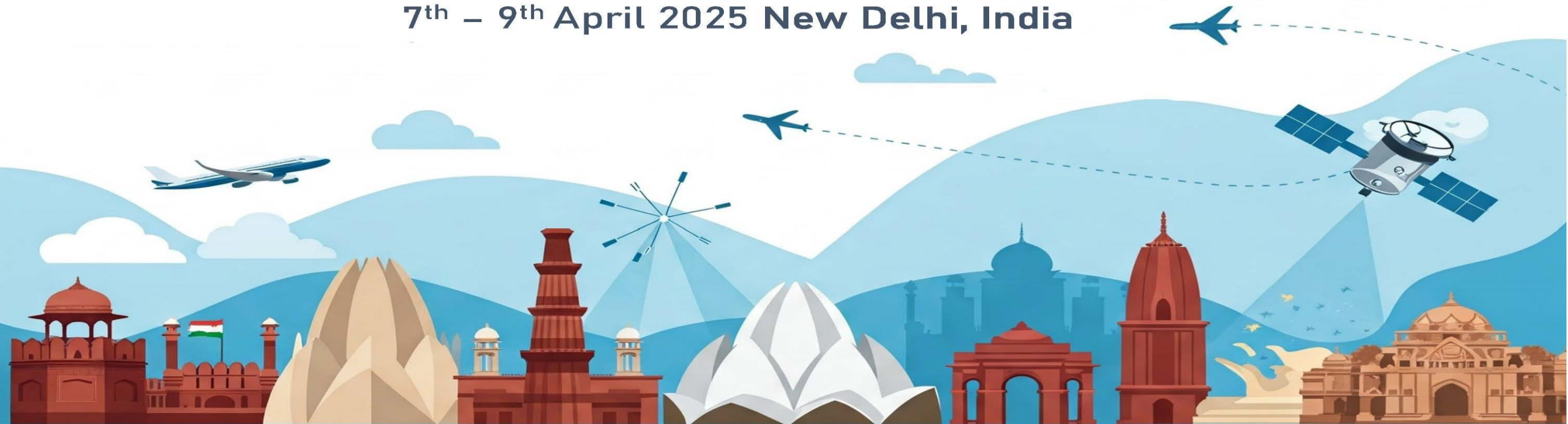


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Massimiliano Ferla

Product Line Manager for Navigation Aids and
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Context

The growing complexity of operational and environmental requirements for civil aviation systems, driven by Performance Based Navigation (PBN) and Low Frequency Communications (LFC) and other technologies, is leading to a need for a more integrated approach to the design and implementation of these systems. This is particularly true for the design and implementation of the next generation of navigation systems, which will require a more integrated approach to the design and implementation of these systems. The growing complexity of operational and environmental requirements for civil aviation systems, driven by Performance Based Navigation (PBN) and Low Frequency Communications (LFC) and other technologies, is leading to a need for a more integrated approach to the design and implementation of these systems. This is particularly true for the design and implementation of the next generation of navigation systems, which will require a more integrated approach to the design and implementation of these systems.

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Resilient Tim

Chief Scientist

U.S. Fed



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It's all Resilient Time.

Ken

Chief Scientist for
U.S. Federal A



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Resilient Time Overview

4

The Challenge

Aircraft and ATC Timing Standards

GNSS Disciplined Oscillator /
to the Computer

6

GNSS Dissemination of
Coordinated Universal Time
(UTC)

9

Independent Systems Keep
Aviation Safe

12

Recommendations

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The Challenge

- Aircraft & ATC Critical Infrastructure (CI) systems. Air traffic control and resilient to existing threats - including cyber.
- Modern society and businesses rely on: Commercial Technology (CMT), Automation, Hardware and Software. Increasingly interconnected and supporting UTM (UAS).
- Time and Frequency are increasingly intertwined and into control world (as well as for many legacy analog systems).
- Computer applications, communications networks, buses, and avionics need stable, phase aligned frequency.
- Digital time reference services across the spectrum at the same time, preventing interference and maintaining safety critical operations.
- Most Applications & Services need Universal Coordinated Time (UTC) or related time std.
- Time distribution requires time domain protection and fault location technologies for accuracy and speed.

Services must be time-aware
Networks & Information Systems and Busses (e.g. ticketing, etc.) are increasingly digital









Thank You

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Mc

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Saudi



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Saudi Arabia's Contingency Layer



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SAFETY MANAGEMENT SYSTEM

Navigation —
Saudi Arabia's
Contingency
Layer

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DME/DME Navigation – Saudi Arabia's Contingency Layer

*A strategic layer aligned with
national and regional resilience efforts*















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the future?

Navigation systems to

ng of System?



Repeater based attacks observed on 800
MHz interference observed in the Dallas
Speaker attacks observed in the Dallas
Attacks caused result in

No impact

Typical attacks that result in time and
loss of 10% that recovers automatically
Loss of 10% that recovers after power is
Loss of 10% that recovers after a factory
Loss of a variety of functions (control, etc)



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Flagship airport
Repeater based affair
IFF interference of
Speaker affair is also
Affair is not result of
No impact
Speaker affair is that
Issue of IFF that never
Issue of IFF that never
Issue of IFF that never
Issue of a variety of for



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Repeater based attack
Cyber interference into
Speaker attacks also
Attacks could result in
The impact
Specifying attacks that
Based on PPS that rely
Based on PPS that rely
Based on PPS that rely
Based on a variety of h



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- * Spoofing attacks could result in
 - * No impact
 - * Spoofing attacks that
 - * Loss of GPS that reco
 - * Loss of GPS that reco
 - * Loss of GPS that reco
 - * Loss of a variety of fur



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SAFETY NAVIGATION

GNSS threats – Reported over last 2+ years

Multiple RFI Reports received from the Field

- Loss of GNSS for over 2 hours on some flights over the Middle East
- Time Jumps noticed on Flights over the Syria/Iraqi Airspace
- Corruption of GPS almanac observed on some flights near the Baghdad airport
- Repeater based attacks observed on some flights in the Chinese Airspace
- GPS interference observed in the Dallas Area
- Spoofer attacks observed in the Baltic Region

Attacks could result in

- No impact
- Spoofing attacks that result in Time and/or Position Corruption
- Loss of GNSS recovers autonomously after flying out of RFI region
- Loss of GNSS recovers after power cycle
- Loss of GNSS recovers after a factory reset
- Loss of GNSS of functions (comm, surveillance, platform nav) at the aircraft level



KOBE APPROACHES – REPEATER

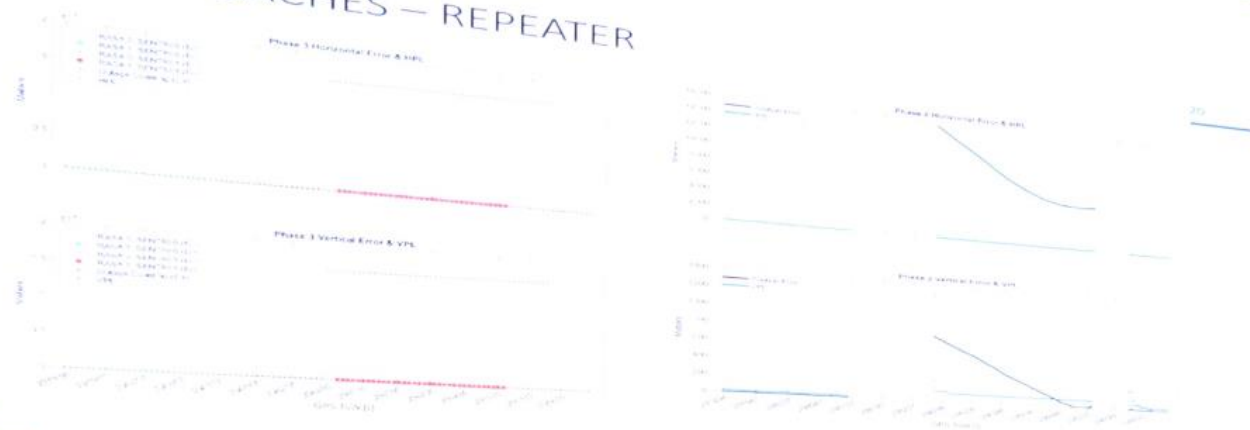


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