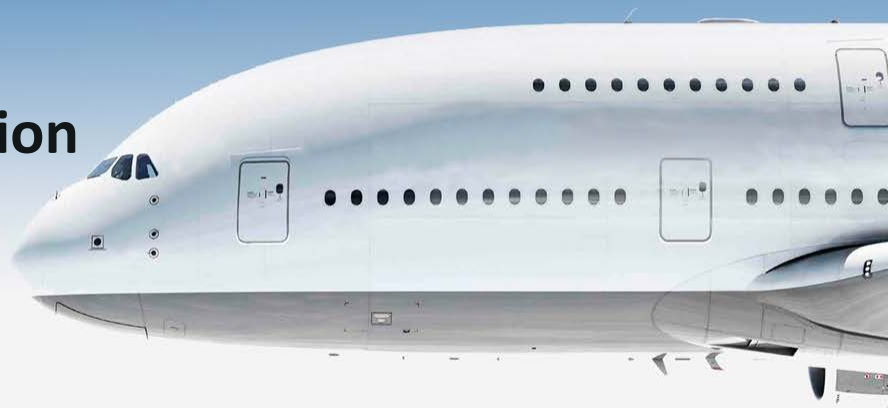
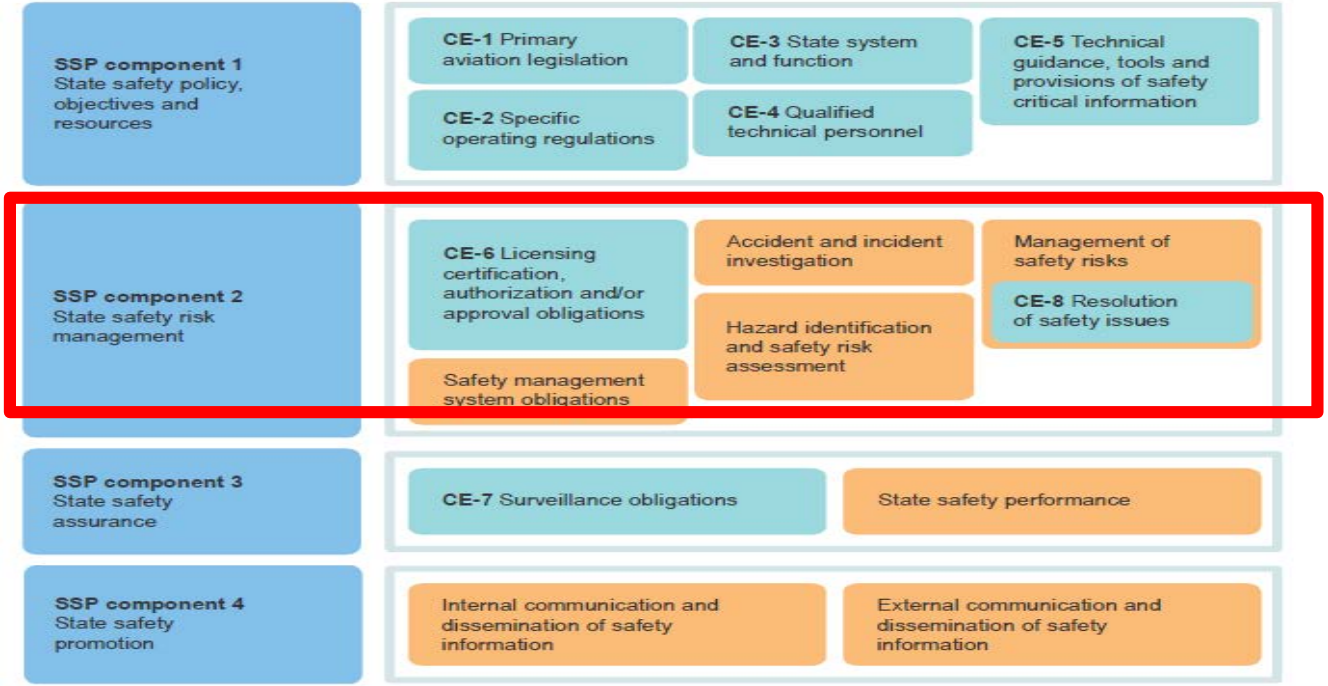
AIIG/2
Jeddah, Saudi Arabia
13-15 Sep 2022

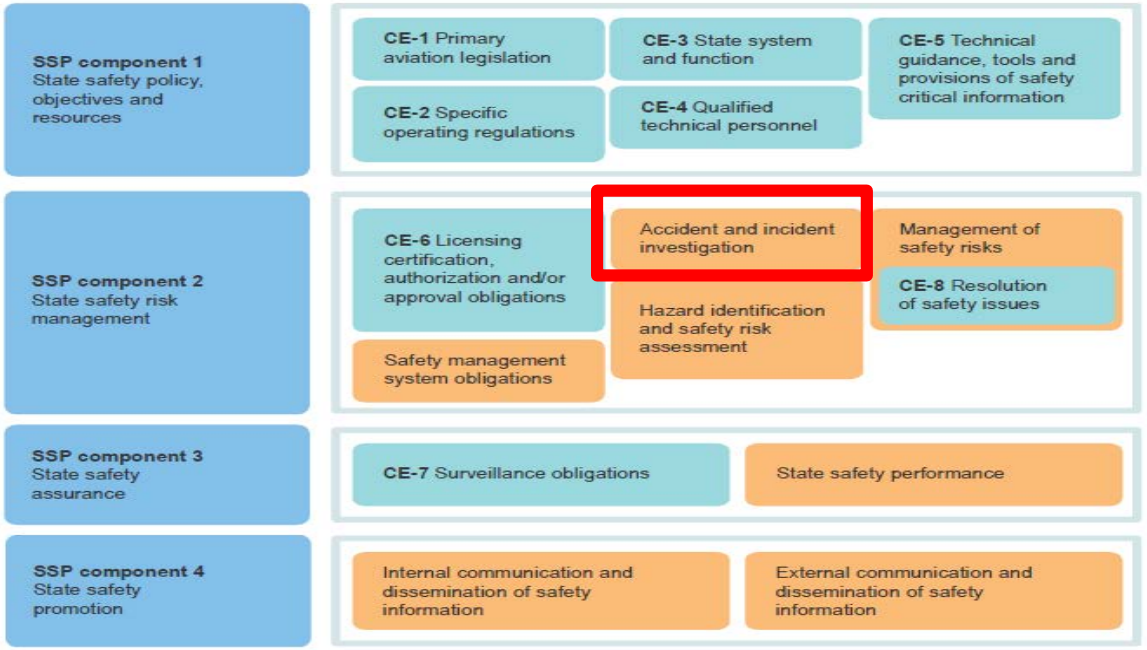
ARMS-Event Risk Classification



Mohamed Chakib
Regional Officer, Safety Implementation
ICAO MID Office


SSP component 1
State safety policy, objectives and resources
CE-1 Primary aviation legislation
CE-3 State system and function
CE-5 Technical guidance, tools and provisions of safety critical information
CE-2 Specific operating regulations
CE-4 Qualified technical personnel
SSP component 2
State safety risk management
CE-6 Licensing certification, authorization and/or approval obligations
Accident and incident investigation
Management of safety risks
CE-8 Resolution of safety issues
Hazard identification and safety risk assessment
Safety management system obligations
SSP component 3
State safety assurance
CE-7 Surveillance obligations
State safety performance
SSP component 4
State safety promotion
Internal communication and dissemination of safety information
External communication and dissemination of safety information

Accident and incident investigation

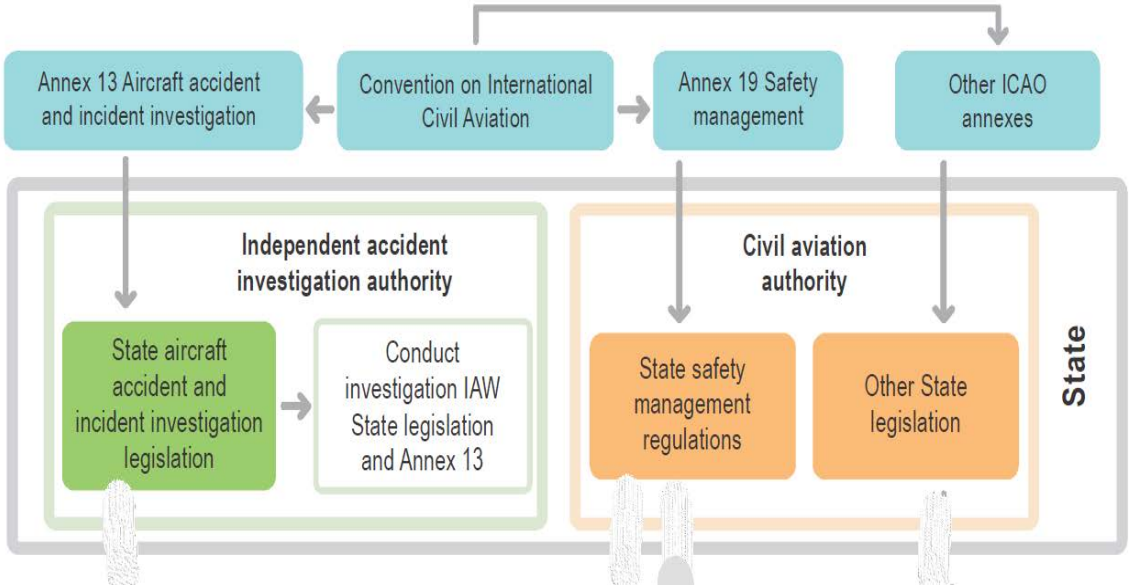


- The accident investigation authority (AIA) must be functionally independent from any other organization. Independence from the CAA of the State is of particular importance

- The accident investigation process has a pivotal role in the SSP.
- It enables the State to identify contributing factors and any possible failure within the aviation system, and to generate the necessary countermeasures to prevent recurrence.

- Contributes to the continuous improvement of aviation safety by discovering active failures and contributing factors of accidents/incidents and providing reports on any lessons learned from analysis of events.
- Support development of corrective actions decisions and corresponding allocation of resources and may identify necessary improvements to the aviation system

Accident and incident investigation



ICAO Annex 13

- The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents.
- It is not the purpose of this activity to apportion blame or liability

- A State shall establish an accident investigation authority that is independent from State aviation authorities and other entities that could interfere with the conduct or objectivity of an investigation

Aviation Risk Management Solutions (ARMS) Methodology
ARMS-Event Risk Classification (ERC)

Question 2

What was the effectiveness of the remaining barriers between this event and the most probable accident scenario?

Effective	Limited	Minimal	Not effective
50	102	502	2500
10	21	101	500
2	4	20	100
1			

Question 1

If this event had escalated into an accident, what would have been the most probable outcome?

		Typical accident scenarios
Catastrophic Accident	Loss of aircraft or multiple fatalities (3 or more)	Loss of control, mid air collision, uncontrollable fire on board, explosions, total structural failure of the aircraft, collision with terrain
Major Accident	1 or 2 fatalities, multiple serious injuries, major damage to the aircraft	High speed taxiway collision, major turbulence injuries
Minor Injuries or damage	Minor injuries, minor damage to aircraft	Pushback accident, minor weather damage
No accident outcome	No potential damage or injury could occur	Any event which could not escalate into an accident, even if it may have operational consequences (e.g. diversion, delay, individual sickness)

ICAO DEFINITIONS

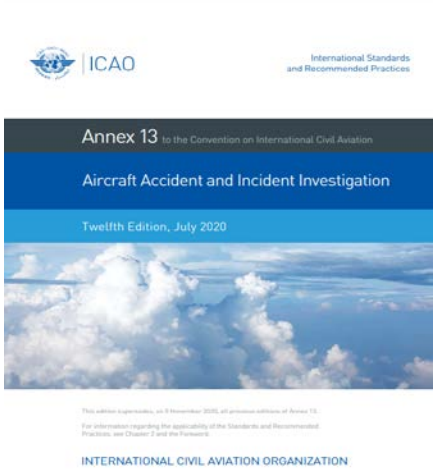
Accident:

An occurrence *associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:*

a. a person is fatally or seriously injured […] or

b. the aircraft sustains damage or structural failure […] or

c. the aircraft is missing or is completely inaccessible"



ICAO DEFINITIONS

Serious incident:

An incident *involving circumstances indicating that there was* ***a high probability of an accident*** *and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.*

Incident:

An occurrence, other than an accident, *associated with the operation of an aircraft which affects or could affect the safety of operation.*

The Relationship between Incidents and Accidents

- The definition of a serious incident indicates, that according to ICAO, there is a **clear relationship between an incident and an accident**, as **both follow similar event paths and differ only in their outcome.**

- This is highlighted by a note in ICAO Annex 13: **"The difference between an accident and a serious incident lies only in the result"**

Assessment Incidents vs. Serious Incidents

ATTACHMENT C. LIST OF EXAMPLES OF SERIOUS INCIDENTS

2.2 The combination of these two assessments helps to determine which incidents are serious incidents:

		b) Remaining defences between the incident and the potential accident	
		Effective	*Limited*
a) Most credible scenario	*Accident*	Incident	Serious Incident
	No accident	Incident	

Applicable since 5 November 2020 (amendment 17 of Annex 13)

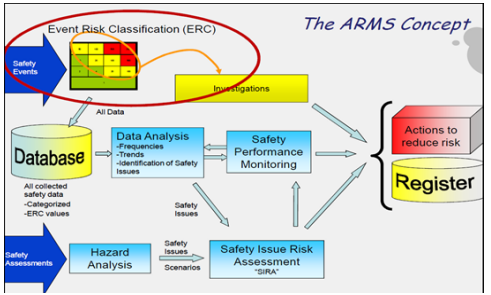
Aviation Risk Management Solutions (ARMS) Methodology

- **Event Risk Classification: ERC**
- **Safety Issue Risk Assessment: SIRA**

Event Risk Classification (ERC)

- Allow **initial risk classification** of any incoming **safety event** on a standardized basis.

- **Individual safety Events** may reflect a high level of risk and consequently require urgent action. Therefore all incoming events need to be risk assessed. This step is called **Event Risk Classification (ERC)**



a. First, to understand what was **the risk involved** in a specific historical event and;

b. Second, being able to treat a large number of events through their **cumulated risk** rather than **only counting numbers of events**

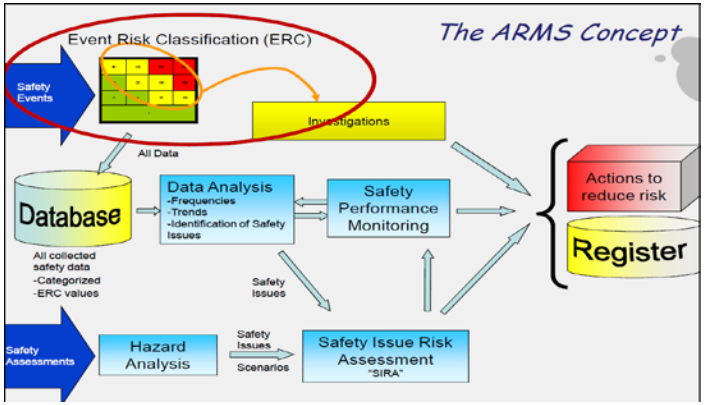
Event Risk Classification

- The ERC does **not replace a safety risk assessment**

- The ERC is based on the concept of **"Event-Based Risk level",** which represents an assessment of the risk level of this one event and not of the risk associated with all similar events

- ERC considers only the **likelihood of the remaining barriers,** not the probability of the event itself or the overall probability of the worst foreseeable outcome happening

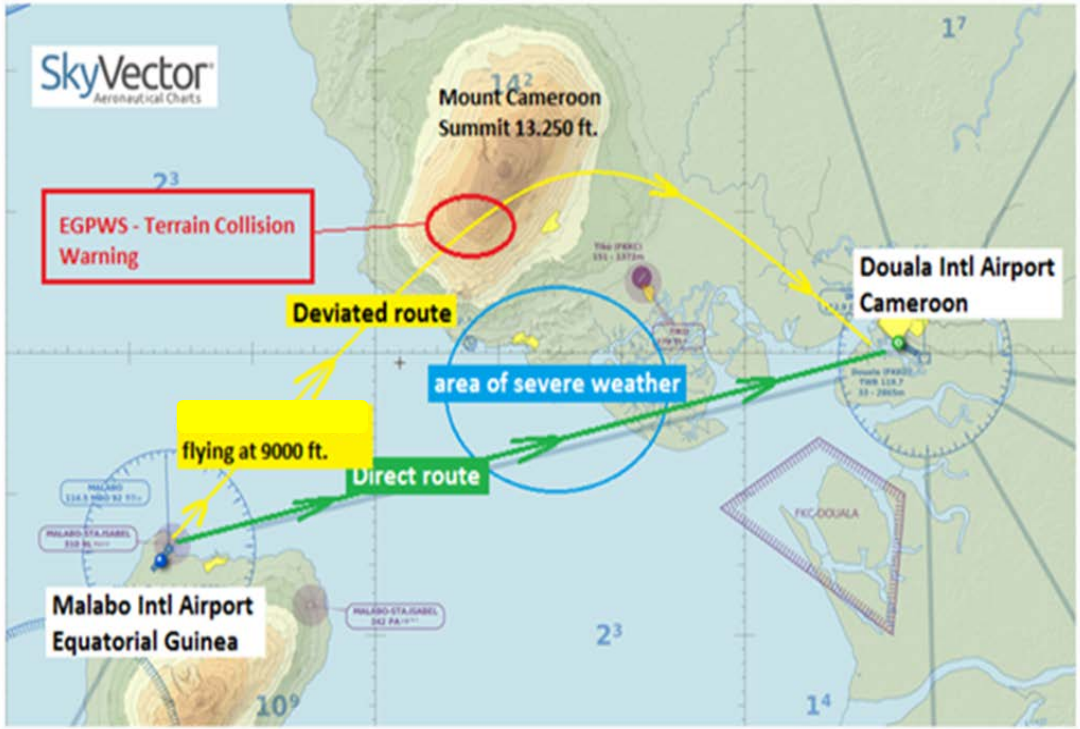
- The **aggregation** of individual event risks is an adequate means for **safety performance monitoring**



Step 1: ERC -Severity Question

If the experienced event had escalated in an accident outcome, how severe would the most credible accident scenario have been?

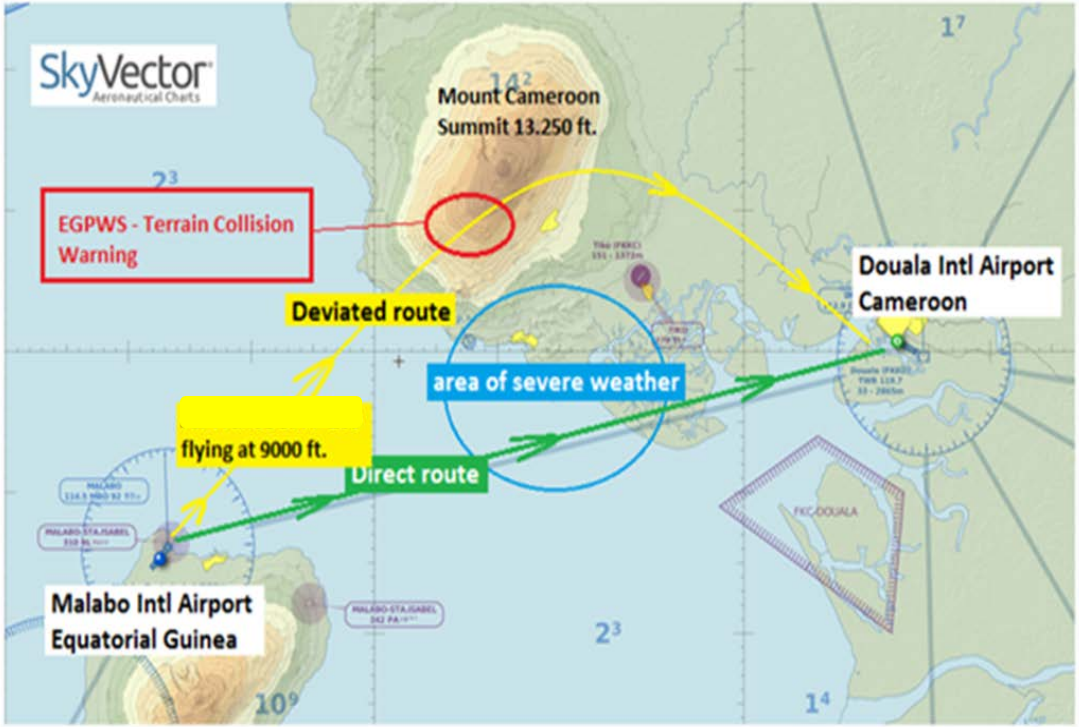
- The severity question has to be based on the **credible accident outcome** and not some intermediary point.



Step 2: ERC –Probability Question

What was the effectiveness of the remaining barriers between this event and the accident scenario? **Effective / Limited / Minimal / Not Effective**

- To assess **the remaining safety barriers**, consider both the **number and robustness of the remaining barriers** between this event and the accident scenario identified in Question 1.
- Barriers, which already failed ***are ignored***



Effectiveness of the remaining barriers

Not effective:

The accident occurred, or could only be prevented by either pure luck or exceptional skills

Minimal:

Some safety barriers were still in place, but their total effectiveness was minimal

Limited:

The effectiveness of the remaining safety barriers was limited. This is usually an abnormal situation, which is more demanding to manage, but with still a considerable remaining safety margin

Effective:

The safety margin was effective, typically consisting of several good safety barriers

Event Risk Classification (ERC)

Step 3: Risk Estimation

Risk estimation

Question 2

What was the effectiveness of the remaining barriers between this event and the most probable accident scenario?

Effective	Limited	Minimal	Not effective
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		1	

Question 1

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Risk Tolerability

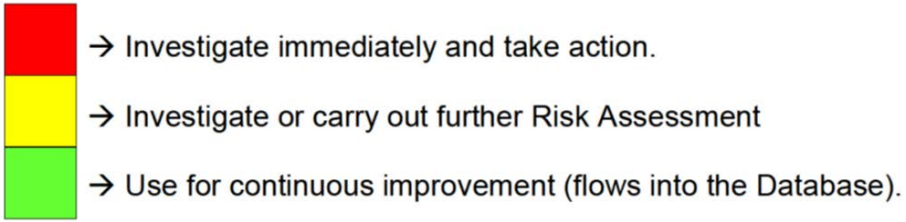
The ERC has two outputs:

The first output is the color of the matrix element, which indicates what should be done about the event

Red: The event can be considered to be a safety issue. An immediate in-depth investigation is due

Yellow: The event should be investigated and/or risk assessed in more depth

Green: Use for continuous improvement, flows into the safety database



Recommended actions on the ERC results

Main outputs of Event Risk Assessment

Outputs of occurrence risk assessment should give answers two questions:

1. **What should be done about the event (qualitative output value)**

   a. Investigate immediately and take actions
   b. Investigate and carry out a further risk assessment
   c. Use data for improvements

Main outputs of Event Risk Assessment

2. What is the magnitude of event risk (quantitative output value)

a. In the transition from traditional **compliance-based** prescriptive schemes towards a **performance-based** approach,

b. Measuring **events' safety risk values** is recognized as one of the top priorities in the context of a SMS

c. Quantitative risk values are the **relative risk values between events**

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THANK YOU!