AUSTRALIA

AERONAUTICAL INFORMATION CIRCULAR (AIC)

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H22/24

Effective: 202406270200 UTC

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RECOGNISING, MITIGATING AND ADAPTING TO GNSS INTERFERENCE (JAMMING OR SPOOFING)

1. INTRODUCTION

1.1 In recent times, there has been an increase in interference with the correct functioning of the Global Navigation Satellite Systems (GNSS). While the direct effects are mostly confined to European and Middle Eastern conflict zones, GNSS interference has recently occurred closer to Australia, for example in the Bay of Bengal.

1.2 GNSS is a critical component of communication, navigation, and surveillance (CNS) in Australian airspace. For example, GNSS position information is essential for the operation of Automatic Dependent Surveillance – Broadcast (ADS-B).

1.3 Some aircraft use GNSS as a reference source for aircraft flight control and stability systems. It is also a necessary component of the Aircraft Terrain Awareness and Warning System (TAWS) – an aircraft safety system that alerts pilots of upcoming terrain. There are examples of false 'terrain−pull up' warnings during GNSS anomalies.

1.4 Given the many uses of GNSS in aviation, operators of aircraft using GNSS need to be aware of these vulnerabilities, how to recognise interference when it happens, and how to adjust to degraded signals.

1.5 This AIC aims to remind pilots and operators of the causes of GNSS interference and provide advice on ways to mitigate the effects.

2. CAUSES OF INTERFERENCE

2.1 The low−strength data transmission signals from GNSS satellites are vulnerable to intentional and unintentional interference. This inference can come from a wide variety of sources and can significantly reduce the reliability of the navigation signal.

2.2 Sources of interference include:

- radars
- microwave links
- ionosphere effects
- solar activity
- multi-path error
- satellite communications
- GNSS repeaters
- some systems on board the aircraft
- deliberate jamming or spoofing.

2.3 Aside from deliberate jamming or spoofing, these types of interference are unintentional, localised and intermittent.

3. DELIBERATE INTERFERENCE (JAMMING OR SPOOFING)

3.1 Intentional and unauthorised interference of GNSS signals is caused by jamming or spoofing. These activities can disrupt air navigation by interfering with the reception of valid satellite signals.

3.2 ‘Jamming’ is an intentional radio frequency interference (RFI) with GNSS signals. This interference prevents receivers from locking onto satellite signals and has the main effect of rendering the GNSS system ineffective or degraded for users in the geographic area of the jamming.

3.3 ‘Spoofing’ involves broadcasting counterfeit satellite signals to deceive GNSS receivers, causing them to compute incorrect position, navigation, and timing data (PNT).

4. DEALING WITH GNSS INTERFERENCE DURING FLIGHT

4.1 Pilots should take actions appropriate to the operational circumstances prevailing at the time of the interference and, in relevant, in accordance with company instructions.

4.2 In general, pilots are recommended to:

a) Maintain control of the aircraft.

b) Use the last reliable navigation information as the basis for initial headings.

c) If below a minimum safe altitude or minimum obstacle clearance altitude, climb to a safe level.

d) Change to another source of navigation, if available (for instance, VOR, DME, instrument landing system (ILS), ATC vectors).

e) Notify air traffic control as soon as practical.

5. RECOMMENDATIONS

5.1 CASA recommends operators:

i) consider the likelihood of GNSS interference on their planned route and potential emergency diversion routes

ii) have a plan for ensuring aircraft can safely navigate and operate in the event of GNSS interference.

5.2 If flying in an area where GNSS interference is reasonably possible, CASA recommends that pilots:

i) avoid relying entirely on GNSS-reported position during flight

ii) use several methods for cross-checking position during flight, including:

- reference to ground features
- information from an aircraft's inertial navigation system (INS) or flight management system (FMS) - if so equipped

- information from ground-based navigation systems such as non-directional beacon (NDB), very high frequency omni-directional range (VOR) and distance measuring equipment (DME)
- surveillance position information from air traffic control (ATC)

iii) have a backup plan that does not involve the use of GNSS when planning to conduct performance-based navigation approaches, particularly in instrument meteorological conditions (IMC).

6. CANCELLATION

6.1 This AIC self-cancels at 202501060100 UTC.

7. DISTRIBUTION

7.1 Airservices Australia website only.