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ASIA AND PACIFIC REGIONS**

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AGENDA ITEM 3: AVIATION SAFETY AND
 AIR NAVIGATION

**MANAGING INTERFERENCE TO
GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)**

(Presented by the International Air Transport Association)

SUMMARY

This paper highlights the continued growing importance of GNSS to current and advanced aviation applications and the safety of flight. It also reinforces the requirements to ensure robust processes are in place to detect, mitigate and stop sources of harmful interference to aviation GNSS systems.

MANAGING INTERFERENCE TO GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)

1. INTRODUCTION

1.1 The Global Navigation Satellite System (GNSS) provides position and timing information supporting several important flight and Air Traffic Management (ATM) operations. In line with ICAO Assembly resolution A37-11, GNSS, particularly Global Positioning System (GPS), has become an important component of navigation infrastructure supporting high priority ICAO initiatives such as Performance Based Navigation (PBN). Additionally, some business aircraft are using GNSS as a reference source for flight control and stability systems.

1.2 The aircraft GNSS receiver is safety-critical piece of equipment and the main source of position information which drives aircraft navigation systems. The receiver is the primary equipment supporting Required Navigation Performance (RNP) operations and provides position input to aircraft Navigation Display (ND), Ground-Proximity Warning System (GPWS) and Automatic Dependent Surveillance (ADS).

1.3 In accordance with ICAO priorities, States have been steadily implementing advanced navigation procedures, particularly PBN. Also, ADS-B surveillance is being deployed throughout the region. GNSS is a critical enabler of both of these advanced technologies. The ongoing integrity and availability of GNSS are necessary to ensure the benefits of these technologies, and the associated investments, can be realized.

1.4 As aviation becomes more reliant on satellite based systems requiring GNSS, the issues of managing any harmful GNSS interference also becomes a critical element of any implementation.

1.5 APANPIRG (22/28 and 27/36) adopted conclusions to urge states to implement measures to protect aviation utility of GNSS, and to educate and have in place mechanisms to detect and eliminate jamming. Recent ICAO State Letter APO72/17 (CNS) refers.

1.6 The purpose of this paper is to:

- Reinforce the importance of detecting and managing/mitigating incidences of harmful GNSS interference
- Urge States to ensure proactive processes and procedures are in place involving all stakeholders to detect and address any instances of harmful GNSS interference
- Highlight the availability of ICAO guidance

2. DISCUSSION

2.1 GNSS interference can occur from a range of sources. In terms of aviation, most interference is not deliberate but occurs as an unintended consequence. Examples may be (but not limited to):

- Jammers used by individuals (e.g. truck drivers wishing to avoid detection or a restaurant wishing to disable cell phones for diners)
- Poorly-managed cell or broadcast tower sites and transmitters
- Jammers used by institutions to disable cell phone communications (e.g. prisons)
- Military applications

2.1.1 In some States, laws allow aviation authorities to take action when GNSS interference is identified. However, the responsibility for regulating and managing Cell or Broadcast sites is most

usually with a National Telecommunications Authority. Often these telecommunications regulators do not have a good understanding of the impact of the various interference sources on aviation applications of GNSS.

2.1.2 As more and more aviation procedures reliant on GNSS are implemented, the detection, management and, when required, enforcement of measures to mitigate and stop interference with aviation systems becomes critical to protect the safety of flight.

2.1.3 To ensure the ability to effectively manage this issue, regulations should ideally be in place to allow aviation authorities to take action to mitigate the effects of harmful interference.

2.1.4 In the absence of such regulations, it is very important that CAAs and ANSPs work proactively with their National Telecommunications Authorities to ensure understanding of the impact interference can have in terms of the safety of flight, efficiency, and of their obligation as per Article 4.10 of the Radio Regulations of the International Telecommunication Union (ITU).

2.1.5 Aviation authorities should ensure such National bodies have in place robust detection regimes and processes to effectively deal with and stop sources of interference. Experience shows that often these authorities do not realize the role they are required to play in managing the impact on aviation frequencies and safety of flight.

2.1.6 Public education is also an important factor in managing instances of harmful GNSS interference – experience often shows that a direct approach explaining the unintended consequences (e.g. a restaurant jammer) will yield a positive outcome.

2.1.7 Proactive and close co-ordination with the military is important to ensure any required military applications are notified in advance to advise operators of possible interference.

2.2 ICAO GUIDANCE

2.2.1 ICAO has recognized the concerns with harmful GNSS interference and this was highlighted by AN-Conf/12 recommendation 6/8 where, in planning for mitigation of GNSS vulnerabilities, States were recommended to:

- assess the likelihood and effects of global navigation satellite system vulnerabilities in their airspace and apply, as necessary, recognized and available mitigation methods;
- provide effective spectrum management and protection of global navigation satellite system (GNSS) frequencies to reduce the likelihood of unintentional interference or degradation of GNSS performance;
- report to ICAO cases of harmful interference to global navigation satellite system that may have an impact on international civil aviation operations; and
- develop and enforce a strong regulatory framework governing the use of global navigation satellite system repeaters, pseudolites, spoofers and jammers.

2.2.2 ICAO has made available a GNSS Radio Frequency Interference (RFI) Mitigation Plan to advise States on how to address this interference issue and to mitigate its associated risks and impacts on flight and ATM operations. The Mitigation Plan is now available to use as an advanced copy and is scheduled to be formally published in 2017 as part of the in the *Global Navigation Satellite System (GNSS) Manual* (Doc 9849).

2.2.3 The aim of the Mitigation Plan is to ensure the implementation of a list of measures which give confidence that the interference risk is reduced as far as practicable – permitting the full operational benefits provided by GNSS. The mitigation framework recommended by the Mitigation

Plan includes a continuous three-step process of 1) Monitoring Threats, 2) Assessing Risks and 3) Deploying Mitigation Measures. The Mitigation Plan then suggests preventive and reactive measures which States can choose to apply, both strategically during GNSS implementation planning, and tactically during day-to-day operations. The Mitigation Plan also explains the need to inform airmen in the event of GNSS outages and the necessity to train airspace users and air traffic controllers to be able to recognize RFI events and to react appropriately.

2.3 CONCLUSION

2.3.1 Advanced navigation, and other aviation and air traffic management applications are increasingly reliant upon reliable and accurate GNSS. Any instances of harmful interference therefore become relevant to safety of flight operations as well as the efficiency of ATM systems.

2.3.2 To ensure the integrity of aviation safety systems, States are required to have in place proactive and robust detection, mitigation and enforcement processes to manage and stop any harmful interference to GNSS for aviation.

2.3.3 Public Education is important to ensure understanding of the possible impact on aviation and the safety of flight.

2.3.4 Close co-ordination with military authorities is required to ensure adequate notifications can be promulgated to aviation stakeholders regarding interference from military applications.

2.3.5 ICAO guidance is available together with practical experience from States who have been dealing with these issues for some years.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the information contained in this Paper and:

- a) Ensure there is a comprehensive understanding of the impact of GNSS interference on the safety and efficiency of aircraft operations within the State
- b) Ensure they proactively work with their National Telecommunications Authorities to ensure robust detection, management and mitigation processes are in place to address GNSS interference
- c) Note ICAO guidance material is available and ensure this is widely available and well understood by relevant stakeholders

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