

How Airlines Are Countering the Surge in GPS Disruptions and GNSS Interference

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GNSS Disruptions Latest News

- Incidents of GPS/GNSS interference—mainly signal jamming and spoofing—have increased sharply in recent years, posing growing risks to safe and efficient flight operations worldwide.
- Once largely confined to conflict zones and tense borders, such disruptions are now being reported in a wider range of regions, raising serious aviation safety concerns.
- GPS jamming and spoofing can disrupt navigation, cause aircraft misrouting, reduce separation between planes, and increase the workload of pilots and air traffic controllers, heightening operational risks.

GPS Interference Reported at Major Indian Airports

- India has seen a rise in GPS/GNSS interference incidents near key airports.
- The Ministry of Civil Aviation informed Parliament that such events were reported around Delhi airport and other major hubs including Mumbai, Bengaluru, Hyderabad, Chennai, Kolkata, and Amritsar.

- Except for border-adjacent Amritsar, incidents at these airports are a growing concern, with **Delhi** emerging as a significant hotspot, especially in November.

Global Nature of the Threat

- India is not alone. GNSS interference has become a key global aviation challenge.
- Europe's aviation regulator, EASA, has flagged it as a significant safety risk, particularly around conflict zones and regions such as the eastern Mediterranean, West Asia, the Baltic Sea, and the Arctic.
- According to IATA, GPS signal loss events surged by **220%** between 2021 and 2024.
- With ongoing geopolitical tensions, industry bodies warn that GNSS interference is unlikely to decline soon, underscoring the need for sustained vigilance, technological upgrades, and international coordination.

Role of GNSS in Modern Aviation

- Aircraft rely heavily on Global Navigation Satellite Systems (GNSS) for position, navigation, and timing (PNT) information, which is essential for safe flight operations and air traffic management.
- American Global Positioning System (GPS) is the most widely used system, alongside Galileo, GLONASS, and BeiDou.
- GNSS works through satellite constellations and ground infrastructure that transmit weak signals to onboard receivers in aircraft.
- Although highly accurate, these signals are susceptible to interference due to their low power.

Jamming: Disrupting Navigation Signals

- GNSS jamming occurs when strong radio interference overwhelms satellite signals, temporarily disabling GNSS-based navigation.
- While sometimes accidental or natural, most aviation-related jamming incidents are deliberate.

Spoofing: A More Dangerous Threat

- Spoofing involves transmitting fake GNSS signals to mislead aircraft systems about their actual position or time.
- This can trigger abnormal system behaviour and false cockpit warnings, creating serious operational confusion.

Safety Implications for Aircraft Systems

- Critical avionics such as Flight Management Systems, Terrain Avoidance Warning Systems, and Ground Proximity Warning Systems depend on accurate GNSS data.
- As IATA notes, interference-free GNSS services are essential to ensure flight safety and prevent system malfunctions.

Pilots' Preparedness Against GNSS Interference

- Although GNSS jamming and spoofing can pose risks to flight safety, pilots are trained to recognise such interference and respond methodically.
- They cross-check GNSS data with independent aircraft systems, ground-based aids, and air traffic control inputs, switching to alternative navigation systems when needed.

Identifying Jamming and Spoofing

- Common signs of spoofing include inconsistent aircraft positions, mismatches between ground speed and airspeed, sudden time shifts, and false terrain or altitude warnings.
- Jamming is easier to detect, as GPS signals are typically overwhelmed or lost entirely.

Use of Redundant Navigation Systems

- Modern aircraft are equipped with multiple sensors and navigation tools, allowing pilots to verify position, speed, and altitude.
- When GNSS data is unreliable, crews can rely on systems like the Inertial Reference System (IRS), which independently calculates position using onboard gyroscopes, accelerometers, and pre-flight inputs.
- In rare cases, severe interference has led to **rerouting** or **flight diversions**.
- However, because aircraft systems continuously cross-reference data, even sophisticated spoofing requires significant effort to disrupt operations meaningfully.

Layered Navigation Safeguards

- GNSS in commercial aviation is typically used alongside augmentation systems such as Wide Area Augmentation System (WAAS) for navigation and Ground Based Augmentation System (GBAS) for precision approaches.
- These layers, combined with inertial navigation, ensure that pilots can maintain safe operations despite GPS interference.

Ground-Based Navigation Systems as Critical Back-Up

- With GNSS increasingly vulnerable to jamming and spoofing, airlines and aviation authorities are turning back to conventional **ground-based navigation aids** (GBNAs) as essential backups.
- These systems form part of **Minimum Operating Networks** (MONs) to ensure flight safety when satellite navigation becomes unreliable.

India's Preparedness and Global Alignment

- India has retained MONs in line with global best practices.
- The government has confirmed continued reliance on conventional navigation and surveillance infrastructure and active participation in international platforms to adopt emerging technologies and methodologies.
- The DGCA has made GNSS interference reporting mandatory in 2023.
- As a result, regular reports have been received from airports including Delhi, Kolkata, Amritsar, Mumbai, Hyderabad, Bengaluru, and Chennai, highlighting the expanding scope of the threat.

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