The Global Voice of Pilots

IFALPA

POSITION PAPER

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Disruption of Satellite-Based Signals

BACKGROUND

Modern air traffic relies heavily on the internal accuracy of aircraft systems and the aircraft's ability to monitor its own reliability. In recent years, satellite-based Communication, Navigation and Surveillance (CNS) services have been taking a growing part in the overall ATM system and aircraft are becoming more reliant on space-based signals.

The accuracy achieved by these signals enables aircraft to perform instrument procedures without the need to rely on ground-based navigational aids, facilitates the reduction of separation by ATC, and helps optimizing airspace capacity. Many aircraft navigation and warning systems rely heavily on accurate position.

In recent years, however, thousands of occurrences of partial or complete loss of these signals have been reported by pilots in different Regions, with interruptions generally lasting 10 to 20 minutes. This very serious concern was raised last year at the 40th ICAO Assembly and has led to three IFALPA Safety Bulletins:

- 19SAB04 - Loss of GPS signal at Guanajuato International Airport (MMLO) published 3 April 2019;
- 19SAB05 - Loss of GPS signal at Ben Gurion Airport, Tel Aviv, Israel (LLBG) published 25 June 2019, warning about GPS interference in TEL AVIV FIR, affecting LLBG. The phenomenon spread afterwards to NICOSIA FIR also and affected LCLK. GPS signal jamming and spoofing occurs also above Turkey, the Black Sea, and other regions in the Middle East;
- 19SAB07 – GNSS Vulnerabilities published 18 July 2019.

REASONS FOR SIGNAL LOSS

Satellite signals are by nature very weak when they arrive at the receiver. They are therefore vulnerable to interference, natural or artificial, intentional (including jamming and spoofing) or unintentional (malfunctions).

The Federation is very concerned about the proliferation of interference capable equipment including portable electronic devices (PEDs), incorrectly operated GNSS repeaters, miss-operated test equipment and the foreseeable proliferation of sophisticated spoofing devices in the future. Personal Privacy Devices (PPDs) for example,

designed to make their users 'untraceable' by jamming GNSS signals around them, can also interfere with aircraft or airport Ground-Based Augmentation System (GBAS) and ADS-B ground stations at close distance.

In many cases, en-route signal loss has been linked to military operations. Though investigations cannot always confirm that military activities are the causes of the outages, it remains very likely for cases near conflict zones. These zones are normally closed to civilian traffic, which is re-routed, but interference to CNS services can extend far outside of the prohibited airspace, particularly when high power jammers are used, impacting a very large volume of airspace.

EFFECTS OF GNSS SIGNAL INTERFERENCE ON AIRCRAFT

The effects of a degradation of the GNSS signal vary greatly. Satellite signal jamming is not always identified by aircraft systems and the crew, but can have a serious effect on navigation systems accuracy and, in some cases, results in unusual system behaviour. For example, some aircraft types have lost the enhanced functions of EGPWS and have experienced Terrain Avoidance and Warning System (TAWS) errors which triggered sudden, unwarranted warnings, including during instrument approaches. Other aircraft lost their clocks and in some cases of long-lasting signal loss, the clocks even started moving backwards.

There is also a danger that, as false warnings occur, genuine ones might be disregarded, thus subjecting aircraft to more safety hazards. This might have a lasting effect on the crew's trust in the aircraft's warning systems. A pilot receiving a false warning due to system position inaccuracy may be tempted to disregard a similar, but real, warning later. Moreover, false warnings increase pilot workload and might cause distraction during critical phases of flight.

POSITION

IFALPA believes that the following aspects should be addressed as a matter of urgency:

1. States should establish the necessary legal framework to act upon harmful GNSS interferences caused by illegal transmitters, jamming/spoofing devices, and other sources of electromagnetic radiation and avoid their commercialisation, proliferation, and use.
2. States should assess the interference risks associated with conflict zones and consider that satellite-based CNS systems can potentially be impacted well beyond those zones. A civil military coordination should facilitate the sharing of relevant information with airspace users either during civil or military testing and/or other activities, or when flying in the vicinity of a conflict zone.

3. As resilience measure, fuel planning should take signal outage into consideration. Approach procedures to destination and alternate should not solely depend on GNSS.

4. GNSS signal interference (whether intentional or unintentional) can occur at any time, with or without prior notice. GNSS resiliency should be improved through a combination of measures such as:

   - Independent networks based on ground and/or airborne components.
   - Appropriate interference protection, detection, mitigation, and reporting capabilities such as Multi-Mode Receivers (GPS/GLONASS/Galileo…) for both the on-board equipment and the ground segments of the satellite-based systems.
   - A review or development by ATS Units and Operators of procedures to mitigate safety hazards from GNSS signal disruptions.