

**59th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

*Cebu, Philippines
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AGENDA ITEM 4: AIR NAVIGATION

GNSS RFI SITUATION AWARENESS AND COOPERATION

(Presented by the Republic of Korea)

SUMMARY

GNSS (Global Navigation Satellite System) is one of the key navigation systems and has emerged as a critical infrastructure with increasing dependence. However, GNSS radio frequency interference (RFI) is continuously rising, affecting the safe operation of aircraft and obstructing the implementation of future navigation plans. This paper shares ICAO resolutions related to GNSS RFI, emphasizes the need for situation awareness and international cooperation, and recommends collaboration between States/Administrations.

GNSS RFI SITUATION AWARENESS AND COOPERATION

1. INTRODUCTION

1.1 Global Navigation Satellite System (GNSS) has already become essential infrastructure in aviation with significant reliance placed on it. Meanwhile, GNSS radio frequency interference has been on the rise, threatening the safe operation of aircraft flying through terminal areas, airport approaches, and air routes.

1.2 At the 40th and 41st sessions of ICAO Assembly, many papers stressing the need for strong CNS (Communication, Navigation, Surveillance) system resilience and safety mitigation measures in response to GNSS interference were presented. As a result, a resolution was adopted to develop appropriate measures for ANSP and pilots to mitigate the GNSS RFI.

1.3 At the 14th ICAO World Navigation Conference, member states were advised to establish GNSS interference monitoring and reporting procedures through PIRG.

1.4 It is necessary to analyze GNSS RFI accurately for the mitigation of its impact and consider the introduction and implementation of PBN and new CNS system like ADS-B for the reduction of separation minima. GNSS RFI incidents are hindering the implementation of measures aimed at improving efficiency for increased air traffic and airport capacity. Thus, monitoring and analyzing GNSS RFI incidents can contribute to improving decision making for CNS/ATN in the future.

2. DISCUSSION

2.1 The Spectrum Review Working Group (SRWG) under ICAO APANPIRG adopted the GNSS RFI reporting form, which had been developed through the MID/EU workshop, for application in the Asia-Pacific region. The report includes:

- **Reporters:** ATS personnel and pilots
- **Contents:** Interference awareness, coordinates, duration, GNSS elements affected in aircraft, procedures used in operations, type of GNSS RFI (natural, intentional interference, wireless communication station failure, etc.)

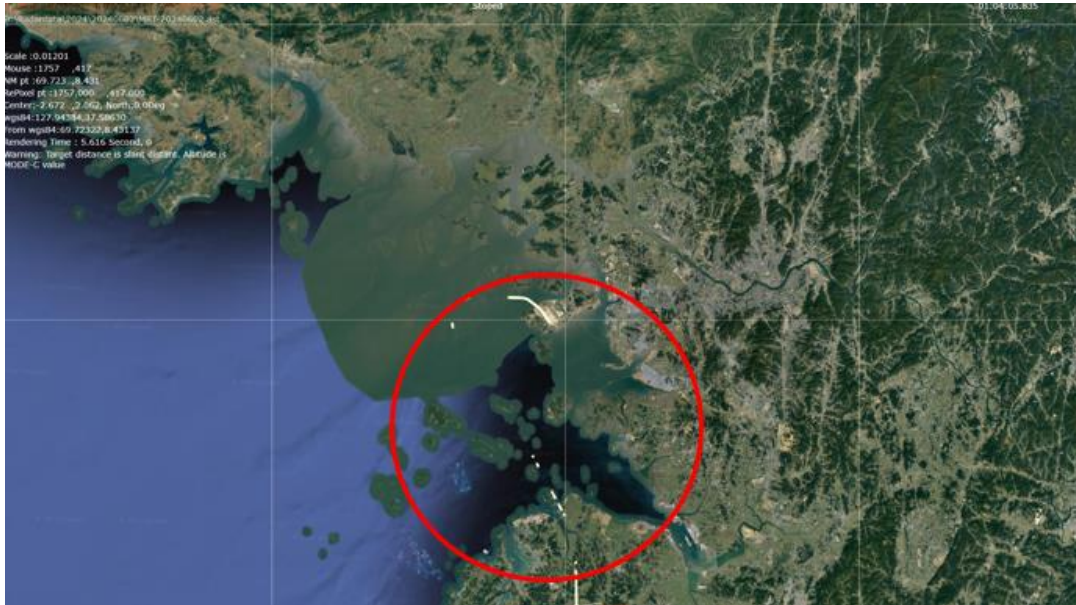
2.2 GNSS RFI reporting should monitor the location, the level of damage, and alternative procedures. It is also important to analyze whether the RFI is caused by natural phenomena, unintentional interference from other wireless communications, or intentional actions such as jamming/spoofing, and to predict the potential impact on domestic or neighboring FIRs (Flight Information Regions). The reporting items include but not limited to:

- **Location of occurrence:** Coordinates, duration, GNSS anomalies experienced by aircraft in domestic or adjacent FIRs, and threats to pilots
- **Interference factors:** Space radiation, malfunctioning wireless communication devices, intentional acts such as jamming and spoofing
- **Impact:** Aircraft (ADS-B, GPWS/EGPWS, communication systems, visual errors, etc.), ground CNS systems (GLS/SLS, Communications, ATM systems, etc.)
- **Alternative procedures**

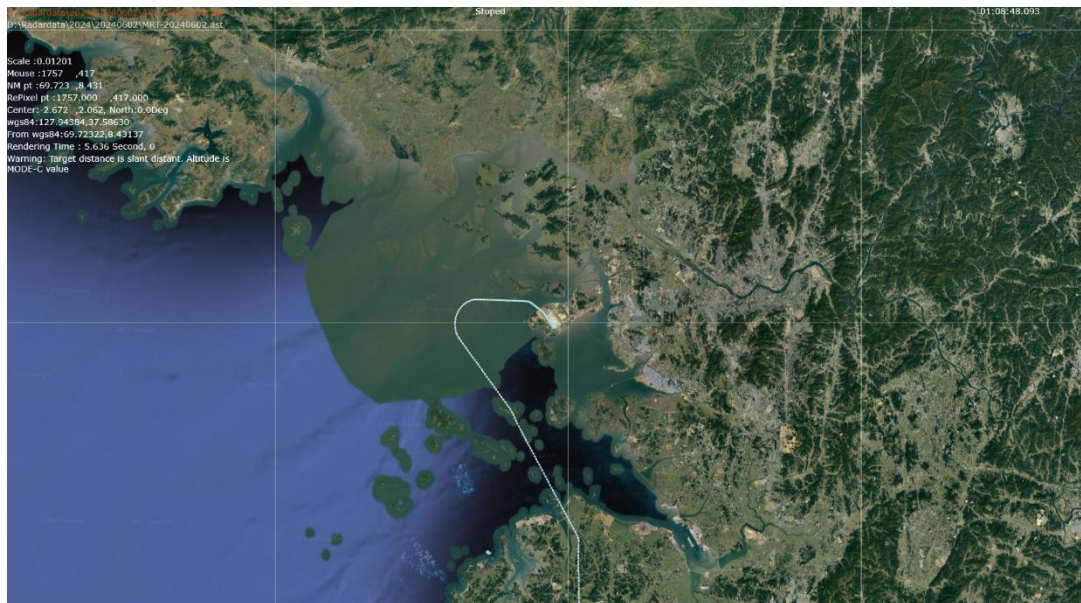
2.3 Detailed GNSS RFI monitoring can help predict possible impacts on FIRs, provide pre-distribution of aviation notices, and enable the sharing of interference cases from the wireless communications industry, allowing member states to prevent interference in advance. Additionally, regional GNSS frequency interference from space radiation and solar flares should be analyzed for the

safe operation of aircraft.

2.4 Most civil aircraft worldwide use GNSS for navigation, and ADS-B ground systems reliant on GNSS are being built to precisely monitor aircraft in airspace and ground, reduce separation intervals, and accommodate growing air traffic volumes. Several member states have mandated or are planning to require ADS-B installation. The following shows one of the abnormal situations in surveillance by ADS-B in Incheon FIR.



[ADS-B only]



[Incheon Multi Radar Tracking]

2.5 For the implementation of ICAO GANP, some member States in the APAC region have been sharing traffic information with neighboring States and tests are underway to enable surveillance information exchange through SWIM for Flight and Flow Information Collaborative Environment (FF-ICE). The Republic of Korea installed and is using ADS-B ground systems as one of the sources for surveillance information. However, GNSS RFI events restrict efforts to require the

equipment of ADS-B to flights operating in Incheon FIR as well as surveillance information exchange with adjacent FIRs.

2.6 In addition, GNSS RFI has made it difficult for aviation authorities to establish the timeframe for the implementation of new reliable and sustainable infrastructure. Therefore, it is crucial to analyze GNSS RFI events and facilitate cooperation on CNS and ATM implementation in the APAC region. Continuous monitoring and consideration on this issue at the Director General level in the region is necessary.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) note the information contained in this paper;
- b) strongly recommend States/Administrations to participate in the APAC SRWG meeting and share experiences of GNSS RFI incidents; and
- c) encourage ICAO to forward the APAC SRWG report regarding GNSS RFI incidents to this DGCA conference for a situation awareness of GNSS RFI in APAC Region.

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