



AVIATION INVESTIGATION BUREAU Kingdom of Saudi Arabia

KSA-AIB Experience in Implementing ARMS Events Risk Classification
(ERC)

11 July 2023



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Introduction to ERC

- What is ERC ?

- Event Risk Classification
- Created by ARMS (Aviation Risk Management Solutions).
- A risk assessment methodology designed for the aviation industry.
- Acts as the first screening to identify urgent action if necessary.
- The ERC methodology is to reduce subjectivity.

ERC Risk Matrix

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?	
Catastrophic Accident	Loss of aircraft or multiple fatalities (3 or more)
Major Accident	1 or 2 fatalities, multiple serious injuries, major damage to the aircraft
Minor Injuries or damage	Minor injuries, minor damage to aircraft
No accident outcome	No potential damage or injury could occur

Typical accident scenarios
Loss of control, mid air collision, uncontrollable fire on board, explosions, total structural failure of the aircraft, collision with terrain
High speed taxiway collision, major turbulence injuries
Pushback accident, minor weather damage
Any event which could not escalate into an accident, even if it may have operational consequences (e.g. diversion, delay, individual sickness)

ERC: a Matter of Three Steps

Step 1 : If this event had escalated into an accident,

What would have been the most probable outcome?

Accident outcome	Outcome description	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, 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, event if it may have operational consequences (e.g. diversion, delay, individual sickness)



ERC: a Matter of Three Steps

Step 2 : What was the effectiveness of the remaining barriers between this event and the most probable accident scenario?

Effectiveness rating	Definition
Effective	Several good barriers remaining
Limited	An abnormal situation, more demanding to manage, but still a considerable safety margin
Minimal	Some barrier(s) still in place
Not effective	An accident was not avoided, or accident avoided by luck

ERC: a Matter of Three Steps

Steps 3 :

ERC Score = Step 1 X Step 2

	Effective	Limited	Minimal	Not effective
Catastrophic Accident	50	102	502	2500
Major Accident	10	21	101	500
Minor Injuries or damage	2	4	20	100
No accident outcome	1			

ERC Result

Very High

Investigate and take action immediately

Medium

Possible investigate or ask for more information

Low

Database entry

Reference

USOAP PQ No. 6.345

- Has the State established and implemented:
 - a) a process, based on risk analysis, to help determine which types of incidents will be investigated by the investigation authority, in conformance with Annex 13?
 - b) a process, based on risk analysis, to help determine which types of incidents will be investigated by the investigation authority, in conformance with Annex 13?



Reference

AIB Regulation 7.2

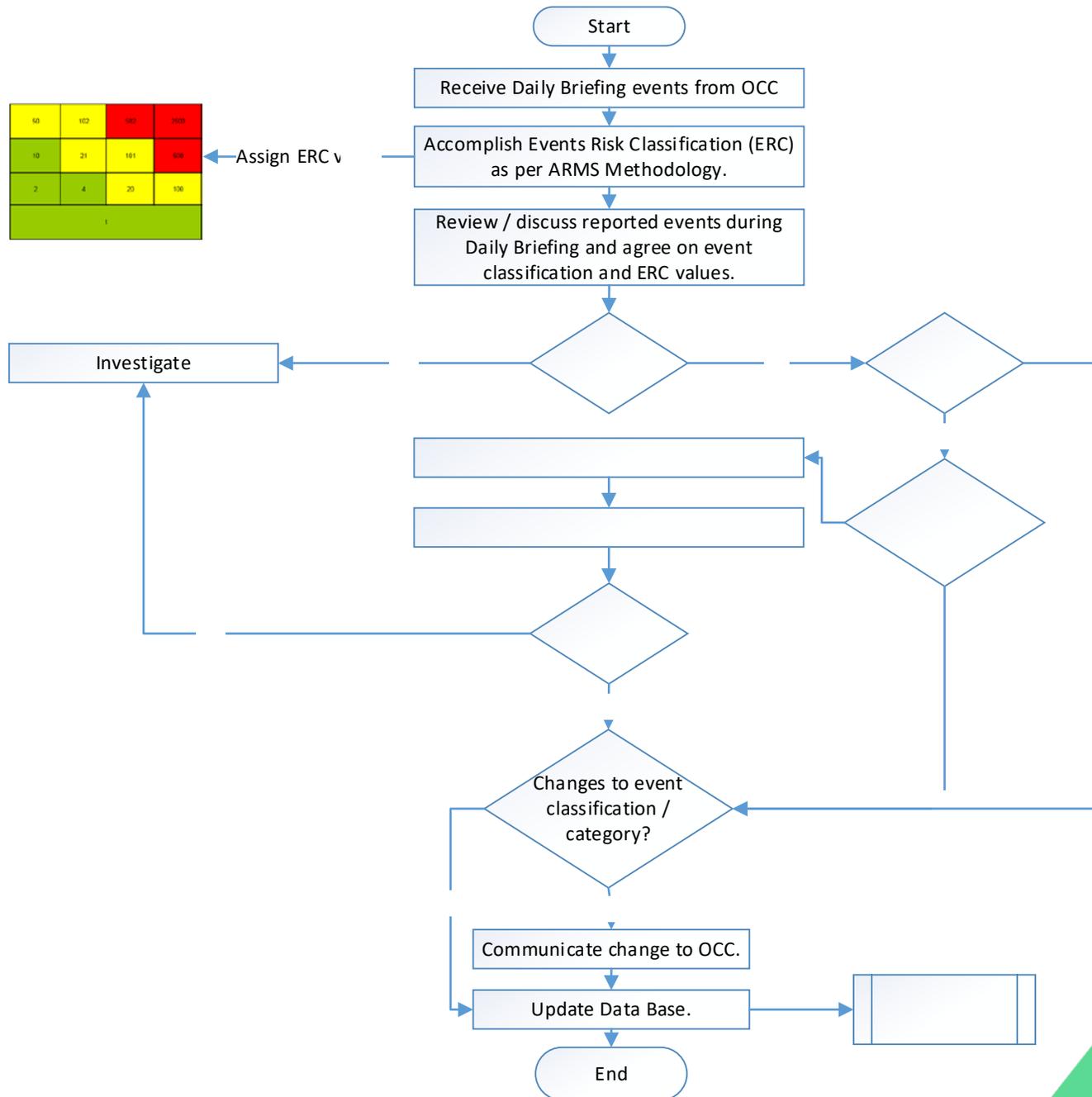
All accidents and incidents, reported under the requirements of this Regulation, will be electronically stored as a standardized descriptive database compatible with ICAO ADREP taxonomy. The data retrieval will display frequencies over time to identify adverse trends. The database will include the following information as available:

- Risk Assessment

AIB ERC Process

10	102	149	2401
10	21	141	504
2	4	20	106
1			

← Assign ERC v



Date of Report		Description	Incident Details				Reporting		Aircraft Information											
			ERC	RiskLnd	Incident	Fatalit	Old Report	Reporter1	Reporter2	Old Data Operator 1	Operator 1	Operation Typ	Operation Type	Aircraft Ty	Aircraft Ty	Other Aircraft Ty	Registrati	Callsig	Flight Phas	Flight Phas
30-Jul-21	SVA1668 during takeoff roll reported bird strike on	2	Moderate	Incident	0	Airport			Saudia Airlines		Commercial		A320			HZ-AS57	SVA1668	Take-off		>5700
12-Aug-21	SVA1049 during landing approach at 7500FT had	2	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		A321			HZ-ASK	SVA1049	final Approach		>5700
15-Aug-21	KNE625 was clear to descent from FL390 to FL360	50	Moderate	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS35	KNE625	descent		>5700
14-Aug-21	FAD4313 during AWAC found bird strike on left side	2	low	Incident	0	Airport			Flyadeal		Commercial		A320			HZ-FAL	FAD4313	unknown		>5700
15-Aug-21	SVA914 during climbing FL347 to FL350 reported	50	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		B777			HZ-AK71	SVA914	initial climb		>5700
17-Aug-21	KNE450 during landing pilot reported a bird strike	2	Moderate	Incident	0	CAA			Flynas		Commercial		A320			VP-CXS	KNE450	Landing		>5700
18-Aug-21	SVA1023 during take-off reported a bird strike on	2	Moderate	Incident	0	CAA			Saudia Airlines		Commercial		A330			HZ-AQ27	SVA1023	Take-off		>5700
23-Aug-21	KNE357 during landing reported bird strike on the	2	Moderate	Incident	0	CAA			Flynas		Commercial		A320			HZ-NS37	KNE357	Landing		>5700
25-Aug-21	SV1049 during AWAC found a bird strike on the R/H	2	low	Incident	0	CAA			Saudia Airlines		Commercial		A330			HZ-AQ25	SVA1049	unknown		>5700
22-Aug-21	N767A was conducting left-hand circuits RWY 16L	50	Moderate	Incident	0	ANS			Aramco		General		B767			HZ-AQH	SVA1110	final Approach		>5700
23-Aug-21	SVA1022 during AWAC reported dent and	2	low	Incident	0	Airport			Saudia Airlines		Commercial		A330			HZ-AQ21	SVA1022	Landing		>5700
29-Aug-21	SVA1057 during AWAC found bird strike on engine	2	low	Incident	0	CAA			Saudia Airlines		Commercial		A330			HZ-AQ23	SVA1057	unknown		>5700
29-Aug-21	KNE442 during AWAC reported bird feather found	2	low	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS26	KNE442	unknown		>5700
1-Sep-21	TCAS RA activated between departed flight	50	High	Incident	0	Operator			Saudia Airlines		Commercial		B777			HZ-AK16	SVA804	descent		>5700
10-Sep-21	SVA3769 was instructed to hold at RWY 07, pilot	1	Moderate	Incident	0	CAA			Saudia Airlines		Commercial		A330			HZ-AQK	SVA3769	Taxi to runway		>5700
5-Sep-21	SVA7591 after landing reported a steering problem	1	Moderate	Incident	0	ANS Airport			Saudia Airlines		Commercial		GLF4			HZ-MF5	SVA7591	Landing		>5700
8-Sep-21	SVA1166 during approach RWY 34L at 7000FT	2	Moderate	Incident	0	Airport			Saudia Airlines		Commercial		A320			HZ-AS56	SVA1166	final Approach		>5700
8-Sep-21	FAD4426 during approach reported a bird strike on	2	Moderate	Incident	0	CAA			Flyadeal		Commercial		A320			HZ-FAB	FAD4426	final Approach		>5700
9-Sep-21	SVA1508 landed RWY 33L and during AWAC	2	Moderate	Incident	0	Airport			Saudia Airlines		Commercial		A321			HZ-ASN	SVA1508	landing		>5700
12-Sep-21	SVA1661 during approach RWY 13 at 9000FT	2	Moderate	Incident	0	CAA			Saudia Airlines		Commercial		A320			HZ-AS58	SVA1661	final Approach		>5700
12-Sep-21	SVA1780 during AWAC reported bird strike on nose	2	low	Incident	0	CAA			Saudia Airlines		Commercial		A320			HZ-AS38	SVA1780	unknown		>5700
12-Sep-21	KNE738 during AWAC reported bird strike on right	2	low	Incident	0	Airport Operator			Flynas		Commercial		A320			VP-CXI	KNE738	unknown		>5700
15-Sep-21	SVA1805 during AWAC found bird strike on nose	4	Moderate	Incident	0	CAA			Saudia Airlines		Commercial		A320			HZ-AS57	SVA1805	unknown		>5700
15-Sep-21	SVA309 during AWAC found bird strike on engine #2	2	Moderate	Incident	0	CAA			Saudia Airlines		Commercial		A330			HZ-AQ15	SVA309	unknown		>5700
16-Sep-21	KNE053 during approach at FL110 reported a bird	4	High	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS43	KNE053	final Approach		>5700
18-Sep-21	HZXF9 during flight reported smoke in the cockpit,	21	Moderate	Incident	0	Operator			Oxford Aviation Academy		General		DA40			HZ-XF9	HZXF9	Cruise		<2250
27-Sep-21	SVA786 during descending from FL370 to FL350	50	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		B787			HZ-AR25	SVA786	descent		>5700
21-Sep-21	SVA1588 during cruise at 21000 FT reported a bird	2	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		A320			HZ-AS65	SVA1588	cruise		>5700
22-Sep-21	KNE426 during landing roll RWY 34R reported a bird	2	Moderate	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS24	KNE426	Landing		>5700
20-Sep-21	IYES17 during decent at 12000 FT RWY 34L reported	2	Moderate	Incident	0	Airport			Yemenia Airways		Commercial		A320			70AFA	IYES17	descent		>5700
22-Sep-21	MSR3915 during rotation reported a bird strike on	2	Moderate	Incident	0	ANS			Egypt Air		Commercial		A330			SV-GDV	MSR3915	Take-off		>5700
23-Sep-21	KNE894 during AWAC reported a bird strike on	2	Moderate	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS42	KNE894	unknown		>5700
27-Sep-21	KNE254 on ILS RWY 15L at 6000FT reported a bird	2	Moderate	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS45	KNE254	descent		>5700
24-Sep-21	FAD4719 after airborn RWY 34C reported landing	1	Moderate	Incident	0	ANS Airport			Flyadeal		Commercial		A320			HZ-FAN	FAD4719	initial climb		>5700
27-Sep-21	SVA1024 during descending to 6000FT for RWY 33L	50	Moderate	Incident	0	ANS			Saudia Airlines		Commercial		A330			HZ-AQ26	SVA1024	descent		>5700
27-Sep-21	SVA1528 during take-off roll speed 125 knots	2	Moderate	Incident	0	Airport			Saudia Airlines		Commercial		A321			HZ-ASU	SVA1528	Take-off		>5700
30-Sep-21	SVA550 during the approach at 4000FT reported a	2	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		B787			HZ-AR13	SVA550	final Approach		>5700
28-Sep-21	SVA1852 during landing roll RWY 24 reported a bird	2	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		A321			HZ-ASM	SVA1852	landing		>5700
29-Sep-21	KNE760 during touchdown RWY 24 reported a bird	2	Moderate	Incident	0	CAA			Flynas		Commercial		A320			VP-CXH	KNE760	Landing		>5700
3-Oct-21	SVA1040 during landing at 750 FT reported a bird	2	Moderate	Incident	0	Operator			Saudia Airlines		Commercial		A330			HZ-AQ27	SVA1040	Landing		>5700
30-Sep-21	N807XA during take-off reported a bird strike on	2	Moderate	Incident	0	Airport			Aramco		General		B737			N807XA	N807XA	Take-off		>5700
1-Oct-21	KNE253 during decent at 8000 FT reported a bird	2	Moderate	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS35	KNE253	descent		>5700
1-Oct-21	SVA1885 reported Sings of bird strike were	2	low	Incident	0	Airport			Saudia Airlines		Commercial		A321			HZ-ASO	SVA1885	unknown		>5700
2-Oct-21	KNE894 during approach at 1000 FT reported a bird	2	Moderate	Incident	0	Operator			Flynas		Commercial		A320			HZ-NS37	KNE894	final Approach		>5700
5-Oct-21	KNE017 after landing RWY 34R and during roll out	2	Moderate	Incident	0	Operator			Flynas		Commercial		A320			VP-CXH	KNE017	Landing		>5700
6-Oct-21	MJF68 departed without ATC clearance	101	low	Incident	0	ANS			MJET		General		CL600			OELAN	MJF68	Take-off		>5700
9-Oct-21	KNE331 during touch down reported a bird strike.	2	Moderate	Incident	0	CAA			Flynas		Commercial		A320			HZ-NS36	KNE331	Landing		>5700
18-Oct-21	HZ-HC6 during landing reported risk of tail rotor	2	low	Incident	0	ANS Operator			THC		General		AW139			HZ-HC6	HZHC6	Docking		>2250
9-Oct-21	N1F796Y during the closure of Jeddah airport	102	Moderate	Incident	0	ANS			Netjets		General		Falcon 2000EX			CSDI H	N1F796Y	final Approach		>5700

	A	B	C	D	E	F	G	H	I	J	K
1											
2	Incident	(Multiple Items)									
3	Reported Date	(All)									
4											
5	Sum of ERC	Column Labels									
6	Row Labels	>5700	Grand Total								
7	RAMP: Ground handling	1873	1873								
8	SCF-NP: System/component failure or malfunction (non-powerplant)	2153	2153								
9	RI: Runway incursion	2334	2334								
10	RE: Runway Excursion	2524	2524								
11	MAC: AIRPROX/TCAS Alert/ Loss of Separation/ Near Midair Collisions/ Midair Collisions	6904	6904								
12	Grand Total	15788	15788								

Incident

- Accident
- Hazard
- Incident
- Serious Incident

Aircraft Weight

- <2250
- >2250
- >5700

Category

- ADRM: Aerodrome
- AMAN: Abrupt Maneuver
- ARC: Abnormal runway contact
- ATM: ATM/CNS
- BIRD: Birdstrike
- CABIN: Cabin safety events
- F-NI: Fire/Smoke (non-impact)
- FUEL: Fuel related
- GCOL: Ground collision
- ICE: Icing

Reported Date

2018 - 2022

2022

JUG SEP OCT NOV DEC

PivotTable Fields

Choose fields to add to report:

Search

- EventID
- Status
- Reported Date
- Location
- Description
- ERC
- RiskIndex
- Operator
- Incident
- OCC ID
- Reporter
- OCC_Date
- Operation Type
- DriftTime

Drag fields between areas below:

FILTERS

- Incident
- Reported Date

COLUMNS

- Aircraft Weight

ROWS

- Category

VALUES

- Sum of ERC



Challenges and Solutions

Challenges	Solutions
Missing Data <ul style="list-style-type: none">• Incomplete fields.• Inconsistency in filling data• Requested data not included in the data base.	Take Necessary Action as Follows: <ul style="list-style-type: none">• Complete missing data.• Standardize data entry (Drop Down Menu, etc.)
Limited Fields <ul style="list-style-type: none">• Some required fields are missing• Mixed up data (within some fields)	Take Necessary Action as Follows: <ul style="list-style-type: none">• Develop new fields.• Segregate mixed up data.
Inaccurate Classification <ul style="list-style-type: none">• Classification based on incomplete reported data.• Some Serious Incidents were classified as Incidents and vice versa.	Develop Measures to Reach Accurate Classification <ul style="list-style-type: none">• Request additional data, as required• Utilize Daily Briefing (representatives from each AIB Department / SMEs) to reach accurate classification.

Before Implementing ERC

Top 5 High Risk Category

Without using ERC (High Frequency Occurrence Types)	
1	SCF – NP : System/Component Failure or malfunction (non-Powerplant)
2	BIRD : Bird Strike
3	MAC : AIRPROX/TCAS Alert/Loss of Separation/ Midair Collisions
4	RAMP : Ground Handling
5	SCF – PP : System/Component Failure or malfunction (non-Powerplant)

SCF-NP: System/component failure or malfunction...

276

BIRD: Birdstrike

242

MAC: AIRPROX/TCAS Alert/ Loss of Separation/ Near...

140

RAMP: Ground handling

124

SCF-PP: System/component failure or malfunction...

115

ERC Implementation

Top 5 High Risk Category

Using ERC	
1	MAC : AIRPROX/TCAS Alert/Loss of Separation/ Midair Collisions
2	RE : Runway Excursion
3	RI : Runway Incursion
4	SCF – NP : System/Component Failure or malfunction (non-Powerplant)
5	RAMP : Ground Handling

**MAC: AIRPROX/TCAS Alert/
Loss of Separation/ Near
Midair Collisions/ Midair...**

7106

RE: Runway Excursion

2524

RI: Runway incursion

2334

**SCF-NP: System/component
failure or malfunction (non-
powerplant)**

2153

RAMP: Ground handling

1873

Advantages of Using ERC

- Ensure that the risk assessment is more likely to be based on facts rather than imagination and guessing.
- The subjectivity is reduced
- Rapid risk assessment of aviation occurrences.
- Flagging a high risk occurrences at a glance.





AVIATION INVESTIGATION BUREAU
Kingdom of Saudi Arabia

AIB

THANK YOU