

GNSS Interference

Towards more resilient system architectures

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Impact on Aviation Safety – Well Know

1 **Dramatic increase** in Jamming and Spoofing levels`

2 **The high dependency on GPS** – Leading to the impact on navigation, communication, and surveillance systems

3 **Lack** of technical information

4 **Risk of complacency** – due to the commonplace encounters of GPS spoofing impacts (normalization)

What can be done?

In the Short Term

Strengthening the mitigation strategy

Procedures

Training

In the Short Term

Strengthening the mitigation strategy

Procedures

Flight planning procedures to stay vigilant on

- NOTAMS related to known or expected GNSS RFI.
- The availability of non-GNSS-based routes, procedures, and approaches (ILS, VOR, and DME).
- Limitations caused by inoperative radio navigation systems or other MEL items to operate in GNSS RFI-affected areas.

FLT OPS - Standard operating procedures to provide pilots with supplemental procedures on

- GPS outage cockpit effects and typical indications of jamming/spoofing
- Keeping the aircraft status scan quality in a high number of ECAM/EICAS warnings situations.
- Handling Nuisance alerts in critical flight phases (Especially EGPWS ECAM alerts)
- Unplanned entry into Danger Areas, Restricted Airspace, and other FIRs
- Dealing with escape routes in case of RNP capability unavailability
- Unavailability of Runway protection systems

In the Short Term

Strengthening the mitigation strategy

Training

Dispatcher recurrent training

- Consider including considerations GNSS Interference technical understanding and safety concerns

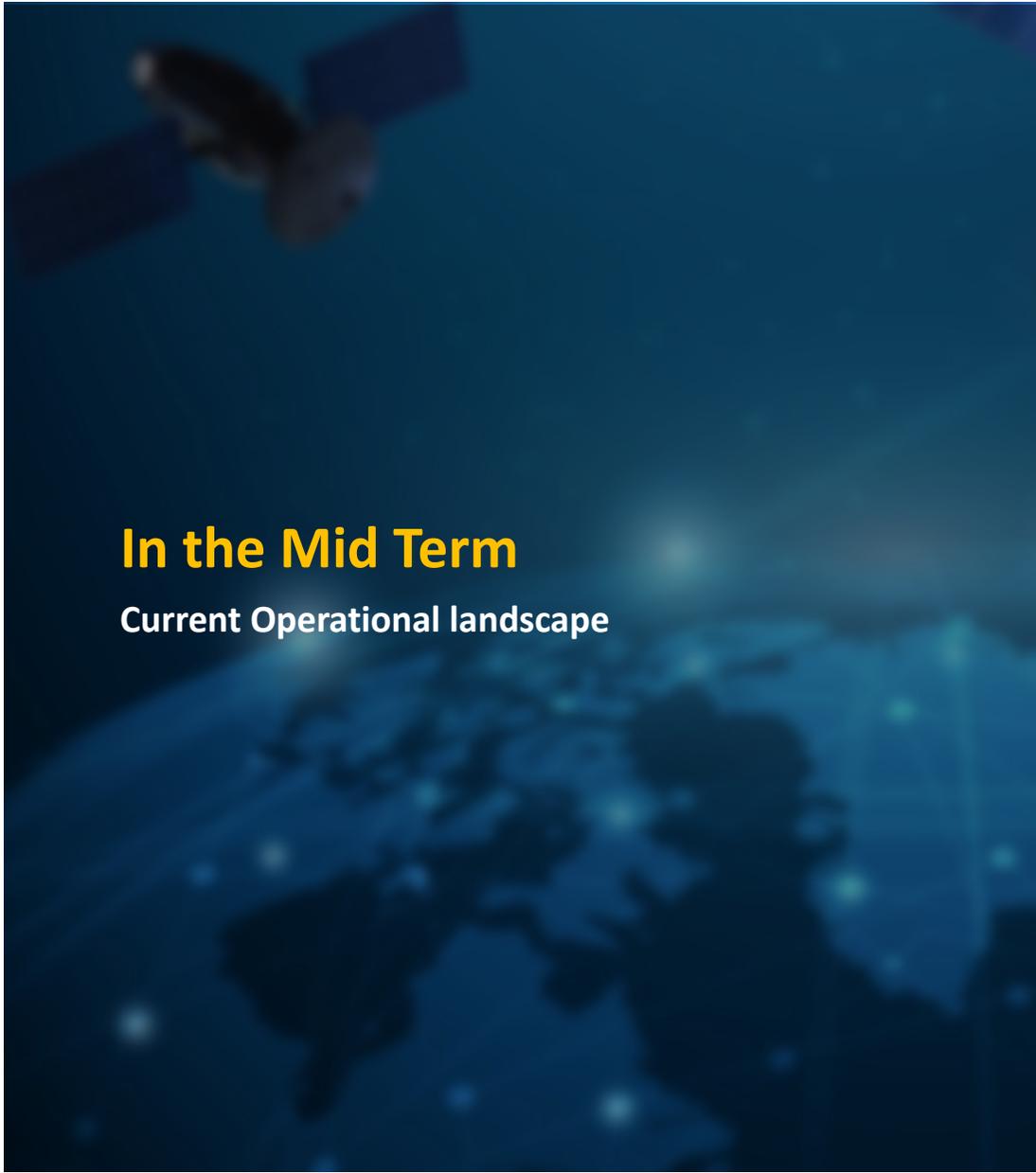
Flight crew Training

- Consider using simulator training sessions to explore RFI-related CRM and crew mitigation

Current Operational landscape

& Mid Term strategy

- ✘ **Winter increases operating risk** - poor weather, icing, and IMC conditions
- ✘ **Operation of Degraded aircraft**
- ✘ **Geopolitical conflicts** leading to a Potential for worsening of the situation



In the Mid Term

Current Operational landscape

- ✂ Develop an easily accessible **Jamming/Spoofing Location Map** that informs the dispatcher and flight crew of GPS outage location
- ✂ Integrate a **periodic evaluation of the exposure to threats** identified in the GNSS RFI risk model into risk management activities
- ✂ Do not let **Spoofing/Jamming** to become “normal” – Encourage Flight crews to continue reporting



In the Long Term

There are no easy solutions

Increasing resilience of onboard equipment /systems

- ✘ Spoofers mitigation using enhanced GNSS receiver signal processing
- ✘ Multi-Frequency Multi-Constellation (MCMF) GNSS Receivers to use other GNSS frequency bands and other constellations
- ✘ Controlled Reception Pattern Antennas CRPA

Thank you

