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FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

Agenda Item 2: Timely and safe use of new technologies
2.2: Addressing safety risks related to evolving aviation technologies

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) INTERFERENCE

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

The global navigation satellite system (GNSS) has played a significant role in enhancing the efficiency of airspace and airport operations, promoting environmental protection and ensuring the punctuality of air traffic passengers. However, due to the increasing cases of intentional and unintentional GNSS interference, ICAO, Member States, air operators and industry stakeholders were requested to identify mitigation measures. Efforts are being made to improve contingency procedures, enhance Standards and Recommended Practices (SARPs) to increase the reliability and improve stability of the GNSS system. The interference with GNSS signals poses a threat to aviation safety and undermines efficient airspace and airport operations.

Recently, Global Positioning System (GPS) signal interference incidents occurred in Incheon Flight Information Region (FIR), with air traffic control (ATC) receiving around 500 reports of GPS signal anomalies and ground proximity warning system (GPWS) warnings by pilots. Through risk mitigation activities against GNSS interference, there were no serious safety issues in Incheon FIR. Based on a thorough analysis of global GNSS interferences, it is recommended to consider integrating GNSS interference-related risk mitigation actions into the future ICAO global air navigation plan revision process. This approach will help address potential challenges and improve resilience against GNSS interference globally.

Action: The Conference calls for the recognition of the global GNSS interference issue in civil aviation and the endorsement of the proposals outlined in paragraph 3 to incorporate GNSS interference scenarios into the Global Air Navigation Plan (GANP, Doc 9750).

1. INTRODUCTION

1.1 The GNSS has served as a foundation of aviation for over two decades, enabling performance-based navigation (PBN), automatic dependent surveillance (ADS), controller-pilot data link communication (CPDLC), and providing positioning, navigation and timing information crucial for both aviation and non-aviation sectors. Its role is indispensable.

1.2 Since 2012, instances of GPS signal interference have been reported by pilots in the Incheon FIR. In May and June 2024, contrary to the usual trend, around 500 domestic and international flights reported GPWS warnings and GPS signal anomalies.

1.3 Domestic interference sources can typically be swiftly identified and addressed through effective collaboration among the civil aviation authority, frequency allocation and management agencies, the military and service providers. However, challenges arise in responding to GPS signal interference from external sources. Assembly Resolution A41-8 urges Member States to: cease GPS radio frequency interferences (RFI); comply with the Chicago Convention; and advocate for frequency protection for aviation safety at International Telecommunication Union (ITU) meetings. Despite these efforts, GNSS RFI threats such as jamming and spoofing are on the rise, raising concerns over cybersecurity.

1.4 Interference with GNSS radio frequencies can lead to inaccuracies in GNSS-dependent automatic dependent surveillance – broadcast (ADS-B) transmissions, potentially feeding incorrect aircraft positions to air traffic controllers through air traffic management (ATM) systems. While using multiple surveillance sensors can help mitigate such risks, delays are observed in the ADS-B implementation in several States and in PBN air navigation services with GNSS (included satellite-based augmentation system (SBAS)) due to ongoing GNSS interference challenges.

1.5 The ICAO GANP contains elements to improve air traffic management in densely populated airspaces and maintenance efficiencies of ground-based navigation infrastructure through the utilization of GNSS for navigation and precise aircraft monitoring. Despite the significant benefits offered by GNSS, instances of GNSS RFI impede the evolution of the aviation industry and add burdens to future advancements.

2. DISCUSSION

2.1 To address the escalating challenge of GNSS RFI, it is imperative to monitor and analyse the global GNSS RFI environment comprehensively. Based on multifaceted analyses, incorporating into the ICAO GANP is essential. These approaches should encompass the following actions:

a) Global monitoring of GNSS interference: Establish a comprehensive global monitoring system to track GNSS RFI, collecting data on disrupted frequencies, locations and impacts on civil aviation. Real-time information sharing with Member States, aviation authorities and industry stakeholders is crucial.

b) Review and analysis: Regularly review and analyse the collected data to identify trends and hotspots, and assess the efficacy of existing mitigation measures. Use advanced analytical tools and techniques to pinpoint the underlying causes of GNSS interference and explore potential solutions.

c) Diverse mitigation approaches: Investigate and assess various strategies for mitigating GNSS interference, encompassing technical remedies, regulatory measures and operational procedures. Advocate for the development and deployment of anti-jamming and anti-spoofing technologies, while promoting the integration of complementary navigation systems. Share best practices and innovate solutions from diverse regions and industries to develop a comprehensive toolkit for addressing GNSS interference.

d) Enhanced coordination and communication: Strengthen coordination and communication among Member States, international organizations and industry stakeholders to ensure a unified and effective response to GNSS interference. Promote international cooperation and alliances to tackle GNSS interference as a global concern through workshops, conferences and training programmes aimed at disseminating knowledge and best practices for GNSS interference mitigation.

e) ICAO GANP updates: Update the ICAO GANP based on monitoring and analysis results, reflecting the latest insights on GNSS interference and the most effective mitigation strategies. Ensure that the updated GANP provides clear guidelines and recommendations to Member States for strengthening the resilience and security of navigation systems. Establish mechanisms for regular updates and revisions to accommodate new information and technologies, fostering a culture of continuous improvement.

2.2 Considering future navigation planning, it is necessary to evaluate the suitability of investment in infrastructure to support efficient aircraft operations relying on GNSS. This includes assessing initiatives such as ADS-B implementation, PBN/performance-based communication (PBC)/ performance-based surveillance (PBS), and the potential efficacy of regional efforts to improve the GNSS RFI environment.

2.3 By implementing these measures, updates to the GANP with considerations on GNSS interference are needed to ensure the safety, efficiency and reliability of the global air navigation system, benefiting the entire aviation community.

3. CONCLUSION

3.1 Recognizing the negative impact of GNSS RFI on global civil aviation safety and efficiency, the Conference is invited to agree on the following recommendation:

Recommendation 2.2/x – GNSS interferences

That States:

a) consider establishing a framework for monitoring global navigation satellite system (GNSS) radio frequency interference (RFI), recognizing the significant safety threats to civil aviation; and

b) cooperate with ICAO, international organizations and stakeholders in developing ICAO's framework for monitoring and analysing the global GNSS RFI;

that ICAO:

c) continue to accord priority to ICAO’s work in the area of GNSS interference and its implications on the safety and security of international civil aviation;

d) develop a mechanism for continuous monitoring and analysis of global GNSS RFI in cooperation with Member States, international organizations, service providers and other stakeholders; and

e) conduct global GNSS RFI impact assessments regularly and use these outcomes for effective reviews and enhancements of the *Global Air Navigation Plan* (GANP, Doc 9750).

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