



INTERNATIONAL ASSOCIATION OF INSTITUTES OF NAVIGATION

International Civil Aviation Organization (ICAO) Representative

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ICAO is the United Nations' International Civil Aviation Organization with its headquarters in Montreal. IAIN has observer status to ICAO meetings.

This report contains three highlights from recent ICAO work in progress on civil navigation issues:

- (1) Short report of the latest European Performance Based Navigation task force meeting (Paris);
- (2) Draft outcome of the first global in-person ICAO meeting on True north (Montreal);
- (3) Recommendations from the recent ICAO Radio Navigation Symposium (Antalya).

Remark: attendance of the Montreal meeting was funded (in part) by IAIN.

(1) Short report of the latest European Performance Based Navigation Task Force meeting (Paris)

Introduction

The Combined 10th ICAO EUR PBN Consolidation Task Force (PBNC TF) and 37th EUROCONTROL Navigation Steering Group (NSG) was held at the ICAO EUR/NAT Office in Paris from 16 to 18 April 2024. The meeting was attended by approximately 170 participants (in-person and remote) from EUR States, ANSPs, airspace users, international organizations and other industry representatives.

Full reports of PBNC TF/NSG meetings are available on the ICAO Secure Portal (group PBNTF).

GNSS Interference, Jamming and Spoofing

The PBNC TF/NSG reviewed the outcomes of the ICAO EUR/NAT and MID jointly organized Radio Navigation Symposium, held in Antalya, Türkiye from 6 to 8 February and attended by 134 participants from States, ANSPs, international organizations, airlines and other industry representatives. The PBNC TF/NSG took note of the set of recommendations for CAAs/ANSPs, National Military Authorities, National Spectrum Regulators, Aircraft Operators and Civil Aviation Authorities (CAAs), aimed at addressing potential safety and capacity issues stemming from GNSS interference, jamming, and spoofing. The PBNC TF/NSG participants recognized the importance of these recommendations in

safeguarding air transport and ensuring operational efficiency. The meeting agreed to further review the set of recommendations at the PBNC TF/10, NSG/38 meeting.

State Reports on PBN Implementation

The PBNC TF reviewed updates from State participants on PBN implementation and challenges. EUR States presented the progress of PBN implementation, updating their transition plans and NAVAIDs infrastructure plans through the review of States' reports. Reports were provided by France, Poland, Kazakhstan, Spain, Cyprus, Morocco, Algeria, Türkiye, Italy, Latvia and Belgium (not presented at this meeting). The meeting, in particular noted challenges faced by States related to GNSS interference. All States/ANSPs were invited to further share their experiences at upcoming PBNCTF/NSG meetings.

Following discussions of the State reports, the meeting requested Eurocontrol to develop a first draft concept of GNSS monitoring on local and regional level for ATC purposes.

Amendment to Regional Supplementary Procedures – EUR SUPPS (Doc 7030) and EUR Air Navigation Plan (EUR eANP) Volume II

During PBNC TF/10 and NSG/37, the meeting reviewed proposed amendments to the EUR Regional Supplementary Procedures-SUPPs (Doc 7030) and the EUR Air Navigation Plan (EUR eANP) Volume II, focusing on updating relevant NAV/PBN related provisions, which had not been revised since 2012. The PBNC TF and NSG formed an action group which held ten online meetings over the course of eleven months to thoroughly revise Chapters 4, 6 and 10 of the EUR SUPPs and Volume II of the EUR eANP. The proposal for amendments were reviewed by PBNC TF/10, NSG/37 and reviewed by States and Organizations (members of the PBNC TF). The draft proposal for amendments are provided in EASPG PCG/06 – WP/08.

Outcomes of EASPG/05

The PBNC TF/10, NSG/37 meeting reviewed the outcomes of the Fifth Meeting of the European Aviation System Planning Group (EASPG/05) relevant to PBN. The following EASPG conclusions were presented:

Conclusion 5/2 – Transition from Magnetic to True North

Conclusion 5/3 – Harmonized Cold Temperature Correction Procedure

Conclusion 5/22 – Impacts of Incorrect QNH setting on Baro-VNAV Approaches

Conclusion 5/23 – Inconsistencies or Complexity of PBN Approach Procedures

In relation to Conclusion 5/22, the meeting recalled the EASPG discussions that a harmonized transition altitude (TA) could be a solution to mitigate safety issues related to QNH setting errors. The meeting was informed that EASA had previously published a Notice of Proposed Amendment for a harmonized TA, but it was cancelled due to lack of State agreement. The meeting invited Eurocontrol and EASA to seek further actions, as appropriate, on a harmonised TA and provide a report at the next PBNC TF, NSG meeting. The meeting also invited States and ANSPs to take necessary actions related to Conclusion 5/23, including to review their PBN approach procedures published in AIPs to ensure harmonization with the ICAO procedure design provisions.

(2) Draft outcome of the first global in-person ICAO meeting on True North (Montreal)

In the previous years, preparatory work and studies on True North had been conducted by the informal AHRTAG working group of experts, led by co-chairs from NAV CANADA and IAIN, with the

secretary from RIN. This was followed by an international survey by ICAO among its member states, which in turn led to the establishment of the ICAO TRUE-AG (True North Advisory Group). That group held its first in-person meeting in Montreal from 6-10 May 2024.

On the first day of the meeting, the TRUE-AG chose as its chairman Mr Anthony McKay from NAV CANADA and as co-chairperson Ms Susan Cheng from Boeing. The second and third days were used for introductions and views from all participating States and organizations, including IAIN as a full member. Three subgroups were formed to discuss the main issues that had been identified. The group formulated a very first draft of the Concept of Operations and transition plan, to be further elaborated during the coming (3) years. A proposal to the ICAO Air Navigation Commission is expected by 2027.

Below is a version of the draft CONOPS, which should not be further distributed or shared until its formal release by the ICAO office.

May 2024 True North Advisory Group Draft Concept of Operations v0.1

Realizing there are many unknowns globally with current capabilities for aircraft, aerodromes, air traffic services, and other supporting infrastructure to operate entirely with a true north reference, the TRUE-AG proposes the following CONOPS to transition to true north. This draft CONOPS discusses what potential operations could entail and changes from today's environment where much of the system is based on navigating with magnetic reference. The TRUE-AG has identified stakeholders and key elements to consider investigating potential impacts. As these findings are revealed, the CONOPS will be refined to become the CONOPS deliverable to the Air Navigation Commission (ANC) to allow them to make a decision.

The initial proposal is to fully transition from magnetic reference to true north reference within 20 years (the timeline described in this document will need adjustment based on current aircraft capability, cost, human resources assessment, etc.). It is recognized that the impact to all stakeholders will vary and need to be accounted for. It may not be cost-effective for aircraft operators with legacy equipment that are not currently capable of true reference to modify their aircraft in the near term.

If an ICAO ANC decision to implement true north operations is announced (T_0), aircraft, aerodrome and air traffic systems not capable of operating with a true north reference would no longer be produced. Aircraft, aerodrome and air traffic systems remaining in operation after the date of transition will need to be enabled or modified for true north reference. The magnetic compass will be retained on all aircraft as a backup system.

The ICAO decision to implement will drive ICAO panels and industry standards (RTCA, EUROCAE, ARINC, flight plan regulations, etc.) to be updated and implemented 5 years after T_0 . This effort assumes 2 years of technical activity, and 3 years of ICAO process time. It is encouraged that discussions to update standards and regulations begin at the earliest feasible time to prevent delay.

The timing to transition to true north reference for the first implementation region is currently estimated at T_0+10 years, and will be refined after current capabilities and assessments are evaluated. If aircraft were to fly between magnetic and true referenced regions, the aircraft and pilots must be capable/trained to operate in both environments. Air Traffic Control will operate with a single heading reference, i.e. implementation regions in true operate only in true, regions in magnetic

operate only in magnetic. Sub-components of the aerodrome and air traffic system may transition to true earlier where a safety risk assessment allows (e.g. runway designators).

Those regions currently using a true north reference and oceanic operations may transition to true north operations anticipated at T₀+11. After all regions have transitioned to a true reference system, not all aircraft in a region may yet be able to reference true. Pilots flying non-capable aircraft may need to convert between magnetic bearings and true bearings (to be evaluated if this is recommended). VFR flights may be less impacted than IFR flights. Meteorological data is reported in true today except for takeoff and landing winds. Take off and landing winds would change to true in true designated regions.

It is assumed that by T₀+20 years, all regions have transitioned to operating with true north reference. At T₀+28 (to be validated), almost all aircraft are capable of true north reference due to attrition (retirement of older aircraft). Further study, including safety risk assessment and cost-benefit analysis is needed for operations during the transition period and/or end state where certain designated aircraft may be exempt from operating with true reference.

Having developed this draft CONOPS, next steps for the TRUE-AG will be to conduct further studies on the impact of a True North transition on different stakeholders, based on the CONOPS, including a cost-benefit analysis, safety assessment and SWOT analysis.

(3) Recommendations from the recent ICAO Radio Navigation Symposium (Antalya)

Following a recent Radio Navigation Symposium, ICAO issued a global State Letter to all its member states, on GNSS interference, on 30 April 2024. Due to its importance, the (edited) complete text follows below.

Subject: Aviation safety concerns regarding interference to the Global Navigation Satellite System (GNSS)

1. I have the honour to bring to your attention the concerning escalation of jamming and spoofing activities targeting the global navigation satellite system (GNSS), which have been increasingly observed recently in various regions globally. GNSS, as one of the main enablers for performance-based navigation (PBN), provides navigation guidance for all phases of flight, from enroute through to precision approach. By providing accurate position and timing information, GNSS enables several systems critical to the safety of flight.
2. Since 2003, the International Civil Aviation Organization (ICAO) has been actively developing recommendations and guidance concerning GNSS Radio Frequency Interference (RFI). It is pertinent to recall ICAO Assembly Resolution A41-8, Appendix C: *Ensuring the resilience of ICAO CNS/ATM systems*, which serves as the latest ICAO policy on GNSS resilience.
3. To bring attention to the critical issue of GNSS interference, and to foster discussions on the management of GNSS vulnerabilities and potential mitigation measures against GNSS RFI, ICAO recently convened the ICAO EUR/MID Radion Navigation Symposium from 6 to 8 February 2024 in Antalya, Turkey. One important outcome of this symposium is the attached list of recommendations regarding Stakeholders' continued efforts towards ensuring safe, reliable, and resilient air navigation.
4. I would like to take this opportunity to refer to recent safety-related publications by the European

Union Aviation Safety Agency (EASA), Safety Information Bulletin No. No. 2022-02R2 and the Federal Aviation Administration (FAA), Safety Alert for Operators (SAFO 24002).

5. You are kindly requested to consider and disseminate as appropriate, the guidance material provided in the above links to all relevant entities in your State, and to consider the attached recommended actions, as applicable.

ICAO EUR/MID Radio Navigation Symposium, Antalya, Turkey (6 to 8 February 2024)
RECOMMENDATIONS

Recognizing with concern the impact of global navigation satellite system (GNSS) Radio Frequency Interference (RFI) on aviation safety, capacity, efficiency and security, the Symposium recalled and underlined Resolution A1-8, Appendix C: Ensuring the resilience of ICAO CNS/ATM systems and services and agreed on the need to take necessary actions to ensure continued safe, reliable, and resilient air navigation.

The Symposium recommended:

- All Stakeholders to be aware of the potential safety and capacity impacts of GNSS interference, jamming, and spoofing.
- Civil Aviation Authorities (CAAs) to ensure that air navigation service providers (ANSPs) deploy and maintain adequate distance measuring equipment (DME) infrastructure and DME based Performance-Based Navigation (PBN) procedures and enable aircraft operators use of multi-DME and multi-DME/inertial reference system (IRS) complementary solutions as appropriate to maintain PBN operations during GNSS local or regional interference, jamming or spoofing.
- CAAs to ensure that air navigation services providers (ANSPs) implement and maintain necessary minimum operational networks (MON), or greater, of navigation aids and radar infrastructures (including very high frequency omnidirectional radio range (VOR), instrument landing system (ILS) Cat I/II/III and DME) to ensure the necessary levels of resilience for navigation when core constellations, satellite-based augmentation system (SBAS) or ground-based augmentation system (GBAS) are unusable.
- ANSPs to develop contingency procedures (technical and operational) for GNSS radio frequency interference (RFI) events, to minimize any operational impact and ensure continuous safe operation of air traffic. The contingency procedure may require the provision of reliable surveillance coverage that is resilient to GNSS interference.
- ANSPs to implement/maintain a GNSS-independent time source for synchronisation of relevant Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) infrastructure.
- CAAs/ANSPs to facilitate or deploy as appropriate real-time monitoring and detection solutions for GNSS RFI situational awareness for all stakeholders, while recognizing that only the aircraft operator is responsible for determining their ability to navigate.
- ANSPs to issue notice to airmen (NOTAMs) on GNSS RFI events in a timely manner; to establish coordination arrangements with neighbouring flight information regions (FIRs) on how to best to share their navigation infrastructures in the event of GNSS RFI and any resulting air traffic diversion.
- CAAs/ANSPs to improve civil-military coordination to address interference risks associated with GNSS testing and conflict zones, to ensure the uninterrupted and reliable operation of navigation systems in diverse applications.
- National Military Authorities to coordinate with National Spectrum Regulators, CAAs and ANSPs, to the extent possible, ahead of any necessary GNSS RFI activity. This will enable ANSPs to mitigate any safety impact on civil aviation.
- CAAs to foster collaboration with their National Spectrum Regulators regarding GNSS RFI.

- National Spectrum Regulators to locate and determine the source of reported GNSS RFI and attempt to resolve it, as appropriate. The GNSS RFI resolution may require coordination with other authorities at national or regional levels.
- National Spectrum Regulators to report frequent unresolved GNSS RFI incidents to the Radiocommunication Bureau of the International Telecommunication Union (ITU), describing GNSS RFI impact as experienced within their national borders, or as reported by their registered aircraft.
- Aircraft Operators to develop a procedure requesting crew to notify air traffic control (ATC) whenever GNSS RFI events are experienced and notify respective aircraft and avionics original equipment manufacturers (OEMs) and State of Aircraft design's CAA through normal safety channels when safety effects are encountered.
- Aircraft Operators to develop procedures and training based upon information received from aircraft and avionics OEM and State of aircraft design's CAA.
- Aircraft Operators to place additional emphasis on flight crews closely monitoring aircraft equipment performance for any discrepancies or anomalies, promptly informing ATC of any apparent GNSS degradation, and being prepared to operate without GNSS navigation systems.
- Original Equipment Manufacturers (OEMs) to improve their equipment and provide further guidance and information on the effects and mitigations of GNSS RFI (including interference, jamming and spoofing) from the perspective of aircraft equipment.
- OEMs to ensure that aircraft equipment quickly recovers and resumes GNSS navigation once not impacted anymore by a GNSS RFI event.
- ICAO Navigation Systems Panel (NSP) to develop recommendations on how to share information on GNSS RFI (NOTAM or other measures).
- All stakeholders to collaborate towards developing simple and automated common reporting of GNSS RFI.
- All stakeholders to continue to evolve solutions, while leveraging the ICAO NSP as a common focal point.
- ICAO to continue raising awareness and supporting States, as required.

- END -