International Civil Aviation Organization

MIDANPIRG Air Traffic Management Sub-Group

Eleventh Meeting (ATM SG/11)
(Abu Dhabi, UAE, 19 – 23 October 2025)

Agenda Item 3: Planning and Implementation issues related to ATM/SAR

RESILIENT OPERATIONAL NAVIGATION OPERATIONAL NETWORK (RON)

(Presented by Saudi Arabia)

SUMMARY

This paper provides an overview of the conclusion and decision adopted by MIDANPIRG/22 and RASG/12 to establish and maintain an adequate network of conventional navigation aids, ensuring continuity of air navigation services in case of GNSS signal degradation or RFI. The paper also summarizes the outcome of the Assembly technical commission deliberations associated with the ongoing efforts by ICAO expert groups to develop new provisions related to the resilient navigation operational network (NAV RON), aiming at optimizing conventional navigation infrastructure and establishing more resilient networks. The paper proposes to organize a regional workshop to identify all operational needs, criteria, and factors that should be considered in defining the MID-optimized and resilient navigation operational network (NAV RON).

Action by the meeting is in paragraph 3.

REFERENCES

- A42-TE-WP/656 (https://www.icao.int/sites/default/files/Meetings/a42/Documents/WP/wp_656_en.pdf).
- ICAO Global Air Navigation Plan (GANP, Doc 9750).
- Report of the Fourteenth Air Navigation Conference (AN-Conf/14, Doc 10209).
- MIDANPIRG/22 & RASG-MID/12 final report.

1. INTRODUCTION

1.1 During the discussion on GNSS Radio Frequency Interference (RFI) Management in the MID Region, MIDANPIRG/22 and RASG-MID/12 adopted *Conclusion 2: CONSOLIDATED REGIONAL APPROACH TO GNSS RFIMANAGEMENT*, inviting States to maintain an adequate network of conventional navigation aids to ensure continuity of air navigation services in case of GNSS signal degradation or RFI.

1.2 The MIDANPIRG/22 also adopted decision 22/20 establishing a dedicated regional Navigation Minimum Operational Network (NAV-MON) to collect data on existing navaids infrastructure, assess operational needs, and identify facilities that can be relocated or decommissioned. The principal role of NAV-MON AG will be to develop a proposal for the Regional Navigational Minimum Operational Network, ensuring the continued provision of air navigation services in the MID region during both normal and contingency/reversion operations, particularly in the event of GNSS interference.

1.3 As defined under the GANP framework, the ASBU element NAVS-B0/4 titled "*Navigation Minimal Operating Networks (Nav. MON)*" allows the rationalization of the ground-based conventional infrastructure through the definition of minimal networks of ground navaids. Consultations and agreements from airspace users and aircraft operators are required to define this element. ICAO recommends revisiting this element with the introduction of new navigation

1.4 During the ICAO Assembly 42 session held from 23 September to 3rd October 2025, the technical commission, under *Agenda item 24 - Aviation Safety and Air Navigation Priority Initiatives,* extensively discussed the GNSS RFI. The commission agreed that the navigation minimal operational network (NAV MON) ASBU element should evolve to better support States in their transition from providing minimum navigational service levels to a more resilient navigational service, ensuring operational safety and continuity during CNS disruptions such as GNSS RFI.

1.5 The Technical Commission noted the ongoing efforts by ICAO expert groups to develop new provisions related to the resilient navigation operational network (NAV RON), aiming at optimizing conventional navigation infrastructure and establishing more resilient networks. These efforts focus on defining a "sufficient NAV network" and its relationship with the minimum navigation operational network (NAV MON). Additionally, the commission was informed that NAV RON will include provisions to enhance aeronautical digital data and charts that allow pilots to fully utilize the available navigation infrastructure, based on accurate facility types and coverage. Finally, the Technical Commission noted that capacity-building activities related to NAV RON will be carried out to support States in planning and implementing the new concept.

1.6 Based on a proposal from the technical commission, the Assembly adopted a revision to supersede Assembly Resolution 41-8, *Appendix C - Ensuring the resilience of ICAO CNS/ATM systems and services, inviting ICAO to establish a comprehensive review framework to enhance the CNS/ATM resilience*[1].

2. DISCUSSION

2.1 During GNSS RFI or disruption, conventional terrestrial navigation aids (NDB, VOR, DME, ILS) can be used in three ways:

1) as redundant aids to support PBN navigation specifications (e.g., RNAV1, RNAV 5);
2) as contingency support to facilitate aircraft PNT awareness and/or
3) as infrastructure for conventional Instrument Flight Procedures (IFP).

2.2 The MID NAV-MON study or analysis should identify the optimum "Navigation Minimum Operational Network" to ensure the continuity of Air Navigation Services (ANS) under both normal and contingency conditions, using the ground NAVAIDS infrastructure, which should support the needed resilience. In particular, the DME coverage in the en-route and terminal areas can provide an effective complementary system to support PBN operations in the event of a GNSS disruption. The DME/DME RNAV coverage will constitute a resilient position and navigation service.

2.3 As PBN operations are expanding in the MID region, the ground-based infrastructure, including facilities and conventional instrument flight procedures, will be reduced, and consequently, this infrastructure may be rationalized, maintaining the necessary safety backup capability. With the increase in GNSS RFI occurrences observed recently, MID States should consider operational risks during their planning for the rationalization and optimization of ground-based navigation and surveillance infrastructures and engage airspace users while developing a CNS rationalization plan.

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[1] *The draft report of the Assembly technical commission on Agenda item 24 can be reached using the following link: https://www.icao.int/sites/default/files/Meetings/a42/Documents/WP/wp_656_en.pdf . This report covers the outcomes of the discussion of GNSS RFI and NAV-MON, and Resilient Navigation Operational Network (RON).*

2.4 Therefore, there is a need to refine the MID Operational concepts considering existing conventional terrestrial navigation aids, to ensure that MID States can evolve and optimize their terrestrial navigation infrastructure to serve airspace users in an improved way, by providing operational resilience with an optimized mix of such infrastructure at minimum cost. Moreover, the Aeronautical data products and charts should be improved to ensure that flights can make maximum use of the optimized infrastructure.

2.5 To enable **an effective GNSS-independent ground navigation service during normal and contingency operations for all airspace users and ensure continued aircraft operations in the MID region, using currently available ground-based navigation systems in an optimized way**, the following operational needs, criteria, and factors should be considered:

1) Identification of the optimum MID ATS routes network that can support PBN applications during normal operations;
2) Identification of all scenarios and options for the MID ATS route network that can be used during emergencies and abnormal events within the MID region (e.g., Closure of FIRs)
3) Identification of the MID contingency ATS routes in case of major failures or ATS disruptions as defined under Annex 11 – Attachment C;
4) Listing of all IFPs published by MID States using ground-based navigation aids;
5) Identification of PBN IFPs serving MID aerodromes that can be subject to overlay using ground-based navigation aids; and
6) Improvements to the aeronautical information publication and MID documentation, considering all previous factors.

2.6 To progress the development of the MID resilient navigation operational network (NAV RON), it's proposed to organize a regional workshop with the participation of regional specialized organizations (ACAO, CANSO, Eurocontrol, and IATA) to identify all operational needs, criteria, and factors that should be considered. This approach will define a sustainable and cost-effective MID concept of operations that should be used as the principal basis for this network.

2.7 The outcome of this workshop should be used by the MID NAV-MON Action Group as the principal basis for determining the MID optimum and resilient conventional terrestrial navigation aids that can support normal and contingency operations during GNSS RFI or unavailability.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) take note of the information provided;

b) invite States to provide detailed information on the ATS network and IFPs used during normal and contingency conditions;

c) support the proposal to organize an ATM regional workshop with the involvement of specialized organizations to define operational needs, criteria, and factors that should be used to define the MID-optimized resilient navigation operational network (NAV RON) based on traffic density, and aircraft capabilities; and

d) task the Secretariat to draft a working paper for MIDANPIRG/23 to progress the development of the MID resilient navigation operational network (NAV RON).

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