International Civil Aviation Organization

Twelfth Meeting of the Air Traffic Management Sub-Group (ATM/SG/12) of APANPIRG

Bangkok, Thailand, 23 – 27 September 2024

Agenda Item 5: ATM Systems (Modernization, Seamless ATM, CNS, ATFM)

RATIONALIZATION OF NAVIGATION INFRASTRUCTURE

(Presented by IATA)

SUMMARY

Satellite GNSS signals can be blocked, altered or otherwise compromised by a growing array of threats including solar activity, man-made interference and malicious spoofing.

Civil aviation has a high dependence on GNSS for communications, navigation and surveillance (CNS). Even temporary loss of GNSS can have significant operational impact and in some cases lead to heightened safety risk.

With elevated and persistent levels of GNSS RFI as a baseline, and in coordination with airlines and airspace user representative organizations, States and air navigation services providers (ANSPs) are encouraged to re-evaluate Ground-Based Navigation Aid (GBNA) infrastructure under their control and establish a minimum operating network (MON) that facilitates continued safety of flight in circumstances where GNSS can potentially be unreliable or unavailable.

1. INTRODUCTION

1.1 Currently, commercial aircraft navigation entails the predominant use of satellite positioning and timing for performance-based navigation (PBN) and data link e.g., controller-pilot data link communications (CPDLC).

1.2 Use of GNSS results in significant operational benefits and less dependence on conventional Ground-Based Navigation Aids (GBNA) which, during certain phases of flight, are only needed as an alternate source in the event of a GNSS outage, or because of certain avionic failures, e.g., loss or degradation of one or more aircraft GNSS receivers, in flight.

1.3 GNSS derived data is also used to enable safety critical functionality in avionic systems such as terrain awareness and warning system (TAWS).

2. DISCUSSION

2.1 Satellite GNSS signals can be blocked, altered or otherwise compromised by a growing array of threats including solar activity, man-made interference and malicious spoofing.

2.2 Civil aviation has a high dependence on GNSS for communications, navigation and surveillance (CNS). Even temporary loss of GNSS can have significant operational impact and in some cases lead to heightened safety risk.

2.3 Mitigating against GNSS RFI has become a critical risk management activity for airlines. Few pragmatic options currently exist to guarantee GNSS integrity considering the increasing levels of RFI, jamming, and spoofing by State and military entities without advance notification to airline operators. This is unlikely to change in the near term due to the number of conflict zones, globally.

2.4 At the 36th Session of the ICAO Assembly, States agreed to Resolution 36/23 which urges the implementation of route and airport procedures in accordance with ICAO PBN criteria. Regional PBN implementation task forces were developed to coordinate implementation programs. Subsequently, several initiatives have been launched.

2.5 The most recent Regional Aviation Safety Group - Middle East (RASG-MID) meeting concluded that ICAO, with the support of States and IATA, will establish a regionally determined minimal operational network (MON) of conventional navigation aids for use in case of GNSS interference/spoofing.

2.6 However, since the ICAO Resolution and various State plans for PBN were published, the operational environment for GNSS has markedly changed with a significant increase in jamming, spoofing and GNSS spectrum interference, especially in and near conflict zones.

2.7 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. Several receivers do not recover until subjected to a ground maintenance reset.

2.8 Prompted by the operational impacts of non-NOTAM GNSS RFI and the unlikely termination of such harmful activity in the short-term, IATA invited member airlines to specify GBNA they consider could be decommissioned without significantly impacting safety of flight.

2.9 Airlines have responded by listing GBNA they consider can be decommissioned at end of life (not replaced) without compromising safety, assuming GNSS is unavailable. The IATA survey remains open for additional airline input as the GNSS RFI situation evolves, globally.

2.10 As aircraft use of GNSS is subjected to increasing levels of jamming, spoofing and spectrum RFI, airlines and their representative organizations are being forced to re-evaluate retention of specific GBNA as part of a MON.

2.11 GNSS loss has a significant impact on air traffic services, namely: increased use of vectoring (since most aircraft are flying PBN standard instrument departures / standard instrument arrivals (SIDs/STARs) and routes, and/or are flying GNSS waypoints), extended routes and reduced capacity leading to reduced efficiency and ground delay programmes (GDPs).

2.12 In some instances, aircraft may be refused entry into oceanic airspace if GNSS derived services are deficient, e.g., loss of data comm prior to oceanic entry waypoint.

2.13 With elevated and persistent levels of GNSS RFI as a baseline, and in coordination with airlines and airspace user representative organizations, 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 MEETING

3.1 The meeting is invited to:

a) consider current and future risks related to GNSS RFI when developing and reviewing

plans for decommissioning conventional navigational aids (NAVAIDs);

b) in collaboration with airspace users, establish regional minimal operational networks (MONs) of conventional NAVAIDs to mitigate GNSS RFI risks; and,

c) ensure that conventional navigation aids enabling flight safety in the event of GNSS RFI are retained beyond 2030, or until alternative means of non-GNSS navigation are established especially in airspace experiencing GNSS jamming, spoofing and/or loss of signal.

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