International Civil Aviation Organization

MIDANPIRG/21 & RASG-MID/11 Meetings

(Abu Dhabi, UAE, 4 – 8 March 2024)

Agenda Item 5.3: ANS (AIM, PBN, AGA-AOP, ATM-SAR, CNS and MET

GNSS ANOMALIES (JAMMING AND SPOOFING REPORTS IN THE MID REGION

(Presented by the Secretariat)

SUMMARY

The Global Navigation Satellite System (GNSS) is a critical component of Air Traffic Management (ATM) operations and flights. However, GNSS is vulnerable to a variety of factors, including intentional and unintentional interference, space weather events, and other technical issues. These vulnerabilities can have serious consequences for ATM operations, including loss of situational awareness, navigation errors, disruption of critical ATM functions, delays and diversion/cancellations of flights.

Given the increasing threat of GNSS vulnerabilities in the Middle East, it is imperative for all MID States to develop solutions to mitigate this risk. Finding a mechanism to overcome these vulnerabilities is essential to ensure the continued safe and reliable use of GNSS in air traffic management.

Action by the meeting is at paragraph 3.

REFERENCE(S)

- ICAO DOC. 9613 4TH. EDITION
- ICAO ANNEX 11 15TH. EDITION
- ICAO ANNEX 10 - VOLUME I - 7TH. EDITION
- ICAO DOC. 9849 3RD. EDITION
- RSA 14 – APRIL 2019
- ATM SG/9 MEETING REPORT; SHARM EL SHEIKH, EGYPT, 14 – 16 NOVEMBER 2023)

1. INTRODUCTION

1.1 Global Navigation Satellite System (GNSS) signals vulnerability is a global challenge, affecting the Middle East region in particular more than any other ICAO regions. To address this challenge, concerted efforts are required from all stakeholders with the interest to safety of flights. It is necessary to develop mechanisms to reduce the impact of GNSS signals vulnerability and to mitigate its effects, where it occurs.

1.2 The Global Navigation Satellite System (GNSS) is a critical component of Air Traffic Management (ATM) operations. GNSS provides precise positioning, navigation, and timing information to aircraft, which is used for a variety of purposes, including:

a) Flight planning and navigation,
b) Surveillance and separation,
c) A-GPWS and situation awareness,
d) Arrival and departure procedures, and
e) RVSM Monitoring through ADS-B.

1.3 GNSS has proven its benefits for ATM safety and efficiency. However, its low signal strength makes it vulnerable to interference and other factors have the potential to affect multiple aircraft at the same time over a wide area.

2. DISCUSSION

2.1 GNSS vulnerabilities can be caused by a variety of factors, including:

a) Intentional interference, such as jamming and spoofing, which can be used to disrupt or manipulate GNSS signals;

b) Unintentional interference, such as from radio frequency (RF) emissions from other devices and systems such as terrestrial radio and television transmitters;

c) Space weather events, such as solar flares, Coronal Mass Ejection (CME), Solar storm, magneto storm, etc…., which can generate electromagnetic interference that can disrupt GNSS signals; or

d) Technical issues, such as satellite failures and equipment malfunctions.

2.2 The impact of GNSS vulnerabilities on ATM operations can range from minor disruptions to major incidents. For example, GNSS vulnerabilities can have serious consequences for ATM operations, including:

a) Loss of situational awareness for pilots and air traffic controllers,
b) Navigation errors that can lead to aircraft deviations, penetrating reserved or restricted areas,
c) Disruption of critical ATM functions, such as surveillance, which provides separation, and
d) Delays and diversions/cancellations of flights.

2.3 In addition to the safety risks, GNSS vulnerabilities can also have a significant impact on ATM efficiency. For example, if aircraft are unable to use GNSS for navigation, controllers may need to use more conservative separation standards, which can reduce the number of aircraft that can operate in a given airspace, i.e. impacting the airspace/ATC sector capacity.

2.4 The requirement to rely on terrestrial navigational aids to comply with RNAV specifications has re-emerged. States have studied the feasibility of using terrestrial navigational aids to support RNAV5 and RNAV1 specifications during the En-route and terminal maneuvering area (TMA) phases of flight (using VOR/DME, DME/DME, and DME/DME/IRU sensors). Terrestrial approach aids will remain the primary and backup sources for RNAV approaches.

2.5 The RASG-MID/6 meeting (Bahrain, 26 – 28 September 2017) agreed that IATA and ICAO MID Office should develop Regional Safety Advisory (RSA) on GNSS vulnerabilities; therefore, the Regional Aviation Safety Group for the Middle East Region (RASG-MID) has issued a Safety Advisory concerning GNSS Vulnerabilities and provided guidance material to mitigate the safety

and operational impact of GNSS service disruption (RSA-14 in April 2019). This Safety Advisory provides guidance on a set of mitigation measures that States would deploy to minimize the GNSS vulnerabilities impact on safety and air operations. The RSA-14 also includes the regional reporting and monitoring procedures of GNSS anomaly with the aim to analyze the threat and its impact on performance and assess the effectiveness of the mitigation measures in place. However, the SRA-14 has not addressed the newly introduced risk (spoofing) and the required ATC procedures.

2.6 Recently, there was concentrated reporting of GNSS jamming and possible spoofing within the MID Region; in some cases compromising safety, by miss leading Aircraft off the intended navigation course, and led to penetration of reserved areas and operations near FIR boarders. Thus, cross boarder coordination procedure has to be developed to be implemented incase similar events occurs.

2.7 Based on the above, establishing mechanism to override the GNSS vulnerabilities in the MID Region has become imperative for the following actions:

a) Developing a regional plan for mitigating GNSS vulnerabilities, in collaboration with States, airspace users, air traffic control providers, and other stakeholders.
b) Issuing guidance to States to support the implementation of mitigation measures on GNSS vulnerabilities in their airspace.
c) Developing GNSS augmentation systems guidance, if required, to improve the accuracy and reliability of GNSS signals.
d) Following up on recommendations from the International Telecommunication Union (ITU) and other organizations to protect the GNSS spectrum from harmful interference.

2.8 Accordingly, and due to the urgency of the subject, the meeting agreed on the following Draft Decision:

Why	Propose guidance on possible ATM operational mitigation measures to address identified GNSS Anomalies in the MID Region.
What	Develop GNSS Anomalies mitigation guidance material
Who	TF members
When	31 December 2024

DRAFT MIDANPIRG DECISION X: ESTABLISHMENT OF MID GNSS ANOMALIES ACTION GROUP

That, the MID GNSS Anomalies Action group established, to develop ATM operational GNSS Anomalies mitigation guidance material and to support the associated contingency procedures. The TF is composed of:

- *Oman,*
- *UAE (reporter),*
- *ATM SG Chairperson,*
- *AIM SG Chairperson,*
- *CNS SG Chairperson,*
- *ACS WG Chairperson,*
- *PBN SG Chairperson,*
- *IATA/ Airspace users, and*
- *The ICAO MID.*

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss any relevant matters as appropriate; and

c) agree on the draft decision at para 2.8 above.

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