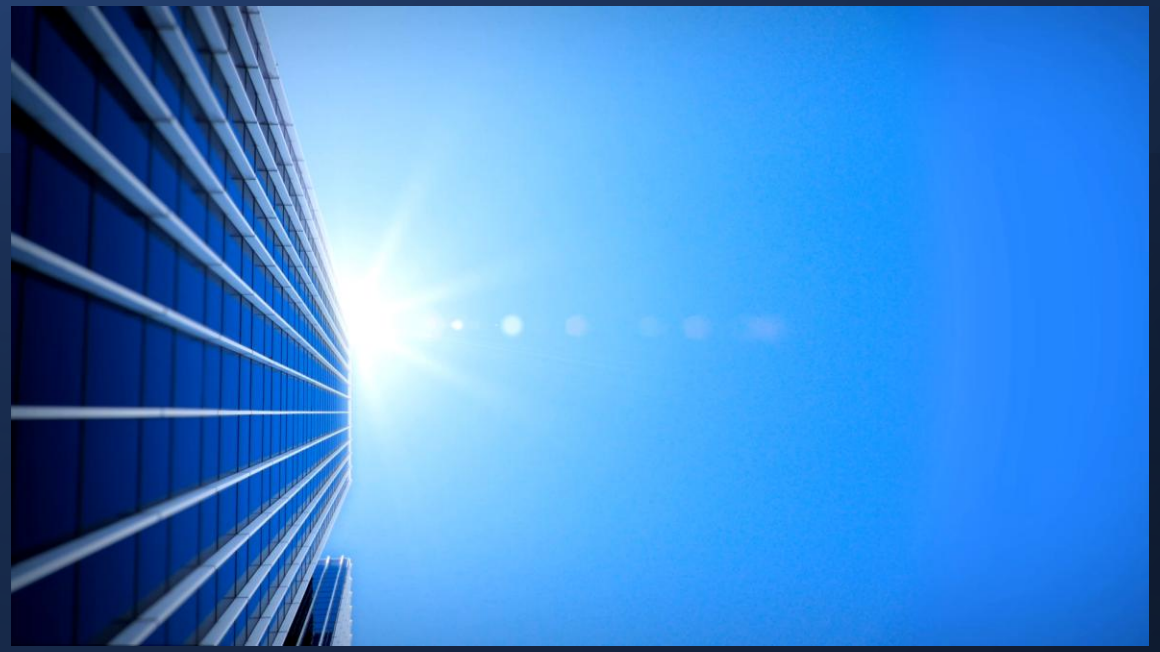
# *GNSS Jamming and Spoofing Workshop*

Doha, Qatar
18-19 NOV 2025

Frédéric Deleau, IFATCA EVP Europe

# *Let me take you on a journey…*



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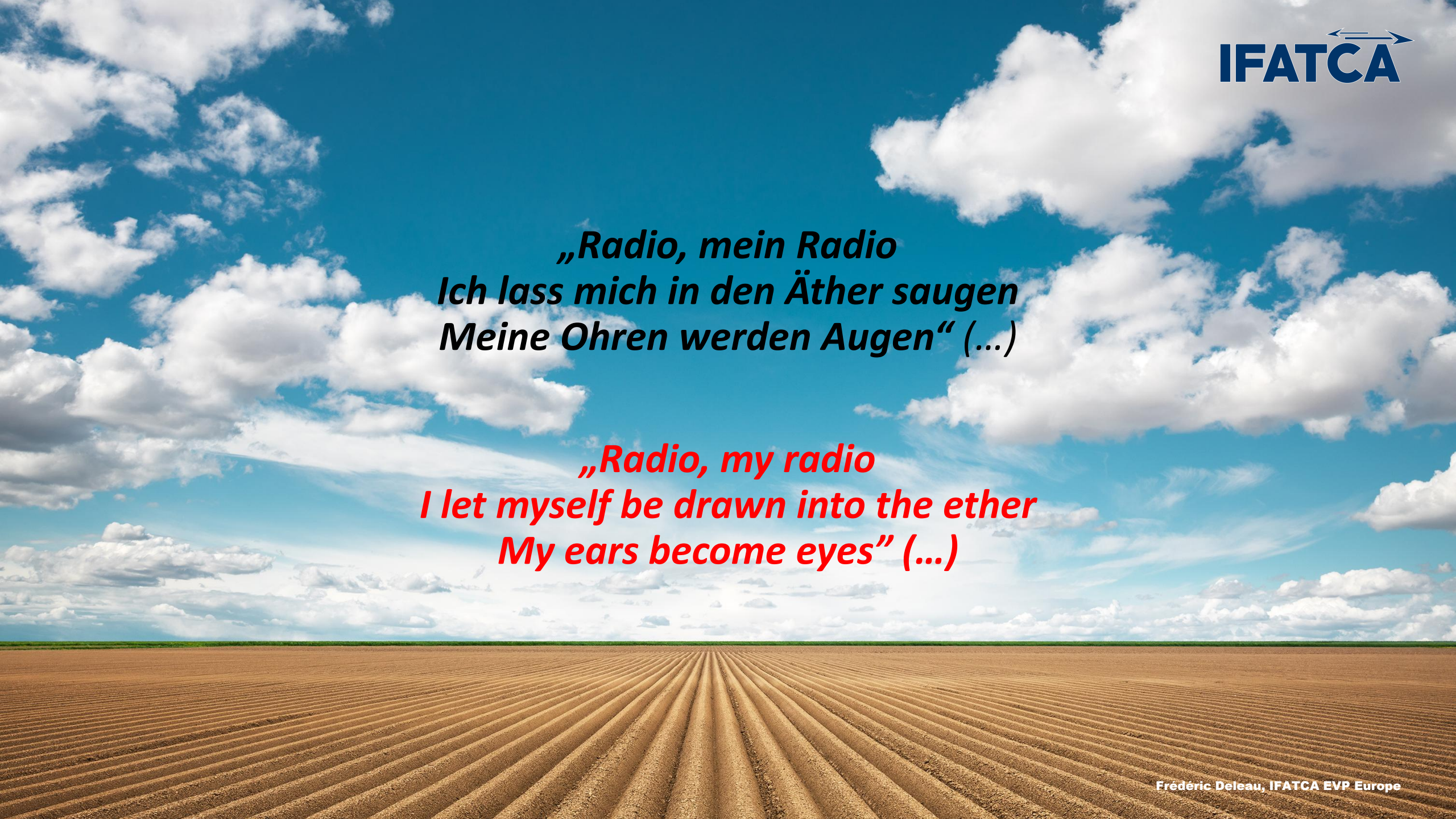
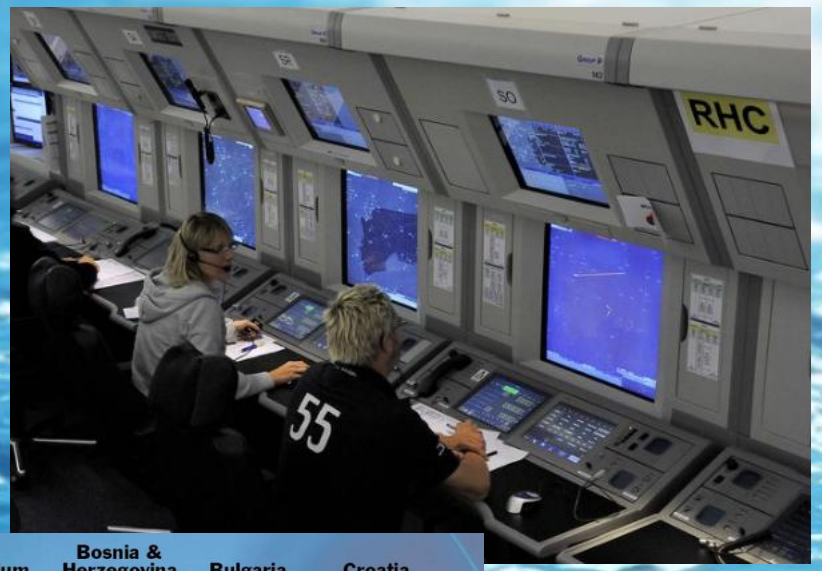
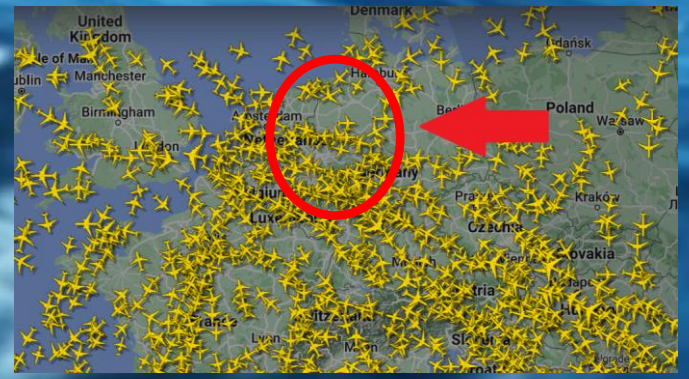

„Radio, mein Radio
Ich lass mich in den Äther saugen
Meine Ohren werden Augen“ (…)
„Radio, my radio
I let myself be drawn into the ether
My ears become eyes” (…)

IFATCA








Frédéric Deleau, IFATCA EVP Europe

# GNSS Jamming - Spoofing

- IFATCA EUR
- Set the scene
- Thoughts/ Recommendations
- Conclusions
- Q/A

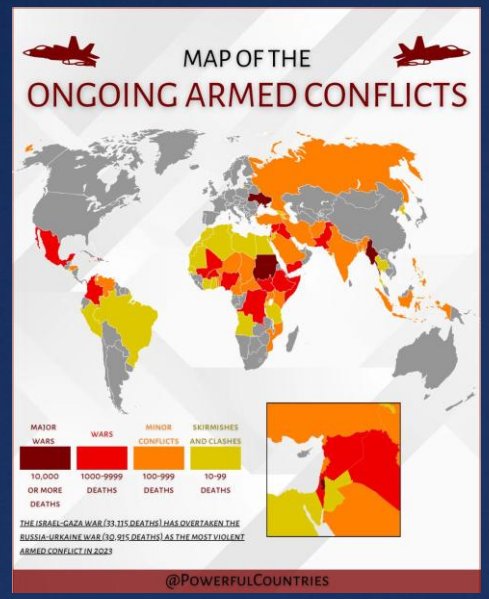
Frédéric Delenu, IFATCA EVP Europe

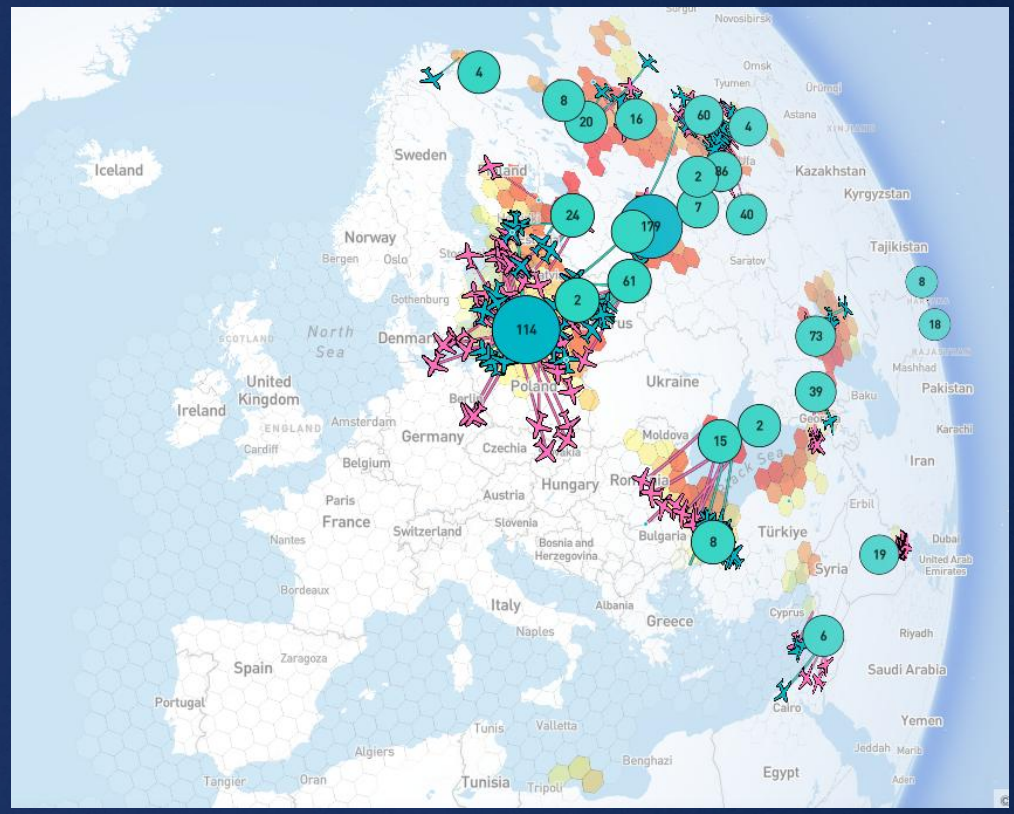
# Set the scene :

Not only near, or in conflict zones anymore…

… but through, and in the core of the Network

# Set the scene :




# But also…

**Police/National Defence/others**

**Frédéric Deleau, IFATCA EVP Europe**

# Set the scene :

Many in ATC often consider that GNSS jamming and spoofing are only affecting Navigation and therefore it is more a nuisance, than  a safety issue.

IFATCA strongly believe it is a **Safety issue.**

Because  GNSS RFI affects all the 3 components of ATM :  Comms, Nav. and Surveillance, and also affects time coordination between computers.

IFATCA is at the forefront on raising the issues…


## Set the scene :

# Surveillance issues

**GNSS RFI means loss of Surveillance in a non-radar environment using ADS-B ( ex. Iceland, Canada, Australia)**

**Undetected turns in case of map shifts: While large map shifts might be recognized and/or ignored by the crews, small ones may not, and after a while, aircraft will be reporting a totally different position than in reality..**


Frédéric Deleau, IFATCA EVP Europe

# Set the scene :

# Navigation en-Route

**Degradation to RNP10 (procedural) after spoofing , continuing for some a/c types for the whole duration of the flight .**

**Upcoming issue: Potential reluctance, or even in some cases, request by Aircraft operator NOT to report having been spoofed by fear of being rerouted or descended below optimum level, especially in oceanic airspace (RNP4) and in dense continental airspace (RNP1) Examples : Iceland, Shannon.**

**Safety issues : Collision risk increases if undetected by ATC .**


Frédéric Deleau, IFATCA EVP Europe

## Set the scene :

# Navigation on Approach

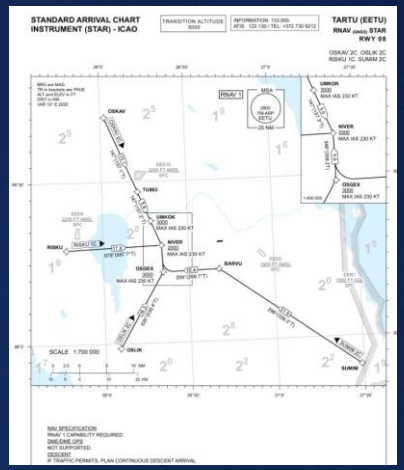
**Unable to perform RNP GNSS Approaches (Ex.: Finnair EETU diversions )**

**or tying to approach and being spoofed off localizer during the Approach phase (Ex.: Azerbaijan E190 in Grozny)**

**Additional issue : Jamming capabilities include DMEs and VORs (Ex.: Grozny )**

**Safety tools : eGPWS false alerts resulting in “Pull up” alerts - either at high altitude (Ex.: Over Iraq ) or during approaches (ex.: Nicosia )**

**GNSS REQUIRED .**
**No DME/DME**



## Set the scene :

# Spoofing = Map shifts and false eGPWS alerts

**TIME lost => eGPWS PULL UP @ FL 360**
**and MAP SHIFT with TERRAIN**

**(Boeing 737-800 over Cyprus)**


Frédéric Deleau, IFATCA EVP Europe

# Set the scene :

## Communications : Loss of Time = loss of CPDLC (and ADS-B)

**No prominent visual, and no aural warnings, when GPS is jammed or spoofed**

**Example: B737-800 over the Black sea.**




Frédéric Deleau, IFATCA EVP Europe

# Set the scene :

# Phraseology issues in Grozny

**“We lost both GPS “ mentioned 7 times by pilots - Not understood by Air Traffic Controllers .**

**2 eGPWS “ PULL UP” alerts ( 04.37 and 04:39) while aircraft was well above MSA. Not reported by pilots.**

**Controller kept sending aircraft to RNAV points**

**Time shift of 4 min and 32 sec on the FDR (typical of spoofing)**

Not only a phraseology issue… Training?

Frédéric Deleau, IFATCA EVP Europe

## Set the scene :

# NEXT WARFARE THREATS for ATC

There are other threats coming up as conflicts are expanding worldwide…

**Targeted spoofing** (Locking up on a specific aircraft and diverting it somewhere else),

**Creation of false tracks** to create decoys for anti drone weapons,

**Cheap access** to spoofing devices coming up (SDR radios),

**Satellite constellations jamming** over large area (Up to a whole country)

**????**


*Screenshots from Boeing 777 over UUEE, August 2025*

Frédéric Deleau, IFATCA EVP Europe

# The CHALLENGES IFATCA sees…

## SUGGESTIONS

- Phraseology missing (to avoid misunderstandings)
- Pilots need to report when aircraft capabilities are or have been affected by GNSS.
- Pilots needs to advise ATC asap when following a **GPWS alerts ,** above MSA and during APP. (but against the Aviate –Navigate –Communicate concept prevails)
- Loss of RNP 1 or 4 capabilities in specific airspace , loss of ADS-B, Time , CPDLC capabilities = increase separation standards , or move or descend aircraft out of that airspace.
- **ACAS loss during GPWS events,**
- Responsibilities of controllers, false TAs and RAs generation

Frédéric Deleau, IFATCA EVP Europe

# ATM Regulatory issues to be considered…

- **PHRASEOLOGY - Reporting the issues**: Currently the phraseology (in PANSATM – DOC4444) for pilots to report GNSS interferences is not clear – Reporting is not mandatory neither – Need = **"Simple" Global new Phraseology (IFATCA –IFALPA initiative)**
- **PHRASEOLOGY on eGPWS alerts**: No Phraseology yet (like TCAS RAs) to **report immediately to ATC** by crews of aircraft is climbing following an alert and to which altitude.
- **LEGAL : Responsibilities for separation**: No clear procedures for controllers , **Responsibilities to avoid collision** with surrounding aircraft during a false eGPWS alert (ACAS RAs inhibited during GWPS alerts )

# ATM Regulatory issues to be considered…

- **CERTIFICATION OF GNSS RFI Automatic and Dynamic Alerting tools:** Encourage PC based tool to be made available to supervisors to **alert controllers in real time** when GNSS RFI (both jamming and spoofing) affected aircraft will enter their airspace. (**Dynamic Database following flight plan/path/sectors**)
- **Making MON a priority**: i.e **Retaining Basic Ground Navigation infrastructure** ( ILS, DME and VOR ) - (MON = Minimal Operational Network)
- **Training/Refresher Training**: Mandatory training module covering Jamming/Spoofing

# SUGGESTIONS/RECOMMENDATIONS

"Responsibility:
• Ceasing Responsibility Once an aircraft departs from its ATC clearance or instruction in compliance with an RA, or a pilot reports an RA, the controller ceases to be responsible for providing separation between that aircraft and any other aircraft affected as a direct consequence of the manoeuvre induced by the RA.
• Resuming Responsibility, The controller shall resume responsibility for providing separation for all the affected aircraft when:
The controller acknowledges a report from the flight crew that the aircraft has resumed the current clearance or,
* The controller acknowledges a report from the flight crew that the aircraft is resuming the current clearance and issues an alternative clearance which is acknowledged by the flight crew"

PANS-ATM (Procedures for Air Navigation Services - ICAO Doc. 4444, 15.7.3.3)

"Responsibility:
• Ceasing Responsibility Once an aircraft departs from its ATC clearance or instruction in compliance with an eGPW Climb, or a pilot reports eGPW Climb, the controller ceases to be responsible for providing separation between that aircraft and any other aircraft affected as a direct consequence of the manoeuvre induced by the eGPW Climb.
• Resuming Responsibility, The controller shall resume responsibility for providing separation for all the affected aircraft when:
The controller acknowledges a report from the flight crew that the aircraft has resumed the current clearance or,
* The controller acknowledges a report from the flight crew that the aircraft is resuming the current clearance and issues an alternative clearance which is acknowledged by the flight crew"

Frédéric Deleau, IFATCA EVP Europe

# IFATCA Actions:

- **Current**: Identification of threats - Education of IFATCA Member Associations/parties involved, discussion in our meetings and in our Technical and Ops committee (TOC) for determining/developing Policies .
- Coordination with IFALPA (ATS Comm/Accident & Prevention Committee )
- ICAO EUR/MED/NAT GNSS RFI Workshop (Doha, Qatar)

- **Past**: Participation with EASA and EUROCONTROL in a Think Tank to propose phraseology.
- Proposals presented to EUROCONTROL APDSG for approval

- **PLAN** (Immediate future): Make the proposal to ICAO – first, at regional level (EASPG) then to HQ Montreal, ANC, ATM OPS and NSP groups .

- **Longer term** : ICAO secretariat to approve and publish the agreed changes - It will take a few years…

Frédéric Deleau, IFATCA EVP Europe

***Glossary** : APDSG ( ATM procedures Development subgroup , a Eurocontrol working group ) EASPG : ICAO Europe Planning group , ANC ( ICAO Air*

# CONCLUSION:

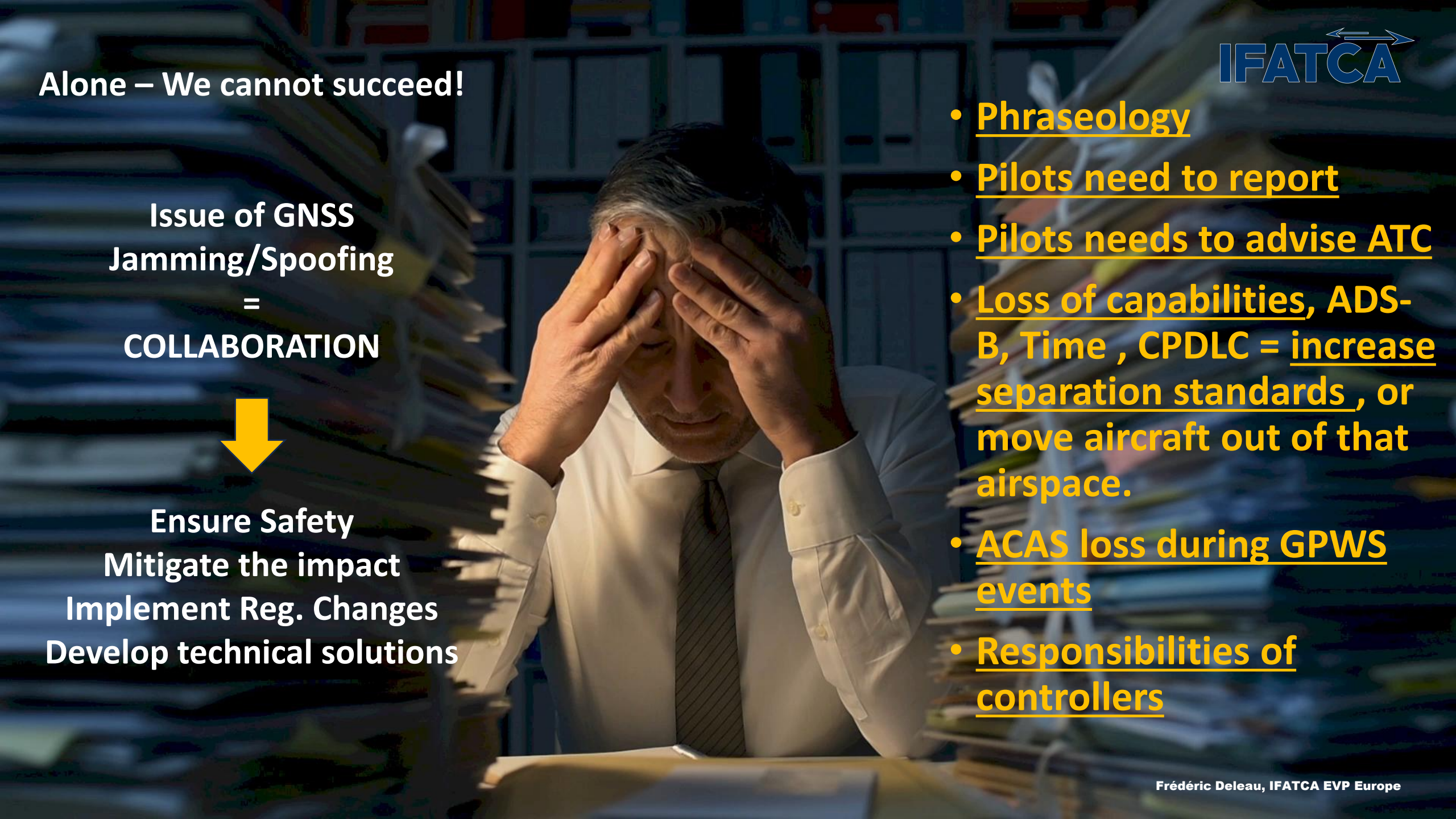
## Security ≡ Safety ≡ Capacity

More planes, more data, more passengers…

Faster, always faster…

Green, greener, greenest…

And always SAFE - Safer – SAFEST!



Alone – We cannot succeed!

Issue of GNSS
Jamming/Spoofing
=
COLLABORATION

Ensure Safety
Mitigate the impact
Implement Reg. Changes
Develop technical solutions

- Phraseology
- Pilots need to report
- Pilots needs to advise ATC
- Loss of capabilities, ADS-B, Time , CPDLC = increase separation standards , or move aircraft out of that airspace.
- ACAS loss during GPWS events
- Responsibilities of controllers

Frédéric Deleau, IFATCA EVP Europe

# CONCLUSION:

**Jamming and spoofing of systems is not new but is increasing at a rapid state and will evolve as drones are now part of how the future wars/defenses/law enforcement will be fought.**

**Civil aviation  is (at the moment) only a collateral damage but ATC, as critical and essential infrastructure, might be directly targeted.**

Frédéric Deleau, IFATCA EVP Europe

# THANK YOU FOR YOUR ATTENTION!

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**EUROPE**

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IFATCA
Question(s)?
Frédéric Deleau, FATCA EVP Europe

# Set the scene :

## E190 Grozny 25 Dec 2024 from Kazakhstan preliminary report (selected extracts )

04:26:Pilot : For information **we lost both GPS** - 04:36 :**We lost both GPS** request vectoring NDB APP - 04:37 : ( eGPWS PULL UP x 3 heard in R/T )

04:37 : (Time shift 4 min 32 sec on FDR) - 04:39 , “eGPWS . Terrain Terrain PULL UP - 04:53 : Going around . **We lost both GPS -** 04:55 : ATC : confirm you need GNSS APP ? - 04:55 : **No GNSS APP we lost both GPS -** 04:59: **We lost both GPS Cannot perform RNAV APP -** 05:01 : ATC : report distance from airport

05:01 :30 miles but **we lost GPS -** *( this distance might be inaccurate as DME also jammed*) - 05:12 : ATC: Proceed direct to PINTA ( *an RNAV point*)

05:12 : **Both GPS lost , need vectoring -** 05:13 : Hit by missile .

**EXTRA - Annex**

**Frédéric Deleau, IFATCA EVP Europe**