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

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AGENDA ITEM 4: AIR NAVIGATION

GNSS RADIO FREQUENCY INTERFERENCE (RFI) – IMPACTS TO AIRSPACE USERS

(Presented by IATA)

SUMMARY

This paper discusses the growing incidence of GNSS Radio Frequency Interference (RFI) in Asia-Pacific and the impacts on civil Airspace Users.

GNSS RADIO FREQUENCY INTERFERENCE (RFI) – IMPACTS TO AIRSPACE USERS

1. INTRODUCTION

1.1 The Global Navigation Satellite System (GNSS) is a key enabler of modern aviation. Satellite-based CNS services play an important part in ATM with a growing dependence on space-based infrastructure.

1.2 Airspace Users rely on the normal functioning of aircraft systems, including automated monitoring, caution, and warning sub-systems. Therefore, interference-free GNSS position, navigation, and timing (PNT) service is essential for flight safety.

1.3 Flights crews are reporting increasing events of GNSS interference across the globe, including an increasing number of locations in Asia-Pacific, causing interruptions to navigation capabilities and activation of false alarms.

2. DISCUSSION

2.1 GNSS signals can be blocked, altered or otherwise compromised by a growing array of threats including solar activity, man-made interference and malicious 'spoofing'. Spoofing means transmitting fake GPS satellite signals that replace genuine ones, usually presenting false information about the location / position of the aircraft.

2.2 Signal jamming and/or spoofing can seriously impact aircraft navigation systems, resulting in non-normal avionic system behavior.

2.3 The aviation industry is concerned at elevated levels of GNSS radio frequency interference (RFI) occurring in multiple regions with increasing numbers of pilot and automated reports, often correlated with conflict zones.

2.4 Elevated levels of long duration and deliberate jamming and spoofing of GNSS/GPS threatens the integrity of Positioning, Navigation, and Timing (PNT) service. IATA evaluation of data from over 370,000 flights reveals that a significant number of current GNSS aircraft receivers can take 30 minutes to recover normal functionality when subjected to RFI.

2.5 From August 2021 to June 2024, members contributing to IATA's data program experienced >580K instances of GPS signal loss for around 18.4 million flights processed by the program. The figures are not based on voluntary pilot reports but aircraft-recorded data, so IATA's data provides a good geographic identification of the RFI hotspots. Anecdotal reports indicate continued significant increases in RFI events in the Asia-Pacific region since June 2024.

2.6 Mitigating against GNSS RFI has become a critical risk management activity for airlines. Several receivers do not recover until subjected to a ground maintenance reset. IATA has developed and released a GNSS Radio Frequency Interference Safety Risk Assessment that includes Threat, Possible Consequence / Impacts, and Preventative Controls.

2.7 Threats span the range of jamming, spoofing, solar storms and signal reflection and include drowning out satellite signals, broadcasting counterfeit GNSS signals, electromagnetic interference from space weather events, and reflection and/or refraction of GNSS signals due to objects such as buildings or ionospheric effects.

2.8 Airlines are exercising preventative controls as barriers preventing the threat from becoming a top event. These controls include flight planning (e.g.: checking NOTAMs and confirming the availability of non-GNSS-based routes, procedures, and approaches), en-route (system monitoring and display, and supplemental procedures for loss of GNSS), and post-flight (recording events and reporting broadly to all relevant stakeholders).

2.9 Few pragmatic options currently exist to guarantee GNSS integrity considering the increasing levels of interference. This is unlikely to change in the near term due to the number of conflict zones, globally.

2.10 Airspace Users are also looking to national/international organizations, Regulators and OEMs to introduce complementary preventative controls. This includes regulatory control of RFI, coordination for civil/military GNSS interference testing, identification and localization of interfering sources, and development of receivers with multi-frequency and multi-constellation capabilities, along with Minimum Operational Performance Standards (MOPS).

2.11 As aircraft use of GNSS is subjected to increasing levels of interference, airlines and their representative organizations are being forced to re-evaluate retention of specific ground-based navigation aids (GBNAs) as a back-up to the loss of GNSS/GPS capabilities. These Minimum Operating Networks (MON) will be a necessary mitigation until reliable system capabilities can be developed to suitably protect against RFI.

2.12 States and air navigation services providers (ANSPs) are encouraged to re-evaluate GBNA infrastructure under their control and establish a MON that facilitates continued safety of flight in circumstances where GNSS can potentially be unreliable or unavailable.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

a) note the content of this Discussion Paper;

b) discuss methods to eliminate GNSS RFI; and,

c) discuss strategies to ensure MONs are retained and operable.

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