BEYOND INTERFERENCE

Integration of 5G in civil aviation

Capt. José Antonio Ruiz
IATA Regional Director
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Key Message #1

Aviation industry **technology** can either benefit from investments already made by telecom **- or pay to catch up**

$637 USD Million – just for Rad Alt

Technologically the telecommunications industry is looking at the aviation industry in a rear-view mirror.

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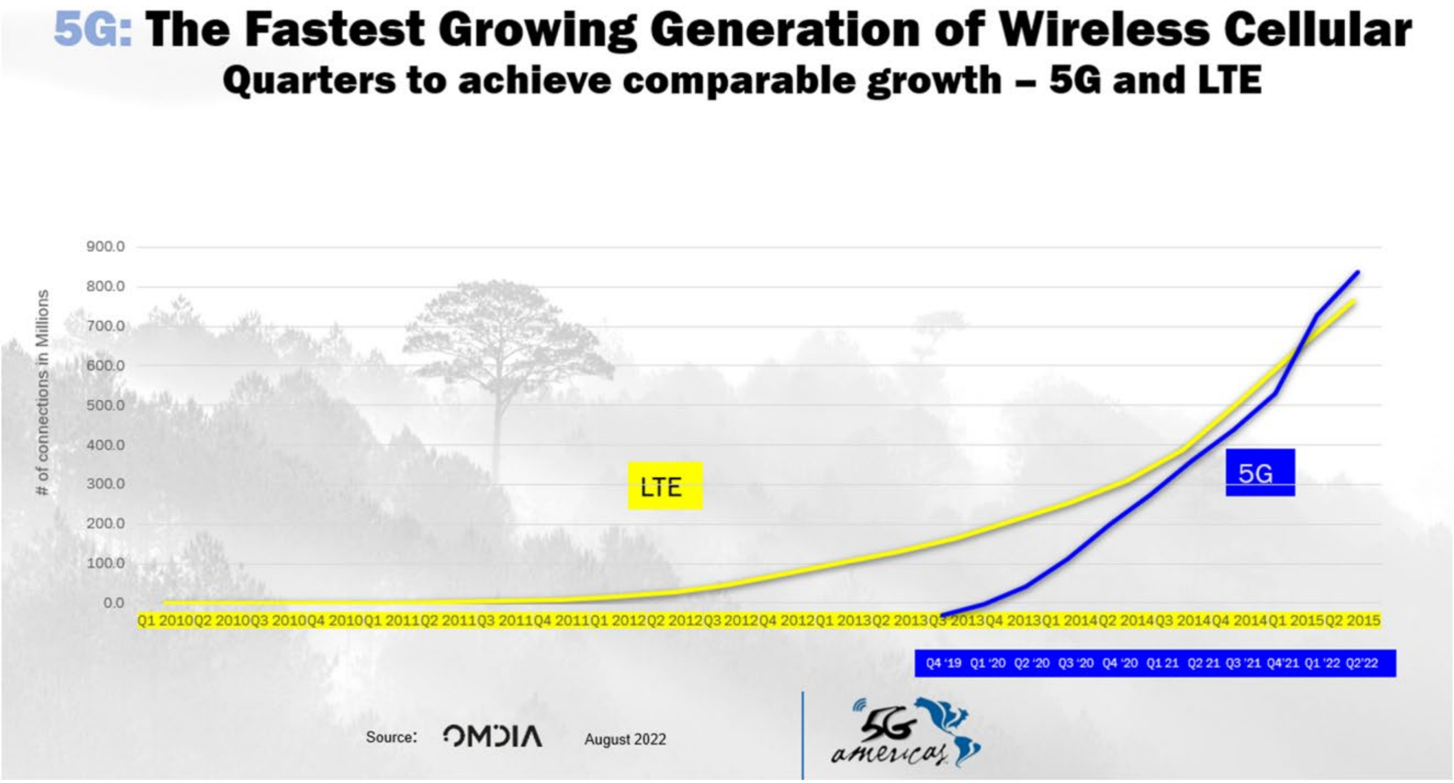
5G Pace of Change

- 5G coverage will roll out rapidly to cover 71% of the global population by 2027
- 5G will account for 46.4% of all telecom connections by 2027
- 5G will connect 29.4 billion Internet of Things (IoT) devices globally in 2030



Key Message #2

5G Needs More Spectrum

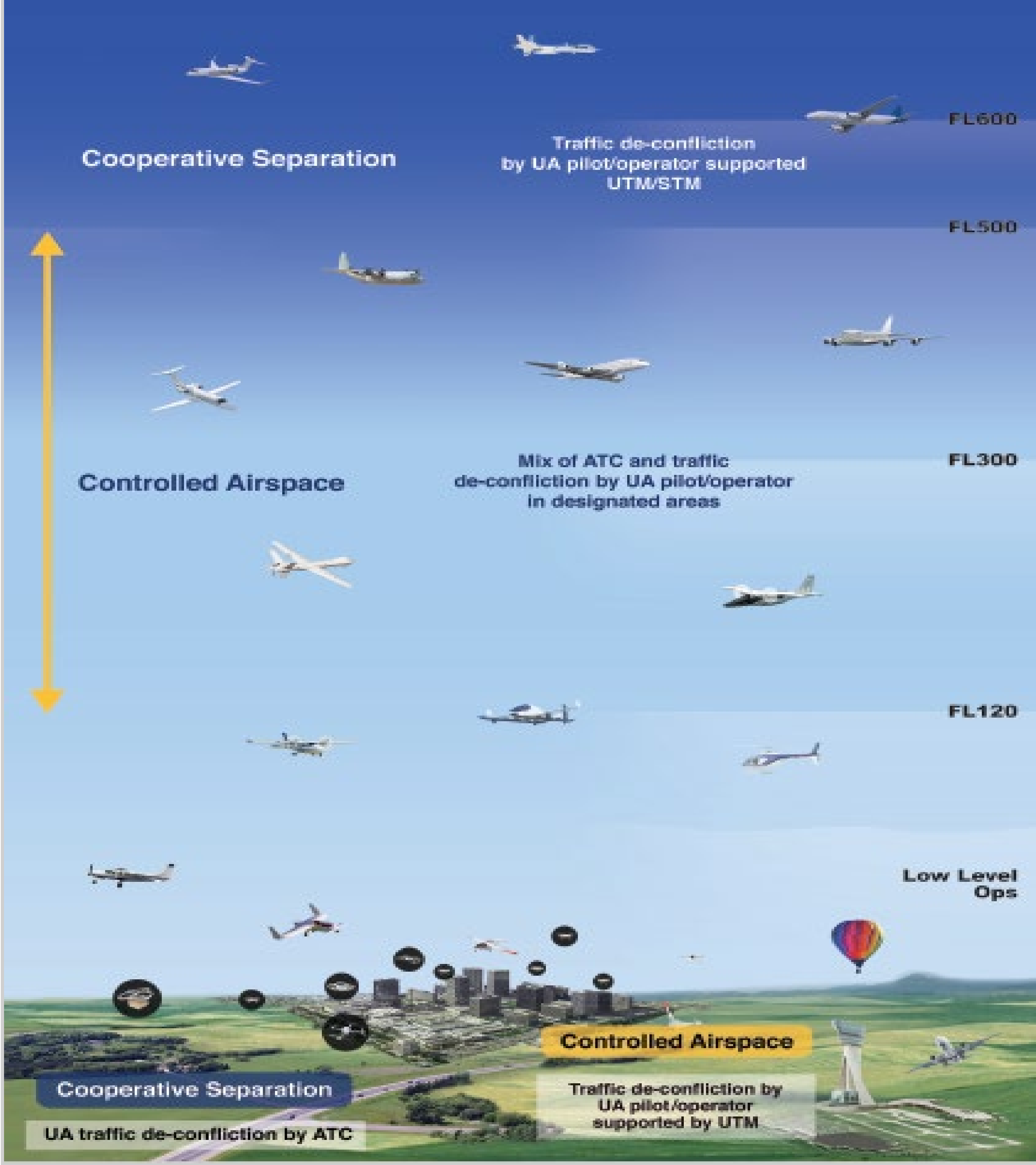
As demonstrated by the USA FCC

avionic **interference** is **not** a limitation for **some** spectrum **regulators**

The future of aviation is characterized by:

Minimal **tactical human intervention**

Making secure, reliable, **communications** a fundamental requirement



MITRE ENGENUITY | Open Generation

ENABLING 5G INNOVATION LEADERSHIP

THROUGH USE CASE-DRIVEN COLLABORATION

by Leila Z Ribeiro (MITRE), Thierry Klein (Nokia), Luiz A DaSilva (Virginia Tech), Attila Takacs (Ericsson), Prasanth Ananth (Nokia), Salvatore D'Oro (Northeastern University), Dipesh Modi (MITRE), Rick Niles (MITRE), Izabela Gheorghisor (MITRE)

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By 2025, the number of cellular-connected DRONES will total

6.5 million

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5G Areas of Impact

Out of the box thinking required

Opportunities include **transitioning certain functions of crewed aviation systems to commercial** **5G services** including **secure ground communications** and certain **surveillance** and **navigation** functions

Uncrewed Aircraft Systems (UAS):

5G will enable **operations beyond visual line of sight (BVLOS)**

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Telecommunications Industry
5G Solutions to Aviation Challenges

Reliable C2 communications

A key challenge for UAS is the need to improve the connectivity and reliability of the Command and Control (C2) channel

The utilization of 5G capabilities for C2 channel is expected to improve connectivity compared to existing methods

Telecommunications Industry
5G Solutions to Aviation Challenges

Collision avoidance

A key challenge is the need to **detect and avoid (DAA).**

The utilization of **5G** increases DAA reliability and allows new methods for drone position broadcasting, drone-to-drone communications, and **potentially utilizing the cellular 5G network as a ground-based surveillance systems (GBSS).**

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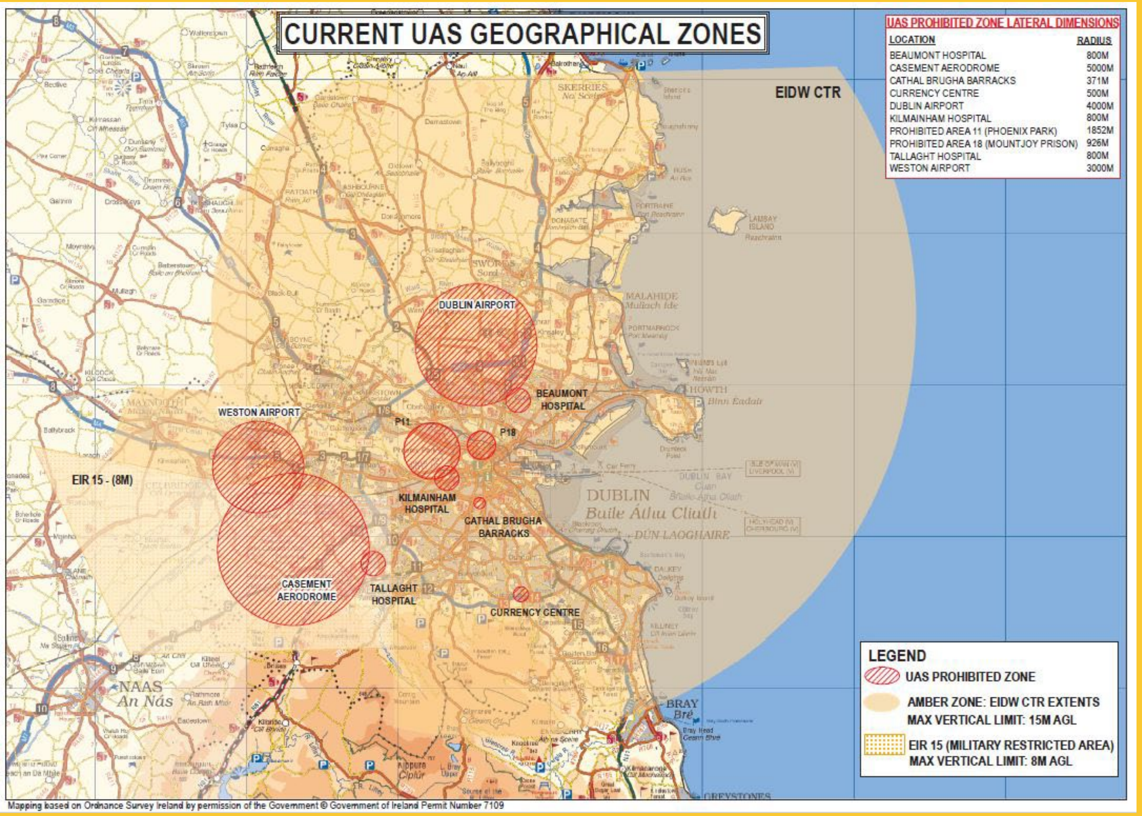
Telecommunications Industry
5G Solutions to Aviation Challenges

Tracking and Geofencing

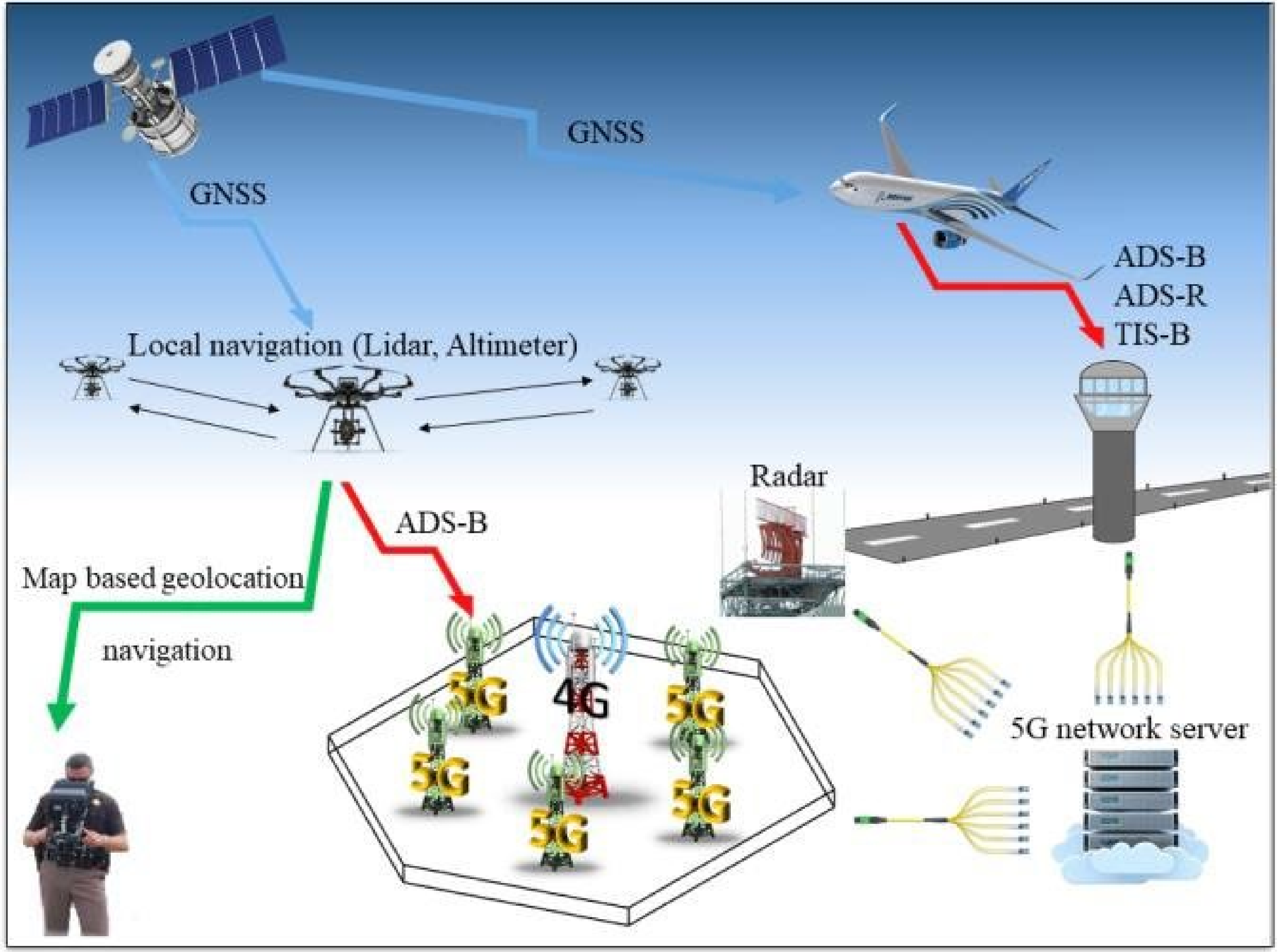
5G increases reliability and reduces C2 latency to ensure that a UAS will not breach a No-Fly-Zone (NFZ)



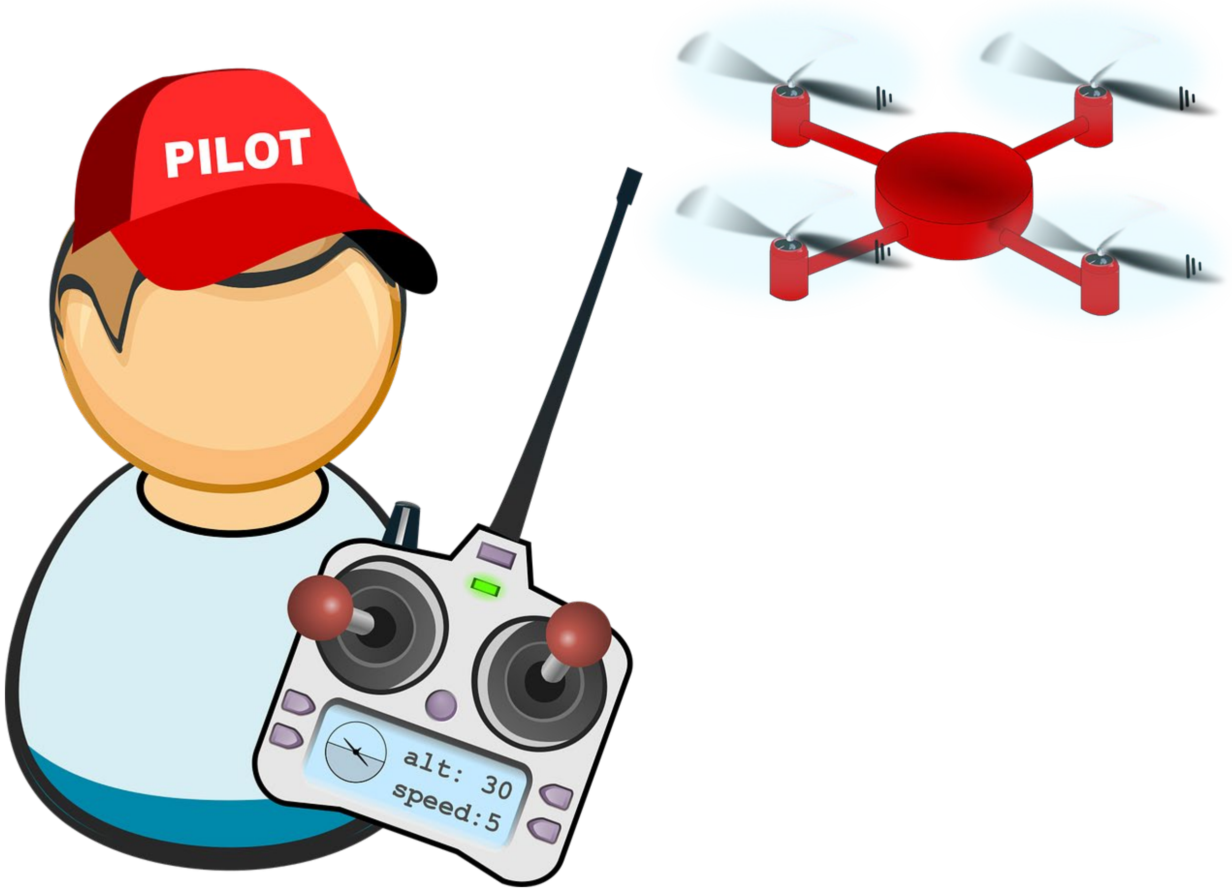
Use Case – Remote Operations

Using 4G / 5G infrastructure, engineers created NFZs which network connected drones interacted with

Engineers were able to create air restrictions remotely from London, UK, for flights being conducted in Jaen, Spain



5G latency – remote drone operations



Average latency <60ms

This suggests that the 5G solution is sufficiently capable of communicating commands to drones without allowing them to make significant headway into restricted airspace, even when separated from the pilot / server by **large geographical distances**

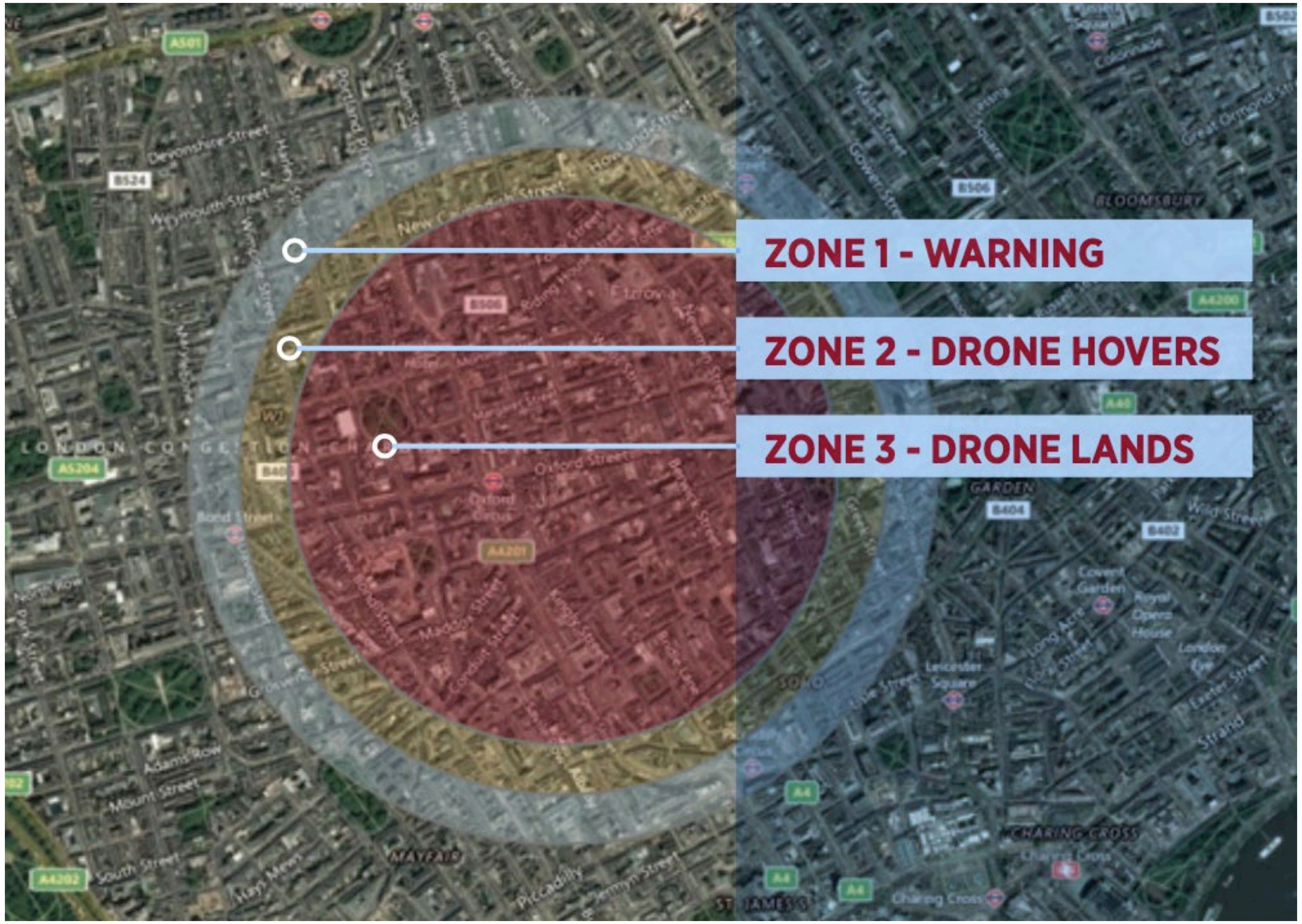
Example of network connected drone response to an NFZ

Upon entering Zone -1, the drone operator receives an alert, informing them of the approaching UAV NFZ, and offering an opportunity to change course with ample time.

As a precautionary measure, if a given UAV ignores the warning and **enters Zone -2,** an automatic command will be sent to the drone, forcing it to hover and preventing the drone actually entering the NFZ.

This is accompanied by a warning, informing the operator that remedial action has taken place.

In a dynamic scenario where a NFZ is created in a region where a UAV happens to be operating **(Zone-3),** an automatic command will be issued to the drone forcing it to land immediately.



Passengers today, flightcrew soon?

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR COMMUNICATIONS NETWORKS, CONTENT AND TECHNOLOGY

The Director-General

Brussels,
CNECT B4

MANDATE TO CEPT
TO UNDERTAKE TECHNICAL STUDIES ON THE POTENTIAL USE OF 5G TECHNOLOGY AND ON MAKING THE USAGE OF THE NETWORK CONTROL UNIT (NCU) OPTIONAL ON BOARD MCA ENABLED AIRCRAFT

CEPT ECC
Electronic Communications Committee

CEPT Report 81

Report from CEPT to the European Commission in response to Task 1 of the Mandate *"Study and assess conditions to operate 5G non-AAS connectivity for MCA in the 1800 MHz (1710-1785 MHz and 1805-1880 MHz) frequency band"* and Task 2 of the Mandate *"Study and assess whether, and under what conditions, the usage of an NCU in MCA operations could be made optional"*

Report approved on 05 November 2021 by the ECC

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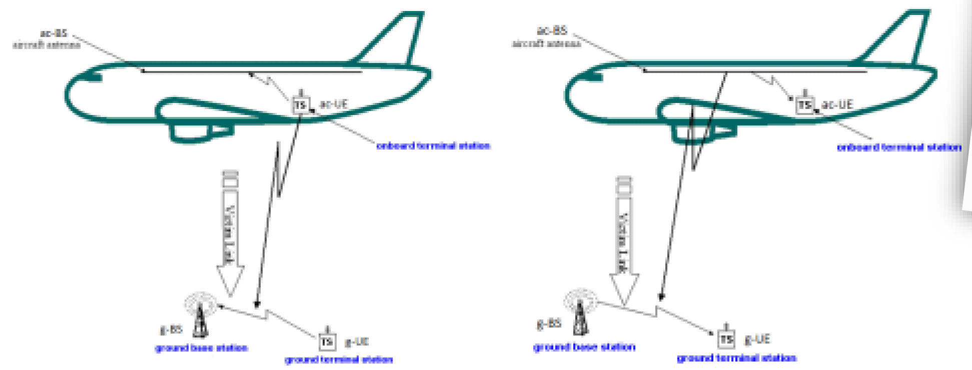

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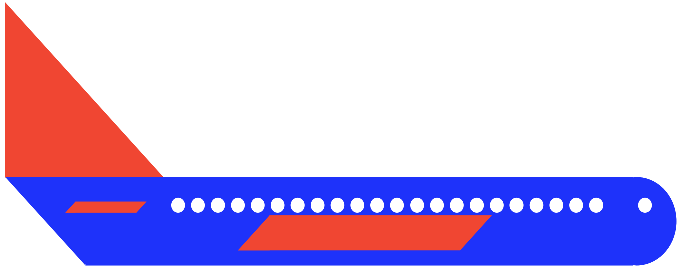
Value Chain for a Telecommunications Entity

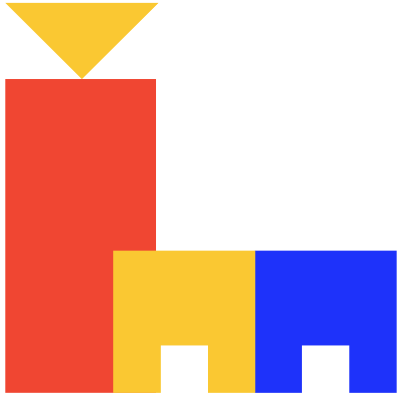
Traditional ANSP/CSP tasks?

Value chain possibilities for a Mobile Network Operator

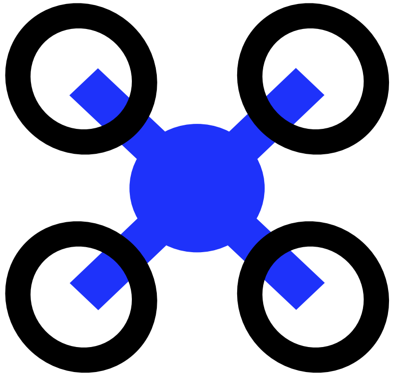
Device	Drone operator/ provider	Provider and/or operators of drones
Platform	Common information system provider	Centralized overview of manned & unmanned air traffic at national level
Platform	USSP/UTM-system provider	Consolidation and steering of unmanned air traffic in a given area (e.g. region)
Platform	Fleet management platform provider	Operational management and steering drone fleets for enterprises
Platform	Data & API platform provider	Provisioning of enriched data and APIs required for flight operations and steering (e.g. positioning, coverage maps)
Data	Data provider/ owner	Owner or provider of data necessary for flight operations (e.g. coverage or positioning)
Connectivity	Connectivity QoS provider	Provisioning of QoS optimized for drone behavior and operations
Connectivity	Connectivity provider (DL/UL)	Provisioning of UL:DL data packaged optimized for drone behavior and operations
Connectivity	Drone communication network operator	Owner and operator of communication network infrastructure optimized for drone operation and behavior

Cooperative Airspace Environment





Sharing **intent** , **trajectory** , even **weather** data for better and more **automated** airspace management



Key Message #3

The future desired state can only be achieved through **pragmatic evolution of aircraft and ground based CNS**

Combined with sustainable progression in ANSP business models

Risks & Challenges

- Continued and growing **Radio Frequency Interference (RFI)** with existing avionic technology.
  - **6G** is on the horizon – potential impact to **aircraft weather RADAR.**
- **Technological innovation** moves at a faster pace than the civil aviation industry has traditionally been able to absorb.
- **Steep Learning Curve** for both aviation and telecom industries.
- If aviation lags further behind the telecommunications industry in political and technological engagement, we may find ourselves as **secondary stakeholders** when seeking continued (and potentially new) **spectrum access.**