



Deconfliction and Separation

Drone dynamic Demand & Capacity Balance

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with the support of



Spanish General Directorate of
Civil Aviation (DGAC)



ICAO's DRONE ENABLE/3

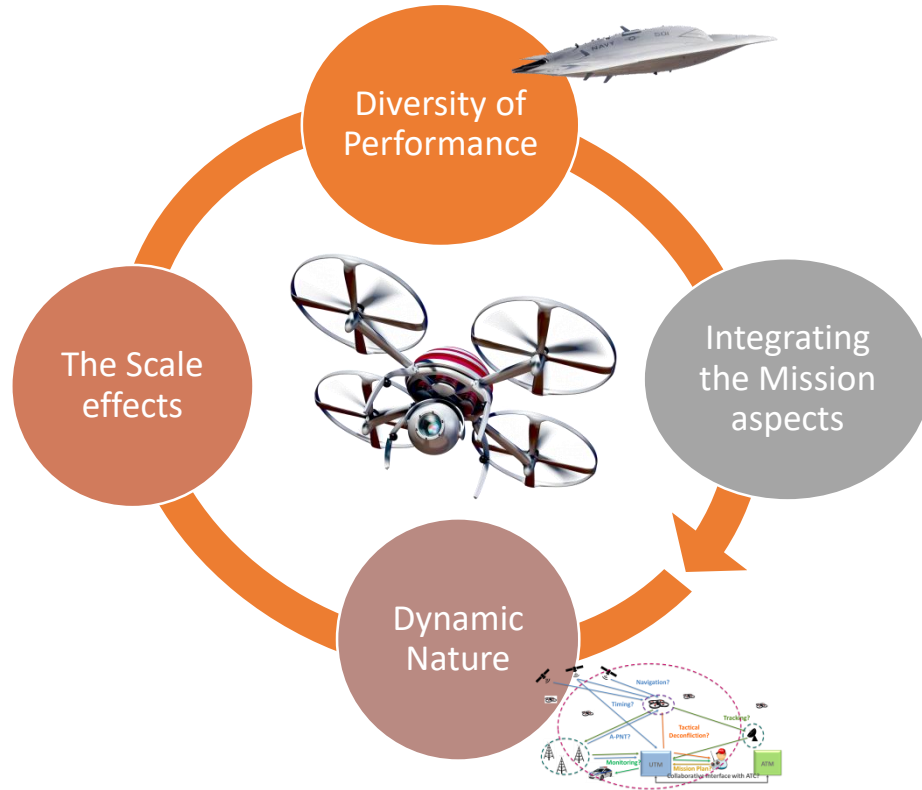
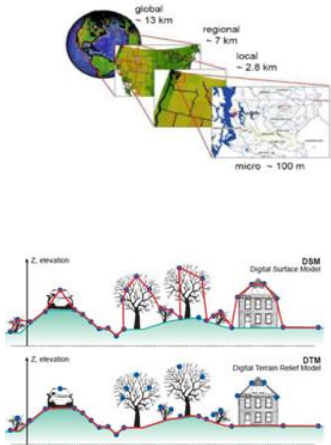
"Facilitating Future Innovation"

Montreal, 13th November 2019



Separation standards?

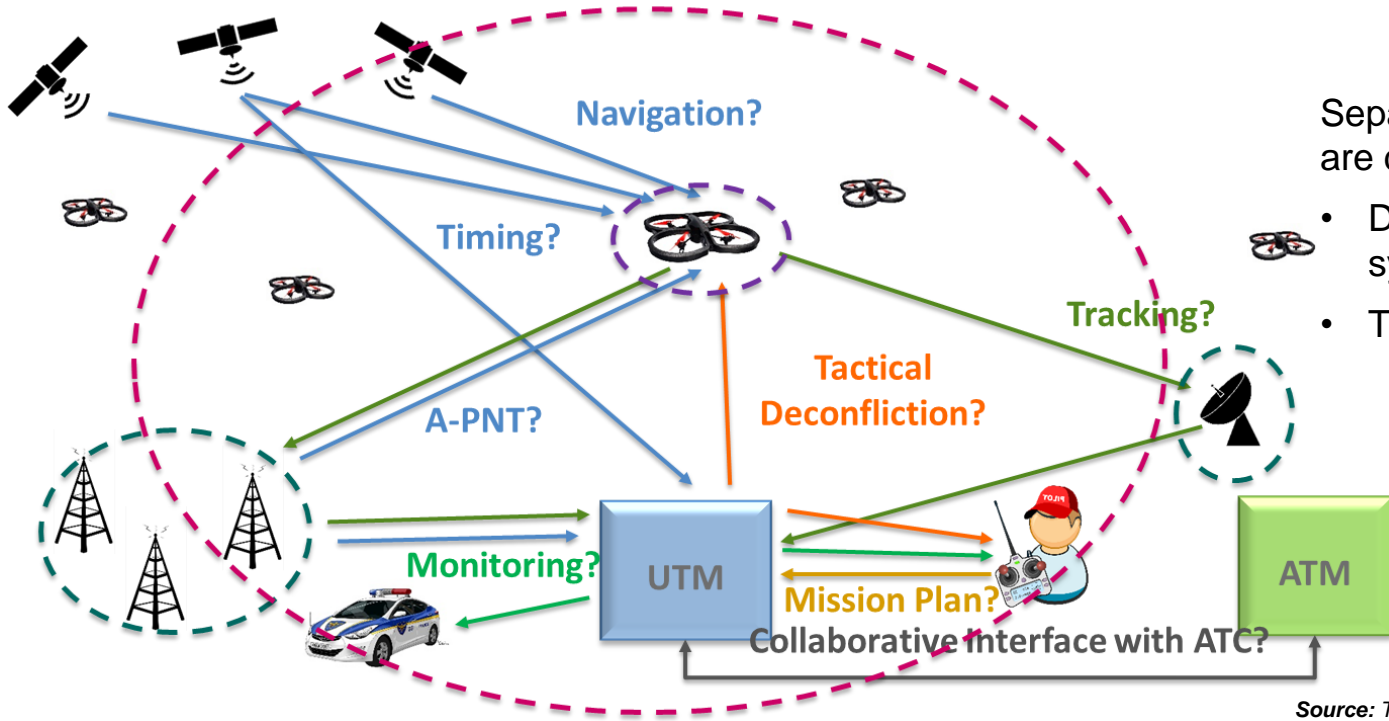
Drone specificities and their impact



- Flight plan execution linked to mission tasks:
- Trajectory execution uncertainty;
 - Drone swarms executing a single mission.

CNS Technologies

Their required performances



Separation standards are dependant on:

- Dynamic CNS system performance;
- The environment.



Source: TERRA project, SESAR JU

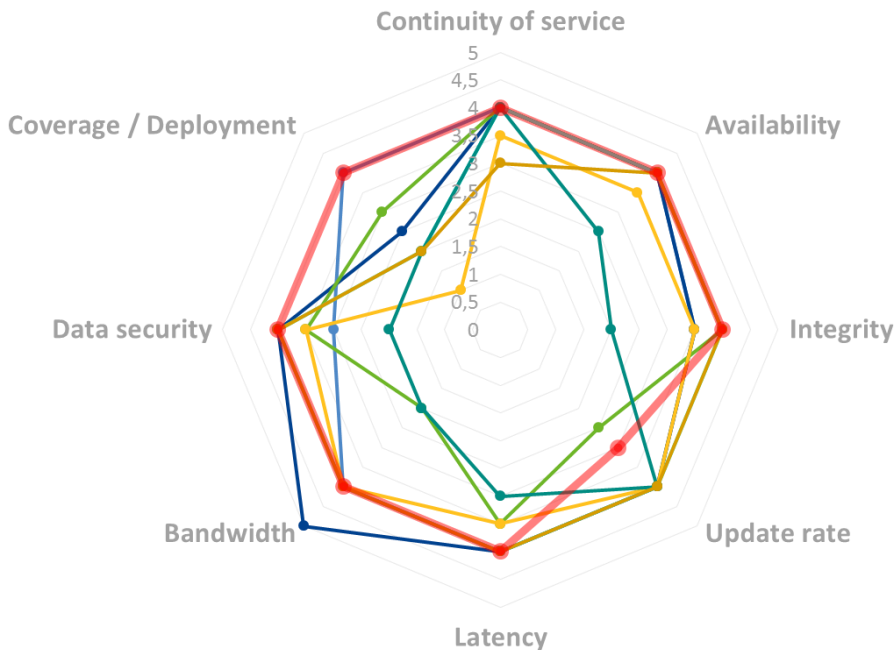
CNS Technologies

Their required performances



Urban Delivery – Type Z

— LTE — 5G — LoRA — L-DACS — EAN — V2X — WIMAX — Delivery



Gap analysis for A/G communication technologies:

- Requirements per environment, versus
- Technologies performances.

LTE – Long Term Evolution

5G – Future 3GPP technology

LoRA – Long Range WAN

L-DACS - L-band Digital Aeronautical Communications System

EAN - European Aviation Network

V2X – Vehicle to X

WIMAX – standard IEEE 802.16E



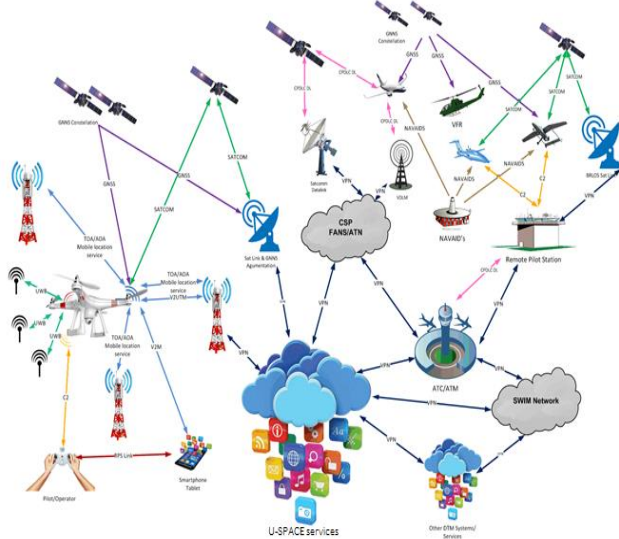
Source: TERRA project, SESAR JU



CNS Technologies

Recommended architecture & manned aviation access to UTM

Navigation technologies



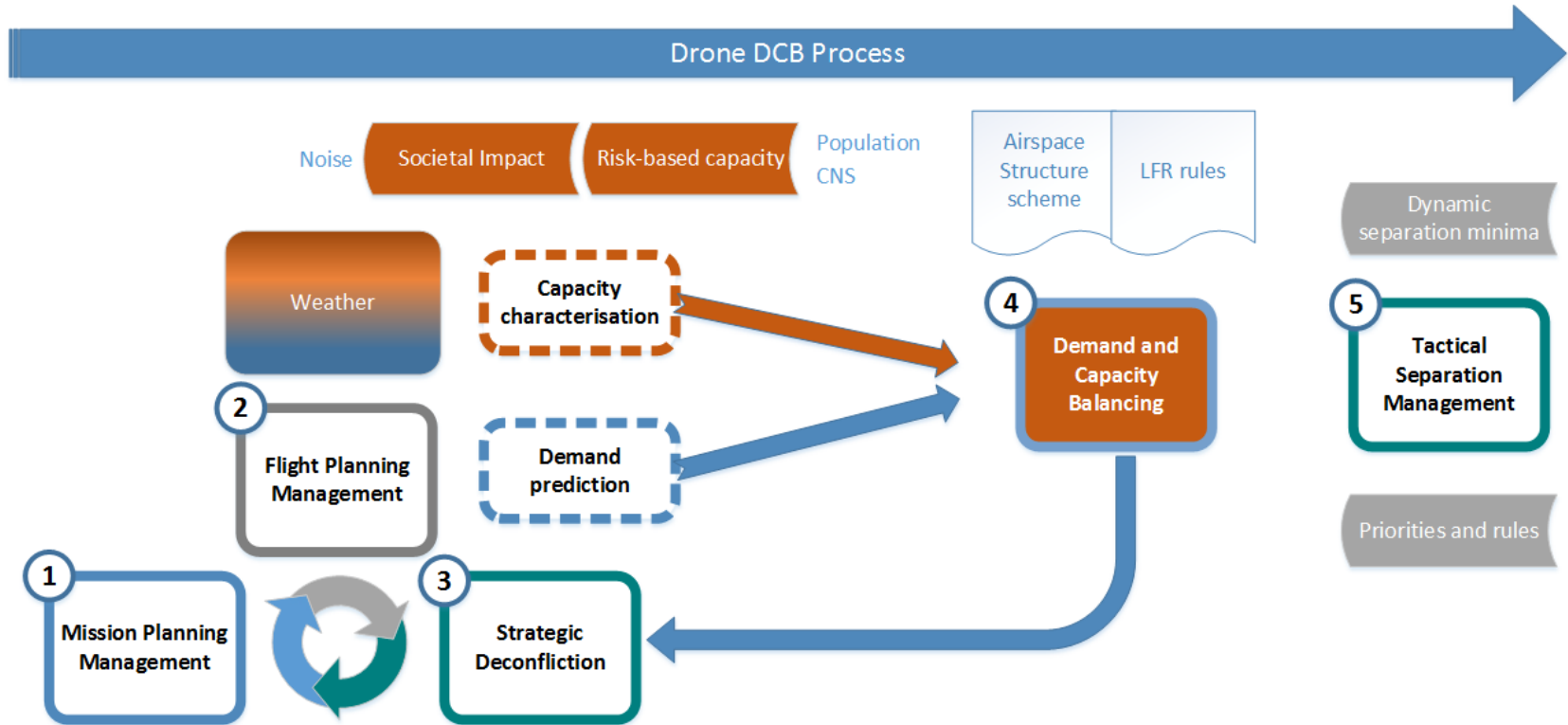
Source: TERRA project, SESAR JU

The **manned aviation** challenges:

- Not all users make themselves “visible”;
- Interoperability of systems for UTM and ATM management;
- Low-level Flight Rules (LFR) and manned traffic managed by UTM in VLL:
 - Electronic conspicuity;
 - Use of UTM Traffic Information service for situational awareness;
 - Submit operational declaration/ flight plan.

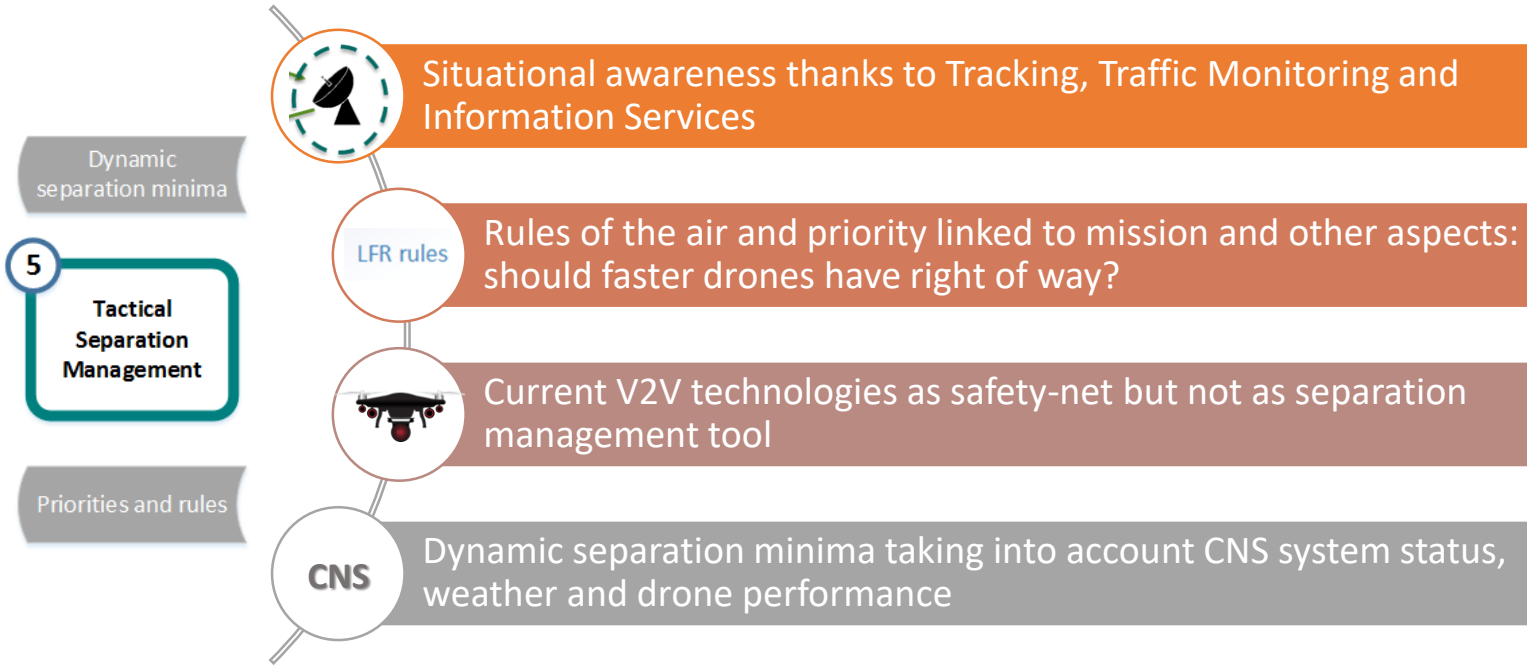
Strategic Deconfliction

A step in drone DCB



Tactical Separation

Enablers of separation management

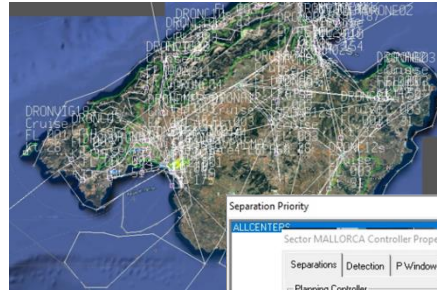


Separation Standards

Inputs from modelling and simulation

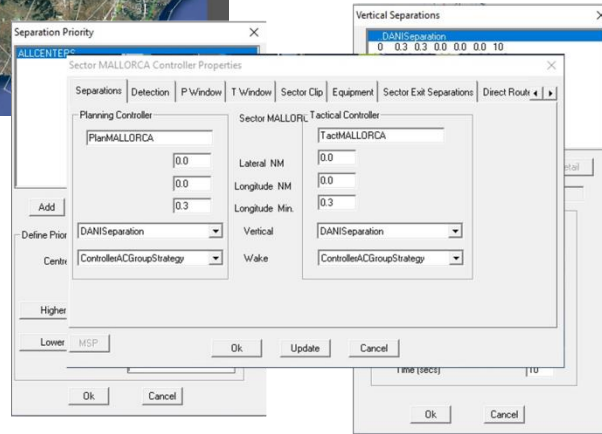
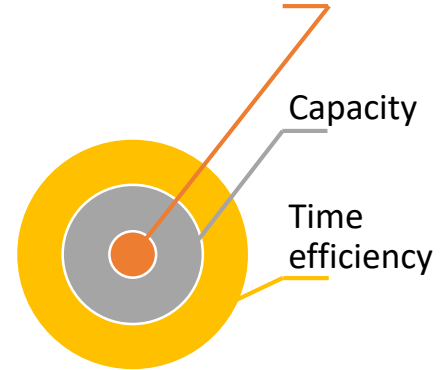


Fast Time Simulations



- Separation minima criteria (time based);
- Test CNS degraded conditions.

Target level of safety:
residual risk of conflict





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