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WORKING PAPER

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

RATIONALIZATION OF NAVIGATION INFRASTRUCTURE

(Presented by the International Air Transport Association (IATA),
International Federation of Air Traffic Controllers' Associations (IFATCA),
International Coordinating Council of Aerospace Industries Associations (ICCAIA),
International Federation of Air Line Pilots' Associations (IFALPA),
International Federation of Air Traffic Safety Electronics Associations (IFATSEA) and
International Business Aviation Council (IBAC))

EXECUTIVE SUMMARY

Pragmatic rationalization of ground-based navigation aids (GBNA) with a view to establishing a minimal operating network (MON) includes more use of global navigation satellite system (GNSS) -based procedures.

Key objectives are to streamline the number and type of GBNA, reduce maintenance costs and enhance navigation accuracy and dependability. However, the escalation in non-NOTAM GNSS radio frequency interference (RFI) hinders this objective.

In particular, GNSS RFI associated with conflict zones will necessitate the retention and possible addition of specific GBNA, impacting potential cost savings.

This paper presents a revised IATA/IFATCA/ICCAIA position regarding GBNA and MONs and proposes a review of current and emerging risks with all established MONs.

Action: The Conference is invited to agree to the recommendation in paragraph 4.

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 GBNA which, during certain phases of flight, are only needed as an alternate source in the

[1] Arabic, Chinese, English, French, Russian and Spanish versions provided by IATA.

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.

2.4.1 The European PBN Implementing Rule (PBN IR), Regulation (EU) 2018/1048, seeks to enhance aircraft operations by transitioning to PBN by 6 June 2030.

2.4.2 The French Directorate General for Civil Aviation is considering removal of instrument landing system category 1 (ILS CAT 1) at secondary airports to be replaced by satellite-based augmentation system (SBAS) procedures.

2.4.3 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.

2.5 Similarly, other States have responded to the ICAO Resolution by publishing PBN operational procedures in their aeronautical information publication (AIP) manuals.

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. The related IATA survey is located here: IATA MON SURVEY[2].

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.

3. CONCLUSION

3.1 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.

3.2 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).

3.2.1 In some instances, North Atlantic high-level airspace (NAT HLA) being a case in point, 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.

3.3 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.

4. ACTION BY THE MEETING

4.1 The Conference is invited to agree to the following recommendation:

That States:

a) consider current and future risks related to GNSS RFI when developing and reviewing plans for decommissioning conventional navigational aids (NAVAIDs);

b) 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;

[2] https://forms.office.com/pages/responsepage.aspx?id=hBcirahyY0KshgzMaxUs2PtXoUfqKnFFqJn2iFAo8JlUOFVDRVQyMk45MlFPWE0yMUhTTkVZVkNCTy4u

that ICAO:

d) consider risks related to GNSS RFI in the future work programs of relevant ICAO panels, specifically when related to future navigation systems; and

e) encourage States to ensure their MON reflects pragmatic operational requirements for airspace under their control.

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