International Civil Aviation Organization

MID Annual Safety Report Team

Second Meeting (MID-ASRT/2)
(Cairo, Egypt, 4 – 5 February 2018)

Agenda Item 2: Work Programme

DEVELOPMENT OF THE SEVENTH MID ANNUAL SAFETY REPORT

(Presented by the Secretariat)

SUMMARY

The aim of this paper is to propose improvements to the methodology used for the identification of focus areas and emerging risks for the development of the MID Annual Safety Reports (MID-ASRs).

Action by the meeting is at paragraph 3.

REFERENCES

- ARMS Methodology for Operational Risk Assessment in Aviation Organization
- http://www2.developpement-durable.gouv.fr/IMG/pdf/DGAC-PS-2018-GB-WEB.pdf

1. INTRODUCTION

1.1 The current process of the identification of risk areas and focus areas has been used for the development of the Aviation Safety Report for several years and reached a certain maturity level. Therefore, it is time to review the methodology used for risk assessment and propose/introduce some improvements.

2. DISCUSSION

2.1 The proposed methodology is based on the following:

1) improvement of the current risk matrix used for the identification of focus areas;

2) introduction/adoption of the “feared consequence” of the risk portfolio of DGAC France; and

2.2 The introduction of the Event Risk classification matrix to be applied for ICAO reactive data information analysis in order to define the risk index numbers for each accident and serious incident category, may also be considered by the meeting.

2.3 **Review of the current risk matrix:** In order to facilitate the identification and prioritization of the main Regional Focus Areas (FAs), accidents are categorized in terms of frequency and severity. The severity assessment is based on the fatalities, injuries and damage to aircraft, property and equipment. It is proposed to have four (4) levels of severity instead of three. The level of severity is categorized as follows:

1) Catastrophic: multiple deaths; serious damage to aircraft/equipment (destroyed)
2) Major: serious injury/fatalities; major aircraft/equipment damage
3) Minor: little consequences (minor injuries, minor damage to aircraft);
4) No potential damage or injury.

2.3.1 Based on the above, the following risk matrix is proposed:

Frequency / Severity	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24

2.3.2 Risk scoring: To facilitate the identification of the safety priority areas; the accidents data is analysed in terms of frequency and severity using the above risk matrix (for Frequency rating: 1 is the most frequent and 6 is the least frequent. For Severity: 1 is the most severe and 4 is the least severe): Calculate the risk score by multiplying the severity by the likelihood: S (Severity) x L (Likelihood)= R (Risk score).

2.3.3 For grading risks, the scores obtained from the risk matrix are assigned grade as follows:

1-6: Focus areas
8-9: Emerging risks
10-24: Accepted risks

2.4 **"Feared consequence" of the risk portfolio of DGAC France:** This is the risk portfolio related to commercial air transport, managed by the DGAC France within the framework of the State Safety Programme (SSP).

2.4.1 A feared consequence (FC) (in the causal chain) is an accident in the sense of ICAO Annex 13.

2.4.2 An undesirable event (UE) is an unwanted event in view of the services expected. An undesirable event may be technical, procedural or human.

2.4.3 In the analysis model used by DGAC France, which is close to the «bowtie» model, the feared consequence is placed on the right side, and the undesirable event at the centre.

2.4.4 The Risk Portfolio is included in **Appendix A**

Accident outcome → Categorized as…….

CFIT	LOC-I	MAC	GCOL	RE/ARC	Damage/Injury inflight	Damage/Injury on Ground
Catastrophic	Catastrophic	Catastrophic	Catastrophic	Major	Minor	Minor

2.5 **Event classification matrix**: *to be only applied at this stage for ICAO reactive data information analysis* in order to define the *risk index numbers for each accident and serious incident category*. Additionally, the new proposed approach will help to perform event risk assessment on all events and to obtain risk information. This offers a view to the potential severity of events instead of just counting them.

2.5.1 ARMS defined a concept of event risk which truly depends *only on the single event in question*.

2.5.2 The ARMS Event Risk Classification (ERC) is based on two components:

- If the experienced event had escalated in an accident outcome, how severe would the most credible accident scenario have been?
- How probable would this escalation have been? This can also be expressed in terms of barriers: what was the combined effectiveness of the *remaining* barriers?

2.5.3 A risk classification is to be applied to each occurrence, according to the ARMS methodology. The "ERC Risk index" is expressed as a number from 1 to 2500, with associated green (1-10), yellow (20-102) and red bands (≥500).

Question 2

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

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

Question 1

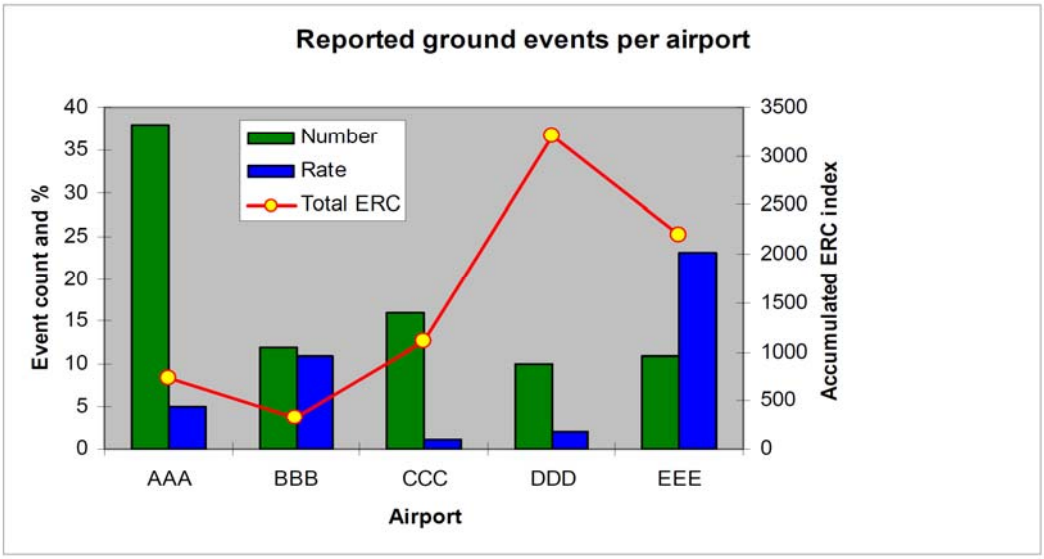
If this event had escalated into an accident outcome, what would have been the most credible outcome?

		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)

ERC – Event risk classification (ERC) according ARMS.
Source: The ARMS Methodology for Operational Risk Assessment in Aviation Organisations. Developed by the ARMS Working Group, 2007-2010

2.5.4 Based on this the sum of ERC risk index numbers can be calculated for each accident and serious category. Event risk values can be also summed to obtain cumulative values.

2.5.5 **Example 1. Accumulated total risk.** Fictitious example of cumulative ERC risk index use Sum together the ERC values of a batch of events and state the cumulative risk value as the total risk for that batch of event. This graph presents a fictitious example of a chart on ground events sorted by airport.



2.5.6 This example above illustrates the importance of looking at risk instead of only event numbers and rates. The results are presented as an event count, event rate and total risk per airport (cumulative ERC of all ground events in that airport). For airport DDD the risk is high despite a low event number and rate – i.e. the severity of the (potential) outcomes has been high in the events taking place in this airport. Therefore, the classic analysis based only on number/rate or events would lead to underestimating the importance of ground events at DDD. In fact, "ground events at airport DDD could become safety event.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) agree on the following improvements of the methodology used for the development of the MID-ASRs:

i. adoption of four (4) levels of severity instead of three in the risk matrix for the identification of focus areas and emerging risks as detailed in para. 2.2; and

ii. adoption of the "feared consequence" of the risk portfolio used by DGAC France.

b) consider the introduction of the Event Risk Classification matrix to be applied for ICAO reactive data information analysis in order to define the risk index numbers for each accident and serious incident category.

APPENDIX A

Undesirable Event Identification

Nb	Identfication of Undesirable Event	Accident types						
		CFIT	LOC-I	MAC	Ground Collision	RE	Damage to aircraft or injury inflight	Damage to aircraft or /injury on ground
UE.1	Unstabilised or non-compliant approach	X	X			X		X
UE.2	Abnormal airplane attitude (Roll, pitch, speed…)		X				X	
UE.3	Events relating to aerodrome conditions (Runway surafce condition and aerological parameters)		X			X	X	X
UE.4	En-route encounter of dangerous weather phenomena (Thunderstorm, turbulence, Icing)		X	#			X	X
UE.5	Misuse of aircraft system (Weight and Balance, speed track, aircraft config)	X	X	X	X	X	X	X
UE.6	Event pertaining to works/maintenance operations on or close to a runway		#		X	X		X
UE.7	Bad coordination/execution of ground operations (deicing, loading, stowing, line maintenance, etc)	X	X		X		X	X
UE.8	Runway/taxiway incursion				X	X		X
UE.9	Loss of separation in flight/ and/or airspace infringement /level bust		X			X	X	X
UE.10	Wildlife hazard, including bird strike		X		X	X	X	
UE.11	Ground-onboard interface failure (Misunderstanding, unsuitability of transmitted information,etc)	X	X	X	X	X	X	X
UE.12	Aircraft maintenance event	X	X		#	X	X	X
UE-13	Fire/Smoke inflight	#	X				X	X
UE-14	Aircraft system failure resulting in flight management disturbance	X	X		#	X	X	X
UE-15	Loss of cabin pressure		X	#			X	
UE-16	Aircraft damage due to FOD		X			X	X	X

X: Undesirable Event (UE) leads to the significant increase in the probability of the occurrence of a feared consequence

#: Undesirable event (UE) may exceptionally lead to the feared consequence

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