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الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

ATM SG/11 & CNS SG/14 MEETINGS

19-23 Oct. 2025 Abu Dhabi, UAE

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

A UN SPECIALIZED AGENCY

MIDANPIRG Communication, Navigation and Surveillance Sub-Group Fourteenth Meeting

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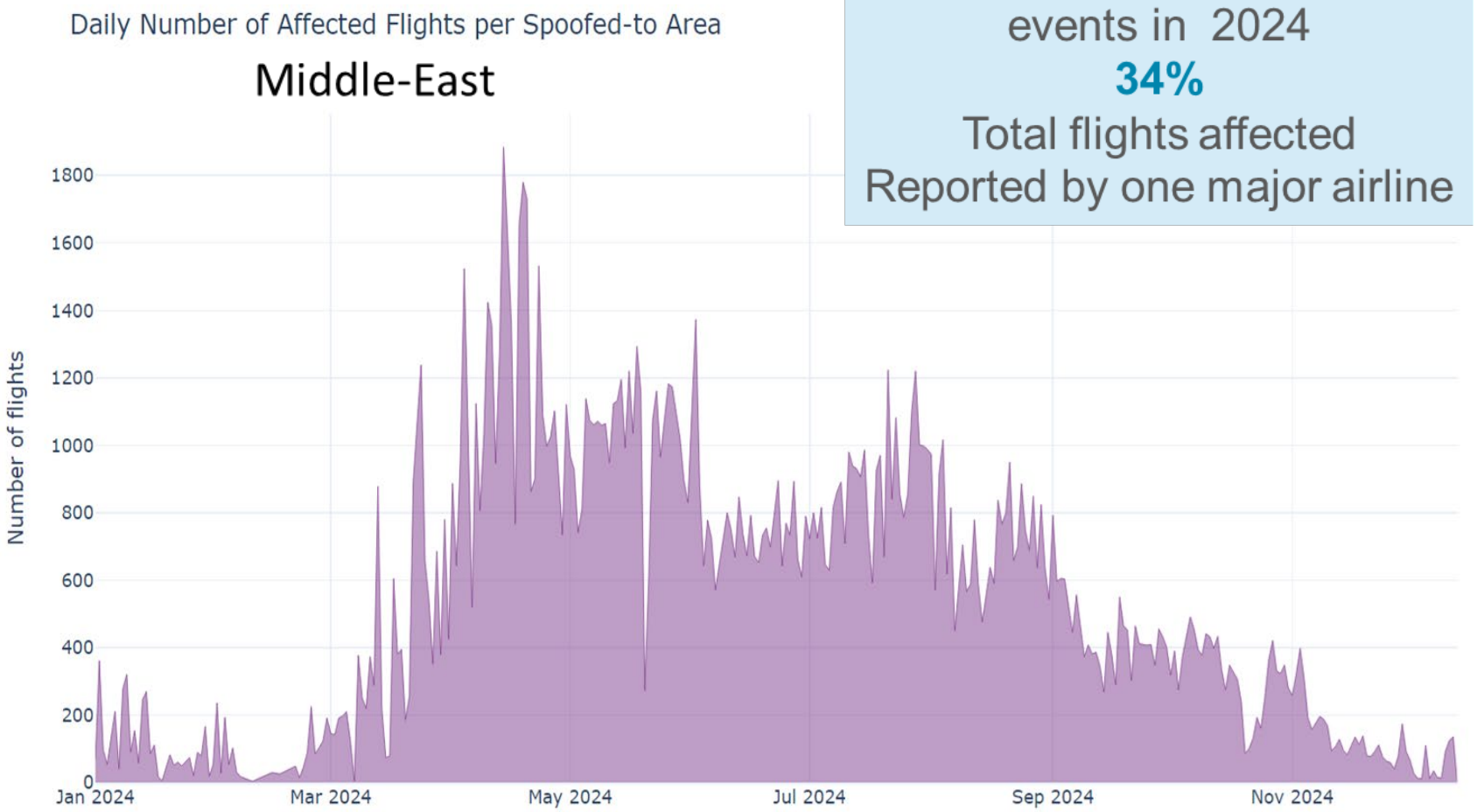
GNSS RFI: MID REGION APPROACH



15000+
events in 2024
34%
Total flights affected
Reported by one major airline

Ref: ICCAIA (Airbus) – skai data services
EUR/MID WRC-27 (World Radiocommunication Conference 2027) Workshop (Paris, France, 06-07 October 2025)

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MIDANPIRG/22 – RASG/12 CONCLUSION

PIRG/RASG Conclusion 2: Consolidated Regional Approach to GNSS RFI Management

That, a consolidated regional approach for the management of GNSS RFI be established with the following actions:

a) States be urged to:

- *i. Support the establishment of regional GNSS RFI monitoring and reporting mechanisms through the appropriate MID regional frameworks;*
- ***ii. maintain an adequate network of conventional navigation aids to ensure continuity of air navigation services in case of GNSS signal degradation;***
- *iii. strengthen civil-military coordination and ensure timely sharing of information related to intentional GNSS interference;*
- *iv. define reversion scenarios and associated contingency procedures to maintain safe and efficient operations in the event of GNSS unavailability.*

b) ICAO MID Office be requested to:

- *i. coordinate the development of the regional GNSS RFI management framework and potential reporting mechanism;*
- *ii. support States through regional capacity building and awareness activities on GNSS interference detection and mitigation;*

MIDANPIRG/22 – RASG/12 CONCLUSION

PIRG/RASG Conclusion 4: Capacity Building on GNSS RFI

That, ICAO, in collaboration with ICAO partners, organize a Regional Capacity Building event on GNSS Interference during 2025.

MIDANPIRG DECISION 22/20: MID NAV-MON ACTION GROUP

That,

a) NAV-MON Action Group be established to develop a proposal for a Regional Navigational Minimum Operational Network supporting the ANS operations;

b) the terms of reference of the NAV-MON Action Group be developed during the first meeting of the Action Group; and

c) States support the NAV-MON Action Group through the assignment of CNS and ANS Subject matter experts and sharing states' experience and provision of required data for developing the MID NAV-MON Network.

General Industry Approach to GNSS Interference

Short Term	Medium Term	Longer Term
• Update technical information regarding expected aircraft effects and recommended procedures • (Automatically) Report and analyze GNSS interference events • Continued airworthiness assessments – aircraft and operational impacts • Promote awareness of GNSS spoofing areas • Update Surveillance systems (e.g. Terrain avoidance systems) • Address Data-Link availability issues	• Update navigation systems to detect, report and reliably recover from spoofing • Study & standardize mitigation technologies (e.g.): ✓ Adaptive GNSS antenna systems, i.e. Controlled Reception Patten Antennas (CRPA) ✓ Signal authentication methods (cryptographic)	• Deploy more advanced mitigation technologies ✓ Introduce GNSS signal authentication ✓ Adaptive Antennas • Robust time reference that is independent from GNSS for applications requiring time synchronization (e.g. Datalink) • Complementary P.N.T. development to support PBN operations without GNSS

Work at **ICAO** with IATA, Airframe Manufacturers, Air Navigation Service Providers, Air Traffic Controllers, Airlines Pilots Associations on **technical and operational recommendations**

Ref: ICCAIA
EUR/MID WRC-27 (World Radiocommunication Conference 2027) Workshop (Paris, France, 06-07 October 2025)

GNSS Vulnerabilities and Resilience: Outcomes of the ICAO Assembly A42

Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives.

- It reflects the Assembly's recognition that GNSS interference (RFI) has become a major global safety risk and must be addressed through a coordinated, multi-layered ICAO strategy.

GNSS Vulnerabilities and Resilience: Outcomes of the ICAO Assembly A42

Identified Risks

- The Commission **reviewed A42-WP/34** (presented by the ICAO Council), highlighting:
  - Rising global occurrences of **GNSS radio frequency interference (RFI)**.
  - **Safety implications**, since GNSS RFI has contributed to *three global high-risk categories of occurrence*.
- ICAO proposed a **roadmap** with:
  - Short-term mitigation (incident reporting, monitoring).
  - Long-term resilience (alternative navigation and time sources).
- **States and stakeholders were urged** to support ICAO's ongoing work, including the validation and deployment of an **iPack for GNSS RFI mitigation**.
- **Reporting procedure:** States should now report unresolved GNSS interference incidents to their **accredited ICAO Regional Office**, in addition to following **ITU Radio Regulations** channels.

Standardization and Technological Mitigation

- The Commission reviewed **industry and State contributions** (A42-WP/108, A42-WP/204):
  - Need for ICAO to **standardize RFI mitigation solutions** such as:
    - **Complementary Position, Navigation and Timing (C-PNT)**,
    - **Signal authentication** for core constellations and augmentations,
    - **Performance standards** for time synchronization across airborne and ground systems.
- ICAO was asked to **coordinate with standards-making organizations** (e.g., RTCA, EUROCAE) and **encourage industry** to accelerate implementation of these solutions.

Operational Monitoring and Reporting

- A new concept, **Digital Operational Reporting Information Service (DORIS)**, is being developed to replace NOTAMs for:
  - Real-time reporting and dissemination of GNSS interference events.
- ICAO noted that **existing phraseology** in *PANS-ATM (Doc 4444)* is not exhaustive; pilots and controllers should use **plain language** if necessary.
- Work is underway to **update phraseology and reporting standards**.
- ICAO supported a **multi-layered approach**, emphasizing real-time monitoring, adaptable mitigation, and a comprehensive **CNS/ATM resilience review framework**.

GNSS Vulnerabilities and Resilience: Outcomes of the ICAO Assembly A42

Ground-Based Resilience and Regional Coordination

- The Commission emphasized the **need for resilient ground-based infrastructure** to complement GNSS:
  - States should integrate **conventional CNS systems (e.g., DME/VOR/ILS)** into resilience strategies.
  - ICAO expert groups are developing **provisions for the Resilient Navigation Operational Network (NAV RON)** to optimize existing infrastructure and define a "**sufficient NAV network**".
  - Capacity-building will support States in implementing these resilient networks.

Assembly Outcome: Resolution 24/3

A new **Assembly Resolution 24/3** was adopted, titled:

“Consolidated statement of continuing ICAO policies and practices related to a global air traffic management (ATM) system and CNS/ATM systems.”

Appendix C : Ensuring the resilience of ICAO CNS/ATM systems and services

GNSS Vulnerabilities and Resilience: Outcomes of the ICAO Assembly A42

Appendix C : Ensuring the resilience of ICAO CNS/ATM systems and services

Key directives include:

1. **Encourage States** to transition toward *optimized, secure, and resilient CNS systems* integrating both satellite- and ground-based infrastructures.
2. **Encourage industry and standards bodies** to develop onboard and ground interference detection and reporting capabilities.
3. **Maintain resilient terrestrial CNS** as backup for satellite services.
4. **Develop ICAO principles** for integration of ground, space, and onboard systems for **resilient PNT**.

GNSS Vulnerabilities and Resilience: Outcomes of the ICAO Assembly A42

Appendix C : Ensuring the resilience of ICAO CNS/ATM systems and services

Key directives include:

5. **Collaborate** with standards bodies to advance complementary PNT solutions.

6. **Establish a global CNS/ATM resilience review framework**.

7–11. **Urge States** to:

- Prevent the use or sale of **illegal jammers or spoofers**;
- Strengthen **civil-military coordination** on spectrum use;
- **Avoid intentional jamming/spoofing** affecting civil aviation;
- Notify **ANSPs** in advance of military operations potentially causing interference;
- Assess **conflict-zone interference risks** beyond national borders.

GNSS Vulnerabilities and Resilience: Outcomes of the ICAO Assembly A42

Strategic Takeaways

- ICAO now treats **GNSS interference** as a **systemic safety and resilience priority**, not just a technical anomaly.
- The adopted approach is **multi-layered**, combining:
  - **Technical** (C-PNT, authentication, RON/DFMC),
  - **Operational** (real-time reporting, phraseology, DORIS),
  - **Regulatory** (standardization, State responsibility, ITU coordination),
  - **Strategic** (Assembly Resolution 24/3 under continuous monitoring by the Council).

Action by the Meeting : Considering the PPT updates and the endorsed Conclusions

PIRG/RASG Conclusion 4: Capacity Building on GNSS RFI

That, ICAO, in collaboration with ICAO partners, organize a Regional Capacity Building event on GNSS Interference during 2025.

Confirmed : Doha, Qatar from 18- 20 November 2025

MIDANPIRG DECISION 22/20: MID NAV-MON ACTION GROUP

That,

a) NAV-MON Action Group be established to develop a proposal for a Regional Navigational Minimum Operational Network supporting the ANS operations;

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The Action Group way forward ?

Action by the meeting:

The meeting is invited to:

1. **Take note** of the ICAO Assembly A42 outcomes on GNSS vulnerabilities and resilience, including the introduction of the **Resilient Navigation Operational Network (NAV RON)** concept to strengthen CNS/ATM system robustness;

2. **Recognize** that **NAV RON** evolves from the **NAV MON** approach by integrating ground- and space-based systems to ensure service continuity in case of GNSS degradation;

3. **Invite the MID NAV-MON Action Group**, in coordination with the **FM WG** and relevant stakeholders, to adapt the global **NAV RON** principles to the MID Region and propose a regional implementation framework;

4. **Encourage States** to contribute operational data, maintain conventional navigation aids as part of the resilience strategy, and coordinate with national authorities to protect navigation spectrum; and

5. **Request ICAO MID Office** to coordinate activities, support capacity-building on GNSS RFI mitigation and **NAV RON** planning, and report progress to **MIDANPIRG/23**.

Thank You

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