



European Risk Classification Scheme Can it help to identify incidents for further classification

Project EuroMed Transport Aviation Project (ETAP)

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Renée Pelchen-Medwed, ATM Domain Safety Risk Manager

EASA

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ERCS – Background



This project is funded by the European Union
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Why?

- The existence of a European Central Repository generated a need for common risk classification
 - “Accident” and “serious incident” don’t accurately categorise risk
 - *Aircraft damaged by ground vehicle during taxi accident, vs airborne near miss serious incident*
 - Prioritisation of occurrences in terms of managing the data
 - Investigation and follow-up with service providers
 - Detailed coding
 - Exchange/sharing of information with other authorities
 - Determining **safety issues**, **key risk areas** of highest risk for SMS/SPAS/EU Safety Risk Management process/EPAS
 - Monitoring of safety performance

Regulatory framework

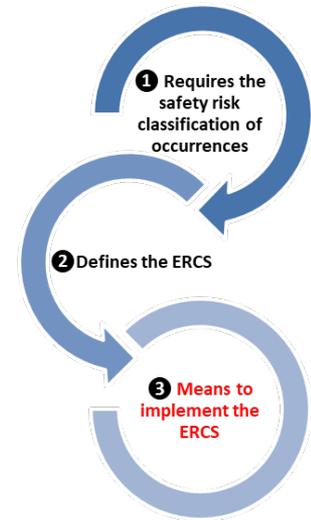


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1 **Regulation (EU) 376/2014** on the reporting, analysis and follow-up of occurrences in civil aviation. **Mandatory only for competent authorities designated under Reg. 376/2014.**

2 Commission **Delegated Regulation (EU) 2020/2034** supplementing regulation (EU) 376/2014 [...] as regards the common European risk classification scheme (ERCS)

3 Commission **Implementing Regulation (EU) 2021/2082** laying down the arrangements for the implementation of regulation (EU) 376/2014 [...] as regards the common European risk classification scheme (ERCS)



Description of the methodology



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Safety risk score

Severity
(letter X, S, M, I, E, A)

Probability/ likelihood
(number 9 to 0)

Most likely type of accident (key risk area)

Potential loss of life category

Barrier model

SEVERITY		CLASSIFICATION (ERCS Score)									
Potential Accident Outcome	Score										
Extreme catastrophic accident with the potential for significant number of fatalities (100+)	X	X9	X8	X7	X6	X5	X4	X3	X2	X1	X0
Significant accident with potential for fatalities and injuries (20-100)	S	S9	S8	S7	S6	S5	S4	S3	S2	S1	S0
Major accident with limited amount of fatalities (2-19), life changing injuries or destruction of the aircraft	M	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0
An accident involving single individual fatality, life changing injury or substantial aircraft damage	I	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
An accident involving minor and serious injury (not life changing) or minor aircraft damage	E	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0
No likelihood of an accident	A	<i>No Implication to Safety</i>									
Corresponding Barrier Score		9	8	7	6	5	4	3	2	1	0
Barrier Weight Sum		17-18	15-16	13-14	11-12	9-10	7-8	5-6	3-4	1-2	0
PROBABILITY OF THE POTENTIAL ACCIDENT OUTCOME											

Determining the severity (letter X, S, M, I, E, A)



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Two (2) steps for determining the severity

1. What is the **worst likely type of accident** that the occurrence under assessment could have escalated to (the key risk area)?
2. What is the **potential loss of life category** based on aircraft size and proximity to populated or high-risk areas?

Description of the methodology



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Safety risk score

Severity

(letter X, S, M, I, E, A)

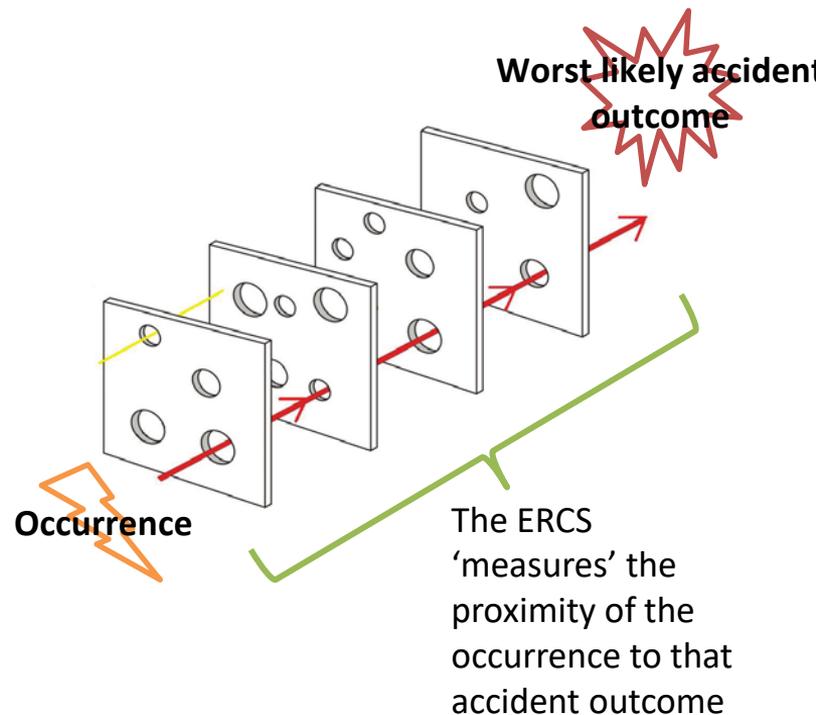
Probability/ likelihood

(number 9 to 0)

Most likely type of accident (key risk area)

Potential loss of life category

Barrier model



Determining the likelihood (number 9 to 0)

the barrier model



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→ An 8-barrier model, barriers ordered in a logical sequence, with 'systemic' barriers and 'operational' barriers, and weighted

→ For each barrier:

- 'Stopped' if the barrier prevented the accident from occurring;
- 'Remaining Known': if it is known whether the barrier remained between the occurrence under assessment and the potential accident outcome;
- 'Remaining Assumed': if it is assumed that the barrier remained between the occurrence under assessment and the potential accident outcome;
- 'Failed Known': if it is known that the barrier has failed;
- 'Failed Assumed': if it is assumed that the barrier have failed even if insufficient or no information is available to determine this;
- 'Not Applicable': if the barrier is not relevant to the occurrence under assessment.

BARRIER NUMBER	BARRIER	BARRIER WEIGHT
1	'Aircraft, equipment and infrastructure design', includes maintenance and correction, operation support, the prevention of problems related to technical factors that could lead to an accident.	5
2	'Tactical planning', includes organisational and individual planning prior to the flight or other operational activity that supports the reduction of the causes and contributors to accidents.	2
3	'Regulations, procedures, processes', includes effective, understandable and available regulations, procedures and processes that are complied with (with the exclusion of the use of procedures for recovery barriers).	3
4	'Situational awareness and action', includes human vigilance for operational threats which ensures identification of operational hazards and effective action to prevent an accident.	2
5	'Warning systems operation and action' that could prevent an accident and which are fit for purpose, functioning, operational and are complied with.	3
6	'Late recovery from a potential accident situation'	1
7	'Protections', when an event has occurred, the level of the outcome is mitigated or prevents the escalation of the occurrence by intangible barriers or providence.	1
8	'Low energy occurrence' scores the same as 'Protections', but for low-energy key risk areas only (ground damage, excursions, injuries). 'Not applicable' for all other key risk areas.	1

Scoring the safety risk in the matrix



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- Safety risk score = two-digit value
- first digit corresponds to the alphabetic value resulting from the calculation of the **severity of the occurrence** (severity score **X to A**)
- second digit represents the numerical value from the calculation of the corresponding **barrier score of the occurrence** (**0 to 9**).

SEVERITY		CLASSIFICATION (ERCS Score)										
Potential Accident Outcome	Score											
Extreme catastrophic accident with the potential for significant number of fatalities (100+)	X	X9	X8	X7	X6	X5	X4	X3	X2	X1		X0
Significant accident with potential for fatalities and injuries (20-100)	S	S9	S8	S7	S6	S5	S4	S3	S2	S1		S0
Major accident with limited amount of fatalities (2-19), life changing injuries or destruction of the aircraft	M	M9	M8	M7	M6	M5	M4	M3	M2	M1		M0
An accident involving single individual fatality, life changing injury or substantial aircraft damage	I	I9	I8	I7	I6	I5	I4	I3	I2	I1		I0
An accident involving minor and serious injury (not life changing) or minor aircraft damage	E	E9	E8	E7	E6	E5	E4	E3	E2	E1		E0
No likelihood of an accident	A	No Implication to Safety										
Corresponding Barrier Score		9	8	7	6	5	4	3	2	1		0
Barrier Weight Sum		17-18	15-16	13-14	11-12	9-10	7-8	5-6	3-4	1-2		0
		PROBABILITY OF THE POTENTIAL ACCIDENT OUTCOME										

Can use of ERCS help in identifying serious incidents?



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- There could be a significant number of occurrences to be screened for detecting serious incidents
- ERCS classifies the risk, **not the actual outcome**,
 - However, in case of serious incidents, there may be one barrier left (sometimes luck), why an occurrence did not result in an accident.
- By focussing on the red and upper end yellow ERCS scores – may allow to preselect serious incidents and not to overlook the serious incidents from the occurrence data



Practicalities



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- ERCS can be used by SIAs to screen the occurrences and decide on classification
- In this SIA may refer to the ERCS classification done by NAAs or (if resources allow) to redo a complete ERCS classification for the occurrences
- At the national level – it should be agreed, which ERCS score will take the precedence

Training material



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→ Training and guidance material is provided. [Click here for the Online training.](#)



Thank you

Renee.pelchen-medwed@easa.europa.eu

Safety.analysis@easa.europa.eu

easa.europa.eu/connect



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Determining the severity (letter)

most likely type of accident (key risk area)



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KEY RISK AREA	DEFINITION
Airborne collision	A collision between aircraft while both aircraft are airborne; or between aircraft and other airborne objects (excluding birds and wildlife);
Aircraft upset	An undesired aircraft state characterised by unintentional divergences from parameters normally experienced during operations, which might ultimately lead to an uncontrolled impact with terrain;
Collision on runway	A collision between an aircraft and another object (other aircraft, vehicles, etc.) or person that occurs on a runway of an aerodrome or other pre-designated landing area. It does not include collisions with birds or wildlife;
Excursion	An occurrence when an aircraft leaves the runway or movement area of an aerodrome or landing surface of any other pre-designated landing area, without getting airborne. It includes high-impact vertical landings for rotorcraft or vertical take-off and landing aircraft and balloons or airships;
Fire, smoke and pressurisation	An occurrence involving cases of fire, smoke, fumes or pressurisation situations that may become incompatible with human life. This includes occurrences involving fire, smoke or fumes affecting any part of an aircraft, in flight or on the ground, which is not the result of impact or malicious acts;
Ground damage	Damage to aircraft induced by operation of aircraft on ground on any other ground area than a runway or pre-designated landing area, as well as damage during maintenance;
Obstacle collision in flight	Collision between an airborne aircraft and obstacles rising from the surface of the earth. Obstacles include tall buildings, trees, power cables, telegraph wires and antennae as well as tethered objects;
Terrain collision	An occurrence where an airborne aircraft collides with terrain, without indication that the flight crew was unable to control the aircraft. It includes instances when the flight crew is affected by visual illusions or degraded visual environment;
Other injuries	An occurrence where fatal or non-fatal injuries have been inflicted, which cannot be attributed to any other key risk area;
Security	An act of unlawful interference against civil aviation. It includes all incidents and breaches related to surveillance and protection, access control, screening, implementation of security controls and any other acts intended to cause malicious or wanton destruction of aircraft and property, endangering or resulting in unlawful interference with civil aviation and its facilities. Includes both physical and cyber security events.

Determining the severity (letter) potential loss of life



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- (a) more than 100 possible fatalities – where the occurrence under assessment involves at least any of the following:
- one large certified aircraft with more than 100 potential passengers on board;
 - an equivalent size aircraft for cargo;
 - one aircraft of any type in a heavily populated area or in a high-risk area or both;
 - any situation involving any type of aircraft where more than 100 fatalities may be possible;
- (b) between 20 to 100 possible fatalities – where the occurrence under assessment involves at least any of the following:
- one medium certified aircraft with 20 to 100 potential passengers on board or equivalent size for cargo aircraft;
 - any situation where 20 to 100 fatalities may be possible;
- (c) between 2 to 19 possible fatalities where the occurrence under assessment involves at least any of the following:
- one small certified aircraft with up to 19 potential passengers on board;
 - an equivalent size for cargo aircraft;
 - any situation where 2 to 19 fatalities may be possible;
- (d) 1 possible fatality – where the occurrence under assessment involves at least any of the following:
- one uncertified aircraft, that is aircraft not subject to European Union Aviation Safety Agency certification requirements;
 - any situation where a single fatality may be possible;
- (e) 0 possible fatalities – where the occurrence under assessment involves personal injuries only, regardless of the number of minor and serious injuries as long as there are no fatalities.

KEY RISK AREA	CATEGORY	SEVERITY SCORE
Airborne collision	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
Aircraft upset	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
Collision on runway	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
	0 possible fatalities	E
Excursions	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
	0 possible fatalities	E
Fire, smoke and permeation	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
Ground damage	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
	0 possible fatalities	E
Obstacle collision in flight	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
Terrain collision	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
Other injuries	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
	0 possible fatalities	E
Security	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I
	0 possible fatalities	E

Safety risk score

Severity (letter)

Probability/likelihood (number)

Most likely type of accident (low risk area)

Potential loss of life category

Barrier model

Determining the severity (letter)



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SEVERITY DEFINITION

- A No likelihood of an accident;
 - E An accident involving minor and serious injury (not life changing) or minor aircraft damage;
 - I An accident involving a single fatality, life changing injury or substantial damage accident;
 - M A major accident with limited amount of fatalities, life changing injuries or destruction of the aircraft;
 - S A significant accident with potential for fatalities and injuries;
 - X An extreme catastrophic accident with the potential for significant number of fatalities.
-

Determining the likelihood (number)

the barrier score



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Two (2) additional steps for calculating the barrier score:

1. Sum all the barrier weights (1 to 5) of all the assessed barriers that were **scored either 'Stopped', 'Remaining known' or 'Remaining assumed'**.
 - The 'Failed' and 'Not Applicable' barriers shall not be counted for the final score, as those barriers could not have prevented the accident.
 - The resulting barrier weight sum is a numerical value between 0 and 18.
2. Match the barrier weight sum with the barrier score between 0 and 9.



This is the likelihood

Barrier weight sum	Corresponding barrier score
0 No barriers left. Worst likely accident outcome realised.	0
1-2	1
3-4	2
5-6	3
7-8	4
9-10	5
11-12	6
13-14	7
15-16	8
17-18	9

Other uses: Numerical equivalent score



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→ For each given safety risk score there is a **numerical equivalent score** for aggregation and analysis purposes of multiple occurrences

ERCS Score	X9	X8	X7	X6	X5	X4	X3	X2	X1	X0
Corresponding numerical value	0,001	0,01	0,1	1	10	100	1000	10000	100000	1000000
ERCS Score	S9	S8	S7	S6	S5	S4	S3	S2	S1	S0
Corresponding numerical value	0,0005	0,005	0,05	0,5	5	50	500	5000	50000	500000
ERCS Score	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0
Corresponding numerical value	0,0001	0,001	0,01	0,1	1	10	100	1000	10000	100000
ERCS Score	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
Corresponding numerical value	0,00001	0,0001	0,001	0,01	0,1	1	10	100	1000	10000
ERCS Score	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0
Corresponding numerical value	0,000001	0,00001	0,0001	0,001	0,01	0,1	1	10	100	1000

