

RSAG-MID/12 Meeting

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GPS Signal Interference Summary Report

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What is GPS signal interference, jamming or spoofing?

GPS signal loss: the loss of GPS signals by an aircraft with a negative impact

GPS signal interference has two forms:

- **GPS jamming:**
 - relatively uncomplicated: a signal that is strong enough to drown out transmissions from GPS satellites
 - receiver unable to produce a geolocation result
 - usually obvious
 - can be deliberate or unintentional
- **GPS spoofing:**
 - involves mimicking transmissions from GPS satellites, tricking the receiver into believing they are real
 - receiver can produce a geolocation result, but this may be incorrect
 - may not be obvious and receiver continues to process the spoofed signals and provides incorrect PNT output
 - requires specialist equipment and specialist operators

What happens when there is GPS signal interference?

- Inability to use GNSS for navigation;
- Loss of RNAV approach capability;
- Inability to conduct/maintain RNP and RNP AR operations;
- Triggering of ground proximity warning system's terrain warnings;
- Inconsistent aircraft position;
- Loss of ADS-B, wind shear, terrain and surface functionalities;
- Failure/degradation of ATM/ANS/CNS and other systems using GNSS as a time reference;
- Potential airspace infringements and/or route deviations.

Datasets

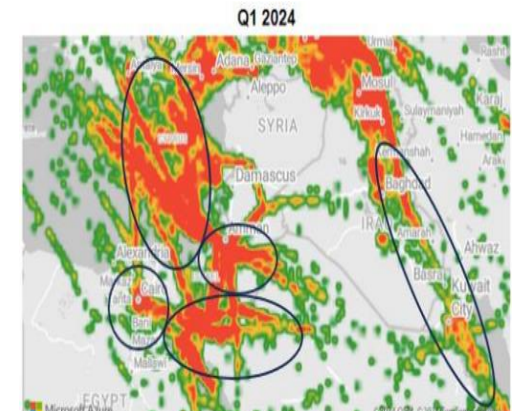
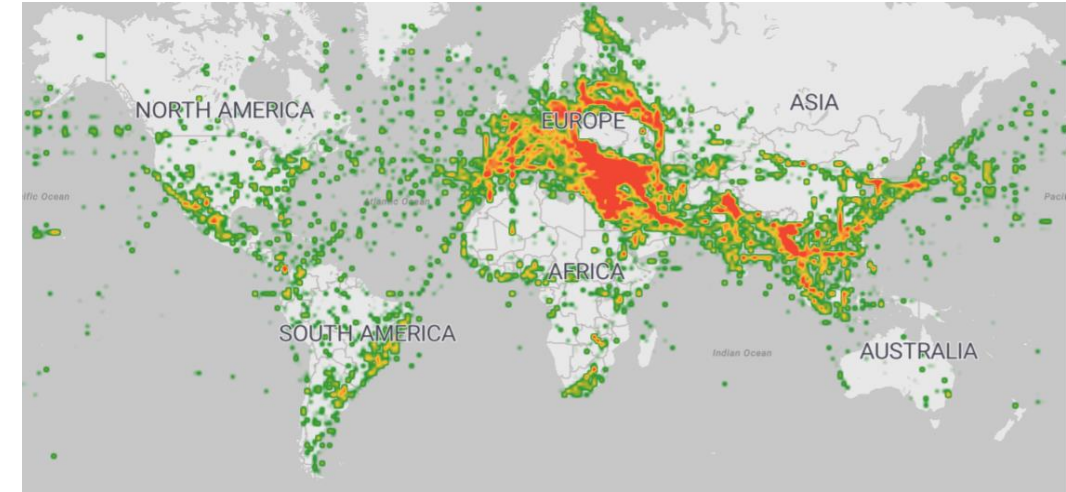
Data source	Date Range	Description of Data
IDX	January 2023 to September 2024	IDX Reported events relating to GPS Signal Interference
FDX	January 2023 to September 2024	FDX Recorded events relating to GPS Signal Loss and EGPWS in Cruise events
NOTAMs	Issued January 2023 to September 2024	All NOTAMs relating to GPS signal interference, excluding tests or trials, and cancelled NOTAMs

Summary of Analysis – IDX Events

	Reported GPS Signal Interference events	Reported GPS jamming events	Reported GPS spoofing events	Reported EGPWS events
Number/Rate	36,253 reported events / 0.77 events per 1,000 flights	25,756 reports / 0.54 events per 1,000 flights	10,497 reports / 0.21 events per 1,000 flights	8,896 reports / 0.19 events per 1,000 flights
Trend	107% increase (no of events) and 175% increase (rate)	58% increase (no of events) and 111% increase (rate)	375% increase (no of events) and 500% increase (rate)	384% increase (no of events) and 500% increase (rate)
Highest Regions	EUR, MENA	EUR, MENA	MENA, EUR	MENA, EUR
Highest Countries	Türkiye, Iraq	Türkiye, Iraq	Türkiye, Egypt	Egypt, Türkiye
Highest FIRs	LTAA/Ankara, ORBB/Baghdad, HECC/Cairo	LTAA/Ankara, ORBB/Baghdad	HECC/Cairo, LTAA/Ankara, ORBB/Baghdad	HECC/Cairo, LTAA/Ankara, OJAC/Amman
Highest Reported Aircraft Category	Wide Body: <ul style="list-style-type: none"> • Highest no: B787 family • Highest rate: A380 family Narrow Body: <ul style="list-style-type: none"> • Highest no: A320 family • Highest rate: B737 family 	Wide Body: <ul style="list-style-type: none"> • Highest no: B787 family • Highest rate: A380 family Narrow Body: <ul style="list-style-type: none"> • Highest no: A320 family • Highest rate: B737 family 	Wide Body: <ul style="list-style-type: none"> • Highest no/rate: B787 family Narrow Body: <ul style="list-style-type: none"> • Highest no: A320 family • Highest rate: B737 family 	Wide Body category: <ul style="list-style-type: none"> • Highest no: B787 family • Highest rate: A350 family Narrow Body category: <ul style="list-style-type: none"> • Highest no: A320 family • Highest rate: B737 family

Summary of Analysis – FDX Events

	Recorded <i>GPS Signal Lost</i> events	Recorded <i>EGPWS in Cruise</i> events
Number/Rate	998,073 recorded events / 79.85 events per 1,000 flights	15,023 recorded events / 1.20 events per 1,000 flights
Trend	21% increase (no of events), and 45% increase (rate)	231% increase (no of events) and 298% increase (rate)
Highest Regions	EUR, MENA	MENA followed by EUR and ASPAC
Highest Countries	Türkiye, Cyprus, Bulgaria	Egypt, Saudi Arabia, Türkiye
Highest FIRs	LTAA/Ankara, LCCC/Nicosia, LBSR/Sofia	HECC/Cairo, OEJD/Jeddah, LCCC/Nicosia
Highest Reported Aircraft Category	Wide Body category: <ul style="list-style-type: none"> • Highest no: B777 family • Highest rate: A340 family Narrow Body category: <ul style="list-style-type: none"> • Highest number/rate: B737 family 	Wide Body category: <ul style="list-style-type: none"> • Highest number/rate: B787 family Narrow Body category: <ul style="list-style-type: none"> • Highest number: A320 family • Highest rate: B757 family



Summary of Analysis – NOTAMs

	Recorded <i>GPS Signal Lost</i> events
Number/ Rate	434 NOTAMs; no of NOTAMs issued and active both increased
Duration of NOTAM validity:	32.7% of NOTAMs valid for less than one day, 16.6% for 1-15 days, 17.3% for 61-90 days, and 15.9% for 91-120 days, and 1.8% of NOTAMs were valid for over 121 days Increase in no of longer duration NOTAMs being issued.
NOTAM code and qualifier analysis	18 QCodes used
Content Analysis	lots of variation in the text of the NOTAMs
Highest Reported Region	Highest no of NOTAMs issued, highest total duration in days, and highest %age of period of the study: EUR Highest average duration of NOTAMs: (AFI), MENA and CIS
Highest Reported FIR:	LTAA/Ankara, LCCC/Nicosia and LBSR/Sofia Highest no of NOTAMs issued: EVRR, RKRR and ESAA (multiple shorter duration NOTAMs) Other FIRs in the top 10 issued NOTAMs for much longer periods, average duration >20 days, and total duration being approx. one year.

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Thanks You

