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SAFE SKIES.
SUSTAINABLE FUTURE.

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GPS INTERFERENCE : DETECTION AND MITIGATION

System's Resilience

How the System is Protected

Cockpit Effect

The Pain Point

The Top-Down Approach

What IndiGo is doing?

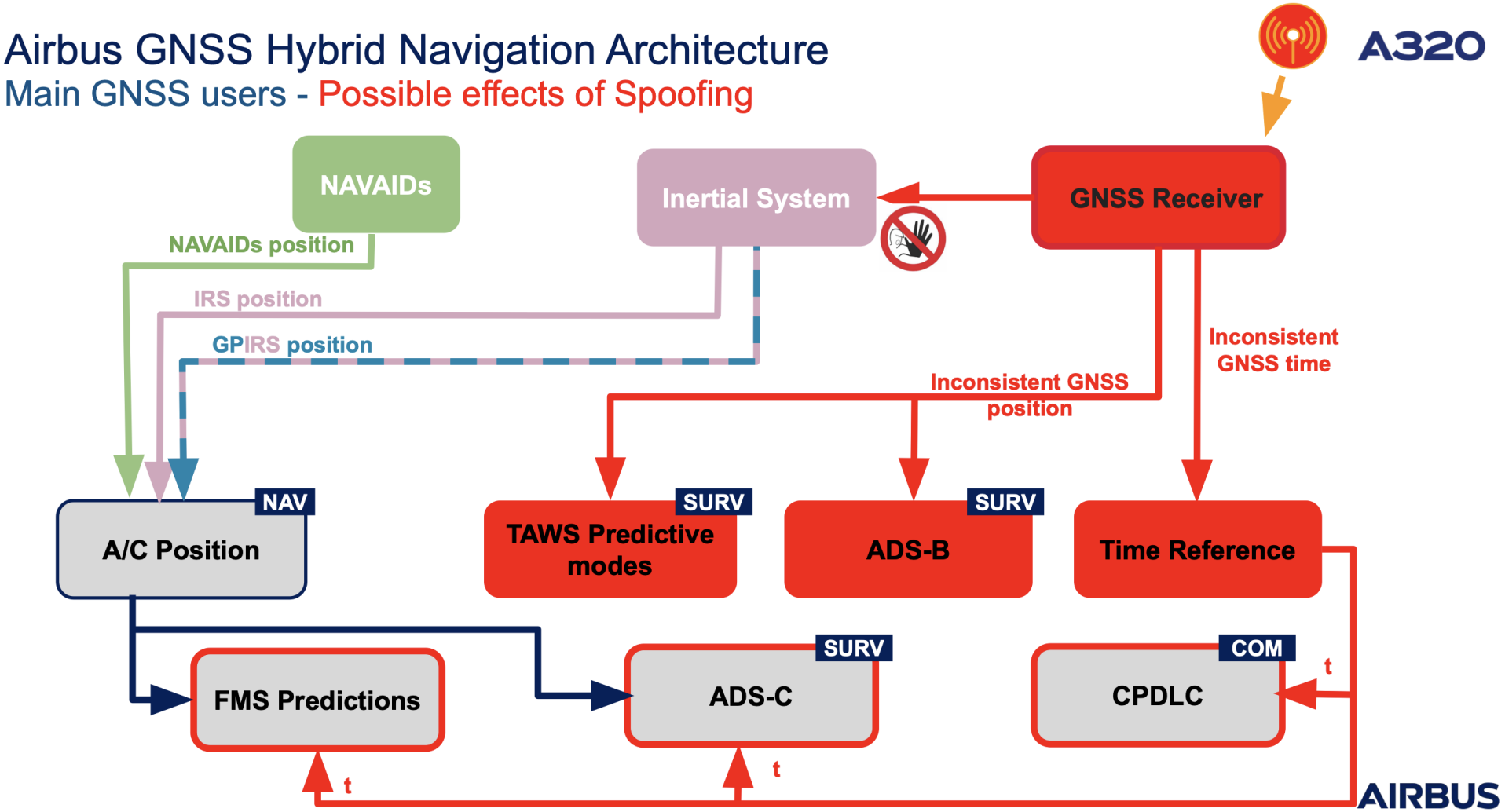
Mitigation Strategies & Best Practices

A/C System, Crew Procedures, Airline + Airspace Management

Evolving Threat

New system behaviors reported by operators worldwide.

01 System's Resilience



02 Cockpit Effects

GNSS Spoofing - Possible cockpit effects (not exhaustive)

Inconsistent pure GNSS Position

NAV:

- GPS PRIMARY LOST / NAV PRIMARY LOST
- NAV FM/GPS POS DISAGREE
- GPS position (GPS MONITOR page) ≠ FMGC position (POSITION MONITOR page)

SURV:

- Undue TAWS alerts
- TERR display shift on ND
- Loss of TAWS
- Erroneous position transmitted via ADS-B Out

Inconsistent GNSS time

- Inconsistent A/C time
- CPDLC and ADS-C capability loss
- Inconsistent time in FMS predictions

Temporary effects
Expected to be cleared after leaving affected area

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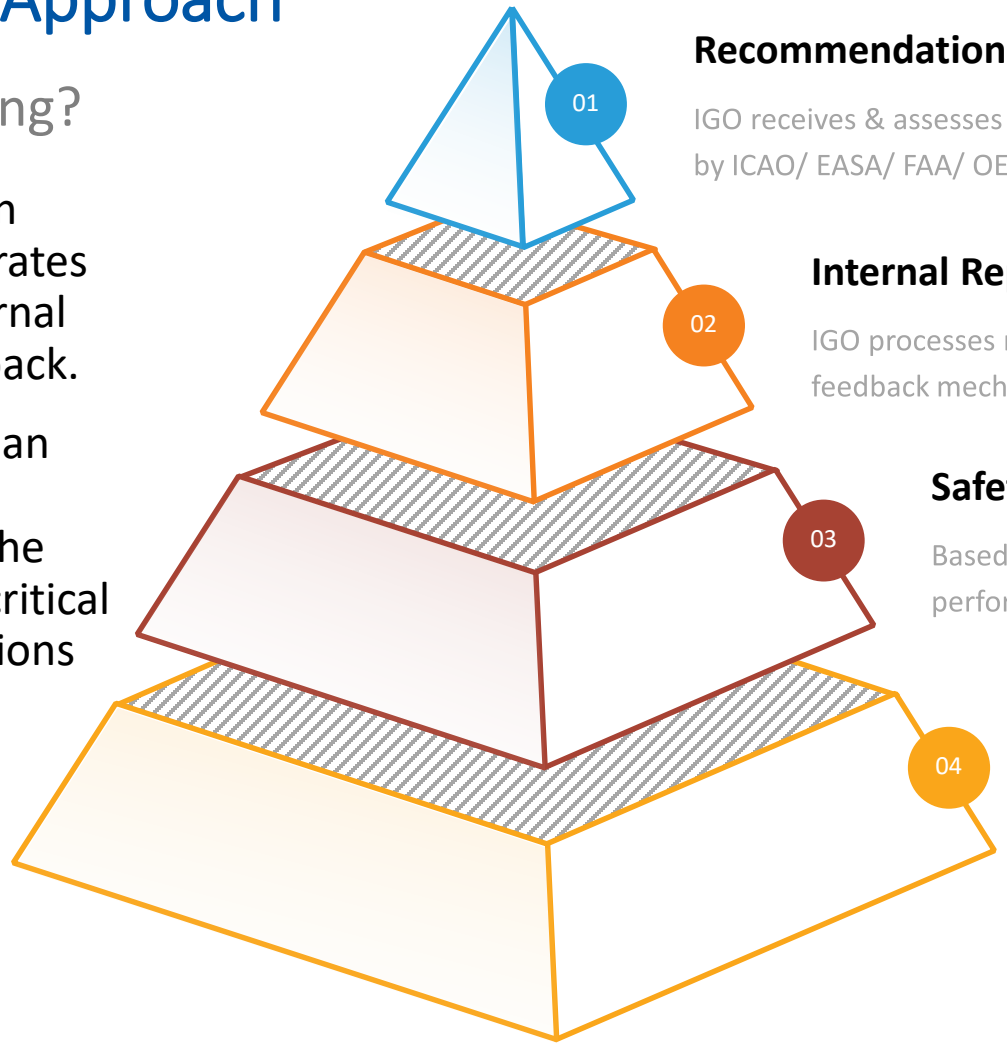
03

The Top-Down Approach

What is IndiGo doing?

IGO follows a top-down approach that incorporates both external and internal inputs, including feedback.

These inputs feed into an SRA, which generates outputs that serve as the foundation for safety-critical internal recommendations for the crew.



Recommendations from ICAO/ EASA/ FAA/ OEM

IGO receives & assesses all the recommendations/ bulletins issued by ICAO/ EASA/ FAA/ OEM.

Internal Reports

IGO processes reports received through internal feedback mechanism.

Safety Risk Assessment

Based on external & internal reports, IGO performs the SRA.

Recommendations & Safety Promotion

Based on the outcome of the SRA,, IGO issues recommendations to the crew & does safety promotion.

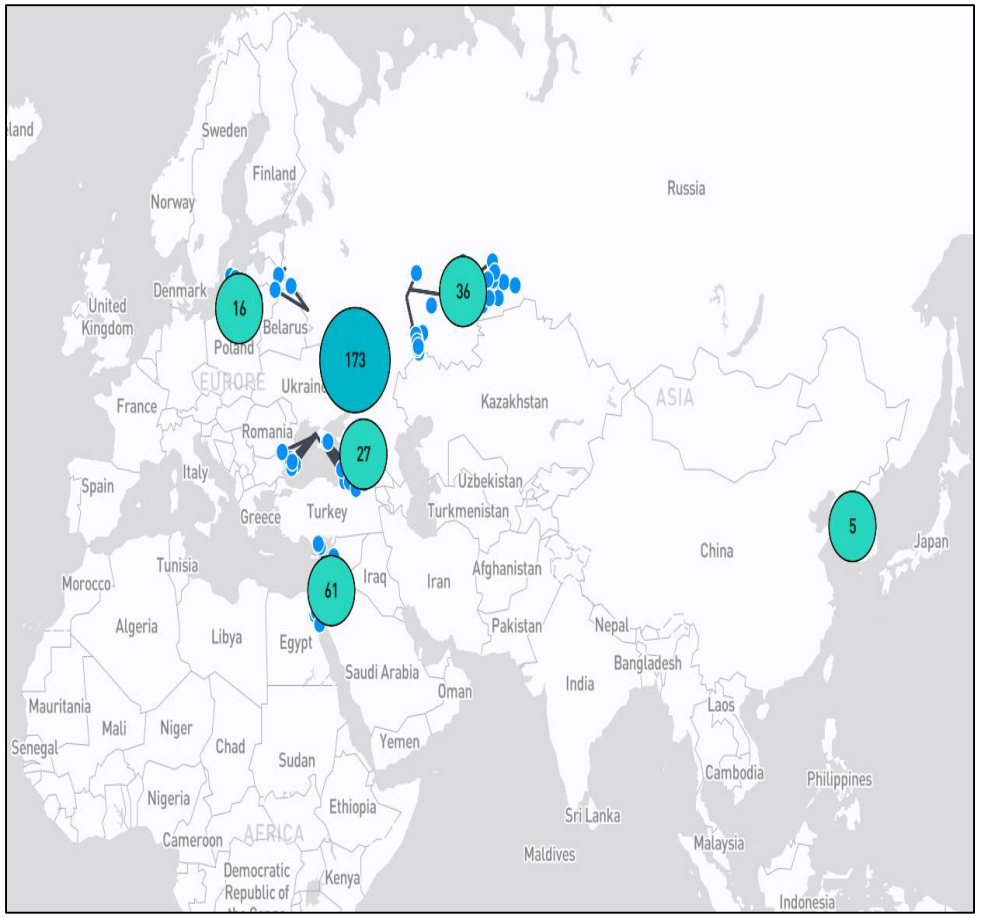
04 Mitigation Strategies & Best Practices

Aircraft System Resilience:
- Multi-sensor integration (IRS, DME/DME)
- Alternate navigation modes

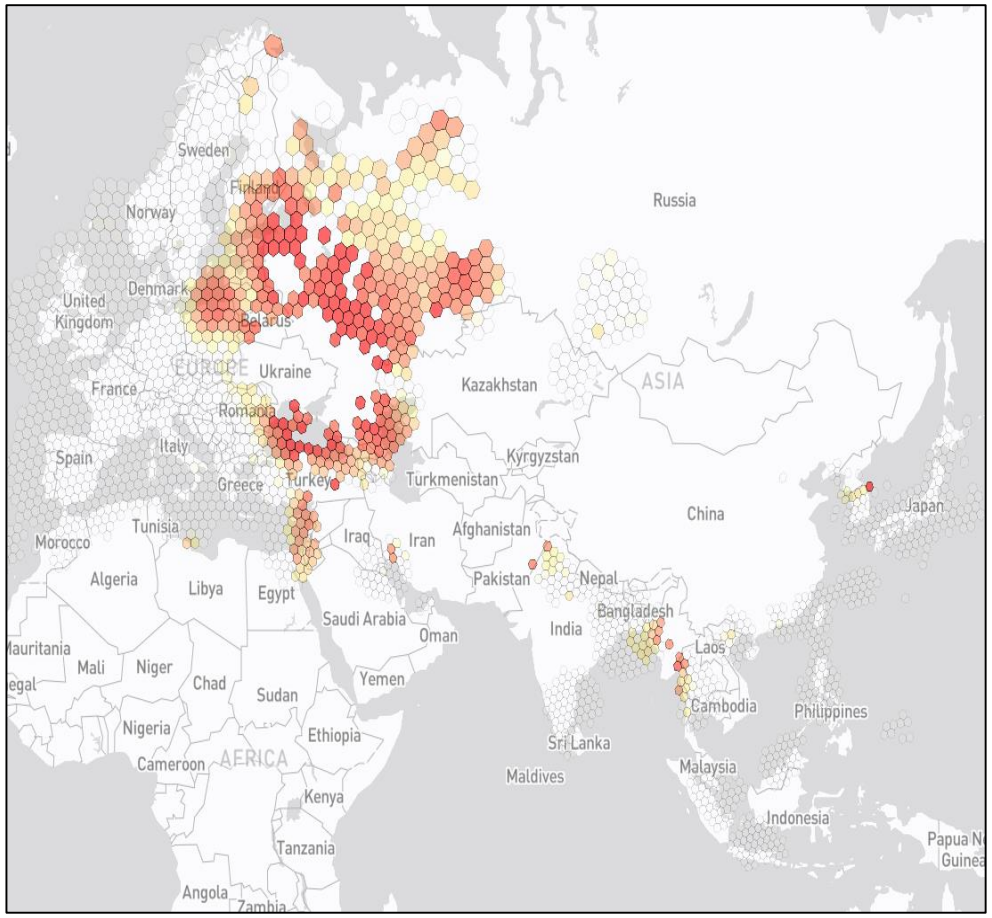
Crew Procedures:
- SOPs for GPS loss scenarios.
- Monitoring cross-checks (raw data)
- Report back events

Airline & ATC Coordination:
- NOTAM awareness
- Use of conventional NAV AIDS in navigation aids in affected regions

GPS Spoofing



GPS Jamming



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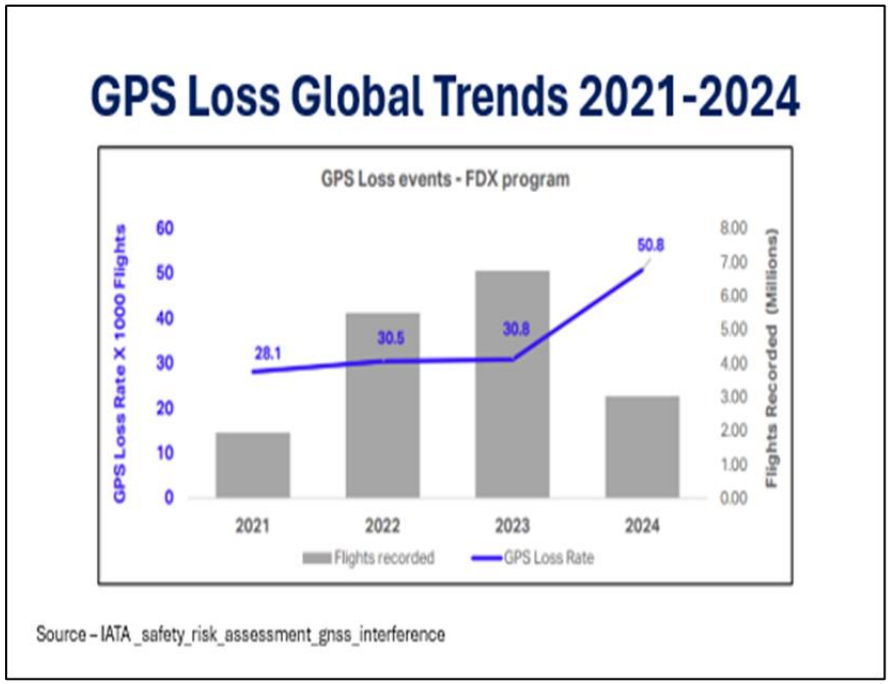
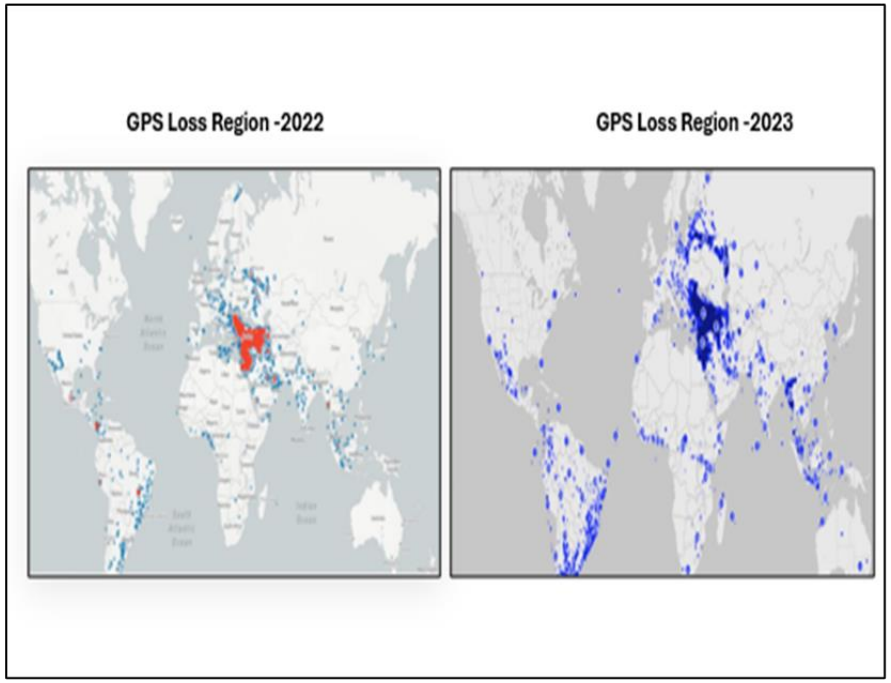
Global GPS Loss Events





EVOLVING THREAT

Effects under investigation by OEM

- Undue TAWS alerts after interference area
- Erroneous IRS alignment on ground
- Suspected cases of GPIRS under spoofing
  - Uncommanded turns and FMS position map shift
  - Loss of WXR, TURB and inability to display WXR at certain ranges

Thank You

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