

ICAO Roadmap for addressing GNSS RFI

ICAO APAC CNS/30

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ICAO GNSS RFI Roadmap



ICAO GNSS RFI Roadmap

Medium Term
To enhance the resilience and efficiency of aviation operations by optimizing ground radio navigation infrastructure, introducing RFI detection capabilities and improving civil-military coordination in managing GNSS RFI

**2027 -
2029**

Long Term
To ensure the resilience of aviation operations in the presence of GNSS RFI through the development and integration of technological enhancements across GNSS, along with independent timing sources

**2030
onward**

**2023 -
2026**

Short Term
To ensure safe operations during GNSS RFI events by sustaining the provision of air navigation services, by development and use of contingency procedures, and strengthening awareness and vigilance of flight crew and ATS personnel

Short-Term

iPack for the Mitigation of GNSS RFI

To support States in managing GNSS RFI incidents and to ensure the continuous provision of safe and efficient ANS

2026 ○

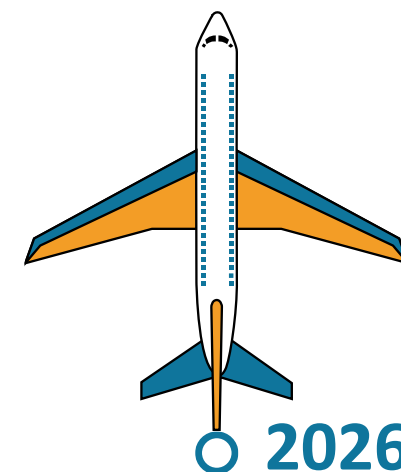
GNSS RFI-related NOTAM Codes & Text

Harmonized text and codes to enhance situational awareness and support more efficient NOTAM filtering by operators

2025 ○

ICAO Workshops & Publications

Conducted regional Workshops and Symposia, & disseminated info on the evolution of RFI (emerging threats, mitigation measures, existing gaps, lessons learned and best practices)



Online Reporting of GNSS RFI to ITU

Enhance international coordination (between States, ICAO and ITU) for resolution or escalation

○ 2025



Inter-agency UN Collaboration

A joint ICAO-ITU-IMO declaration called upon States to protect GNSS from harmful interference

○ 2023 - 2026

ICAO Outreach

Plan for 2026

- ICAO SAM Radio Navigation Workshop
2-4 September 2026
- ICAO MID PBN/GNSS Workshop
28-30 September 2026
- Air Navigation World – 1st ICAO Global CNSS event



Past Events



ICAO EUR/MID Radio Navigation Symposium
(6-8 Feb 2024, Antalya, Türkiye)



ICAO/ACAO Radio Navigation Workshop
(24-26 Feb 2025, Rabat, Morocco)



ICAO APAC Radio Navigation Symposium
(7-9 April 2025, New Delhi, India)



ICAO NACC Radio Navigation Workshop
(2-4 September 2025, Mexico City, Mexico)

Global event on GNSS resilience is planned Q2 2027

GNSS RFI-related NOTAMs

1. NOTAM QCodes:

- New NOTAM Code for Spoofing (LO) –PANS ABC need to be updated (2029)
 - Associate interference code (LF) with GNSS

2) Recommended Item E Text for Jamming: GNSS MAY BE UNRELIABLE WITHIN ...

3) Recommended item E text for GNSS Spoofing: GNSS MAY BE MISLEADING WITHIN ...

4) Guidance for Pilots on the interpretation GNSS RFI-related NOTAMs

Update of relevant ICAO provisions is currently in progress





Implementation Package (iPack) for GNSS RFI Mitigation



Raise Awareness

Educate stakeholders on effects of GNSS RFI on CNS/ATM systems, aviation operations, and GNSS-based services through comprehensive training materials and workshops



Risk Mitigation Framework

Provide methodologies for threat monitoring, risk assessment, and implementation of mitigation measures tailored to specific operational environments



Expert Support

Deliver hands-on guidance to develop essential policies, procedures, and training requirements for managing GNSS RFI events



Infrastructure Assessment

Assist States in assessing conventional navigation infrastructure for a rationalized approach to maintaining necessary backup capabilities

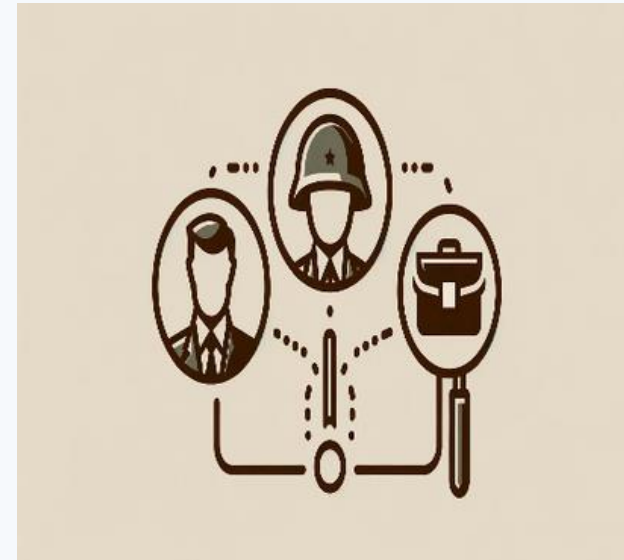
GNSS Manual Update (Doc 9849)

The forthcoming update to the GNSS Manual will include the following enhancements:

- guidance on monitoring and mitigation techniques
 - effects of spoofing on navigation and timing capabilities
 - possible effects of GNSS RFI on other aircraft capabilities
 - alternative and complimentary conventional navigation capabilities
 - Revising terminology and reorganizing content to better address current, global impacts and a wider audience of stakeholders affected by GNSS RFI
 - Updating and correcting content to reflect the current threat environment
-
- Manual updates are expected to be completed by November 2026.



Resilient Navigation Operational Network (NAV RON)



New Guidance for Civil-Military coordination



Update PBN Manual to support PBN operations in case of GNSS RFI



Onboard RFI detection capability

Medium-Term

2027-2029

Objective

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Inclusion of GNSS RFI in Security risk assessment and update relevant security guidance (2027)



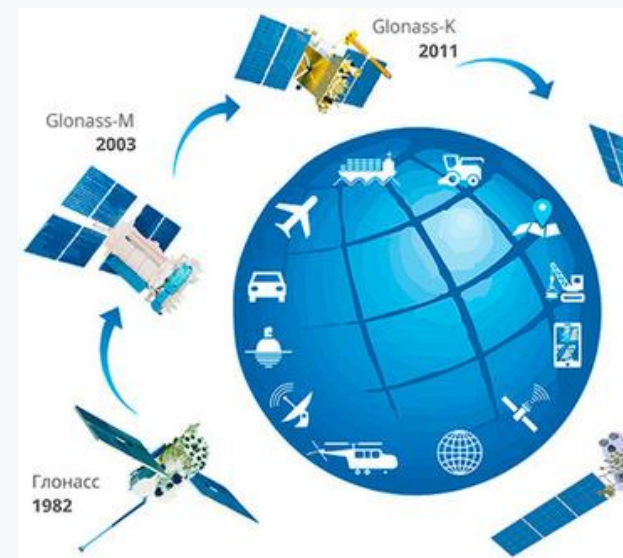
**Complementary Positioning,
Navigation and Timing
(C-PNT)**



**GNSS Signals Authentication for
augmentation systems
(SBAS Authentication)**



**GNSS Signals Authentication
for Core Constellations
(Galileo OSNMA)**



**Dual Frequency
Multiple Constellation
(DFMC GNSS)**

Long-Term

2030 onward

Objective

To ensure the resilience of air navigation in the presence of GNSS RFI through the development and integration of technological enhancements across GNSS, along with independent timing sources.

Forthcoming Actions

Electronic Bulletin

- *Guidance Material for reporting GNSS RFI incidents to ITU through ICAO for assistance and resolution.*
- *Guidance on effective Spectrum regulatory measures to prevent, detect, and mitigate GNSS RFI*
- *GNSS RFI-related NOTAM:*
 - *Recommended Text (Item E)*
 - *Guidance Material for pilots on the interpretation of GNSS NOTAMs*

Review of the ICAO GNSS RFI Roadmap

ICAO Navigation Systems Panel (NSP) to review and update, as necessary, the ICAO GNSS RFI roadmap

ICAO Global Event on GNSS Resilience

- *Addressing and promoting long-term solutions for GNSS RFI (ex. C-PNT, Galileo OSNMA, SBAS Authentication,..etc)*
- *Q2/Q3 2027*



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Thank you for your attention!