# 60th CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGIONS

*Sendai, Japan*
*28 July - 1 August 2025*

AGENDA ITEM 4: AIR NAVIGATION

## FIGHT AGAINST GNSS RFI!

(Presented by Japan)

**SUMMARY**

Addressing the increasing risk of global navigation satellite system (GNSS) jamming and spoofing against civil aviation is an urgent issue both globally and regionally, and the APAC region is no exception. This paper introduces initiatives being taken by Japan to address GNSS RFI, including the detection of jamming/spoofing, information sharing and the implementation of a minimum operational network as a backup, and encourages APAC States to implement detection and mitigation systems against GNSS RFI and to enhance cooperation with other States.

# FIGHT AGAINST GNSS RFI!

## 1. INTRODUCTION

1.1 Addressing the increasing risk of global navigation satellite system (GNSS) jamming and spoofing against civil aviation is an urgent issue both globally and regionally, and the APAC region is no exception.

1.2 The 14th Air Navigation Conference (Montreal, 26 Auguest-6 September 2024) and the 59th APAC DGCA Conference (Cebu, 14-18 October 2024) presented recommendations and/or agreed actions including the implementation of effective GNSS radio frequency interference mitigation measures, the development of regional GNSS reporting mechanisms, and 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.

1.3 Based on those recommendations and/or agreed actions, APANPIRG (Bangkok, 25-27 November 2024) endorsed the Decision ATM/SG/12-8: Establish Procedures for GNSS and Data Link Disruption Ad Hoc Group. While the Ad Hoc Group is still in preparation, the APAC Radio Navigation Symposium (New Delhi, 7-9 April 2025) was held, where useful information was exchanged among participants.

## 2. DISCUSSION

2.1 To counter GNSS RFI, Japan has established an RFI detection system and a reporting mechanism.

2.2 In the past, Japan has experienced multiple events of degradation in on-board GNSS performance. One example is the one that affected around 20 aircraft in the vicinity of Komatsu Airport from December 15 to 18, 2020. Japan analyzed the GNSS data recorded by Michibiki Satellite-based Augmentation System (MSAS) monitoring station at Komatsu Airport and other stations located in Japan, and identified the degradation of C/N0 (Carrier to Noise density ratio) of the GPS signal at the Komatsu Airport station (Figure 1 and 2). It was determined that the RFI was caused by external interference other than GPS, and with the Regional Telecommunications Bureau, the source of the RFI was identified (Figure-3).

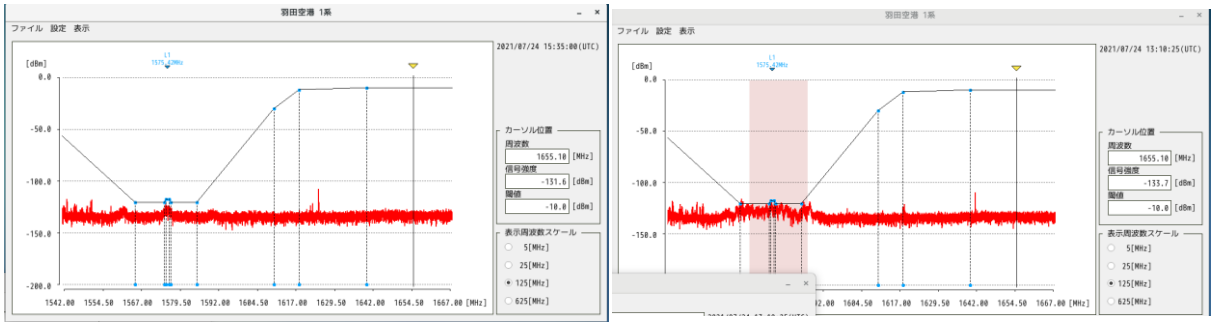

Figure - 1 Spectrum analyzer status
(Left: Normal, Right: Interference example)

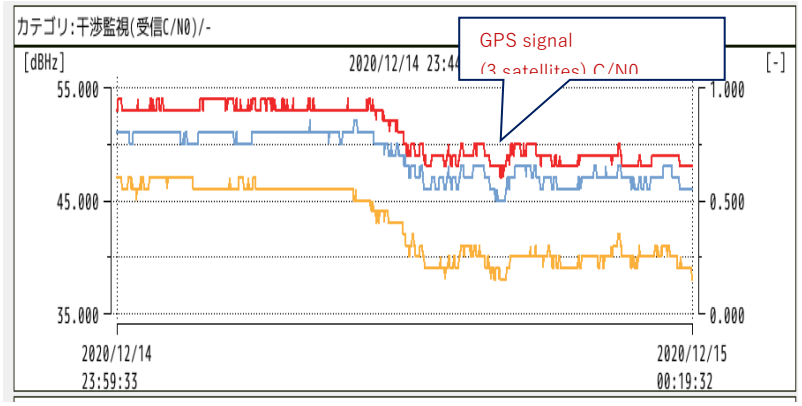


Figure - 2
GPS signal C/N0 fluctuations
(Carrier power to noise power ratio)

Figure - 3 The RFI was caused by a wireless camera mounted on a crane at a construction site.

2.3 To detect GNSS jamming in a timely manner, Japan has developed a prototype GNSS jamming detection tool and is currently evaluating it using real-time positioning data from approximately 80 of the 1,300 GPS-based Control Stations managed by the Geospatial Information Authority of Japan. In addition, to detect GNSS spoofing, Japan has also developed a prototype GNSS spoofing detection tool that can detect possible spoofing by comparing ADS-B position data of each aircraft with fusion data of SSR and WAM processed by HARP (Hybrid Air-route suRveillance sensor Processing equipment) at 2-second intervals. (Figure-4)

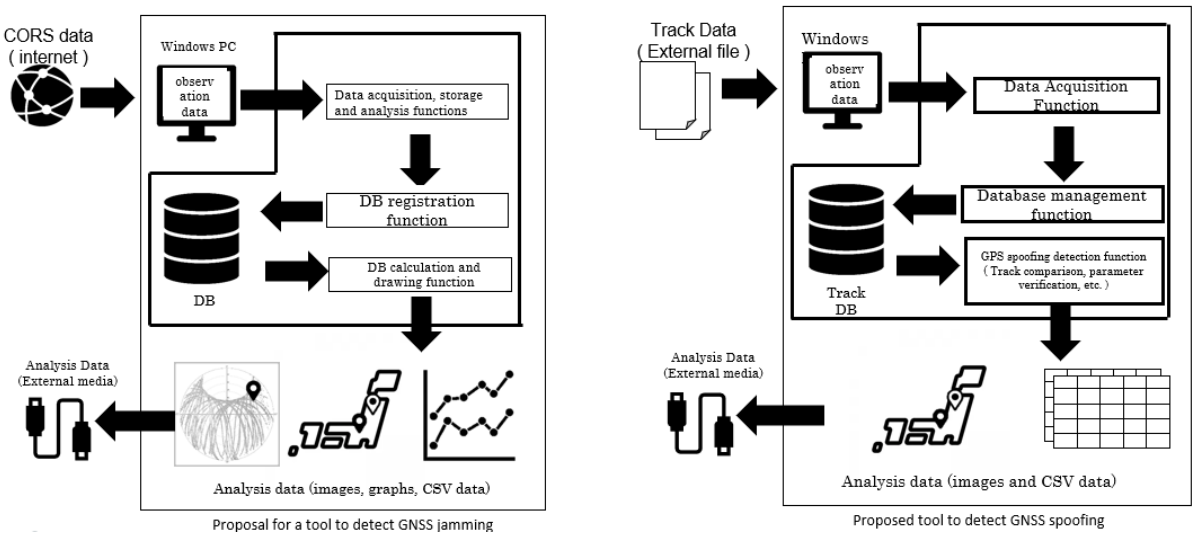


Figure - 4 Jamming and spoofing detection tool

2.4 Information about GNSS RFI will be shared through NOTAM to quickly inform ANSPs of GNSS RFI occurrence events, enabling them to notify to flight users promptly and help avoid flying deviant routes. (Figure-5)

NOTAM
(6366/21 NOTAMN
Q)RJJJ/QGWXX/IV/NBO/E/000/999/4155N14652E100
A)RJJJ B)2110141000 C)2110241459
E)GPS POSITION ACCURACY MAY BE REDUCED WITHIN A 100NM

Figure - 5
Contents of NOTAM issued by GNSS RFI

2.5 The MON (minimum operation network) using conventional navaids is one of the important methods to mitigate GNSS RFI. VOR provides sufficient coverage at an altitude of 10,000 ft in Japan as shown in Figure - 6. Japan's territory consists of mountainous regions and islands, so some low-altitude areas and remote islands may fall outside the coverage of VOR, but there are no major issues with the current operations.

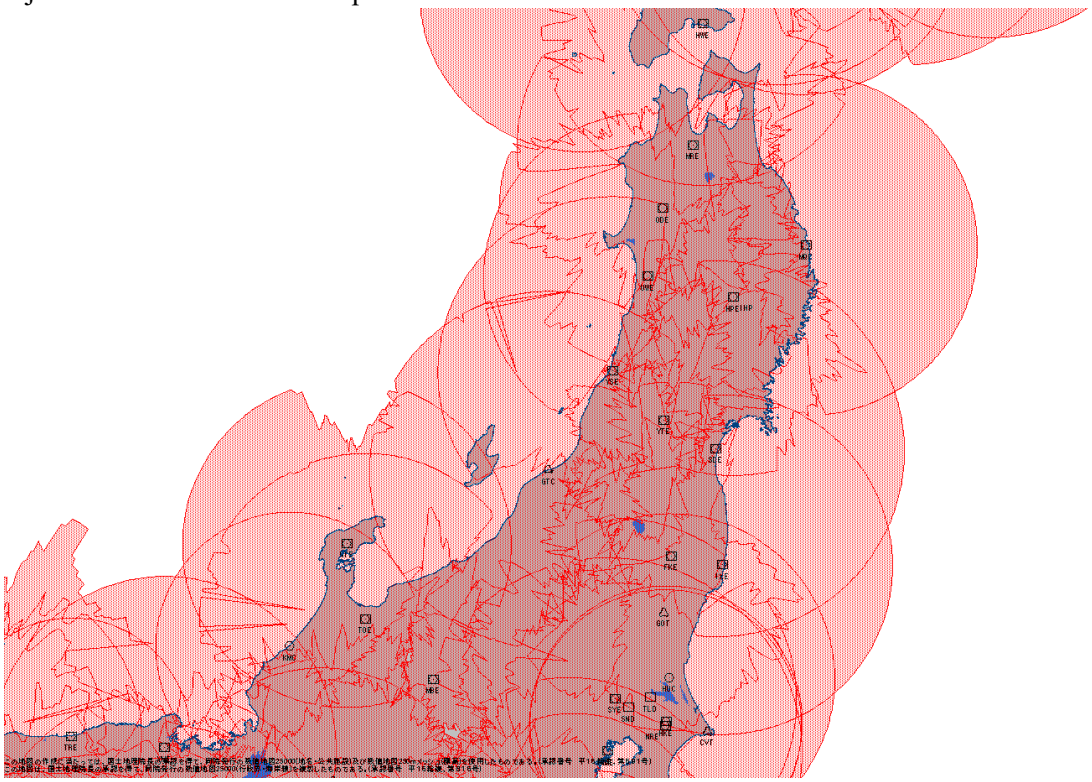

Figure - 6
VOR coverage at 10,000 ft

2.6 GNSS RFI is expected to continue increasing in the APAC region. It is important for States to implement mechanisms for the detection and mitigation of GNSS RFI and to enhance cooperation and coordination with other States in order to maintain and improve a safety and sustainable aviation network in the APAC region.

2.7 Furthermore, active participation in the GNSS and Data Link Disruption Ad Hoc Group and related symposiums under the ICAO APANPIRG, as well as the sharing of GNSS RFI events and mitigation measures among States are encouraged.

## 3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

a) note the content of this paper;

b) encourage States to implement detection and mitigation systems against GNSS RFI and to enhance cooperation with other States;

c) encourage States to actively participate in the GNSS and Data Link Disruption Ad Hoc Group and related symposiums under the ICAO APANPIRG; and

d) encourage States to share GNSS RFI events and best practice of mitigation measures with other States.

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