International Civil Aviation Organization

TENTH MEETING OF SPECTRUM REVIEW WORKING GROUP (SRWG/10)

Bangkok, Thailand, 04 – 06 February 2026

Agenda Item 6: Frequency Interference in the Region

6.2 GNSS interference

GLOBAL UPDATES ON GNSS RFI MATTERS AND PROPOSAL FOR DISCUSSION ON FUTURE MANAGEMENT OF GNSS RFI ISSUES IN APAC REGION

(Presented by the Secretariat)

SUMMARY

This paper presents updates on Global Navigation Satellite System (GNSS) Radio Frequency Interference (RFI) matters, including the relevant 42nd ICAO Assembly Resolution, regional efforts in APAC, and a request to deliberate on the next step for future management of GNSS RFI issues in the region.

1. INTRODUCTION

1.1 The Global Navigation Satellite System (GNSS) plays a technical enabler supporting improved services that meet the objectives outlined in the Global Air Navigation Plan (GANP) towards the achievement of the performance ambitions. However, because GNSS signals from satellites are very weak at the receiver antenna and GNSS radio frequency interference (RFI) is continuously rising, this affects the safe operation of aircraft and is gradually becoming a significant global issue. The issue has been discussed across the APAC region in many technical working groups and subgroups, as well as at regional workshops. ICAO continues to conduct awareness activities on GNSS RFI.

1.2 During SRWG/8, the ICAO Secretariat presented WP/05, which provided an overview of ICAO's Recommendations and Guidance on Global Navigation Satellite System (GNSS) vulnerability. At SRWG/9, the Meeting discussed the next recommended step for States to address GNSS RFI issues.

1.3 This paper recaps key global and regional ICAO resources and past recommendations related to handling GNSS RFI issues and provides updates on actions requested from the ICAO Secretariat for GNSS RFI matters after SRWG/9. It also requests a discussion of the way forward for handling GNSS RFI matters in the APAC Region.

2. DISCUSSION

ICAO Recommendations and Guidance on GNSS RFI

Air Navigation Conference (ANConf/11, ANConf/12, ANConf/14)

2.1 In 2003, the 11th Air Navigation Conference (ANConf/11) developed Recommendation 6/2 to States, based on GNSS vulnerability studies conducted by the GNSS Panel, the predecessor of the Navigation Systems Panel (NSP), and accompanied by a detailed Appendix on mitigation methods. The Appendix addressed spoofers but did not provide specific mitigations, considering that spoofing was not a significant threat in its own right (i.e, as distinct from jamming), as it was felt that it was "difficult" to implement (which was indeed the case at that time) and that it could be detected by normal procedures.

2.2 In 2012, ANConf/12 addressed issues of the use of multiple constellations and GNSS vulnerabilities, developed *Recommendation 6/8* to States, which largely reiterates the main points of ANConf/11 Recommendation 6/2, and explicitly mentions spoofers.

2.3 In 2024, ANConf/14 expressed concerns about the escalation of GNSS jamming and spoofing and emphasized the need to address the growing threat of GNSS interference, developed *Recommendation 2.2/2 to* States and ICAO.

2.4 The text of ANConf/11 Recommendation 6/2, ANConf/12 Recommendation 6/8 and ANConf/14 Recommendation 2/2.2 are provided in **Attachment A** to this paper.

42nd Session of the Assembly

2.5 During the 42nd Session of the Assembly (2025), the Council presented A42-WP/34, highlighted the risks and consequences associated with GNSS RFI, and **outlined an ICAO roadmap that includes short-term mitigation measures and long-term solutions**. The Technical Commission expressed grave concerns regarding the potential impacts of GNSS RFI on aviation safety, specifically noting that it has been identified as a contributing factor to three global high-risk categories of occurrence, while also recognizing the ongoing technical efforts made to mitigate its adverse effects.

2.6 The Commission also noted actions taken to address GNSS RFI and urged States, international organizations, donors and relevant stakeholders to support ICAO's ongoing efforts, through means such as providing voluntary contributions toward the validation and deployment of an implementation package (iPack) for the mitigation of GNSS RFI.

2.7 Noting the improved reporting procedure between ICAO and ITU, the Commission urged States to report GNSS RFI occurrences that cannot be resolved through routine national or international procedures to their accredited ICAO Regional Office, in addition to following the procedures outlined in the ITU Radio Regulations.

2.8 The Commission supported the multi-faceted approach to mitigating GNSS RFI, including the **development of real-time GNSS monitoring and analysis systems**. It also emphasized the need for **further guidance in defining adequate and resilient CNS networks** to ensure the continuity of air navigation services, and the importance of strengthening regional and inter-regional coordination on this issue through the PIRGs.

2.9 With the endorsement of amendments to relevant Assembly resolutions on GNSS vulnerabilities and resilience, **Appendix C of the Assembly Resolution A41-8** is **superseded by Assembly Resolution A42-8/C**, provided in **Attachment B** to this paper. The Provisional Edition of the Assembly Resolutions can be found in A42 Resolution Provisional Edition Oct 2025. It was noted that the **Assembly requested States' active engagement to ensure that resilient CNS capabilities remain available to maintain aviation safety**.

GNSS RFI Reporting Form

2.10 The AN-Conf/14, through **Recommendation 2.2/2 (b),** agreed that States should develop **regional GNSS reporting mechanisms**, to the extent feasible, to raise operational awareness of affected geographical areas as described in the GNSS Manual (Doc 9849), through the mechanism of the planning and implementation of regional groups (PIRGs).

2.11 In accordance with the 42nd Session of the ICAO Assembly, **States are urged to report GNSS RFI occurrences that cannot be resolved through routine national or international procedures** to their accredited ICAO Regional Office, in addition to following the procedures outlined in the ITU Radio Regulations.

2.12 During the ACAO/ICAO Radio Navigation Workshop (24-26 February 2025), a brainstorming session was held to develop a GNSS RFI reporting procedure for the ICAO AFI Regions (ESAF and WACAF). The session included a review of the pilot reporting form example (as outlined in **Appendix F of the GNSS Manual**). It was concluded that the current reporting form requires a comprehensive update.

2.13 Additionally, the ACAO/ICAO Radio Navigation Workshop developed **a draft regional reporting procedure for AFI Regions**, which was decided to be further reviewed by the relevant regional groups before being submitted for endorsement by the AFI PIRG, which is scheduled to be held in March 2026.

2.14 ICAO has planned to launch **a survey to collect feedback from airspace users on the reporting form**, with the goal of recommending a standardized form for use across ICAO Regions. The survey outcomes are expected to update the reporting guidance, including the example of the reporting form provided in the next edition of the GNSS Manual.

GNSS Manual (Doc 9849)

2.15 In 2017, the 3rd edition of the GNSS Manual was published, which significantly extended the coverage of RFI matters. With increasing challenges to GNSS interference and compatibility, a number of issues have arisen that require State attention when implementing GNSS services. The NSP (Navigation Systems Panel) authorized the creation of an ad hoc group to propose GNSS manual changes in support of the SARPS changes and to address significant issues in the manual. The GNSS Manual ad-hoc group met starting in June 2021 and determined early in the process to separate the manual updates into two phases based on their priority.

2.16 The 4th edition of the GNSS Manual was published in 2023 (including the changes in Phase 1), introducing **updates to Chapter 5 (GNSS vulnerability, sections 5.1.3 (Intentional Interference and Spoofing)) and Chapter 7 (Implementation of GNSS-based services** - additions made for interference monitoring, interference anomaly reporting, and space weather advisory). **Appendix F (GNSS RFI Mitigation Plans)** proposed changes addressed current, significant issues related to jamming and spoofing. Changes were limited to those deemed **essential guidance needed for states** to be aware of threats posed by jamming and spoofing and essential tools and recommended practices for mitigation.

2.17 The 5th edition of the GNSS Manual, published in 2025, introduced further updates (including elements in Phase 2). Most changes address **guidance to states on H-ARAIM**, required to support Annex 10, Amendment 94, which contains H-ARAIM standards, along with some minor guidance **on detection, reporting, and resolution of GNSS RFI**.

2.18 The current GNSS Manual revision cycle (generally referred to as Phase 3) is focused on **changes relating to interference issues identified in the NSP job cards**. During JWGs/13, the GSWG proposed to develop further material for the GNSS manual to address the following topics [ref. JWGs/13 Report, Flimsy 5, Item (c)]:

- effect of spoofing on navigation and timing capabilities
- possible side effect of GNSS interference on other air navigation services, notably Communication / Surveillance as well as other capabilities in the aircraft (in cooperation with other relevant ICAO panels and notably the Flight Ops Panel)
- reversion to alternate navigation capabilities based on conventional navaids (in close cooperation with CNTWG)
- possible reversion capabilities for a reliable timing service in case of unreliable or unavailable GNSS

2.19 The **GNSS Manual ad-hoc group** has proposed an initial draft and specific comments for GSWG discussion in JWGs/15. The updated change package will be presented to the GSWG for an initial review in January 2026, and the **finalized change package will be presented to the GSWG in October 2026**.

Electronic Bulletin

2.20 ICAO disseminated the OPSGROUP GPS Spoofing Workgroup report through Electronic Bulletin (EB 2024/27) on 18 December 2024, providing Member States and relevant industry stakeholders with essential information and awareness. The report includes useful technical information, details the impacts to aircraft handling and operation, promotes best practices for flight crew, as well as highlights safety concerns and recommendations for the attention of the global community.

2.21 The ICAO APAC Radio Navigation Symposium on ***GNSS RFI: Collectively Bridging Gaps and Shaping the Path Forward***, which was held in New Delhi, India, from 07–09 April 2025, produced a final list of recommendations addressing critical technical aspects of GNSS dependency. The list was subsequently shared with all ICAO Member States via Electronic Bulletin (EB 2025/20) on 28 July 2025, and includes a link to the Symposium's webpage for information and awareness of Member States, as well as the ITU, ICAO and IMO Joint Statement on the Protection of the RNSS from harmful interference.

Roadmap to Address GNSS RFI

2.22 The industry organizations (IATA, IFALPA, IFATCA, ICCAIA, and CANSO) delivered an informal briefing on their actions related to GNSS RFI to the Council on 20 March 2025, followed by an oral report from the Secretary General.

2.23 The industry organizations presented their short-term, medium-term, and long-term actions to address GNSS RFI. Accordingly, the ICAO Council, through C-DEC 234/11 (j), requested the **Secretariat to prepare a roadmap outlining short-, medium- and long-term actions to address GNSS RFI**, including immediate mitigation measures and long-term strategies to build an air transport system resilient to such interference. C-DEC 234/11 is in **Attachment C**.

Reporting GNSS RFI occurrences to ITU through ICAO

2.24 As part of ICAO's engagement with ITU, the existing GNSS RFI reporting procedure between the two agencies has been reviewed to explore potential enhancements. A new ICAO account will be created in ITU's online tool, the Satellite Interference Reporting and Resolution System (SIRRS),

to facilitate reporting and improve tracking of cases where analysis indicates a significant impact on air navigation with an international scope. In such cases, ICAO will promptly transmit the results to ITU.

2.25 Additionally, the system facilitates keeping ICAO informed about the progress in applying the procedure outlined in Article 15, Section VI, of the Radio Regulations for cases of harmful interference to GNSS identified by ICAO. ICAO will also be notified as soon as the interference incident is deemed resolved.

2.26 SIRRS access will allow reporting from Regional Offices to ITU, support timely coordination, strengthen monitoring capabilities, and improve tracking until full resolution is achieved. **A virtual training session** on the SIRRS platform will be provided **to the nominated focal points of ICAO by ITU** on **10 February 2026**, from 1400 to 1500 UTC via Microsoft Teams.

2.27 ICAO HQ is also planning to conduct a webinar on the subject for all States/Administrations to remind them about the need for enhanced cooperation with their national radio regulators and the possibility of reporting to ITU through ICAO, as explained in A42 WP34.

Activities in the ICAO APAC Region related to GNSS RFI

Relevant Outcomes of APANPIRG/34 and SRWG/9 Meetings

2.28 The APANPIRG/34 (11 - 13 December 2023) urged States and airspace users (through IATA) to report GNSS occurrences to the ICAO APAC Office using the reporting templates, which were circulated in a State Letter Ref.: T 8/5.10 – AP052/24(CNS) dated 23 April 2024. The GNSS Interference Reporting Form for APAC was adopted as an example form for GNSS RFI Reporting to States (also provided in Attachment to Appendix F of Doc 9849 Edition 4) through **Decision SRWG/8/5.**

2.29 The SRWG/9 (07-09 May 2025) discussed the next step recommended for States to handle GNSS RFI issues. It was raised that, after the GNSS RFI reporting form was issued to Member States, a clear procedure and guidelines were not provided on how to report such issues, especially for cross-border incidents. It was recommended to form an ad-hoc group that studies the current situation of GNSS interference in the region, GNSS RFI, analyzes it and proposes a way forward.

2.30 The ICAO Secretariat informed that since last year, not a single incident report has been shared with the ICAO APAC Office. Therefore, there was not enough data for the group to start working on this. It was agreed that it is imperative to first collect some incident reports from APAC States/Administrations. It was suggested that States/Administrations share their incident reports and details at the SRWG/10 Meeting. **Based on reports from States/Administrations, the need to form an ad hoc group will be deliberated at the SRWG/10 Meeting**.

2.31 The ICAO Secretariat was recommended to coordinate with other ad-hoc groups formed in the region for GNSS RFI matters and understand their scope of work. It will help to avoid duplication of efforts. The ICAO Secretariat will share information at the SRWG/10 Meeting.

2.32 After the SRWG/9 Meeting, the Secretariat has approached all GNSS RFI affected States to share the GNSS RFI occurrence. To date, only one State, Thailand, has shared compiled data projected in a dashboard, and India has shared several duly filled GNSS RFI occurrence forms submitted from various sources. However, it is not possible for the ICAO APAC Office to read and extract hundreds of forms and compile information. Therefore, India was requested to share a compilation of data. The response is still awaited.

Procedures for GNSS and Data Link Disruption Ad Hoc Group

2.33 The Procedures for GNSS and Data Link Disruption Ad Hoc Group, comprising subject-matter experts from ten States and three international organizations, was established by ATM/SG/12 **Decision ATM/SG/12-8**. The first meeting of the Procedures for GNSS and Data Link Disruption Ad Hoc Group was held on 1 October 2025, and the ToR was finalized. The ToR included discussion of operational GNSS RFI mitigation measures, while the technical considerations addressed by the CNS SG were kept outside its scope. The Ad-hoc Group is providing updates to date by WP/12 in this Meeting.

2.34 It is to be noted that the group is preparing a **Regional Guidance for APAC States/Administrations to have a common process for coordinating GNSS RFI and data link disruption** between air traffic controllers, pilots, airspace users and ANSPs.

Relevant outcomes of APANPIRG/36

2.35 The Thirty-Sixth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/36) was held in Bangkok, Thailand, from 24 to 26 November 2025.

2.36 The APANPIRG Chairperson highlighted the urgent and growing challenge of GNSS RFI in the Asia/Pacific region, as discussed in both WP/06 and WP/20 of APANPIRG/36. Recognizing the significant operational and safety risks posed by GNSS jamming and spoofing, the Chairperson encouraged States/Administrations to actively share their current practices, experiences, and mitigation measures, including detection, reporting, and operational responses, through established regional mechanisms. By promoting collective learning and open exchange of information, the Chairperson emphasized that the region could strengthen its resilience and ensure a coordinated, robust response to GNSS interference, safeguarding the safety and efficiency of civil aviation across Asia and the Pacific.

2.37 The Meeting noted that GNSS RFI is recognized in the ICAO Global Aviation Safety Plan (GASP 2026–2028) as a precursor contributing to Global High-Risk Categories of Occurrences (G-HRCs): CFIT, MAC, and Loss of Control In-Flight (LOC-I). As these G-HRCs represent unsafe end states, mitigating RFI as a precursor is essential to prevent accidents. The upcoming Asia Pacific Regional Aviation Safety Plan (AP-RASP) 2026-2028 will also recognize the threats posed by GNSS RFI on CFIT and MAC for the APAC region.

2.38 In APANPIRG/36, the Safety Enhancement Initiatives Working Group (SEI WG) proposed to collaborate closely with the CNS SG by WP/21. To operationalize this collaboration, SEI WG proposes the following APRAST actions aligned with the AP-RASP 2026–2028 objectives:

1) In coordination with APANPIRG, **identify geographic areas of concern** and analyze the **underlying factors specific to the APAC region** that contribute to GNSS RFI risk.
2) Based on this analysis, prioritize the **highest-severity threats** and subsequently develop focused regional SEIs and/or RASG-APAC Safety Advisories (RSAs).
3) Develop a comprehensive, holistic understanding of Original Equipment Manufacturer (**OEM) guidance and existing regional efforts** on managing the risk of GNSS interference.
4) In coordination with the appropriate APANPIRG contributing bodies, **identify and implement additional efforts to mitigate the risk of GNSS interference** within the region

2.39 CANSO recognized the importance of **maintaining a minimum operational network of conventional NAV AIDS** in supporting the mitigation of GNSS RFI and introduced the Guidelines for

Implementing a Minimum Operational Network (MON) published by CANSO. It encouraged the CNS SG and SEI WG to collaborate on exploring the possibility of developing a regional, minimal operational network for the APAC region.

2.40 CNS SG Secretariat supported the need for collaboration and agreed to share the proposed collaboration shared in the paper in the SRWG/10 Meeting and CNS SG/30 Meeting planned in 2026. The progress on the proposed collaboration and its associated outcomes will be presented at the APANPIRG/37 Meeting in 2026.

PIRG & RASG Regional Coordination Meeting

2.41 The Twelfth PIRG & RASG Regional Coordination Meeting was held on 27 November 2024 in the ICAO Bangkok Office in a Hybrid format. One specific topic identified for necessary coordination was data sharing between the APANPIRG's CNS SG and the Asia Pacific Regional Aviation Safety Team's SEI WG regarding the emerging risk posed by GNSS RFI.

Fourteenth Meeting of the Regional Aviation Safety Group – Asia and Pacific Regions (RASG-APAC/14)

2.42 During the Fourteenth Meeting of the Regional Aviation Safety Group – Asia and Pacific Regions (RASG-APAC/14) held at Bangkok, Thailand, from 28-29 November 2024, it was agreed to identify a few prioritized Action Items and to establish a suitable platform to initiate the mechanism as described in RASG-APAC/14-WP/22:

Task	**Air Navigation Group/ Subgroup**	**Safety Group/ Subgroup**	**Event Lead**	**Members**	**Potential Members (For Sourcing)**
Identification of Mitigation actions on Large Height Deviation and APAC regional hotspots	RASMAG[1]	SEI WG[2]	RASMAG	TBD	AEROTHAI, CANSO, IATA, IFALPA, AAPA
Identification of Mitigation Actions: Turbulence Encounters	MET SG	SEI WG	MET SG	TBD	Met and ANS experts
Identification of Mitigation actions for GNSS interferences and RF Frequency spoofing	CNS SG	SEI WG	CNS SG	TBD	CNS, Safety, IATA, etc.

2.43 RASG-APAC Decision 14/9 and 14/10 were adopted to develop an effective Coordination mechanism between PIRG and RASG.

2.44 It was agreed that the APRAST's CFIT Task Force will identify geographic areas of concern, analyze contributing factors related to operational safety in the APAC region, and prioritize threats to develop targeted safety enhancement initiatives and advisories. Additionally, the SEI WG aims to understand OEM guidance and existing efforts to manage GNSS interference, while maintaining close coordination with the CNS SG and other safety teams globally.

[1] RASMAG: Regional Airspace Safety Monitoring Advisory Group.
[2] SEI WG: Safety Enhancement Initiative Working Group, working under direction of the RASG-APAC/APRAST. Asia Pacific Regional Aviation Safey Team (APRAST) is a sub-group of the Regional Aviation Safety Group – Asia Pacific (RASG-APAC)

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss the key information to process from GNSS RFI reporting from States;

c) discuss the usage of the provided information on GNSS RFI occurrences;

d) motivate States to share GNSS RFI incidences along with issues in sharing, if any;

e) discuss the proposed future collaboration with SEI WG shared in WP/21 of APANPIRG/36; and

f) discuss any relevant matter as appropriate.

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Recommendation 6/2 of the 11th Air Navigation Conference (ANConf/11) in 2003

Recommendation 6/2 – Guidelines on mitigation of GNSS vulnerabilities

That States in their planning and introduction of GNSS services:

a) access the likelihood and effects of GNSS vulnerabilities in their airspace and utilize, as necessary, the mitigation methods as outlined in the guidance contained in Appendix A to the report on Agenda Item 6;

b) provide effective spectrum management and protection of GNSS frequencies to reduce the possibility of unintentional interference;

c) take full advantage of on-board mitigation techniques, particularly inertial navigation;

d) where determined that terrestrial navigation aids need to be retained as part of an evolutionary transition to GNSS, give priority to retention of DME in support of INS/DME or DME/DME RNAV for en-route and terminal operations, and of ILS or MLS in support of precision approach operations at selected runways; and

e) take full advantage of the future contribution of new GNSS signals and constellations in the reduction of GNSS failures and vulnerabilities.

Recommendation 6/8 of the 12th Air Navigation Conference (ANConf/12) in 2012

Recommendation 6/8 – Planning for mitigation of global navigation satellite system vulnerabilities

That States:

a) access the likelihood and effects of global navigation satellite system vulnerabilities in their airspace and apply, as necessary, recognized and available mitigation methods;

b) provide effective spectrum management and protection of global navigation satellite system (GNSS) frequencies to reduce the likelihood of unintentional interference or degradation of GNSS performance;

c) report to ICAO cases of harmful interference to global navigation satellite system that may have an impact on international civil aviation operations;

d) develop and enforce a strong regulatory framework governing the use of global navigation satellite system repeaters, pseudolites, spoofers and jammers;

e) allow for realization of the full advantages of on-board mitigation techniques, particularly inertial navigation systems; and

f) where it is determined that terrestrial aids are needed as part of mitigation strategy, give priority to retention of distance measuring equipment (DME) in support of inertial navigation system (INS)/DME or DME/DME area navigation, and of instrument landing system at selected runways.

Recommendation 2/2.2 of the 14th Air Navigation Conference (ANConf/14) in 2024

Recommendation 2.2/2 – Addressing global navigation satellite system interference and contingency planning

That States:

a) ensure that effective global navigation satellite system radio frequency interference mitigation measures are implemented, based on measures developed by ICAO and industry, including the need to maintain a sufficient network of conventional navigation aids to ensure operational safety as well as sufficient airspace capacity during times of global navigation satellite system interference;

b) through the mechanism of the planning and implementation regional groups, develop regional global navigation satellite system reporting mechanisms to raise operational awareness of affected geographical areas, to the extent feasible, as described in the Global Navigation Satellite System (GNSS) Manual (Doc 9849);

c) work with industry to identify means to make aircraft systems more resilient to radio frequency interference events, and to provide guidance on detecting global navigation satellite system jamming or spoofing and maintaining safe and efficient aircraft operation in case of global navigation satellite system anomalies; and

d) review aircraft minimum equipage lists to ensure compatibility with States' implemented minimum operational networks.

That ICAO:

e) continue to assess the impact of global navigation satellite system interference on aviation safety and continuity of civil aviation operations and define adequate mitigation measures, while reminding States of their obligations;

f) develop a standardized implementation package to assist and guide States in implementing effective global navigation satellite system radio frequency interference mitigation measures, including optimization and rationalization of conventional navigation aids, commensurate with their local conditions, to ensure continuity in the provision of air navigation services;

g) develop guidance on GNSS interference information exchange and civil-military coordination in relation to harmful interference to global navigation satellite system(s) originated or detected by military authorities; and

h) develop recommendations for globally harmonized minimum aircraft equipage lists to ensure that provided navigation infrastructure can be used by airspace users in line with available air traffic services.

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Resolution A42-8/C

Resolution A42-8: Consolidated statement of continuing ICAO policies and practices related to a global air traffic management (ATM) system and communications, navigation, and surveillance/air traffic management (CNS/ATM) systems

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

Whereas the CNS/ATM systems are evolving and so are the associated CNS **interdependencies**, threats and vulnerabilities;

Whereas the occurrences of interferences against satellite-based CNS systems and global navigation satellite system (GNSS), in particular, have significantly increased;

Whereas CNS resiliency to interference needs to be addressed at a global level with a holistic approach, ensuring an efficient and coordinated evolution between the infrastructure architecture, improved technological capabilities, civil and military operational procedures, radio regulatory authorities and civil-military coordination;

Recognizing that resiliency to interference needs to be improved by maximizing the integration of all suitable ground infrastructure, space infrastructure and airborne components in a complementary and cooperative manner, to be as robust as possible to cases of satellite-based service disruption or environments where false or deceptive signals are present;

Recognizing that both the aircraft on-board and ground infrastructure complementing the satellite-based CNS systems need to be adapted to include, where appropriate, interference detection, mitigation and reporting functions to support the resolution of operationally encountered performance anomalies;

Believing that, combined with the use of the appropriate legal framework, such capabilities and measures will allow for the relevant authorities to act upon harmful interferences caused by the illegal operation of transmitters and avoid the proliferation and the use of such illegal transmitters and the misuse of test and maintenance equipment;

Believing that, with appropriate coordination and application of best practices, military and State authorities can conduct GNSS-related testing and other interventions using radio equipment as necessary and without causing an undue impact on civil aviation;

Believing that civil-military coordination should facilitate the sharing of relevant information with airspace users, especially when flying in the vicinity of a conflict zone; and

Acknowledging that loss of crew's situational awareness from malicious origin is classified as a cybersecurity threat and cannot be tolerated in civil aviation; and that intentionally sending misleading signals to replace the accurate signal is a far more serious threat to flight safety than the loss of this signal.

The Assembly:

1. Encourages States to transition towards optimized, secure CNS systems based on complementary integration of suitable and independent aircraft capabilities, satellite- and ground-based infrastructure which maximize resiliency and robustness to any type of interference*;*

2. Encourages standardization bodies and industry to develop appropriate interference detection, mitigation and reporting capabilities for the aircraft on-board, satellite- and ground-based CNS system components, in order to ensure higher CNS resiliency, continuity of operations and prevent any cascading effects from the use of compromised position, velocity or time data;

3. Encourages States to ensure that **resilient** terrestrial CNS capabilities remain available to ensure safe operations and complement aircraft-level integration of position, **navigation** and time **(PNT)** with independent surveillance information **supporting resilient and safe operations;**

4. Invites ICAO to develop high-level principles on how to integrate CNS ground, space and on-board systems and capabilities **and evolve PNT solutions** to obtain more resilient positioning and timing services;

5. *Encourages* standardization bodies and industry to collaborate with ICAO in advancing PNT solutions that align with ICAO initiatives;

6. *Invites* ICAO to establish a comprehensive review framework to enhance the CNS/ATM resilience;

7. *Urges* States to apply necessary measures to avoid the commercialization/proliferation, **purchase, possession** and the use of illegal transmitters such as jammers and the misuse of test and maintenance equipment which may impact CNS systems;

8. *Urges* States to ensure close collaboration between aviation authorities, military authorities, service providers, radio regulatory and spectrum enforcement authorities to put in place any special measures required to ensure that the spectrum used by all CNS systems, and GNSS in particular, is free from harmful interference;

9. *Urges* States to refrain from any form of jamming, or spoofing affecting civil aviation;

10. *Urges* States to coordinate and notify to the maximum extent possible in advance with the air navigation services provider (ANSP) responsible for the affected airspace in case of military or other Stateauthorized security or defence-related operations or training, potentially causing any form of jamming, or spoofing affecting civil aviation; and

11. *Urges* States and operators, when assessing the interference risks associated with conflict zones, to consider that the use of satellite-based CNS systems can potentially be impacted beyond those zones

C-DEC 234/11
4/04/25

COUNCIL — 234TH SESSION

ELEVENTH MEETING

(COUNCIL CHAMBER, WEDNESDAY, 26 MARCH 2025 AT 1000 HOURS)

SUMMARY OF DECISIONS

OPEN MEETING

Recurring GNSS Radio Frequency Interference and Their Implications on the Safety and Security of International Civil Aviation

1. The Council considered this item on the basis of C-WP/15690 presented by the Republic of Korea, which reported on recurring GNSS Radio Frequency Interference (RFI) on the Korean Peninsula originating from the Democratic People's Republic of Korea (DPRK) and the resulting risks to air navigation safety and security of international civil aviation.

2. Following consideration, the Council:

a) recalled and reaffirmed its serious concerns regarding the harmful impact of GNSS RFI on the safety and security of international civil aviation, which went against the principles enshrined in the *Convention on International Civil Aviation* (Chicago Convention) and its Annexes;

b) noted, with grave concern, that despite the Council's previous decisions of 18 June 2012, 31 May 2016, and 14 June 2024, these incidents of GNSS RFI originating from the DPRK had continued to recur in the intervening period and had been ongoing since 2 October 2024, jeopardizing the safety of international air navigation in the Incheon FIR;

c) strongly urged the DPRK to fully implement the aforementioned Council decisions of 18 June 2012, 31 May 2016, and 14 June 2024, and strictly comply with its obligations under the Chicago Convention;

d) reiterated its call to the DPRK to ensure that similar occurrences did not recur in the future;

e) requested the President of the Council to send a letter to the Minister responsible for civil aviation in the DPRK to communicate the Council's present decision;

f) also requested the Secretary General to issue a State letter informing Member States of the Council's decision on this subject;

g) considering the serious and continuous risk posed to international civil aviation as a

result of these recurring incidents of GNSS RFI originating from the DPRK, agreed to give further consideration to the reporting of this matter in accordance with Article 54(k) of the Chicago Convention to the 42nd Session of the Assembly during the 235th Session;

h) agreed that a press release should be prepared and issued informing of this decision of the Council;

i) considering the implications of the ongoing GNSS RFI in the Incheon FIR for the safety and security of international civil aviation in the region, requested the ICAO Asia Pacific Regional Office to continue its efforts to engage with the Democratic People's Republic of Korea specifically on this issue; and

j) requested that the Council continues to be kept closely apprised of any developments in this regard.

Report on Global Navigation Satellite System (GNSS) Radio Frequency Interference

3. The Council considered this item on the basis of an oral report from the Secretary General, which pursuant to C-DEC 233/7, provided information related to the ongoing risks posed by GNSS Radio Frequency Interference (RFI), and the progress of ICAO's ongoing activities in this area, particularly with respect to mitigation measures aimed at reducing the likelihood and impact of GNSS interference on aviation operations.

4. Following consideration, the Council:

a) recalling its previous decisions on this matter (C-DEC 232/8 and C-DEC 233/7, refer), noted, with concern, the rising number of GNSS RFI incidents and the resulting increased risk to global flight operations, and in that connection, welcomed the Secretariat's efforts to raise Member States awareness of the serious impact on air navigation systems, and to promote a comprehensive and harmonized approach for identifying and effectively mitigating such interference;

b) recognized that, beyond jeopardizing air navigation safety, GNSS RFI also threatens aviation security, requiring a coordinated and holistic response, and in that regard, emphasized the importance of the One ICAO approach to facilitate cooperation and align efforts across Bureaux on this issue;

c) took note of the ongoing coordination between ICAO, the International Maritime Organization (IMO) and the International Telecommunications Union (ITU), including their joint statement emphasizing the critical need to protect GNSS from harmful interference, as well as the Organization's engagement with the United Nations Secretary-General to support and promote the actions outlined therein;

d) encouraged the Secretariat to pursue outreach to Member States and partner organizations to mobilize resources for the development, validation and deployment of the new iPack for the mitigation of GNSS RFI, capacity building and the exchange of best practices for detecting, preventing and reporting GNSS RFI, and in that connection, expressed appreciation to the Government of France for its commitment to contribute to this important initiative;

e) recognized the work of the Air Navigation Commission and its expert groups to address this issue, including the development of new guidance material and the creation of new NOTAM codes for GNSS RFI;

f) underlined the importance of developing and implementing effective mechanisms for detecting, preventing and reporting occurrences of GNSS RFI, as an essential means to mitigate risks posed by such interference, where possible;

g) encouraged Member States to consider, as appropriate and practical, retaining or implementing a Minimum Operational Network (MON) of ground based navigation and surveillance infrastructure to ensure operational safety as well as sufficient airspace capacity during times of GNSS interference, and to explore equipping aircraft with GNSS-independent systems, where feasible;

h) encouraged further collaboration with industry stakeholders with a view to urgently implementing existing, and developing new, solutions that enhance the resilience of GNSS receivers to jamming and spoofing;

i) recognized that the use of Multiple GNSS constellation, augmented and upgraded to dual frequency, can provide redundancy and additional robustness;

j) requested the Secretariat to prepare a roadmap outlining short-, medium- and long-term actions to address GNSS RFI, including immediate mitigation measures and long-term strategies to build an air transport system resilient to such interference;

k) invited the Secretariat to prepare a working paper for consideration by the 42nd Session of the Assembly outlining the scope, risks, and potential consequences of GNSS RFI, to be presented to the Council during the 235th Session;

l) requested that the Secretariat continue to keep the Council apprised of further developments in this regard, for further action, as may be required; and

m) noted the importance of ensuring that sufficient resources are allocated in the 2026–2028 Regular Budget to support the Organization's continued efforts to address GNSS RFI, and emphasized that this should be duly considered in the context of the Council's ongoing deliberations on the Budget scenarios.

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