



*International Civil Aviation Organization*

**MIDANPIRG/20 and RASG-MID/10 Meetings**

*(Muscat, Oman, 14-17 May 2023)*

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**Agenda Item 6.6: CNS**

**NAVIGATION MATTERS**

*(Presented by the Secretariat)*

**SUMMARY**

This paper presents a brief on Amendment 93 of the Annex 10, Vol I, propose actions to mitigate the impact of GNSS RFI on aviation operation and the issue of developing the NAV MON Plan template. The working paper also propose organising a Webinar of the analysis of CNS Building restricted areas

Action by the meeting is at paragraph 3

**REFERENCES**

- Annex 10, Vol I, Amendment 93
- MIDANPIRG/19 Report
- CNS SG/12 Report

**1. INTRODUCTION**

1.1 The shift from facility-referenced navigation to coordinate-based navigation enabled by performance-based navigation (PBN) provides significant benefits, in particular by supplying the flexibility required to design airspace and associated routes and procedures according to operational needs. The most suitable navigation infrastructure to support PBN is GNSS.

1.2 The role of conventional navigation aids is currently evolving towards that of a reversionary terrestrial infrastructure capable of maintaining safety and an adequate level of operations in case of unavailability of GNSS (for example due to outages). During this evolution, terrestrial aids may also enable PBN operations for users not yet equipped with GNSS.

**2. DISCUSSION**

***Amendment 93 to Annex 10, Vol I***

2.1 The Amendment 93 to the International Standards and Recommended Practices, Aeronautical Telecommunications — Radio Navigation Aids (Annex 10, Volume I to the Convention on International Civil Aviation) was adopted by the Council at the fifth meeting of its 228th Session on 20 March 2023. The amendment will become effective on 31 July 2023 and applicable on 2 November 2023.

2.2 The amendment 93 concerns:

- a) support of the introduction of dual-frequency, multi-constellation (DFMC) global navigation satellite system (GNSS) by adding provisions for additional frequencies of operation for the global positioning system (GPS), the global navigation satellite system (GLONASS) and the satellite-based augmentation system (SBAS), and by introducing provisions for the new BeiDou Navigation Satellite System (BDS) and Galileo system; and
- b) support of ionospheric gradient mitigation for the ground-based augmentation system (GBAS).

2.3 The amendment concerning DFMC GNSS is intended to reflect the ongoing evolution of the global GNSS infrastructure and facilitate its fruition by international civil aviation. As part of the evolution, multiple GNSS constellations offering dual-frequency signals are being introduced into service by the United States (GPS modernization), the Russian Federation (GLONASS modernization), European Union (Galileo constellation) and China (BeiDou Navigation Satellite System (BDS) constellation)

2.5 A number of States and regions also plan to deploy DFMC satellite-based augmentation systems (SBASs). DFMC GNSS offers an opportunity to further enhance GNSS robustness, navigation performance and operational benefits. The use of dual frequencies will help mitigate vulnerabilities in respect of ionospheric disturbance and radio frequency interference. The availability of multiple constellations will contribute to mitigating ionospheric scintillation and the risk of having insufficient satellites within a single constellation. These technical improvements will enable operational benefits in terms of safety and efficiency, such as improved operational reliability for communications, navigation and surveillance (CNS) applications, increased deployment of 3D instrument approach operations worldwide in line with PBN global goals, introduction of innovative operational concepts and applications and continued rationalization of conventional navigation aids.

2.6 The meeting may wish to note that Implementation of DFMC GNSS (any element) is not mandatory and will be driven by the specific cost/benefit and policy considerations that apply to individual States, in consultation with aircraft and airport operators and international organizations. For most States choosing to implement DFMC GNSS, no additional infrastructure costs will be involved. For States providing DFMC GNSS infrastructure (core satellite constellations, SBAS), typically costs will not be carried by aviation users, given that the infrastructure is of universal utility and aviation users represent only a small fraction of the user community. Aircraft operators choosing to implement DFMC GNSS (any element) will incur initial avionics equipage costs. However, initial investment costs in the long run should be offset by the decrease in operating costs and by the operational benefits gained.

### *NAV MON Plan Template*

2.7 The ASBU element “Navigation Minimal Operating Networks” (NAVS B0/4) has been classified as priority 1 in the revised MID Region Air Navigation Strategy (MID Doc 002). This element aims to rationalize the conventional Navigational aids network through the increased deployment of the satellite based navigation system.

2.8 The meeting may wish to recall that MIDANPIRG/18 meeting, through Decision 18/42, agreed on the need to develop a template for Navigation Minimal Operating Networks (Nav. MON) plan in line with ICAO SARPs and Regional requirements.

*MIDANPIRG DECISION 18/42: NAV MON PLAN AD-HOC ACTION GROUP*

*That, the NAV. MON Plan Ad-hoc Action Group be:*

- a) *established to develop a template for NAV MON Plan to be presented to the CNS SG/11 for further review and enhancement; and*
- b) *Composed of:*  
*Mr. Saleh Al-Harthy (Oman, CNS SG Chairman)*  
*Mr. Ahmed Abdelwahab (Egypt)*  
*Ms. Amena Dodin (Jordan)*  
*Mr. Khaled Eltanany (Oman)*

2.9 The CNS SG/12 meeting was apprised of the progress made by the Action group in developing the NAV MON Plan Template. Furthermore, the Draft NAV MON plan template was reviewed by the sub-group meeting. The meeting that four (4) States (Egypt, Jordan, Oman and UAE) have volunteered to populate their data in the proposed plan template and provide feedback to the CNS SG/13 meeting.

2.10 Additionally, it was further agreed to share the Draft NAV MON plan template with the ATM and PBN Sub-groups to provide their feedback. Accordingly, the CNS SG/12 meeting proposed the following Draft Decision:

<b>Why</b>	To further review and improve the NAV MON Plan template
<b>What</b>	Share the NAV MON Plan template with the ATM and PBN Sub-Groups
<b>Who</b>	CNS
<b>When</b>	May 2023

*DRAFT DECISION 20/XX: NAV MON PLAN TEMPLATE*

*That, the ATM SG & PBN SG to provide feedback on the NAV MON Plan template to be presented to the CNS SG/13 for further review and improvement.*

**GNSS RFI**

2.11 The meeting may wish to note that the majority of 2022 GNSS RFI incidents reported in Egypt, Iraq, Iran and Turkey. The CNS SG/12 meeting recalled the coordination meeting held between ICAO MID, ICAO EUR/NAT, IATA MENA, IATA EUR, Iraq and Turkey regarding the frequent GNSS interference reported in Ankara and Baghdad FIRs. It was proposed to conduct a follow-up meeting with all concerned States (Egypt, Iraq, Iran and Turkey).

2.12 The CNS SG/12 meeting discussed lengthily the possible means to monitor GNSS signal and provide timely warning to Airspace users, in order to reduce the impact of the GNSS interference on Aviation operation. Therefore, the meeting requested States who have implemented GNSS monitoring system, to share their experience on GNSS interference monitoring with the CNS SG/13 meeting.

2.13 The meeting may wish to recall that EUROCONTROL is working on a Concept of Operation to use ADS-B for GNSS RFI monitoring, the CNS SG/12 meeting requested ICAO MID to coordinate with EUROCONTROL and keep the CNS SG updated on the progress.

2.14 The meeting agreed to collaborate with ACAO to explore the possibility of initiating a Regional GNSS monitoring project and requested that the ICAO MID CNS RO present a Working Paper including project proposal to the coming ACAO ANC Meeting.

2.15 The meeting may wish to note that ICAO Navigation Panel is working on GNSS interference mitigation to be included in the coming Annex 10, Vol 1 amendments.

2.16 Based on all the above, the meeting may wish to agree on the following Draft Decision:

<b>Why</b>	To mitigate the impact of the GNSS RFI
<b>What</b>	Collaborate with ACAO to assess the feasibility of establishing a Regional GNSS RFI Monitoring system
<b>Who</b>	ICAO MID Office
<b>When</b>	May 2023

***DRAFT DECISION 20/XX:***

***GNSS RFI MITIGATION***

*That, The ICAO MID Office is requested to:*

- c) *follow-up with Egypt and Iraq on actions taken to mitigate the likelihood and impact of GNSS RFI within Cairo and Baghdad FIRs; and*
- d) *collaborate with ACAO to assess the feasibility of establishing a Regional GNSS RFI monitoring System and report the outcome to the CNS SG/13 and MIDANPIRG/21.*

***ILS Protection Zone***

2.17 The meeting may wish to note that the CNS SG/12 meeting discussed a case of the impact of the physical presence of a building on the Localizer signals in space, it was agreed on the need to avoid the adverse effect on the availability or quality of CNS signals.

2.18 States were encouraged to share their experience on the issue, moreover, the CNS SG/12 requested ICAO MID to organize a Webinar on the Analysis of CNS facilities Building restricted areas (BRA). Accordingly, the following Draft Decision is proposed:

<b>Why</b>	To assist States in identifying the impact of physical presence of buildings on CNS signals in space
<b>What</b>	Organise a Webinar on the Analysis of CNS facilities building restricted area
<b>Who</b>	ICAO MID Office
<b>When</b>	2024

***DRAFT DECISION 20/XX: ANALYSIS OF CNS FACILITIES BRA WEBINAR***

*That, a Webinar on the Analysis of CNS facilities building restricted area be organized in 2024.*

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the amendment 93 of the Annex 10, Vol I contents, implications, effective and applicability dates;
- b) note the progress made by the NAV MON action Group and propose action(s) as appropriate;
- c) discuss any relevant matter; and
- d) agree on Draft Decision at para 2.9, 2.15 and 2.17

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