UN Open-Ended Working Group on the prevention of an arms race in Outer Space

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Global Navigation Satellite System (GNSS) for aviation

- *GNSS is fundamental to modern aviation*
- *Modern avionics depend on GNSS as their primary source of accurate, continuous location and timing data since the 2000's.*
- *The reliance on GNSS greatly benefits aviation, but creates a vulnerability*



GNSS Aviation Benefits

1 **Enhanced Safety**

GNSS provides accurate positioning and timing information, significantly improving aviation safety

2 **Increased Capacity and Accuracy**

GNSS enables more efficient use of airspace and improved air traffic management, increasing overall system capacity

3 **Fuel Efficiency**

GNSS precise navigation allows for optimized routes and reduced fuel consumption, benefiting both the environment and operational costs.

4 **Global Coverage**

Multiple satellite constellations provide worldwide coverage to ensure reliable positioning services across the globe



Civil aviation uses all GNSS core constellations

GPS

United States' Global Positioning System

GLONASS

Russian Federation's Global Navigation Satellite System

Galileo

European Union’s Global Satellite Navigation System

BeiDou

China’s Global Satellite Navigation System

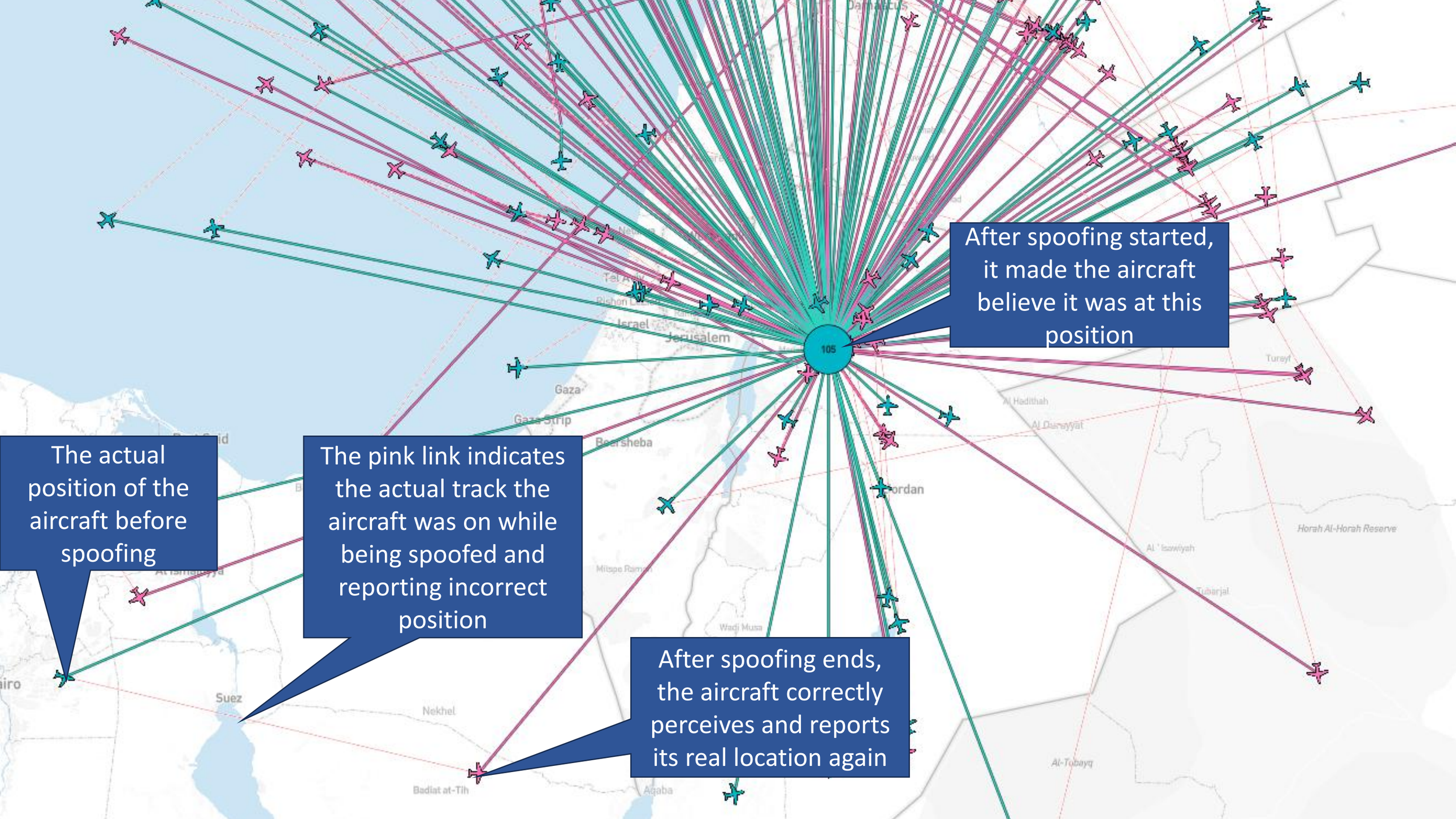


Jamming

Prevents receivers from locking onto satellites signals and has the main effect of rendering the GNSS system ineffective or degraded for users in the jammed area.

Spoofing

Broadcast of GNSS-like signals that cause avionics to calculate erroneous positions and provide false guidance.


After spoofing started, it made the aircraft believe it was at this position
105
The actual position of the aircraft before spoofing
The pink link indicates the actual track the aircraft was on while being spoofed and reporting incorrect position
After spoofing ends, the aircraft correctly perceives and reports its real location again
Israel
Jerusalem
Gaza
Gaza Strip
Beersheba
Suez
Nekhel
Badiat at-Tih
Aqaba
Wadi Musa
Horah Al-Horah Reserve
Al-Tubayq
Turayf
Tuhayjal



Effect of GNSS RFI on Aviation

Operational Disruption

RFI affects flight operation and airspace flow

Safety Impact

RFI weakens Pilot situational awareness

Disruption of Ground Systems depends on GNSS timing

Economic Cost

Flights delay, rerouting, additional fuel, ATC and Pilot workload

Conclusion

GNSS RFI has an immediate effect on the safety of civil aviation, and its unavailability would impact the capacity and efficiency of civil aviation.

GNSS RFI could contribute to a mid-air collision, a controlled flight into terrain, or even a loss of control in-flight

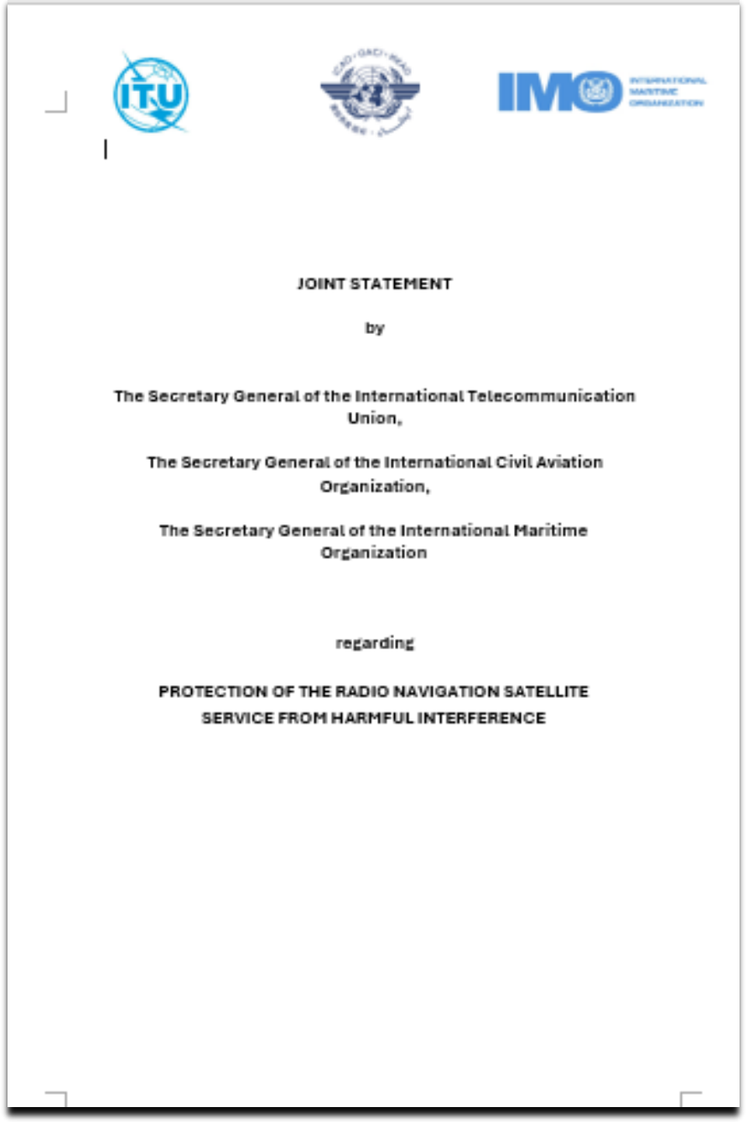
GNSS jamming and spoofing use is restricted to government-authorized operations, conducted under strict oversight to avoid risks to aviation and national infrastructure.

Conclusion

Ground-based spoofing and jamming devices are already a reality; the emergence and use of space-based capabilities would represent a significant escalation with far broader operational implications : larger areas covered, areas covered no longer tied to ground devices, oceanic areas more easily susceptible to spoofing and jamming.


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Thank You!

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JOINT STATEMENT

by

The Secretary General of the International Telecommunication Union,

The Secretary General of the International Civil Aviation Organization,

The Secretary General of the International Maritime Organization

regarding

PROTECTION OF THE RADIO NAVIGATION SATELLITE SERVICE FROM HARMFUL INTERFERENCE

Joint Statement by ITU, ICAO, & IMO regarding the protection of Radio Navigation Satellite System (RNSS) from harmful interference

Joint Statement by ITU, ICAO, and IMO

a **Protect RNSS**

protect the RNSS from transmissions that can adversely cause harmful interference degrading, interrupting or misleading signals used for civilian and humanitarian purposes;

b **Reinforce Resilience**

reinforce resilience of the systems which rely on RNSS for navigation, positioning and timing in relation to this type of interference;

c **Retain Infrastructure**

retain sufficient conventional navigation infrastructure for contingency support in case of RNSS outages and misleading signals, and develop mitigation techniques for loss of services;

d **Increase Collaboration**

increase collaboration between radio regulatory, civil aviation, maritime, defense and enforcement authorities; and

e **Report Interference**

report cases of harmful interference affecting RNSS to the appropriate telecommunication, aeronautical and maritime authorities, and to the ITU Radiocommunications Bureau, to enable the monitoring of the situation.