وزارة الطيران المدني
Ministry of Civil Aviation

ECAA
Egyptian Civil Aviation Authority

ICAO

MIDANPIRG/23 & RASG-MID/13

CAIRO - EGYPT

14 -18 JUNE 2026

Aviation Safety & Modernization

Presented by CP Khaled

EGYPT - NANSC Safety Director

National Air Navigation Services Company

NANSC Safety Implementation

Safety Strategic Objectives

- Alignment with NASP and EAC 19-9 (2024–2025)
- Continuous improvement of safety performance
- Performance- and risk-based safety approach

NANSC safety performance based operation

01 **Safety policy and principle**

Modernization and review Safety Strategic Objectives up grade

02 **Management of Change (MOC)**

03 **Operational Safety Risks**

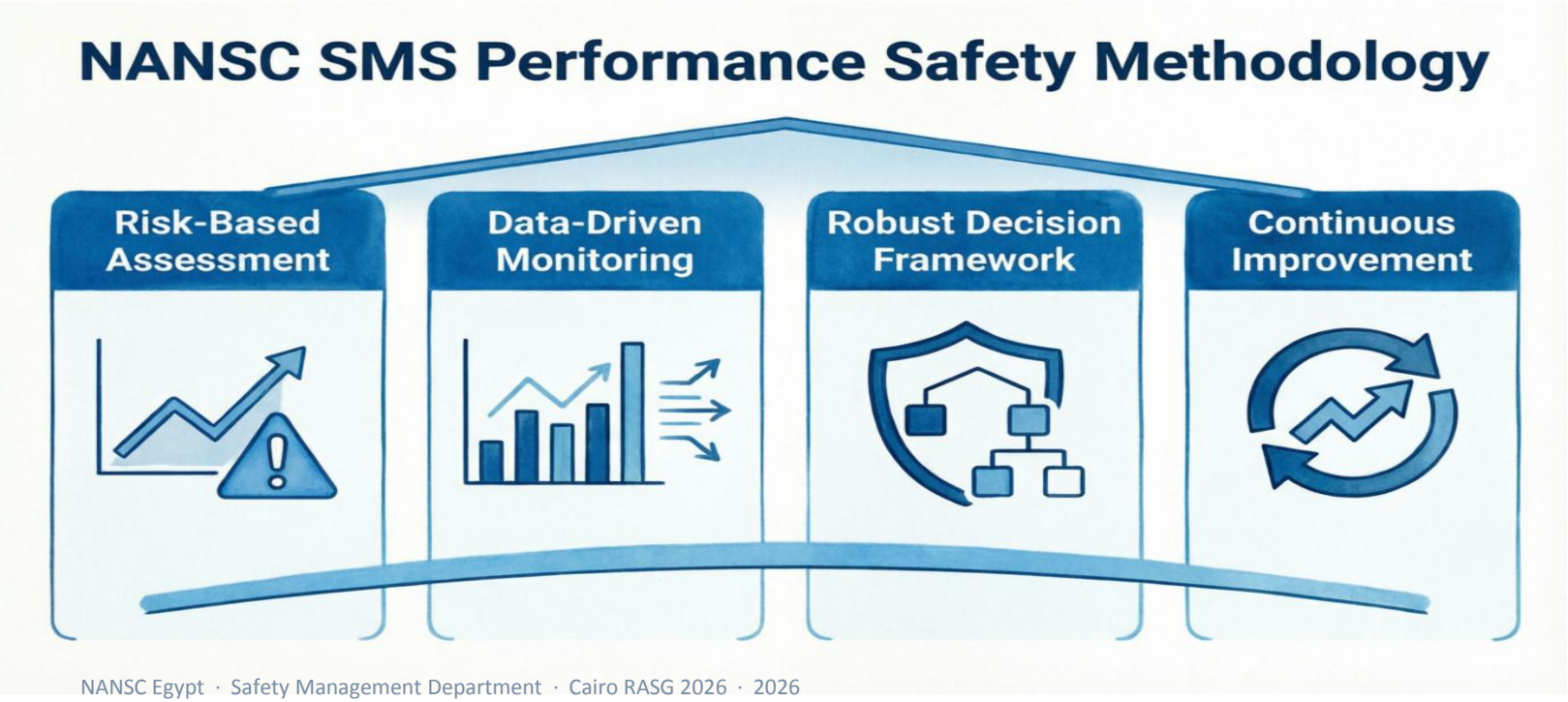
04 **Regional & Global Challenges**

05 **Traffic Growth & Complexity**

06 **Initiatives**

NANSC SMS performance Safety methodology

using the founding principles of a risk-based methodology for robust decision making.
Though a proactive, data-driven framework structured around **four foundational pillars**



NANSC Modernisation — Culture & Core Principles

Embedding the Global Aviation Navigation Plan (GANP) within NANSC's organisational DNA

1 SWIM — System Wide Info Management

Digital information sharing across all aviation stakeholders. Real-time weather, NOTAM, AIM, and flight data via standardised SWIM services. NANSC SWIM node development initiated.

2 TMA — Terminal Management Area

Optimised arrival/departure sequencing at Cairo, Hurghada, Sharm. Continuous Descent Operations (CDO) and Continuous Climb Operations (CCO) for fuel/emissions reduction.

3 Performance-Based Operations (PBO)

Shift from prescriptive to performance-based standards. PBN, RNP-AR approaches, and RNAV routes replace ground-based navaids progressively across Egyptian aerodromes.

4 Trajectory-Based Operations (TBO)

4D trajectory management — predictable flight paths from gate to gate. AMAN/DMAN integration with TBO enables better capacity management in Cairo FIR.

5 Innovation & Digital Transformation

E-NOTAM, digital AIS, remote tower concepts, AI-assisted traffic flow management. NANSC digital road map aligned with ICAO GANP 2025–2030 block upgrades.

6 Safety Culture of Continuous Improvement

Modernisation is not just technical — it demands organisational learning, Just Culture, and leadership commitment. NANSC SRB champions safety culture alongside system capability.

Safety Strategic Objectives & STRATEGIC PRIORITIES

- The aim is to ensure continuous improvement, reduce operational risk exposure, and achieve the ICAO **Global Aviation Safety Plan (GASP)** target of a **50% reduction in high-severity occurrences by 2030**

Review and Governance

- **Monitoring frequency**: Monthly by NANSC SMS Unit; quarterly SRB review.
- **Alert thresholds**: Set of target value; automatic safety review triggered.
- **Data-Driven Approach**
  - **SRB Accountability**: Each SPI assigned to a Responsible Manager (ATS, CNS, MET, AIM, or Safety).
  - **Reporting tools**: Safety Data Management Portal, Feedback Loops.
- **Performance is compared annually against**: Compared annually against ICAO GASP Global Targets (2025–2030) and MID Regional Performance Objectives

NANSC Egypt —Safety, Modernization & Regional Leadership

1. NANSC has evolved from a national ATC provider into a safety-mature organization **aligned** with ICAO, EASA, and FAA frameworks

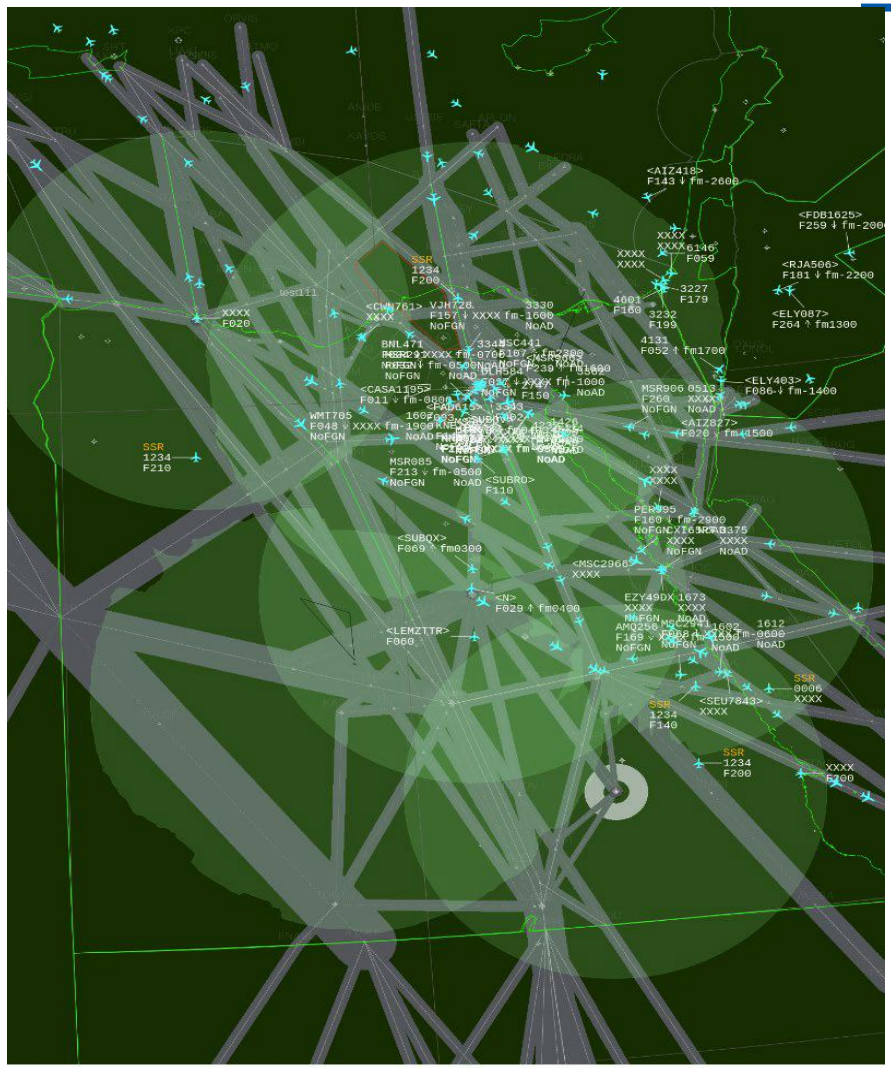
2. The SMS is fully operational — SRB governance, SPIs, hazard registers, and Just Culture form a robust integrated safety system

3. Emerging risks (GNSS, drones, cybersecurity, conflict zones) demand **immediate** dedicated response — not periodic review

4. Modernization (PBN, FRA, SWIM,) must be driven by safety culture, not just technical implementation timelines

5. Human Factors during system transitions remain the highest-probability safety risk requiring continuous investment

6. Egypt and NANSC have a strategic opportunity to lead aviation safety — bridging international standards



ATM Modernization Tools — PBN, Free Route & Dynamic Operations

PBN — Performance-Based Navigation

- RNAV 5 / RNAV 1 published routes across Cairo FIR
- RNP AR approaches at CAI, HRG, SSH, LXR, HBE
- RNAV SIDs/STARs replacing legacy beacon procedures
- Fuel savings estimated 3–5% per flight
- Supports CDO/CCO noise & emissions reduction

Free Route Airspace (FRA)

- Direct routing between defined entry/exit points
- Reduces track miles flown across Cairo FIR
- Coordination with MUAC/EUROCONTROL FRA zones
- Night FRA operations trialled on Sinai overflights
- Capacity increase without additional controller workload

Dynamic Airspace Management

- TSA/TRA real-time activation/deactivation
- Civil-military collaborative airspace planning
- Flexible Use of Airspace (FUA) protocols active
- Conditional Routes (CDR) for peak periods
- Integration with flow management (ATFM)

AMAN / DMAN & ATFM

- Arrival Manager (AMAN) integration planned
- Departure Manager (DMAN) integration planned
- Network-level ATFM coordination with EUROCONTROL and adjacent FIRs
- Pre-departure sequencing to reduce holding
- Ground stop management for capacity events

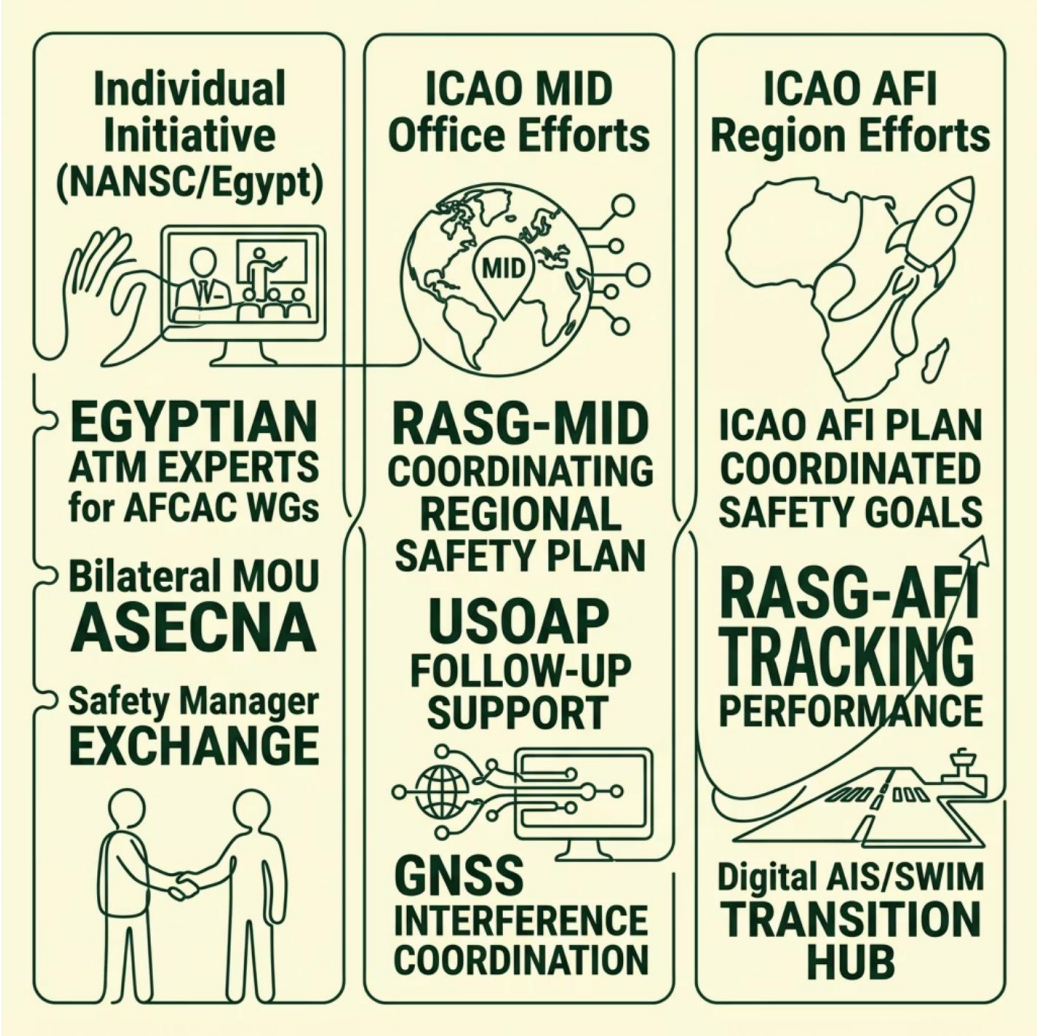
ICAO GANP Blk 1

Implementation Status:
PBN: Operational at major aerodromes. FRA: Night trials completed — full FRA by 2026. AMAN: Cairo ACC live. DMAN: Procurement phase. Dynamic Airspace: Civil-military FUA protocol active.

NANSC — MID Region Linked to Africa through ICAO & Individual Initiative

Egypt occupies a unique geographic position where the **ICAO MID region** (19 states) and **ICAO AFI region** (54 states) converge. NANSC is the only ANSP that bridges both regions operationally — making it the natural connector between Mediterranean safety standards and African capacity-building needs. ICAO MID Office in Cairo amplifies this role.

Vision: NANSC bridges ICAO MID AFI safety frameworks through both institutional cooperation and individual human-to-human professional partnerships.



safety enhancement initiatives (SEIs) policies subject to ECAA comply with global and regional SEIs

Build, maintain, and assure a robust organizational culture that is just, learning, and committed to safety.

TRANSPARENCY

informed on the several initiatives being undertaken to enhance aviation safety, in addition to the progress made towards achieving established goals

Non-Punitive Safety Policy

If it becomes clear that a staff member cannot practice in a reliably safe manner, in spite of education, training and counselling, this situation will be treated as a staff competency issue through normal disciplinary procedures

Fatigue Management Approaches

a **prescriptive** approach that requires the Service Provider to comply with duty time limits defined by the State, while managing fatigue hazards using the SMS processes that are in place for managing safety hazards in general ; and

Safety culture

These core values permeate the enhancement of culture and the realization of ICAO goals on innovation

NANSC foster ICAO Innovation Initiative throw enhance internal coordination and knowledge sharing to assist in the implementation of led activities (have your say / don't prejudge don't criticise)

Simplify and harmonize legalities and procedure through a safety study process and Collaborative Decision-Making process **CDM** principal

Safety framework 2025–2026

CONTINUOUS DEVELOPMENT

- SMS maturity enhancement
- Just Culture expansion
- Voluntary reporting (SHARA / MOC) growth

FRMS IMPLEMENTATION

- Fatigue Risk Management System rollout
- Science-based duty limits
- ATC/CNS roster optimization

GANP INITIATIVES SUPPORT

- FRA – Free Route Airspace
- FUA – Flexible Use of Airspace
- UPR – User Preferred Route (LOSUL, DITAR,..)

SWIM INFORMATION SHARING

- ATM/CDM integration
- Real-time data exchange
- Regional interoperability

Top Operational Safety Risks – NANSC Focus Areas

CRITICAL

CFIT / LOC-I / MAC

Controlled Flight Into Terrain / Loss of Control-Inflight / Mid-Air Collision

HIGH

Runway Excursion & Incursion

Ground movement conflicts and overrun events

HIGH

Bird Strike & Ramp Safety

Wildlife hazards and ground handling incidents

MEDIUM

GNSS Interference & Cybersecurity

Navigation signal jamming and digital threat landscape

MONITOR

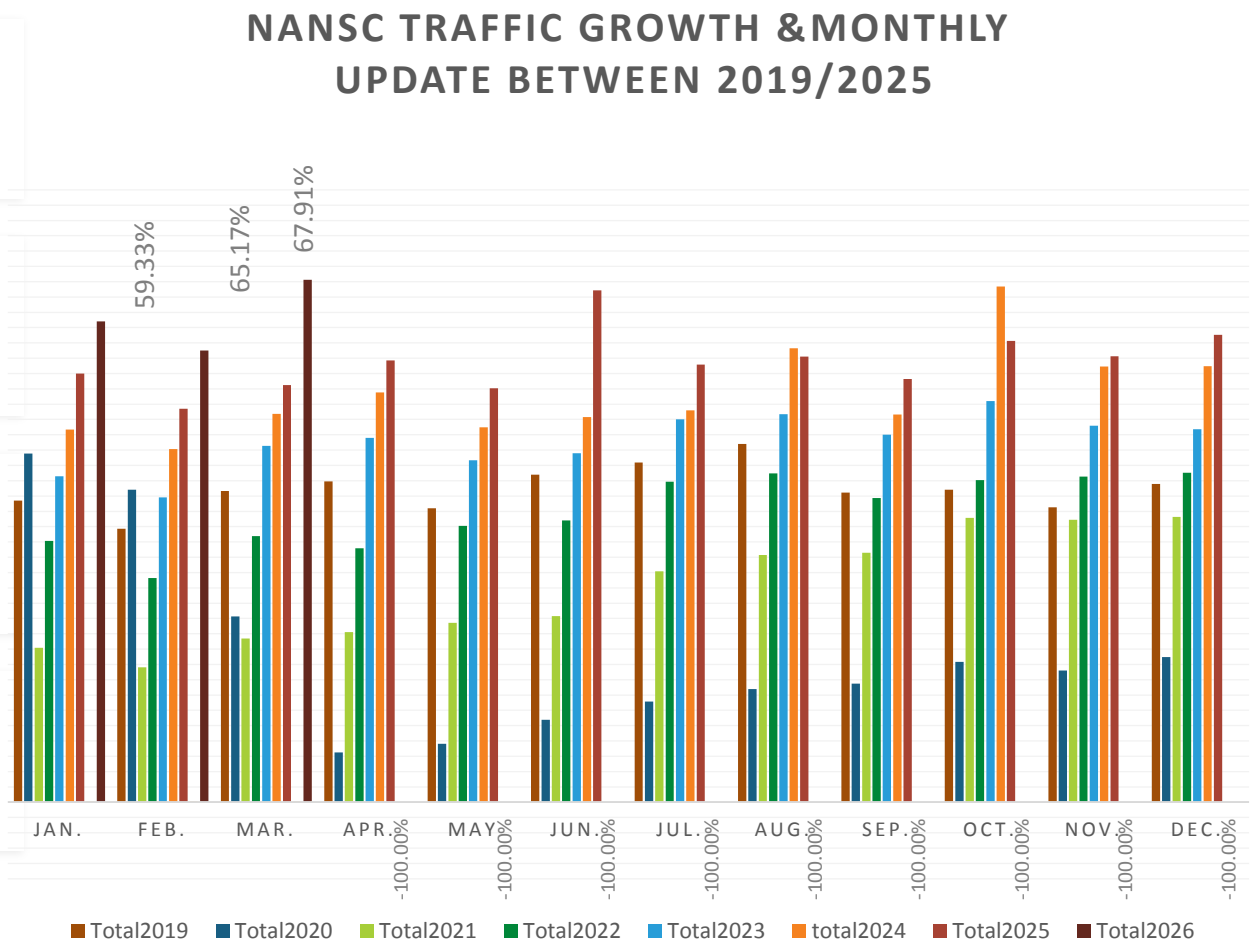
Balloon Operations (Luxor specific)

Low-altitude commercial balloon traffic integration

Each risk area has dedicated SPIs and mitigation action plans

Traffic Growth – Driving Operational Complexity

- Rapid post-COVID traffic recovery
- April 2024: Busiest month on record
- Dynamic sectorization required
- Increasing operational complexity

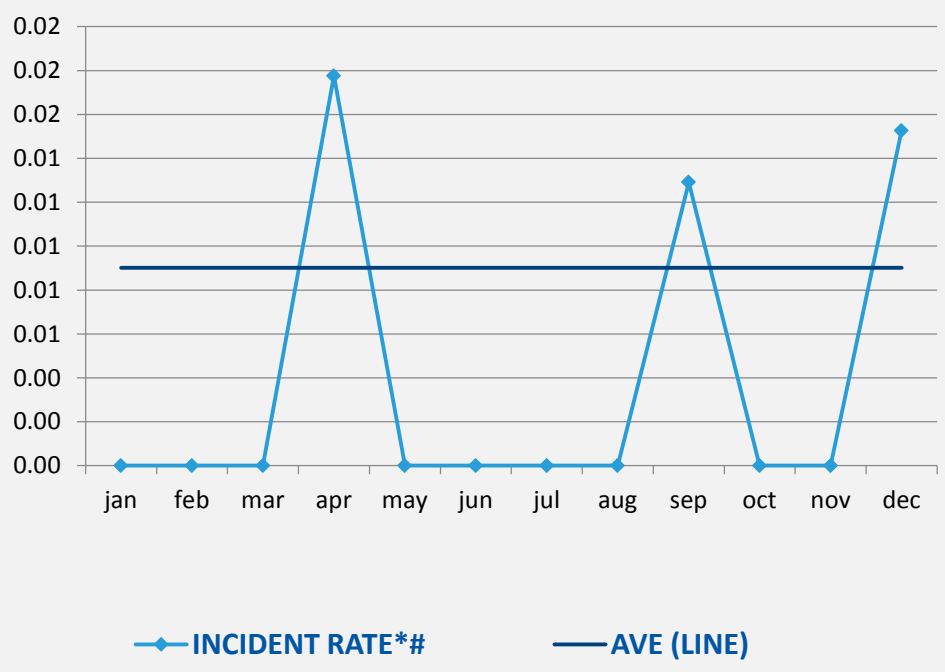


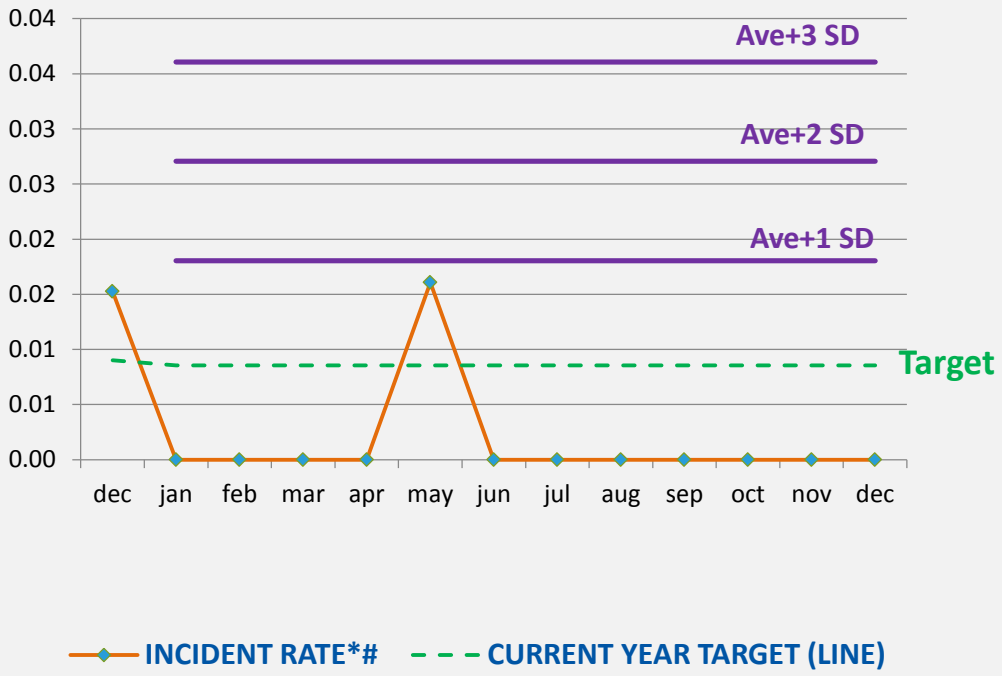
Cairo FIR: ~1.3M km² | 24 Aerodromes | +13% YoY Growth

HIGH

Runway Excursion & Incursion 2024/2025

Ground movement conflicts and overrun events



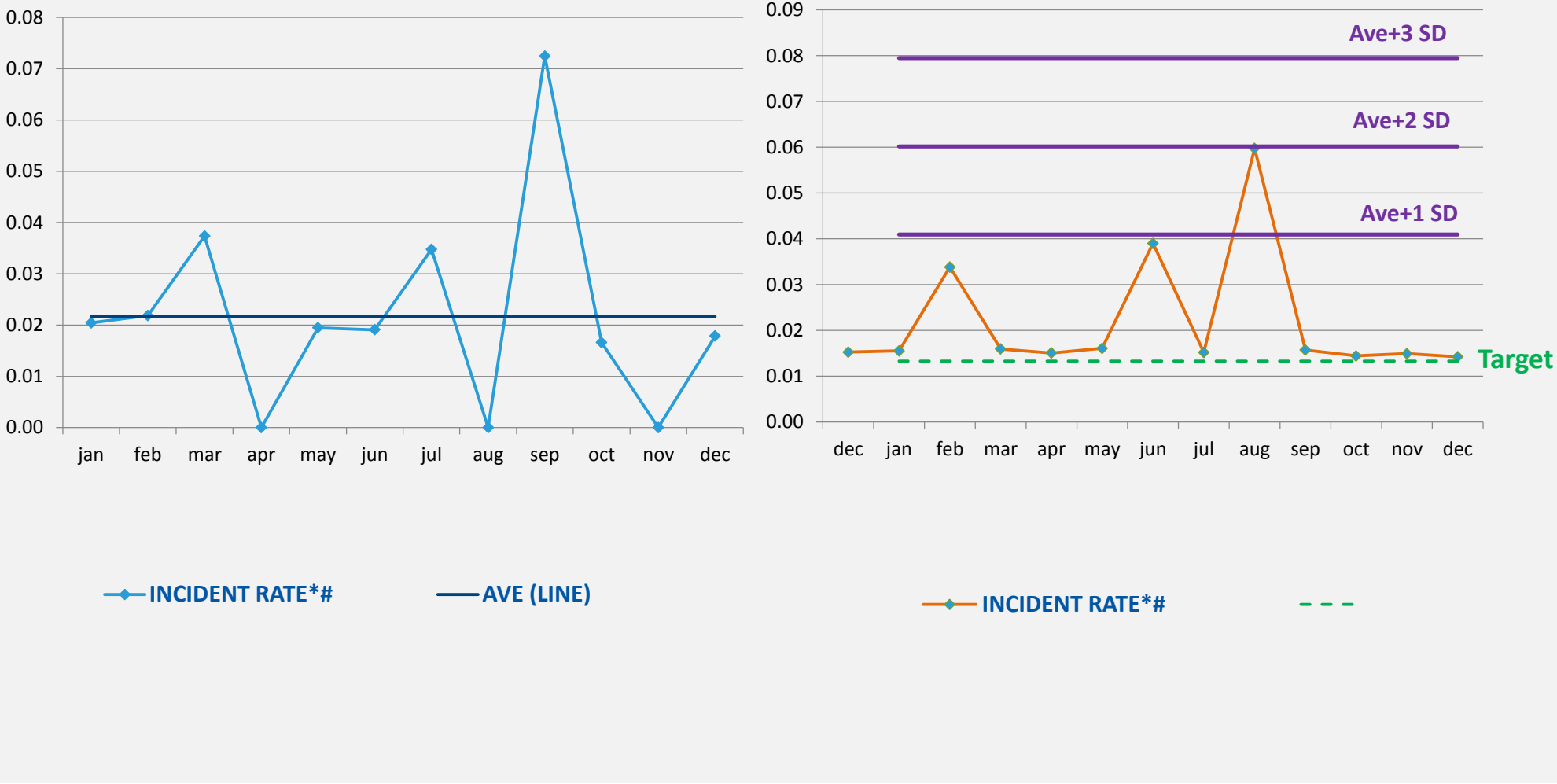


MONITOR

Balloon Operations (Luxor specific)

According to ICAO and EASA Drones to be integrated into the existing aviation system

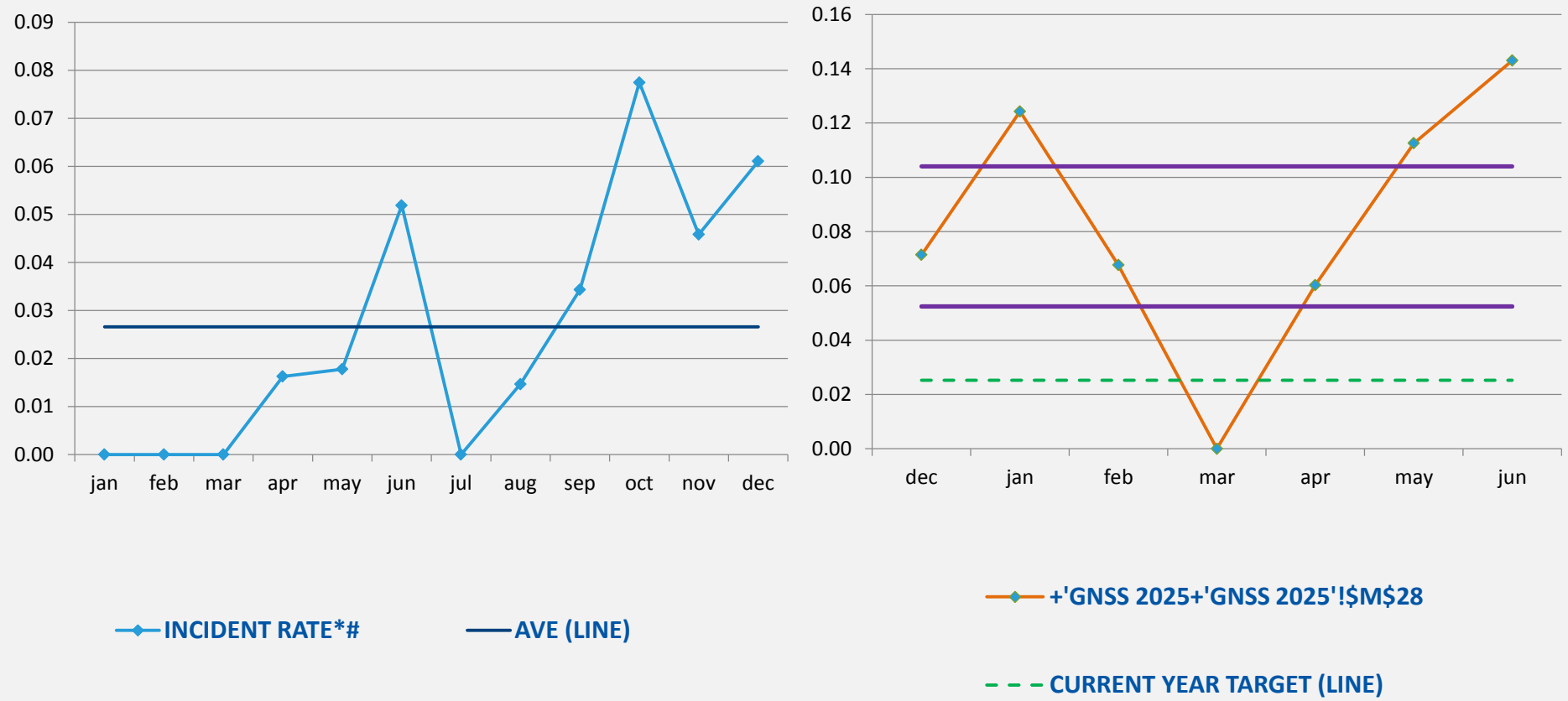
This SPI reflect drones hazards special near to aerodromes may lead to Mid-air collision with civil aircraft



MEDIUM

GNSS Interference & Cybersecurity

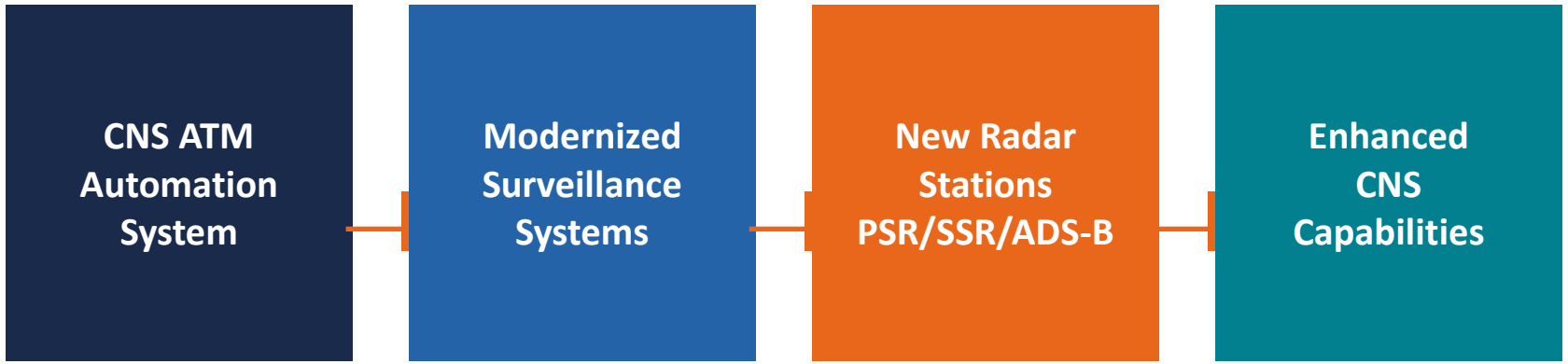
GNSS interference lead to reduction in safety margin Consider **as emerging and security risks** 2024/2025



Note :Number of reporting for GNSS interfering decreased during 2026 due to pilot / ATC familiarization for procedure and awareness

Significant increasing due to operating near to conflict zone issue raised up and monitoring by authority additional studies and control masseur in progress with stakeholders including

Management of Change(MOC) – Major System Modernizations



ATC centers will be fed with data from:

- New PSR (Primary Surveillance Radar) stations
- New SSR (Secondary Surveillance Radar) stations
- ADS-B (Automatic Dependent Surveillance-Broadcast)

Coverage: Full feeding and redundancy increases CNS capabilities

Operational modifications increase risk exposure

→ Additional mitigation measures InProgress

NANSC GANP Initiatives & Modernization

Global Air Navigation Plan (GANP)

Achieving progress in Free Route Airspace (FRA), Flexible Use of Airspace (FUA), and User Preferred Routes (UPR) implementation.

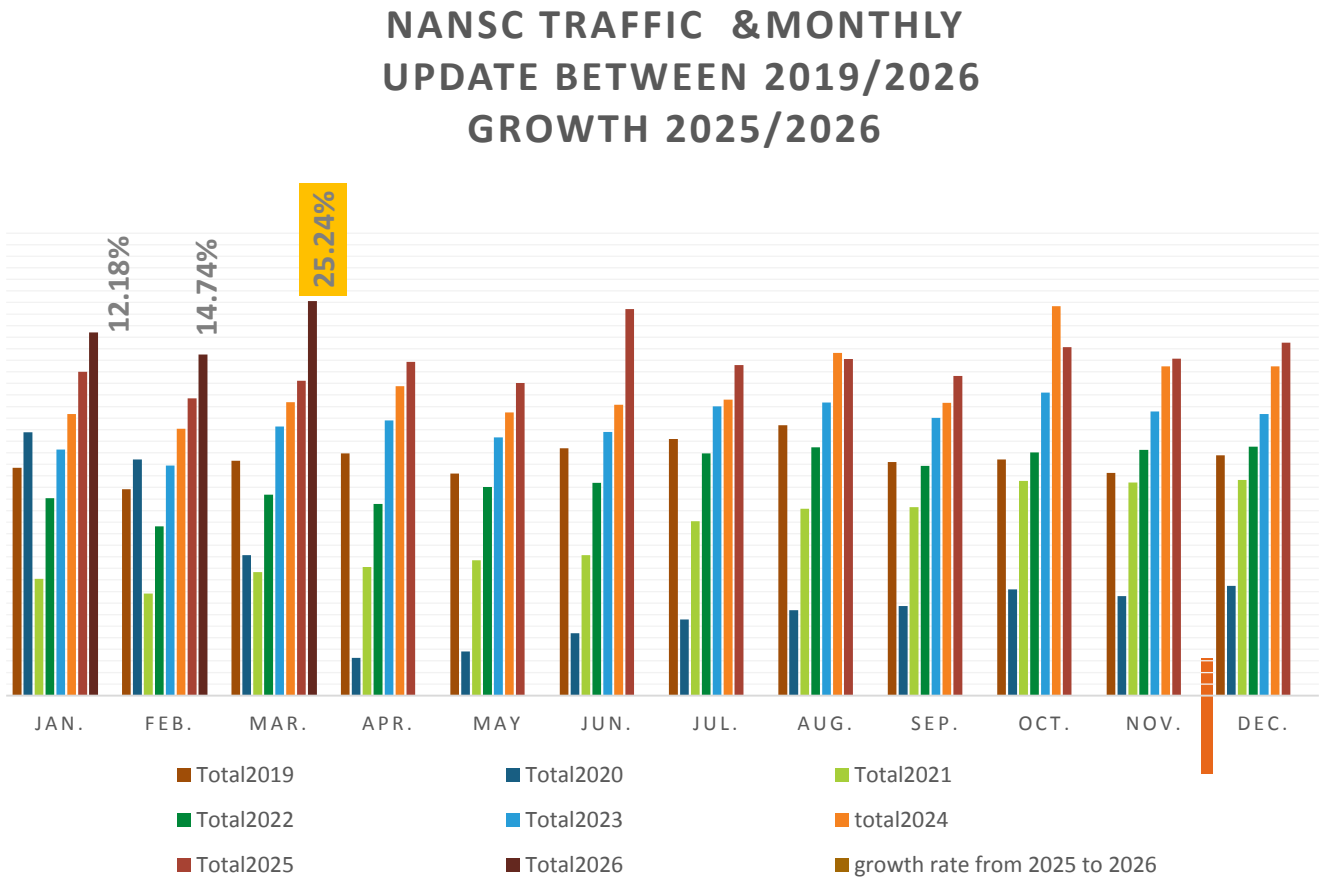
SWIM Information Sharing

Advancing ATM/CDM through System Wide Information Management (SWIM) for real-time data exchange(Jeddah , Athens , Nicosia , Amaan)

Regional Interoperability

Ensuring seamless coordination and data synchronization with MID region ANSPs to enhance safety and efficiency.

SPI Monitoring – Traffic Growth Trends



Key SPIs Tracked

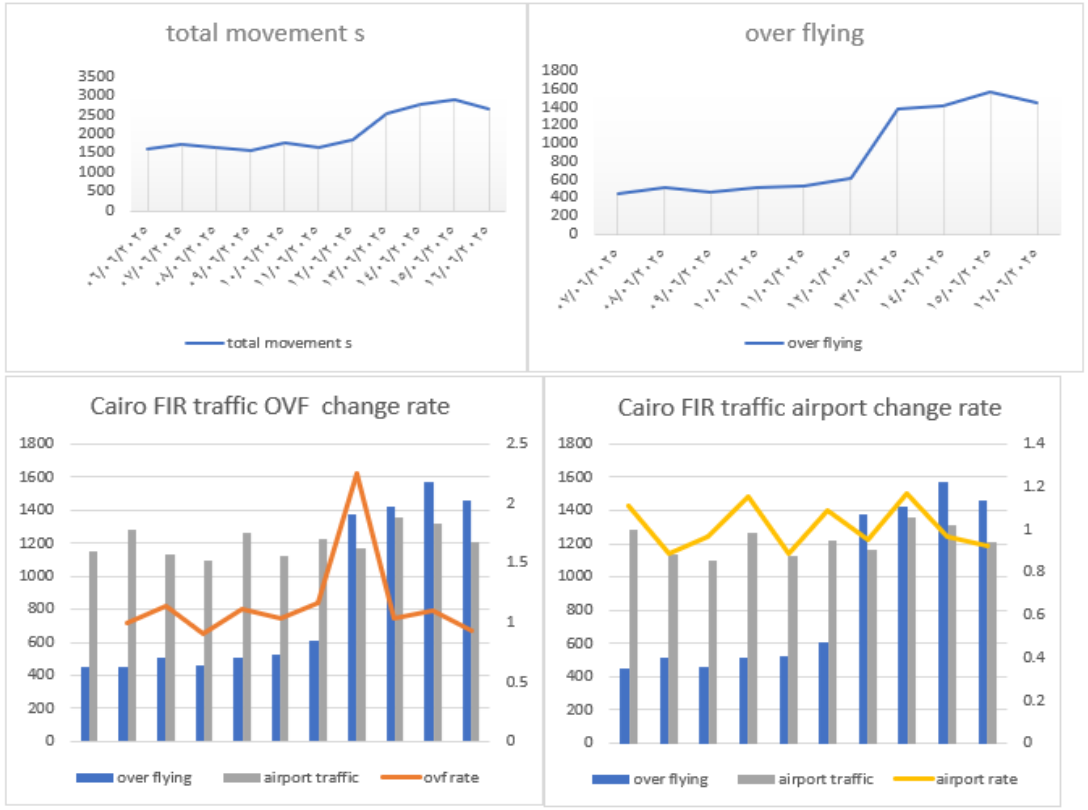
To following up significant expanding due to regional risk exposure

SPI-TR-: Sector complexity index

SPI-TR-0: Dynamic sectorization triggers

Traffic growth directly impacts: ATC workload | Frequency congestion | Separation minima

SPI Monitoring – Traffic Growth Trends 2025



traffic significant volume change closure within CAIRO FIR form 07 to 16 /6**/2025** due to

Day sample by NOTAMs :Friday 13 June 2025

A0569/25 Tel Aviv FIR CLSD TO ALL FLT EXC INTL FLT DEP WB/NB ONLY OR PPR FLT FM NOTAM OFFICE.
A0122/25 DAMASCUS FIR CLSD DUE TO OPS REASONS
A0122/25 BEIRUT AIRSPACE CLOSED DUE TO OPERATIONAL REASONS.
A0265/25 JORDAN AIRSPACE CLSD DUE TO OPSE
A0371/25 BAGHDAD FIR CLSD DUE TO OPS

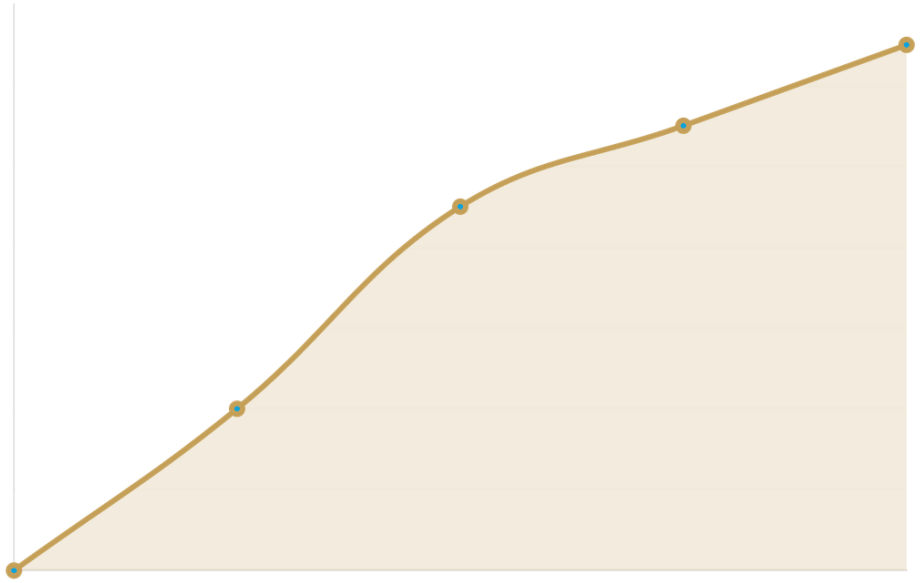
controlled 12/2025

SAFETY confidential data

Traffic growth directly impacts: ATC workload | Frequency congestion | Separation minima

Operational Complexity & Growth

Traffic Growth Trend (SPI-2024/2025)



+13% YoY

Increase in Air Traffic Volume (2024-2025)

System Modernization

Upgrading CNS/ATM automation systems and deploying new PSR/SSR/ADS-B stations to handle increased complexity.

Operation near to conflict zone

CNS\ATM degradations (GNS interfering , spoofing , RFI,..)Special coordination's .

Management of Change (MOC)

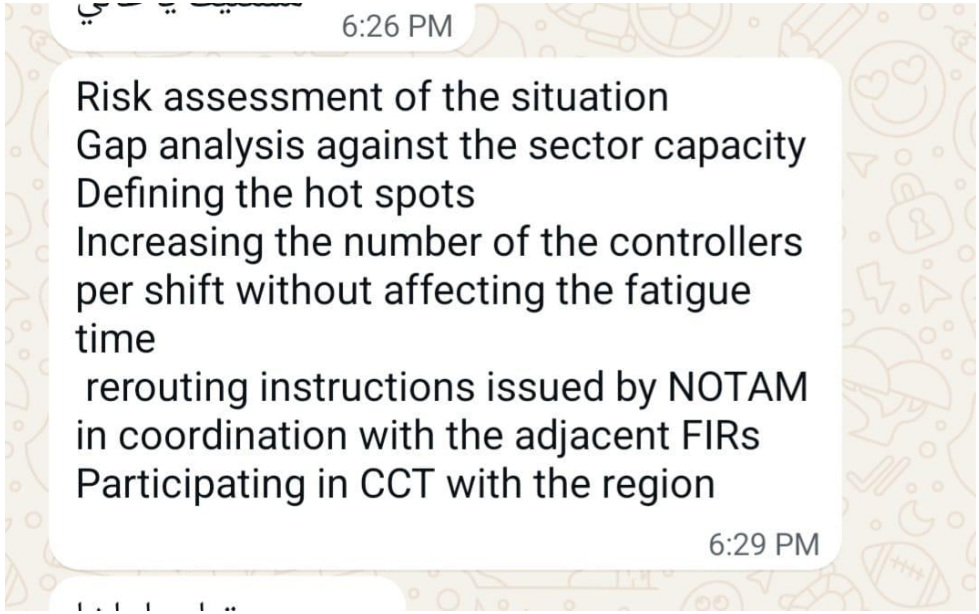
Robust MOC protocols ensuring safe transitions during technical upgrades and infrastructure expansions.

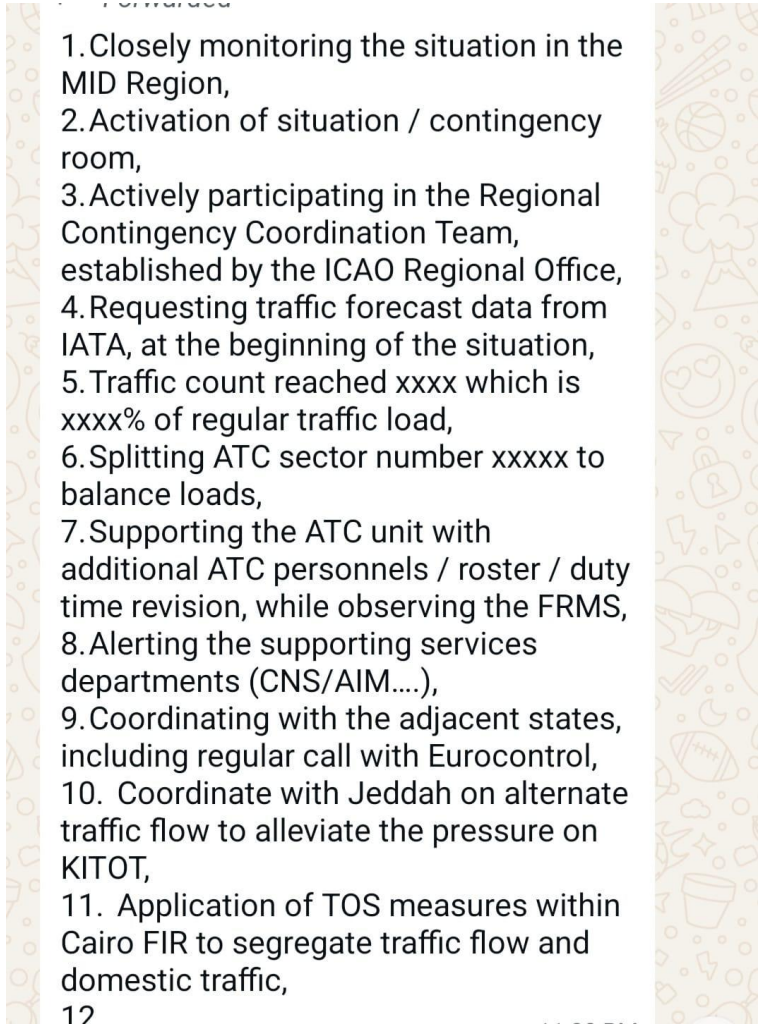
Future-Ready Infrastructure

Evaluating SWIM solutions and advanced automation to support long-term regional interoperability.

Safety communication external & eternal

Contingency Coordination Team (**CCT**). Conflict facilitate crises and unusual situation situations





SMS effectiveness and ECAA follow up performance based

Agreed targets based on safety data

Organizational SPIs (provided 2 times a year , first at July 2025 for preceding months / second at Jan 2026 for preceding months)	JAN	FEB	MAR	APR	MAY	JUN	JUL	Total 2025	Trend
SMS effectiveness									
➢ **Management commitment**									
Number of management meetings dedicated to safety	1	0	0	2	3	5	2	13	
➢ **Reporting/ Safety Awareness**									
Number of received safety reports	1	2	4	2	6	4	1	20	
No. of closed reports	1	2	4	2	5	4		18	
Avrg Ratio between closed and received Safety reports	100%	1	1	1	0.833333	1	0	0.9	
➢ **Hazard Identification**									
Number of new hazards identified through the internal reporting system	1	1	2	2	6	5	2	19	
➢ **Risk Controls**									
Number of new risk controls (effective mitigations upgraded into new controls)	1	0	0	2	3	2	1	9	
➢ **Management of Change (MOC)**									
Number of organizational changes	1	1	3	2	3	2	0	12	
Number of changes to Standard Operating Procedures (SOPs)	1	1	2	1	4	2	3	14	
Number of technical changes (e.g., new equipment, new facilities, new hardware)	0	1	2	1	5	1	0	10	
➢ **Safety promotion**									
Number of established internal safety communications	1	1	1	3	5	1	1	13	
Number of safety meetings with operational personnel	4	2	2	3	5	6	2	24	
Number of required trained personnel (SMS)	40	0	0	0	0	0	20	60	
Number of actual trained personnel (SMS)	0	10	10	10	0	0	20	50	
Ratio between required and actual trained	0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1	0.83333333	

Safety Performance Indicators (SPI) Dashboard and Target

The aim is to ensure continuous improvement, reduce operational risk exposure, and achieve the ICAO **Global Aviation Safety Plan (GASP)** target of a **50% reduction in high-severity occurrences by 2030**

SPI-1

Traffic Growth

+13% YoY

SPI-

Runway Safety

ZERO

Runway Incursions (2024-2025)

Target: 0 | Status: Achieved

SPI-

FRMS Rollout

ACTIVE

System-perspective Implementation

Science-based duty limits operational

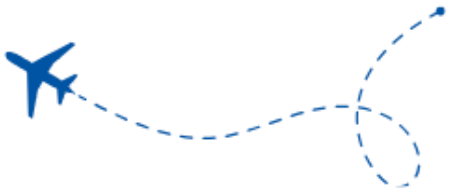
SPI-

Training Completion

100%

Safety Critical Personnel

Enhancing Aviation Safety Operations



Enhancing Aviation Safety Operations

Harmonization

Streamlining safety protocols across all aviation safety operations to ensure consistency and efficiency.

Safety Culture

Continuous expansion of the "Just Culture" framework, fostering an environment of trust and accountability.

Reporting Growth

SHARA and TAGEER systems showing significant increases in proactive safety data submission and analysis.

Safety Performance & Risk Management policy

Continuous Improvement

Ongoing refinement of safety performance metrics and monitoring capabilities to ensure the highest standards of operational excellence.

Regional Risk Approach

Implementation of performance- and risk-based safety strategies across the MID region, aligning with international best practices.

Proactive Risk Mitigation

Advanced identification and management of operational hazards through data-driven analysis and predictive modeling.

Human Factors: FRMS Implementation

FRMS Rollout

Comprehensive implementation of the Fatigue Risk Management System across all operational units to enhance safety margins.

competency Duty Limits

Transitioning to duty limits grounded in fatigue, and actual operational data.

Operational Readiness

Optimizing staff performance and alertness through proactive fatigue mitigation and reporting strategies.

SPI

Active Monitoring & Rollout Status

Safety balanced Personnel Coverage

Technical Resilience & Specialized Operations

GNSS & Cybersecurity

Real-time monitoring via CNS networks to mitigate GNSS interference risks. Implementation of robust cybersecurity protocols to protect critical ATM infrastructure.

MID GNSS Tasking

Active participation in regional reporting and monitoring initiatives. Ensuring data integrity and availability across the Middle East region.

Balloon Operations (Luxor)

Specialized safety procedures and time/airspace segregation for unique aerial activities. Dedicated monitoring to ensure safe integration with commercial traffic.

Advanced CNS/ATM infrastructure supporting specialized regional operations.

CYBERSECURITY IN ATM

Cybersecurity — ATM Systems & NANSC Digital Infrastructure

Attack Surface — ATM Systems

SWIM data exchange, AMAN/DMAN, CPDLC datalink, ADS-B surveillance, and online NOTAM systems all create exploitable entry points. A single system compromise can cascade across multiple safety functions.

ICAO Cybersecurity Framework

ICAO Assembly Resolution A40-10 and Doc 10099 (Aviation Cybersecurity Strategy) **mandate state-level aviation** cybersecurity strategies. NANSC must align with ECAA national framework.

Identified Vulnerabilities

ADS-B spoofing (unencrypted broadcast). GNSS jamming overlap with cyber. Legacy CNS systems without firmware updates. Remote access protocols for maintenance.

Mitigation Framework

- Network segmentation — ATM systems isolated
- Incident response plan (IRP) for ATM cyber events
- Staff cybersecurity awareness training

Regulatory Alignment

- ICAO Doc 10099 Aviation Cybersecurity Strategy
- EASA NIS Directive alignment (Network & Info Security)
- FAA Order JO 1370.117 — Cybersecurity Risk Mgmt
- ECAA national cybersecurity policy for ANSPs

Priority Action:

NANSC does not yet have a dedicated ATM cybersecurity SPI. Recommendation: establish Cyber-Safety SPI framework by during new system deployment , integrate into SRB agenda, and appoint a Cybersecurity Safety Focal Point.

Key Operational Safety Priorities 2026

CFIT / LOC-I / MAC Prevention

Focused mitigation strategies for Controlled Flight Into Terrain, Loss of Control-Inflight, and Mid-Air Collisions through advanced monitoring.

Runway Safety Excellence

Maintaining a Zero Runway Incursion (RI) trend for 2024-2025. Active Runway Safety Teams (RST) at key airports:

- Cairo (CAI) & Hurghada (HRG)
- Sharm El Sheikh (SSH) & Luxor (LXR)

Specialized Operations

Dedicated safety procedures for Luxor Balloon Operations, including strict time and airspace segregation to ensure multi-modal safety.

Thank You

شكراً | Thank You

Safety Rooted in Heritage, Soaring into Tomorrow

CONTACT	RESOURCES	FOLLOW UP
Khaled.sharkawi@nansceg.net www.nansc.gov.eg	SPI Dashboard SMS reports	NANSC web