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## Innovative complexity assessment to support future Capacity Management processes in TBO

Eva María Puntero Parla, Danlin Zheng, Leila Zerrouki, Andrija Vidosavljevic, Victor Fernando Gomez Comendador, Vilmar Volwitz, Clark Borst, E Puntero Parla, F Gomez Comendador

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# COTTON

## Capacity management Optimisation for Trajectory based Operations



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E. Puntero Parla, D. Zheng, L. Zerrouki, A. Vidosavljevic, F. Gomez Comendador, et al.

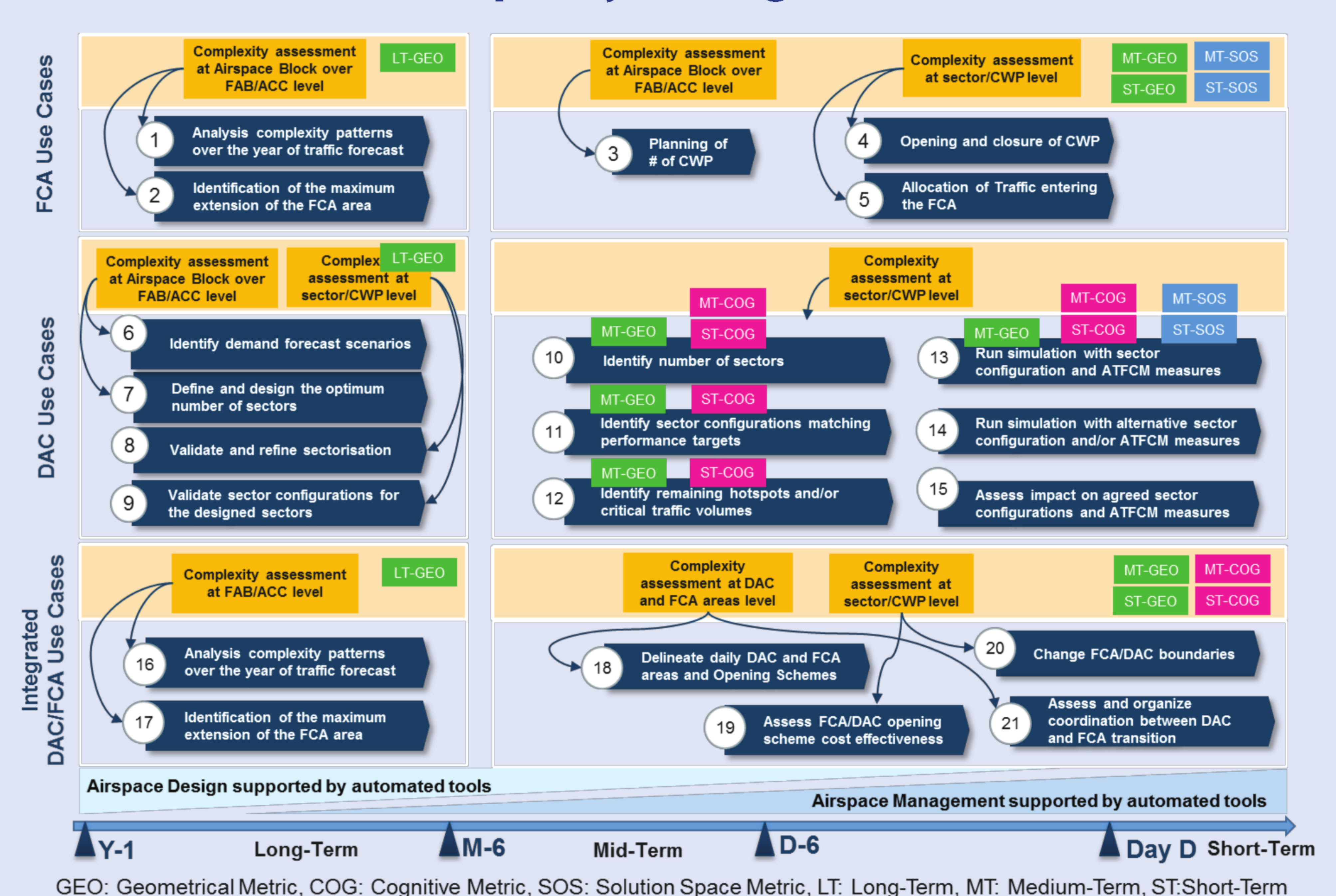
### COTTON Objectives:

- Develop trajectory-based **Complexity Metrics** more suitable to **Dynamic Airspace Configuration (DAC)** and **Flight Centric ATC (FCA)** mode of operations.
- Optimise **Capacity Management** by incorporating **Trajectory Uncertainty** into their Demand and Capacity Balancing (DCB) tools.
- Explore the **integration of DAC and FCA** solutions and the operational requirements for their common implementation.

### COTTON Enhanced Complexity Metrics

- Solution Space**  
Aircraft manoeuvring space
- Cognitive**  
Mental abstraction of Traffic and Sector
- Geometric**  
Aircraft Proximity and Convergence

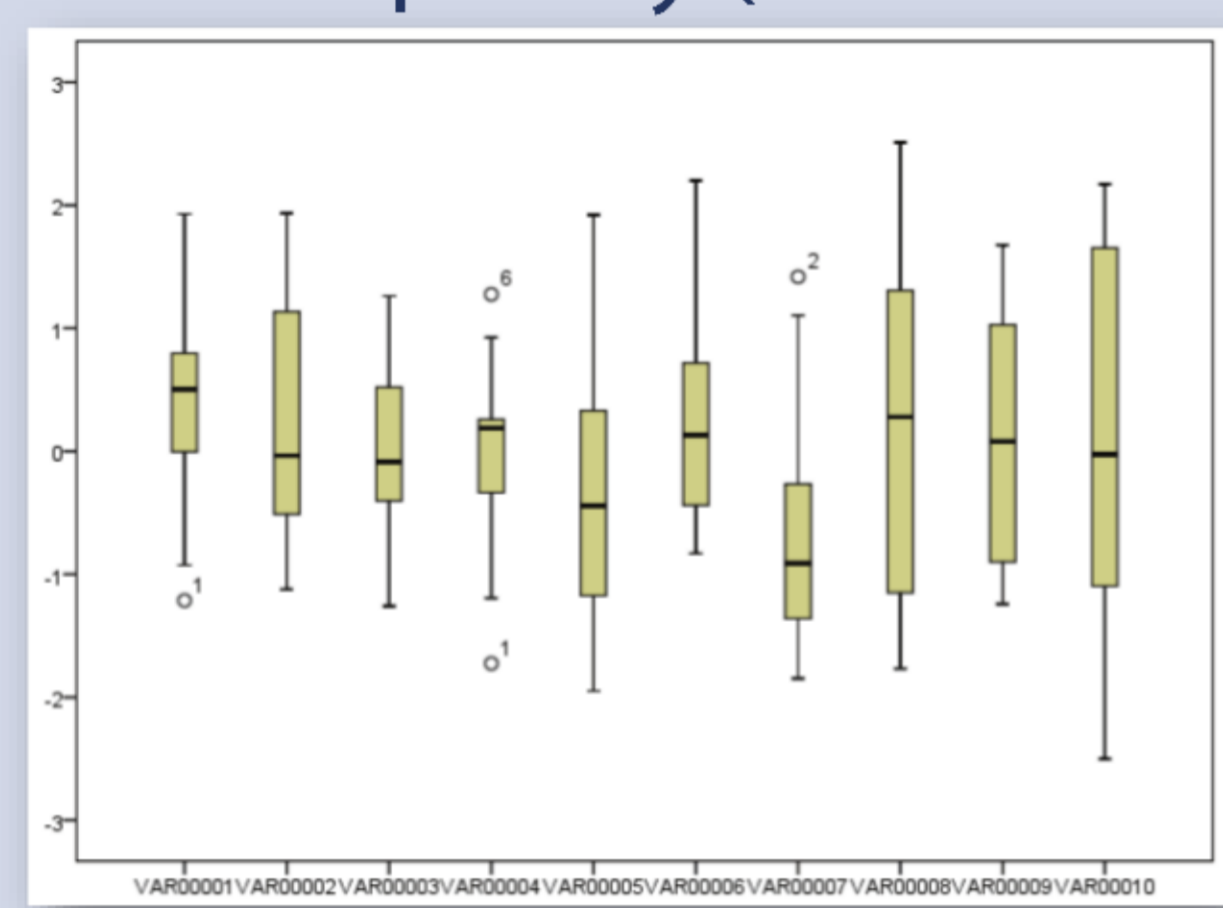
### COTTON Enhanced Capacity Management Use Cases (UCs)



### COTTON Validations

#### FCA in the Short-term

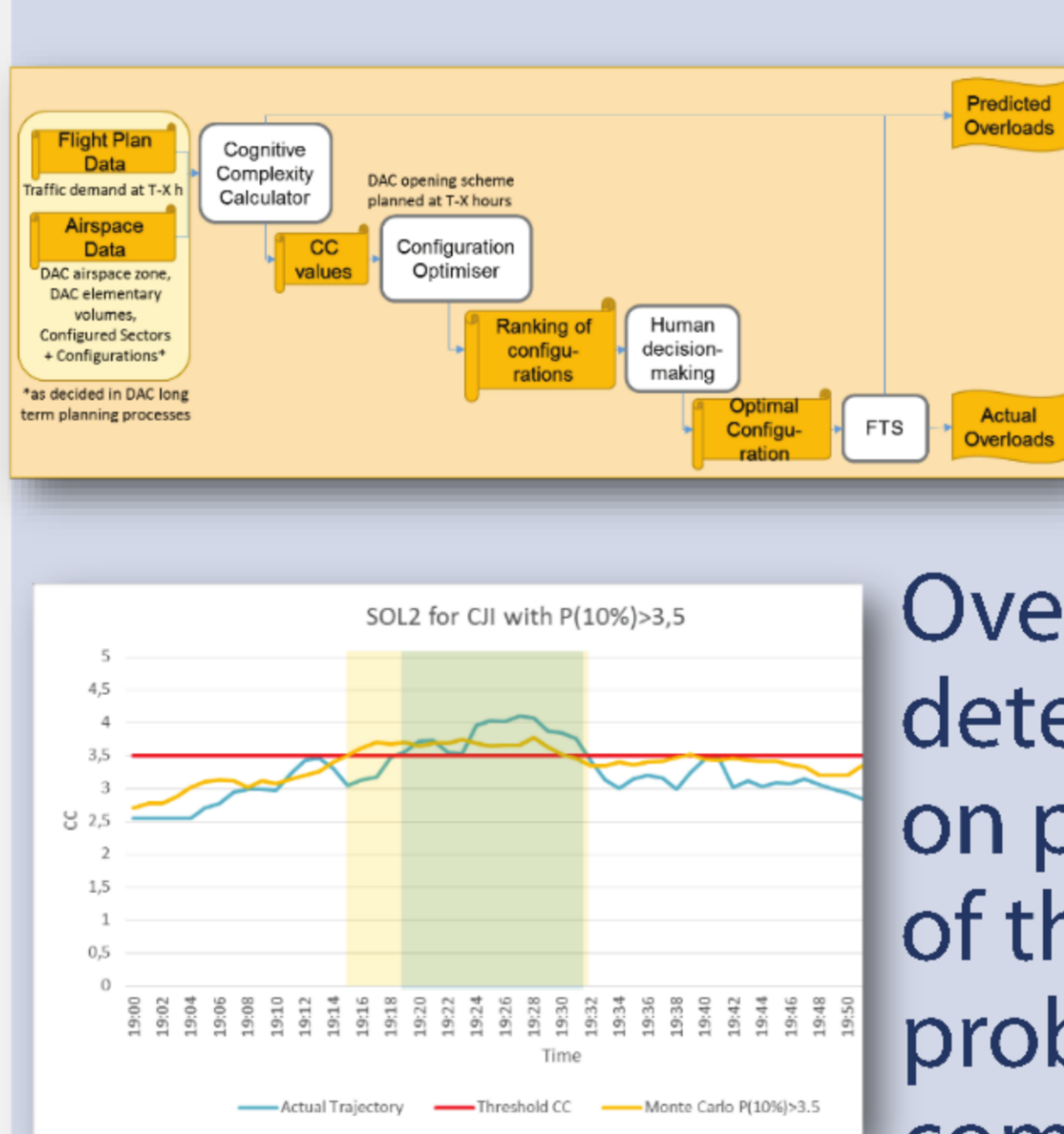
Impact of trajectory uncertainty in FCA short-term planning phase, using Geometrical Complexity (UCs 4 and 5)



Workload Measurement per FCA ATCo after allocation based on Geometric Approach

#### DAC in the Short-term

Optimisation of airspace configuration process in the short-term phase, using Cognitive Complexity (UCs 11 and 12).

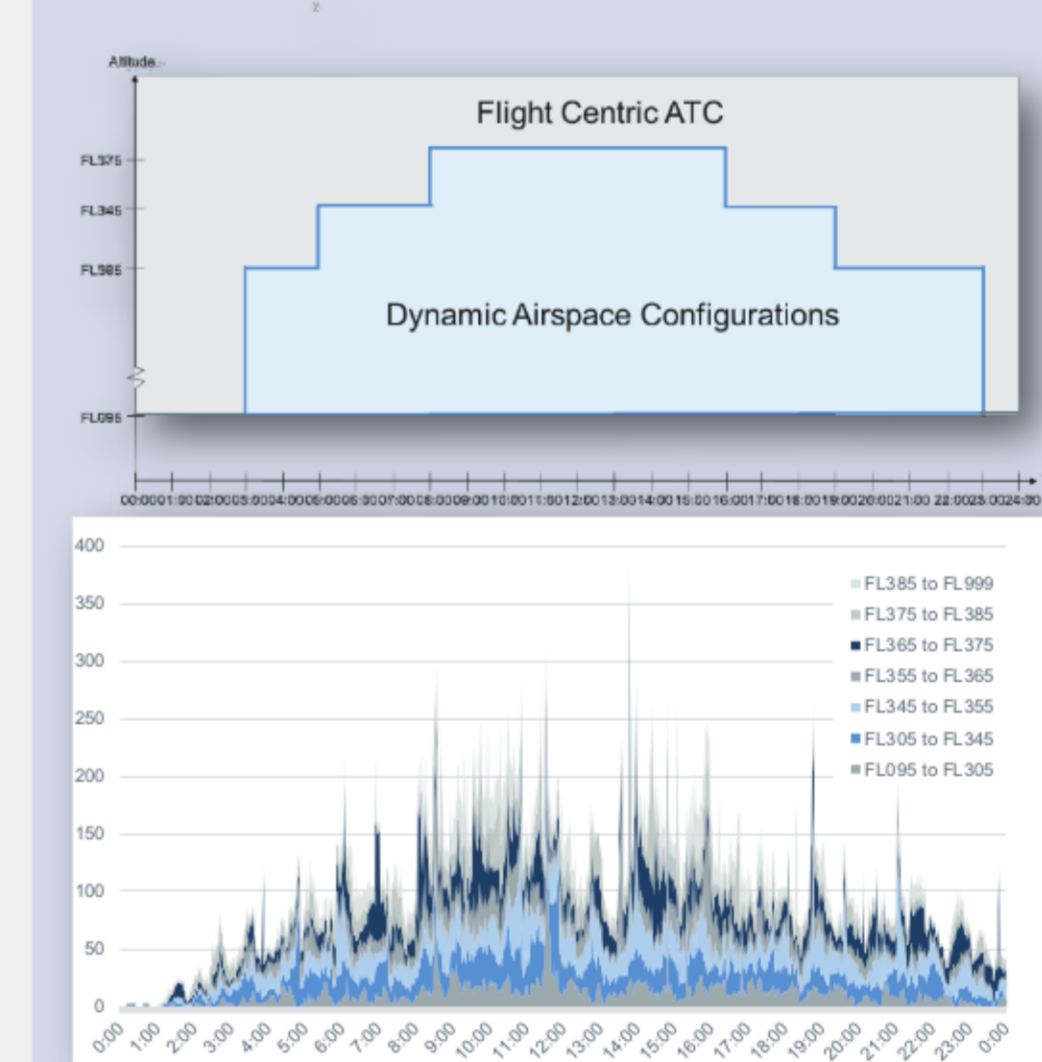


Simulation workflow

Overload detection based on percentile 90 of the predicted probabilistic complexity

#### Integrated DAC/FCA in the Medium-term

Capacity planning process emulation in medium-term phase, using Geometrical Complexity (UCs 3, 4, 10, 11, 12, 18 and 19).

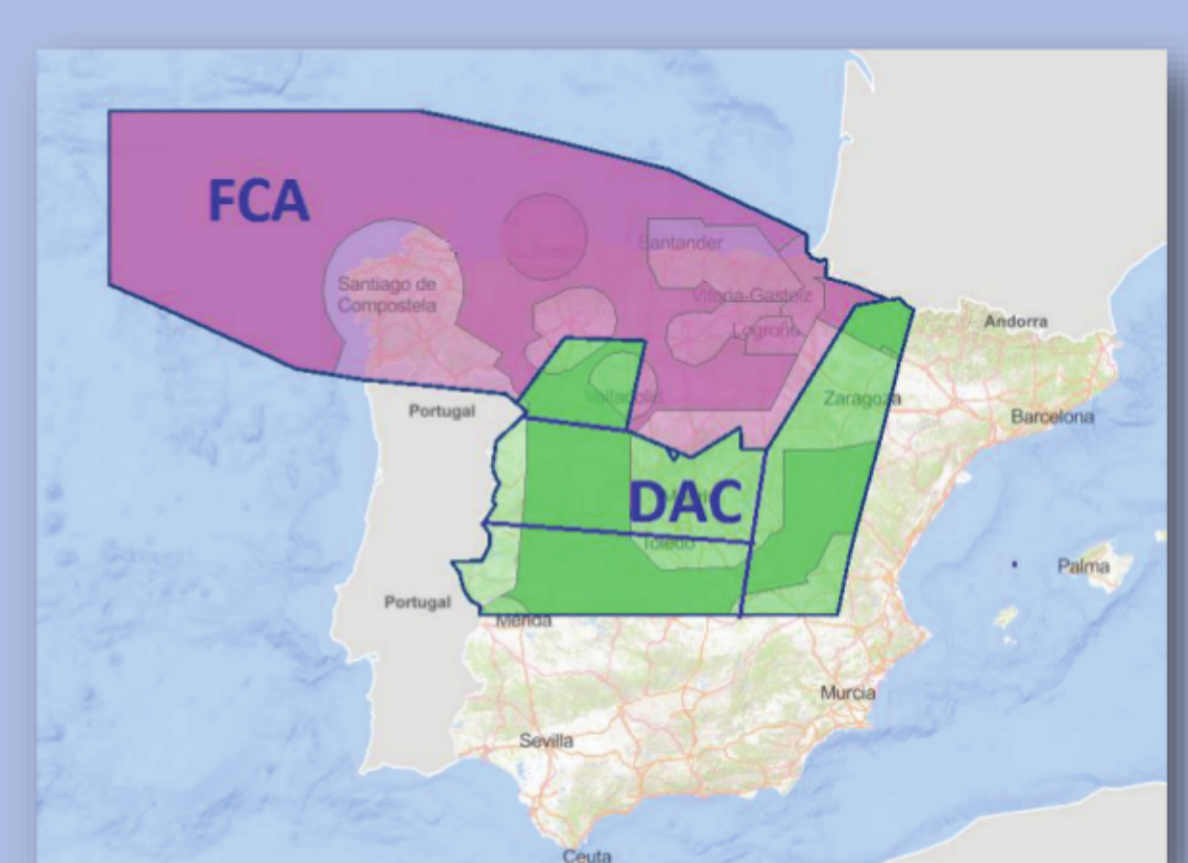


Dynamic DAC/FCA zones delineation

Complexity per flight level division

### VALIDATION RESULTS

FCA	Allocation strategies based on COTTON Enhanced Complexity have showed a better balance of ATCo Workload.
DAC	DAC shows that the application of complexity metrics better adapted to a trajectory-based environment allows a sector configuration plan more adapted to the traffic demand, reducing the risk of imbalances.
Integrated DAC/FCA	DAC/FCA boundary delineation processes with the support of COTTON Enhanced Complexity is defined with sufficient level of detail to demonstrate its technical and operational feasibility and demonstrated a reduction of overloads.



Integrated DAC/FCA Complexity-based sector configuration



Project Coordinator: Eva Puntero – [epuntero@e-crida.enaire.es](mailto:epuntero@e-crida.enaire.es)



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founding members

