

QATAR – MATAR Aerodrome Safety Management System



ICAO MID

ICAO MID. Aerodrome Safety & Planning Implementation Group

Fifth Meeting (ASPIG/5)

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Presented By

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MATAR – Aviation Safety and Compliance



Qatar Company for
Airports Operation
and Management
MATAR

الشركة القطرية
لإدارة وتشغيل
المطارات
مطار





CONTENT

1

Introduction

2

Regulatory Framework and
References

3

MATAR SMS Implementation
Phases

4

Overview on MATAR SMS

5

Safety Performance Index



Introduction

Qatar Company for Airport Operation and Management – MATAR

MATAR - QATAR Company for Airport Operations and Management



DOHA INTERNATIONAL AIRPORT

- Operational since 1959;
- Aerodrome Reference Code : 4E
- Higher Aircraft code 4F operations allowed subject to set conditions;
- GA / BA, Qatar Aeronautical Academy, Gulf Helicopters
- RWY 15/33 – 4570m X 46m



HAMAD INTERNATIONAL AIRPORT

- Commissioned in 2014
- Aerodrome Reference Code : 4F
- International Commercial
- RWY 16L/34R – 4850m X 60m,
- RWY 16R/34L – 4250m X 60m



MATAR SMS

REGULATORY FRAMEWORK and REFERENCES

- QCAR 19 Safety Management Systems
- QCAR – 006 Standards for Aerodrome Design, Operations & Licensing
- QCAR 004-2017 on the Mandatory and Voluntary Reporting, Analysis, classification and Follow-up of Safety Occurrences in Civil Aviation.
- QCAA Advisory Circular No. AC01/09, issue 02, dated 07 November 2015, SMS- Guidance to Organizations.
- ICAO Annex 14 Aerodromes - Volume 1 Aerodrome Design & Operations
- ICAO Annex 19 Safety Management
- ICAO Doc 9859 Safety Management Manual
- ICAO Doc 9774 Certification of Aerodromes
- ICAO Doc 9981 PANS Aerodromes

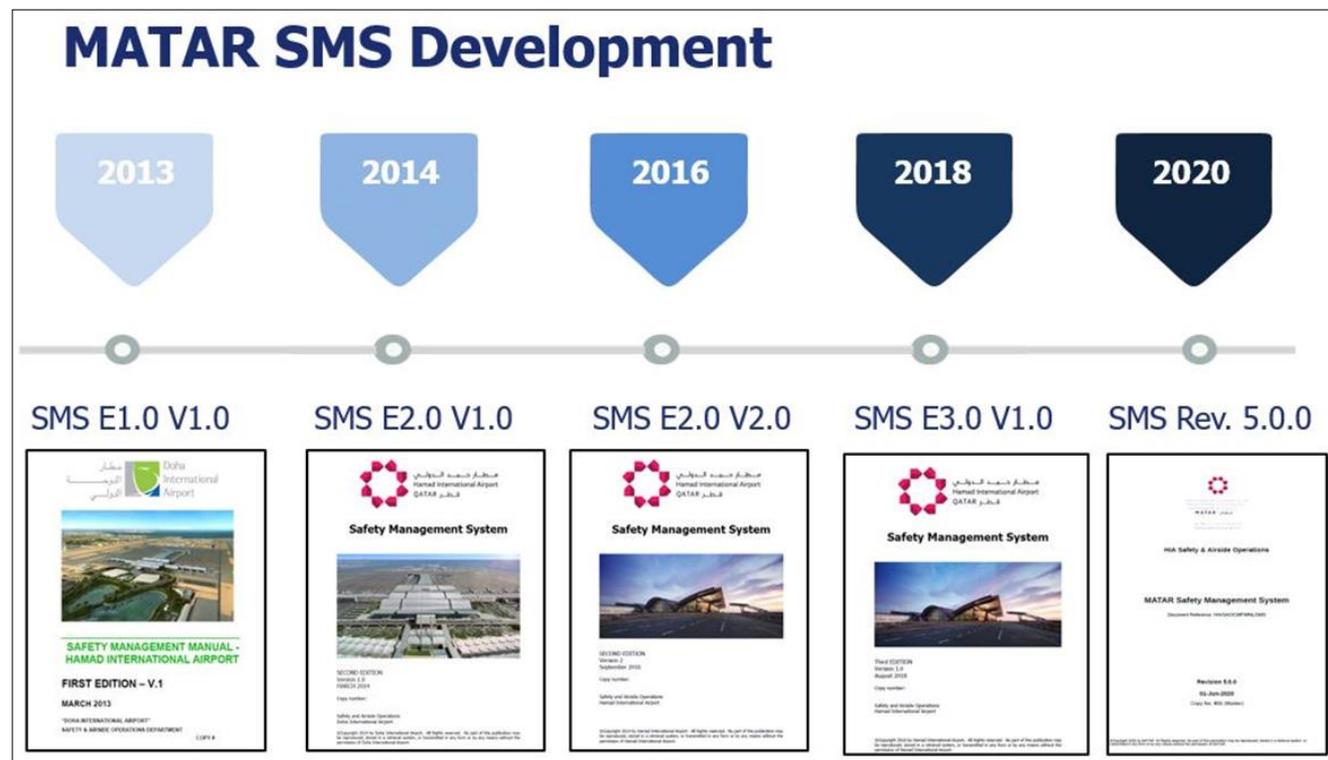
SMS Implementation On a Phased Approach

Phase 1: Defined key Safety Personnel, responsibilities, developed Safety policy, conducted Gap Analysis

Phase 2: Developed safety management processes, corrected deficiencies in existing processes, provided training on the SMS and Risk management systems, and established formal methods of communication.

Phase 3: Fine-tuned the analytical safety management processes

Phase 4: Implemented periodic monitoring to maintain the effectiveness of safety risk controls - Compliance Monitoring.



Safety Policy & Objectives

- ▶ The management's commitment to safety as a core business function.
- ▶ The assurance of assigning an adequate resources for SMS Implementation
- ▶ Safety Culture and Just Culture
- ▶ Safety reporting
- ▶ Indicate which types of behaviors are unacceptable



مطار حمد الدولي
Hamad International Airport
قطر QATAR

SAFETY POLICY

Safety is a core value of our organization and the overriding consideration in all our activities at Hamad International Airport and Doha International Airport, and therefore,

We are committed to:

- ▶ Actively develop and continuously improve the level of safety performance to achieve world class standards and comply with the national regulations as well as international standards and recommended practices as stipulated by ICAO; where possible, we aim to exceed the regulatory requirements;
- ▶ Apply an effective safety management system as an integral part of all our activities to achieve highest levels of safety standards and performance, for which we will provide all necessary resources including financial support;
- ▶ Consider Safety as a core business function and to achieve safe operations with a balanced and realistic allocation of resources between protection and production goals;
- ▶ Encourage a culture of proactive risk assessments and take all actions to manage risks associated with aircraft operations to a point that is as low as reasonably practicable;
- ▶ Employ and train our staff, with adequate safety training and safety information to ensure that they are competent and have sufficient skill in safety matters at all times;
- ▶ Measure our safety performance against realistic objectives and targets;
- ▶ Foster and encourage a just culture where each and every dangerous occurrence, errors, safety deficiencies and hazards are reported without threat of punitive action, however willful negligence and violations will not be tolerated;
- ▶ Develop and embed a safety culture in all our activities that values Safety as paramount;

We acknowledge that ultimate responsibility for safety rests with us, and we will ensure that each manager will implement and manage safety systems in their area of responsibility, for which they will be held accountable.

Each and every employee of Hamad International Airport, tenants, concessionaires and contractors are responsible for creating a safe environment for all employees, passengers and other users of Hamad International Airport and Doha International Airport.



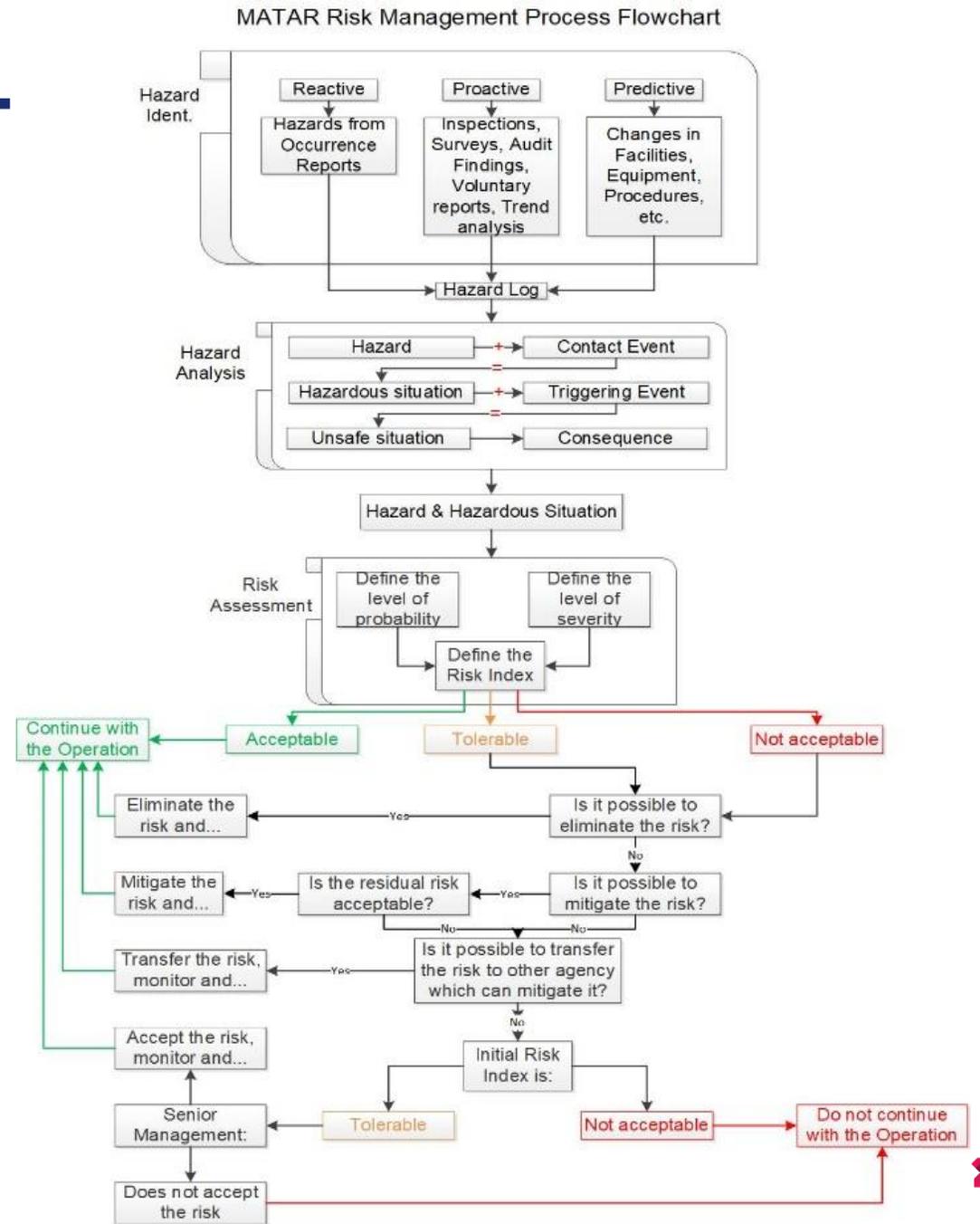
Akbar Al Baker
Group Chief Executive
(Accountable Manager and
Aerodrome License Holder)



Badr Mohammed Al Meer
Chief Operating Officer
(Aerodrome Manager)

SAFETY RISK MANAGEMENT

- Risk management is a task shared by the company as a whole, from the accountable manager through the Safety Committee to Line Managers
- Safety risks are being considered in all decisions.



SAFETY RISK ASSESSMENT – Probability

Table 2-2 : Quantitative Probability Scale

Class	Title	Frequency	Return period (T)	1 Inc / Movement
T1	Extremely improbable	Less than once per T1	50 years	1 per 15 mln
T2	Improbable	Between once per T1 and once per T2	10 years	1 per (15 mln - 3 mln)
T3	Remote	Between once per T2 and once per T3	1 year	1 per (3 mln - 300K)
T4	Probable	Between once per T3 and once per T4	1 month	1 per (300K - 25K)
T5	Frequent	More than once per T4		>1 per 25K

Table 2-3 : Qualitative Probability Scale

Probability of Occurrence		
Qualitative Definition	Meaning	Value
Extremely Improbable	Almost inconceivable that the event will occur and is not known to have occurred on any other comparable airport before.	1
Improbable	Very unlikely to occur (occurs very rarely at other comparable airports)	2
Remote	Unlikely to occur at this airport, but possible to occur (has occurred rarely at some comparable airports)	3
Probable	Likely to occur some times (has occurred infrequently) at this airport	4
Frequent	Likely to occur many times (has occurred frequently) at this airport	5

SAFETY RISK ASSESSMENT

Risk Tolerability Matrix establishes the Risk Index (combination of probability and severity) and shows its criticality.

		Severity				
		S1	S2	S3	S4	S5
Likelihood	L5	2	2	3	3	3
	L4	1	2	2	3	3
	L3	1	1	2	2	3
	L2	1	1	1	2	2
	L1	1	1	1	1	2

Risk Index Criticality is defined in 3 groups - Acceptable, Tolerable and Not acceptable.

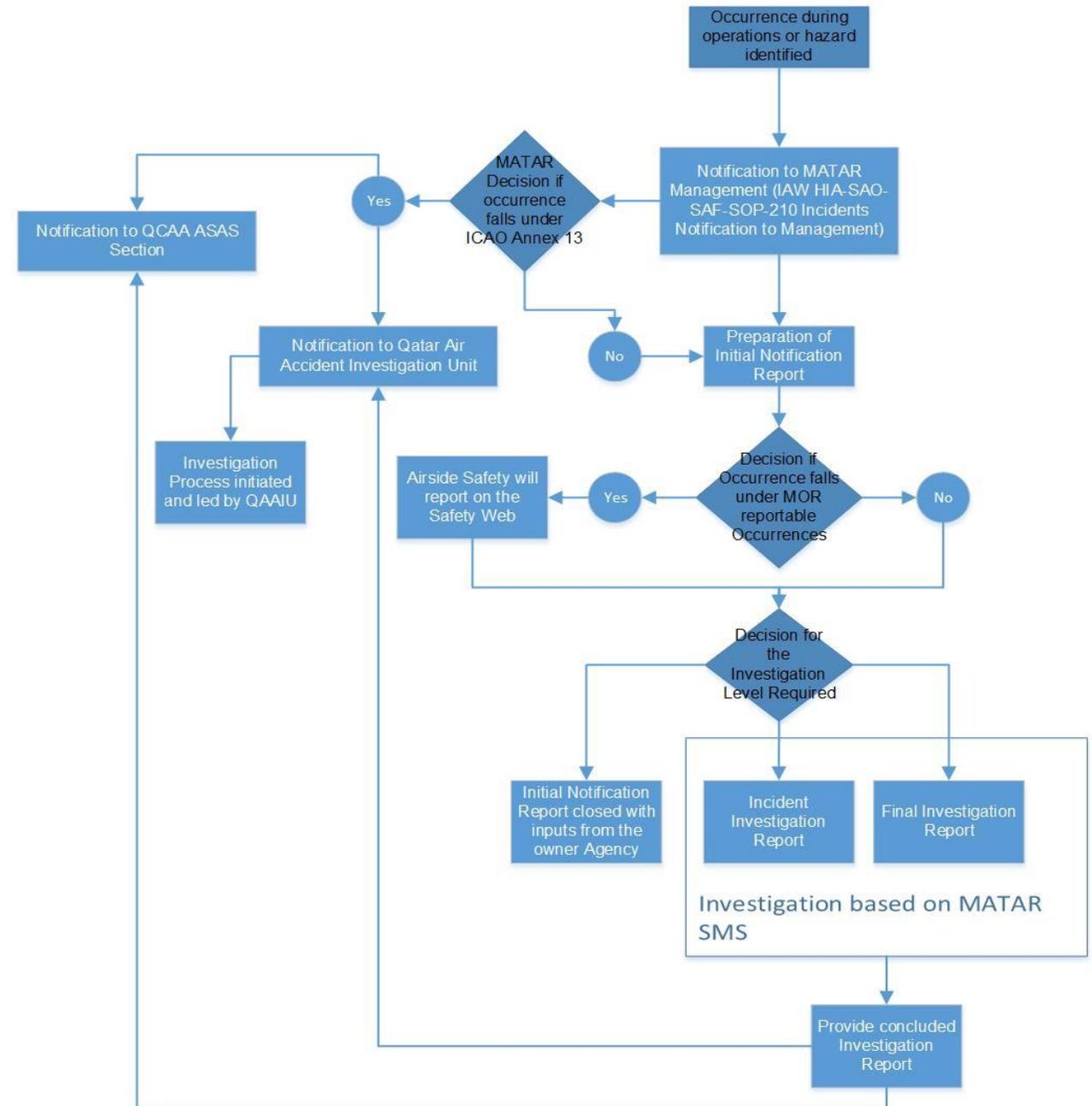
Index	Criticality level	Decisions and actions
C1	Acceptable	Nothing needs to be done
C2	Tolerable under monitoring: A close monitoring must be implemented in terms of risk management.	
C3	Unacceptable	Risk needs to be reduced. If the risk cannot be reduced, the activity must be stopped totally or partially.

Table 2-4 : Risk Severity Scale

Severity Value	Level	Sub-index	Description of consequences	
S1	Negligible	10	No significance to aircraft-related operational safety.	Aircraft
		11	No injury to persons	Person
		12	No Damage to infrastructure	Infrastructure
		13	No Revenue Loss	Revenue
		14	No Effect on Environment	Environment
S2	Minor	15	No implication on Company Reputation	Reputation
		20	Degrade or affect normal aircraft operational procedures or performance.	Aircraft
		21	Minor injury to person	Person
		22	Minor Damage to assets	Infrastructure
		23	Minor Revenue Loss	Revenue
S3	Major	24	Minor Effect on Environment	Environment
		25	Limited Localised Implication on Company Reputation	Reputation
		30	Partial loss of significant/ major aircraft systems or result in abnormal F/Ops procedure application	Aircraft
		31	Serious injury to person	Person
		32	Substantial Damage to assets	Infrastructure
S4	Critical	33	Substantial Revenue Loss	Revenue
		34	Contained Effect on Environment	Environment
		35	Regional Implication on Company Reputation	Reputation
		40	Complete failure of significant/ major aircraft systems or result in emergency F/Ops procedure application	Aircraft
		41	Single fatality	Person
S5	Catastrophic	42	Major Damage to assets	Infrastructure
		43	Major Revenue Loss	Revenue
		44	Major Effect on Environment	Environment
		45	National Implication on Company Reputation	Reputation
		50	Aircraft/ Hull Loss	Aircraft
S5	Catastrophic	51	Multiple fatalities	Person
		52	Catastrophic Damage to assets	Infrastructure
		53	Massive Revenue Loss	Revenue
		54	Massive Environmental Effect	Environment
		55	International Implication on the Company Reputation	Reputation

Occurrence Reporting and Investigation

Airside occurrences are to be recorded on Incident database and reviewed daily by airport safety investigation management.



Occurrence Taxonomy

Safety Performance Indicators / Occurrence Categories		
1	Aircraft Air Return	An occurrence involving Aircraft return to the airport of departure after being airborne
2	Aircraft Collision	An occurrence involving a collision between taxiing aircraft and obstacle, vehicle/equipment or another aircraft
3	Aircraft Damage	An event involving damage to the aircraft which requires repair works to restore the aircraft in airworthy condition.
4	Aircraft Diversion	An occurrence involving Aircraft diversion to an alternate airport from the airport of the intended destination.
5	Aircraft Ground Return	Occurrences involving aircraft return to a stand after initiating the ground move;
6	Bird strike	Occurrences involving collisions / near collisions with bird(s)
7	Dangerous Goods	Information whether dangerous goods were involved in the occurrence
8	Docking Occurrence	An occurrence involving an aircraft docking discrepancy
9	Emergency	Any occurrence resulting in a declaration of emergency, local standby, or activation of the Airport Emergency Response Procedures on board aircraft or at the airport.
10	Fire / Smoke	Any occurrence at an airport that involves emitting heat, smoke, sparks and/or flame, which has the potential to cause damage to property (buildings, vehicles, and aircraft) or injuries/death to a person and require intervention - either mechanical (automated fire suppression system – in the aircraft or building) or human (ARFFS).
11	FOD	Foreign Object Debris (FOD) occurrence includes any damage caused to an aircraft or object found in an inappropriate location that, as a result of being in that location, can damage aircraft or injure personnel
12	Fuel Spillage	Any occurrences involving fuel spillage from aircraft, fueling vehicle, vehicle/equipment or fuel installation
13	Injury	Injury Occurrence is defined as any Occurrence which is causing Physical / Mental harm or damage to someone's body as a result of the incident/accident or as a result of an attack
14	Interference with Aircraft Movement	Any occurrence at the airport involving Interference with aircraft movement which takes place on TWY crossings (with roads) or on the Back of Stand roads
15	Jet Blast	Any occurrence at the airport associated with the propeller strike or blast, rotor strike, helicopter rotor downwash or jet blast damage to the aircraft, vehicle/equipment, facility or injuries to personnel

16	Medical	Any occurrences involving illness of persons on board the aircraft
17	Oil Spillage	Any occurrences involving oil spillage from aircraft or vehicle/equipment
18	Others	This category includes any occurrence type that is not covered by any other category
19	Property Damage	An event involving damage to the infrastructure, building or airport property caused by a vehicle/equipment or by not identified source.
20	RWY Excursion	A runway excursion event occurs when an aircraft on the runway surface departs the end or side of the runway surface during take-off or landing
21	Runway Incursion	Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft
22	TWY Depression	Any occurrence at an aerodrome that causes an aircraft to become unable to start or continue taxiing on a taxiway/taxi lane using the power created by its engines due to the unevenness of the taxiway surface
23	TWY Excursion	A taxiway excursion event occurs when an aircraft on the taxiway surface departs the end or side of the taxiway surface during taxiing or at the end of the landing roll while on a Rapid exit TWY
24	Taxiway Incursion	Any occurrence of unauthorized presence on a taxiway of an aircraft, vehicle, person or object that creates a collision hazard or results in a potential loss of separation
25	Vehicle Traffic Violation	An event-related to a traffic violation by a vehicle (e.g. above the speed limit, traffic priority violated, etc.)
26	Vehicular Occurrence	Any occurrence at an aerodrome involving a collision between vehicles, a collision between a vehicle and a person, and collision by vehicle with infrastructure, fixed object, or obstacle resulting in damage to vehicle or both
27	Wildlife	Any occurrence at an aerodrome involving a collision with, risk of collision, or evasive action taken by an aircraft to avoid wildlife on a runway or taxiway
28	Wrong Aircraft Parking	Any occurrence at an aerodrome involving the incorrect entry or parking of an aircraft into a stand not being planned for that aircraft
29	Wrong Aircraft Pushback	Any occurrence at an aerodrome when an aircraft is wrongly pushed back disregarding the agreed procedures or the ATC instructions.
30	Uncontrolled Equipment Movement	Any occurrence at an aerodrome involving uncontrolled movement of vehicle or equipment on the movement area
31	Drones	Any unauthorized presence of unmanned Aerial vehicle within approach and tower controlled airspace

SAFETY ASSURANCE - Aerodrome Safety Performance Index

▶ Aerodrome Safety Performance Index present a single index, combining all details from the SPIs and the KSPI and representing the overall Aerodrome Safety Performance calculated per 1000 movements.

50	25	10	4	1
Catastrophic	Major	Moderate	Minor	Insignificant

Severity Quantification Index - SPI(cev)

- ▶ ASPI provides airport operator Management, CAA, and airport stakeholders with an indication of the level of the safety performance of the system.
- ▶ The first step in developing the Aerodrome SPI is to establish quantifiers for the severity of the ultimate consequence of each of the SPI.

SAFETY ASSURANCE - Aerodrome Safety Performance Index

The second step is to establish the Comparative Index (SPI ci), which serves as a tool to measure the **Weightage** amongst all SPIs.

The SPIs are divided into 4 groups, based on the level of severity of the consequence.

Group 1	50	Group 2	30	Group 3	15	Group 4	5
RWY Excursion	16	Dangerous goods	5	Wildlife Hazard	3	Injury	1
Runway Incursion	12	Emergency	4.8	Docking	2.8	Fire/Smoke	0.8
TWY Excursion	9	Interference with aircraft movement	4.6	Wrong Aircraft Parking	2.4	TWY Depression	0.7
Aircraft Damage	7	Bird Strike	4.3	Wrong Aircraft Pushback	2	Fuel Spillage	0.65
TWY Incursion	6	Jet Blast	4	Aircraft Diversion	1.7	Oil Spillage	0.6
		FOD	3.8	Aircraft Air Return	1.6	Vehicular Occurrence	0.5
		Uncontrolled Equipment Movement	3.5	Aircraft Ground Return	1.5	Property Damage	0.3
				Medical	1.2	Vehicular Traffic Violation	0.25
						Others	0.2

SPI Comparative Index - SPI (ci)

SAFETY ASSURANCE - Aerodrome Safety Performance Index

Performance review of SPI/KSPI "TWY incursion" in 2 years

Year	No. TWY Incursion	No. aircraft Movement	Ratio per 1000 Mov.
2030	20	250,000	$20 / (250,000 / 1000) = 0.080$
2031	27 	350,000 	$27 / (350,000 / 1000) = 0.077$ 

SAFETY ASSURANCE - Aerodrome Safety Performance Index

- ▶ The performance review of 2 incidents categories, during the same reporting period
- ▶ Comparing the severity of interference with Aircraft movement compared to TWY incursion
- ▶ The impact on ASPI

2030	Incident count	SPI Comparative Index (Weightage)	No. A/C Mov.	SPI per 1000 movement
TWY Incursion	20	6	250,000	$20 * 6 / (250,000 / 1000) = 0.48$
Interference with Aircraft Mov.	25 	4.6	250,000	$25 * 4.6 / (250,000 / 1000) = 0.46$ 

SAFETY ASSURANCE - Aerodrome Safety Performance Index

After an occurrence is logged into the Incident database, its severity and probability are assessed and inserted.

The Methodology then multiplies the SPI Severity Index - SPI(cev) by the SPI comparative index (ci).

For the normalization of the value, the sum of all monthly occurrences is divided by the value of the aircraft movement, expressed in 1000.

$$A\ SPI_{(1K)} = \frac{Occurrence_1(SPI_{(ci)} * SPI_{(cev.)}) + Occurrence_2(SPI_{(ci)} * SPI_{(cev.)}) + \dots + Occurrence_n(SPI_{(ci)} * SPI_{(cev.)})}{Movements / 1000}$$

Movements / 1000

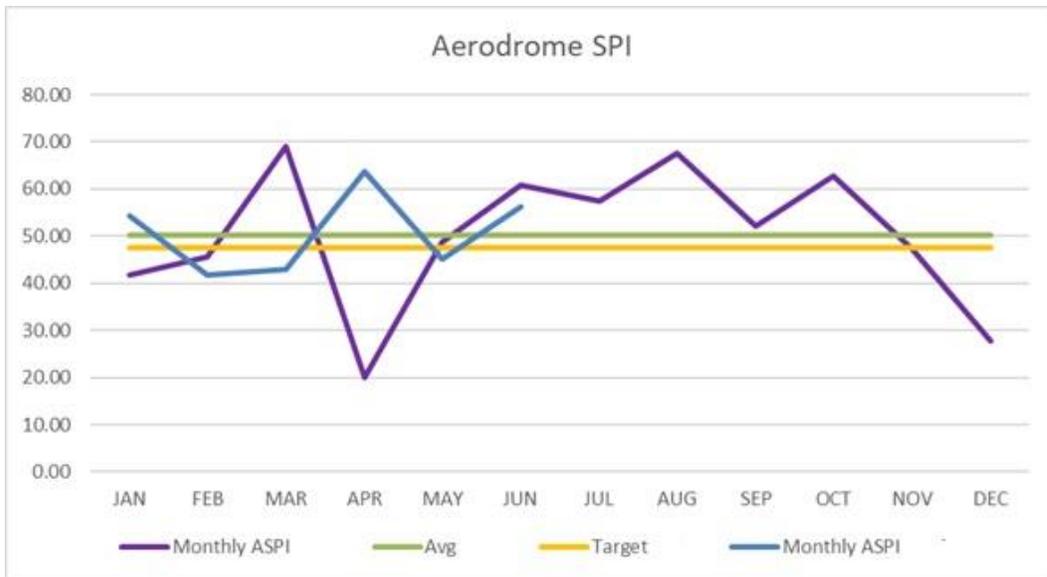
SPI Comparative Index - SPI (ci)

Severity Quantification Index - SPI(cev)

10175.25	SPI (ci)	Severity Quantification Index - SPI(cev)					SPI(cev.)	ASPI
		1 Insignifi- cant	4 Minor	10 Moderat e	25 Major	50 Catastro- phic		
RWY Excursion	16						0	0
Runway Incursion	12	0	0	1	0	0	10	120
TWY Excursion	9	0	0	0	1	0	25	225
Aircraft Damage	7	0	1	2	2	0	74	518
TWY Incursion	6	0	0	0	3	0	75	450
Dangerous goods	5						0	0
Emergency	4.8	0	1	10	5	0	229	1099.2
Interference with aircraft movement	4.6	0	0	11	0	0	110	506
Bird Strike	4.3	4	17	6	0	0	132	567.6
Jet Blast	4	0	0	3	0	0	30	120
FOD	3.8	0	0	0	0	0	0	0
Uncontrolled Equipment Movement	3.5	16	12	11	0	0	174	609
Wildlife Hazard	3	8	13	5	0	0	110	330
Docking	2.7	26	27	15	4	0	384	1036.8
Wrong Aircraft Parking	2.3	0	18	6	1	0	157	361.1
Wrong Aircraft Pushback	1.9	0	0	19	2	0	240	456
Aircraft Diversion	1.5	2	43	1	0	0		
Aircraft Air Return	1.3	2	7	11	1	0		
Aircraft Ground Return	1.2	15	121	65	8	0		Air
Medical	1.1	0	0	37	0	0	370	407
Injury	1	6	20	76	1	0	871	871
Fire/Smoke	0.8	0	7	28	4	0	408	326.4
TWY Depression	0.7	2	128	36	0	0	874	611.8
Fuel Spillage	0.65	0	2	9	3	0	173	112.45
Oil Spillage	0.6	1	11	16	1	0	230	138
Vehicular Occurrence	0.5	35	257	60	11	0	1938	969
Property Damage	0.3	76	83	16	0	0	568	170.4
Vehicular Traffic Violation	0.25	6	9	4	0	0	82	20.5
Others	0.2	7	32	34	11	0	750	150

SAFETY ASSURANCE - Aerodrome Safety Performance Index

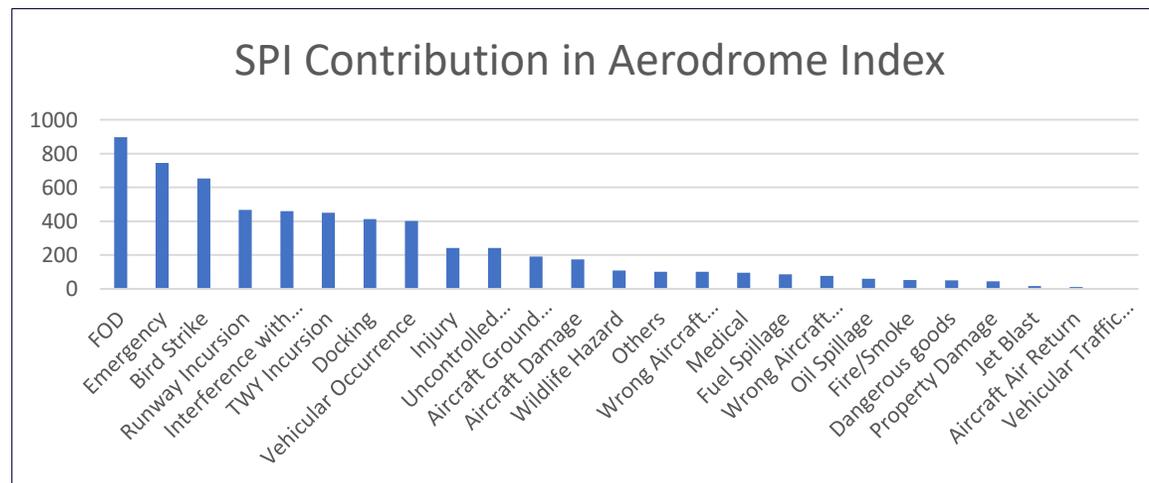
- ▶ The outcome of the methodology is a single index, consisting of two digits that shows the monthly Safety Performance.
- ▶ Analysis of the SPI, KSPI, and Aerodrome SPI is to be performed on a monthly basis.



Aerodrome SPI - Graphical Format

Aerodrome SPI - Tabular Format

Column1	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Movement	17,687	15,968	17,823	17,237	17,745	17,840	18,910	19,041	18,554	19,170	18,541	19,301
ASPI	898.1	934.1	984.25	565.95	1113.8	630.2	951.3	1094.8	827.75	1086.7	494.3	594
ASPI/1k	50.78	58.50	55.22	32.83	62.77	35.33	50.31	57.50	44.61	56.69	26.66	30.78



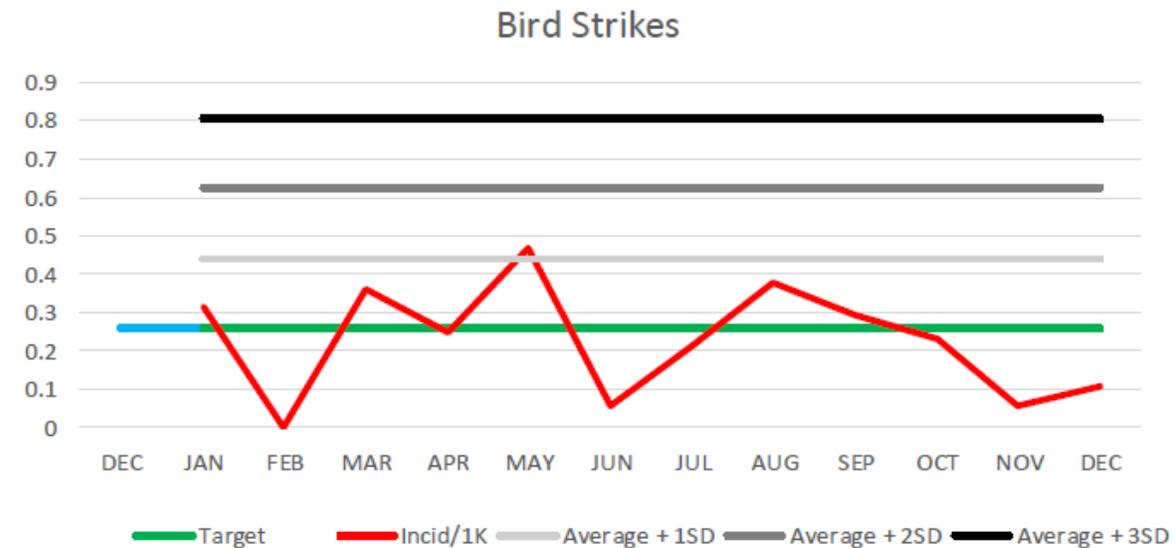
SAFETY ASSURANCE - Safety Performance Monitoring and Improvements

Standard Deviation Methodology, 3 alert levels have been defined.

The three alert lines are: average + 1 SD, average + 2 SD, and average + 3 SD.

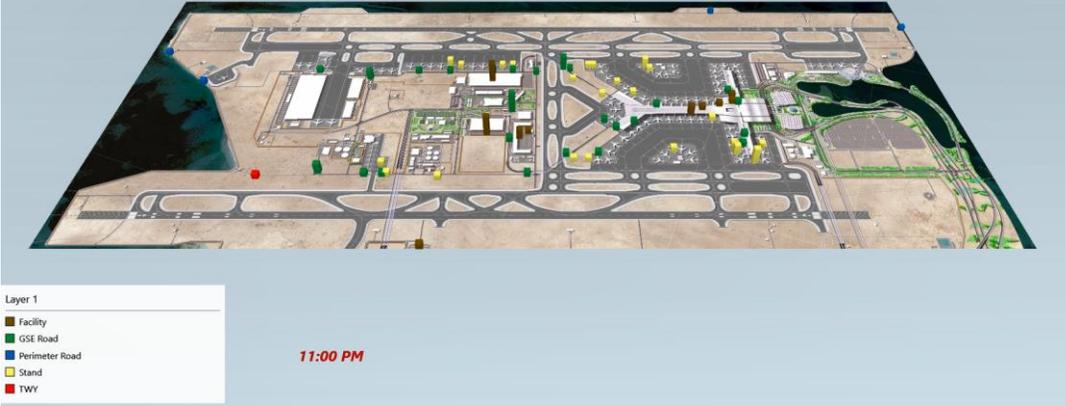
An alert is indicated if any single point is above the 3 SD line, 2 consecutive points are above the 2 SD line, or 3 consecutive points are above the 1 SD line.

When an alert is triggered, appropriate follow-up action will be initiated, such as further analysis to determine the source and root cause of the abnormal incident rate and any necessary action to address the unacceptable trend



SAFETY ASSURANCE - Safety Performance Monitoring and Improvements

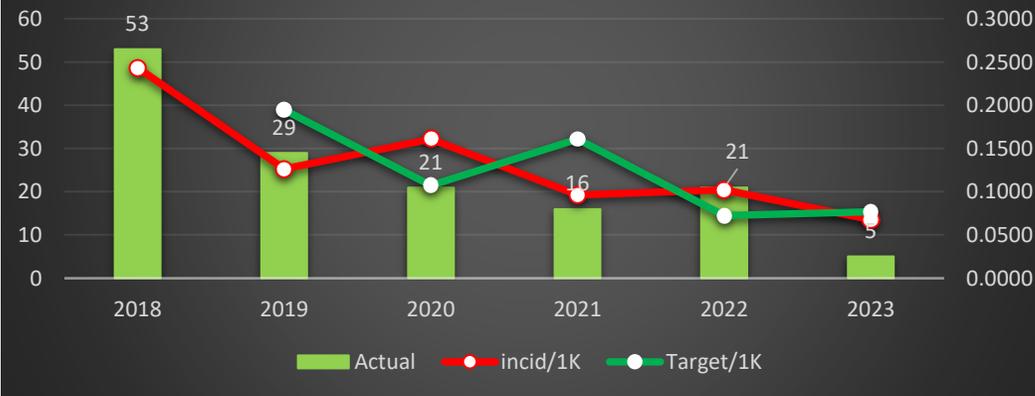
Incident Data Analysis – Vehicular Occurrences



Incident Data Analysis – Bird Strike Incidents



Uncontrolled equipment movement - Yearly



Row Labels	January	February	March	April	May	June	July	August	September	October	November	December
0:00:00	4	4	4	9	9	4	6	6	6	3	6	3
1:00:00	6	4	5	6	5	5	3	7	8	6	6	10
2:00:00	8	4	4	2	3	7	8	4	3	6	2	3
3:00:00	2		8	4	2	5	4	2	9	5	4	4
4:00:00	2	2	5	2	1	3	4	8	5	4	2	6
5:00:00	4	3	4	7	3	4	6	3	6	5	5	2
6:00:00	10	10	15	8	6	13	12	8	14	8	9	8
7:00:00	17	14	10	6	9	10	13	10	13	3	8	7
8:00:00	7	4	8	9	5	11	6	14	10	5	9	9
9:00:00	2	5	5	5	3	7	1	4	8	3	4	5
10:00:00	4	6	5	3	10	6	4	7	9	7	5	4
11:00:00	3	2	9	7	4	8	14	5	7	6	4	3
12:00:00	7	7	4	3	4	5	12	6	9	5	8	2
13:00:00	2	6	3	2	3	7	5	7	3	3	4	3
14:00:00	5	6	7	4	4	7	7	6	5	6	5	4
15:00:00	5	1	9	3	1	5	2	4	6	3	5	5
16:00:00	1	1	5	3	6	3	4	2	4	3	5	7
17:00:00	4	7	3	5	3	5	6	5	5	4	1	8
18:00:00	6	6	4	4	6	8	3	5	4	5	5	4
19:00:00	5	4	4	8	1	3	8		6	6	4	6
20:00:00	4	2	2	1	1	5	4	3	2	2	4	1
21:00:00	3	3	2	1	4	1	1	3	5	2	5	4
22:00:00	5	1	3	1	3	4	4	4	3	5	4	4
23:00:00	7	4	4	4	6	7	3	5	3	6	3	1

Vehicular Occurrence - Monthly KSPI



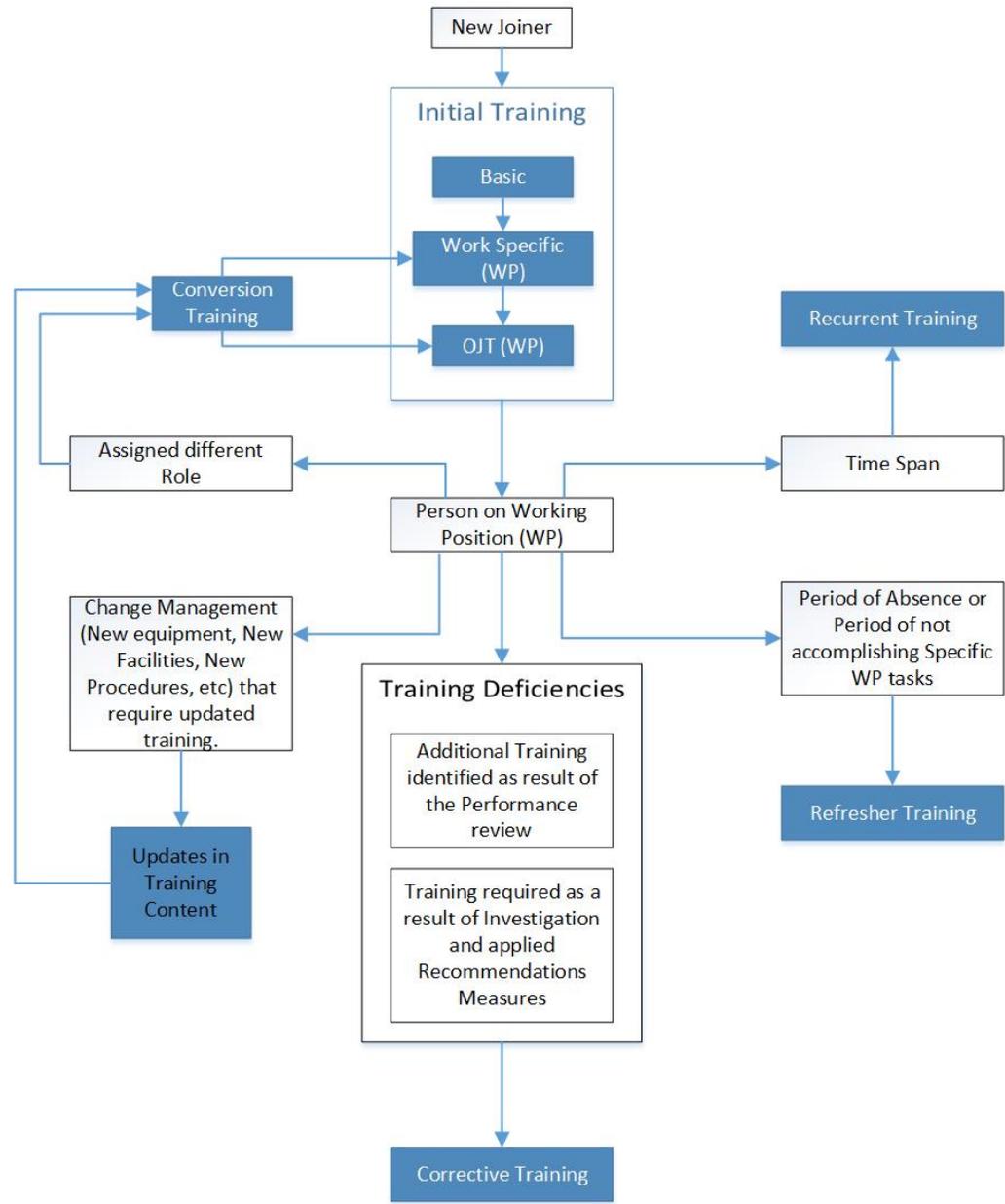
Wrong Pushback SPI



MATAR Training Management Concept

SAFETY PROMOTION

Training and Proficiency Program



SAFETY COMMUNICATIONS





Questions?



Qatar Company for
Airports Operation
and Management
MATAR

لشركة القطرية
لإدارة وتشغيل
المطارات
مطار