

Integration of Unmanned Aircraft Systems in Air Traffic Control

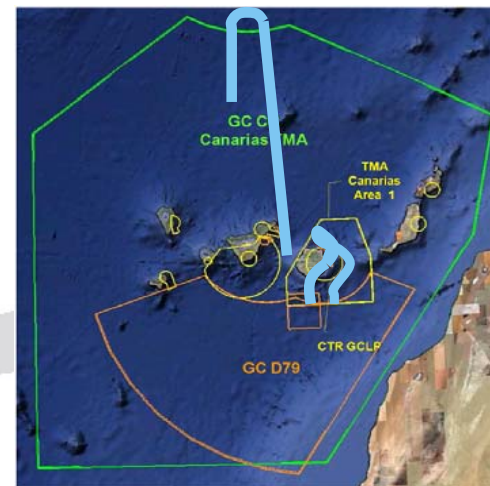
Henk Hesslink, Frank Morlang, Dirk-Roger Schmitt

AT-One EEIG

AT-One combines the strength of NLR and DLR in ATM Research

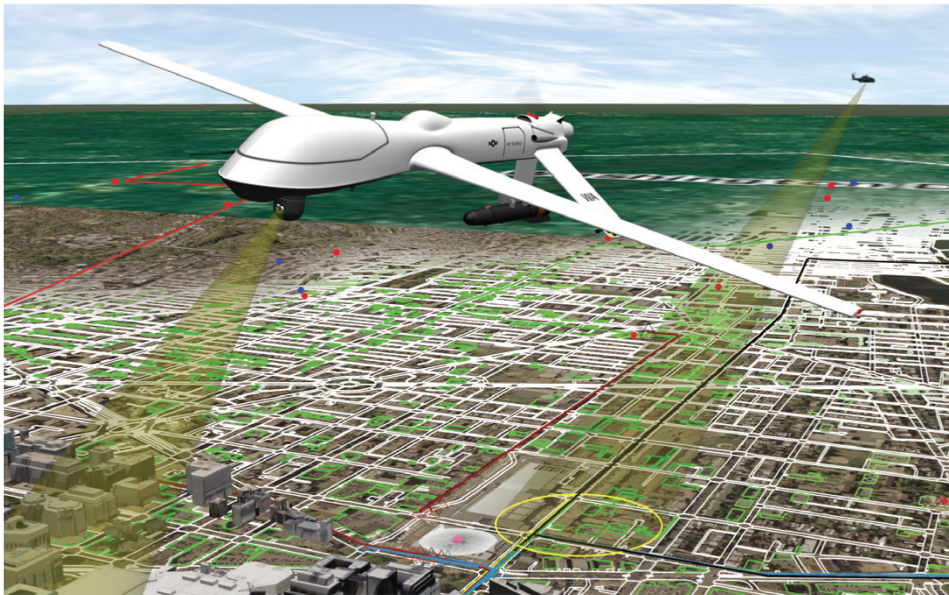
UAS in non-segregated airspace

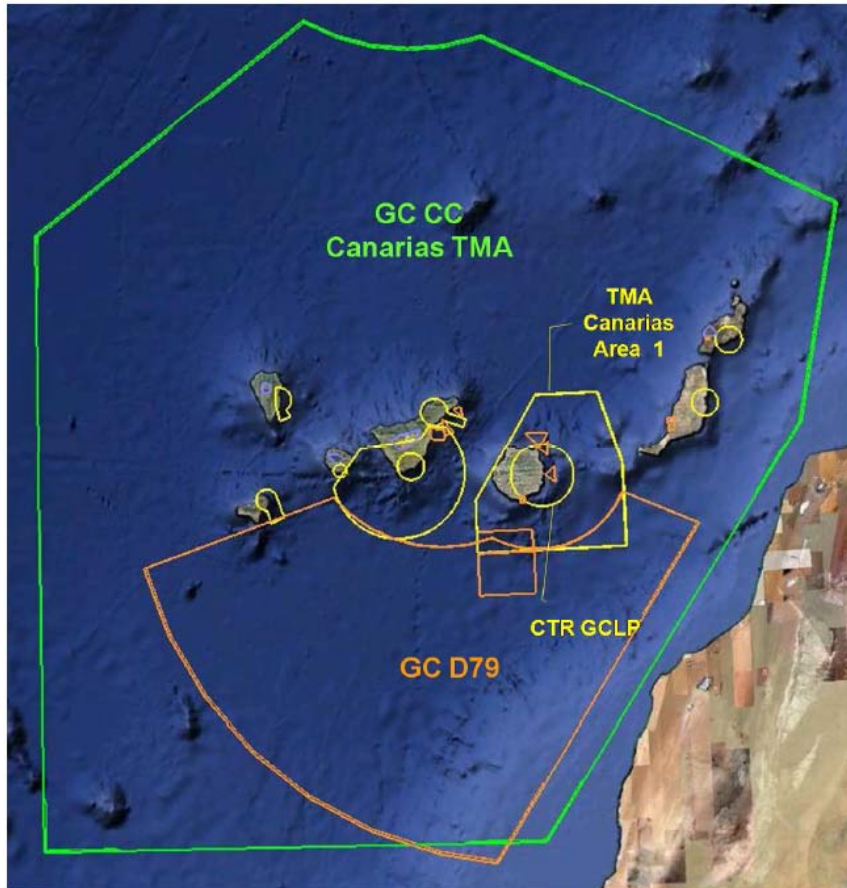
Concept validation through simulation



AT-One combines the strength of NLR and DLR in ATM Research

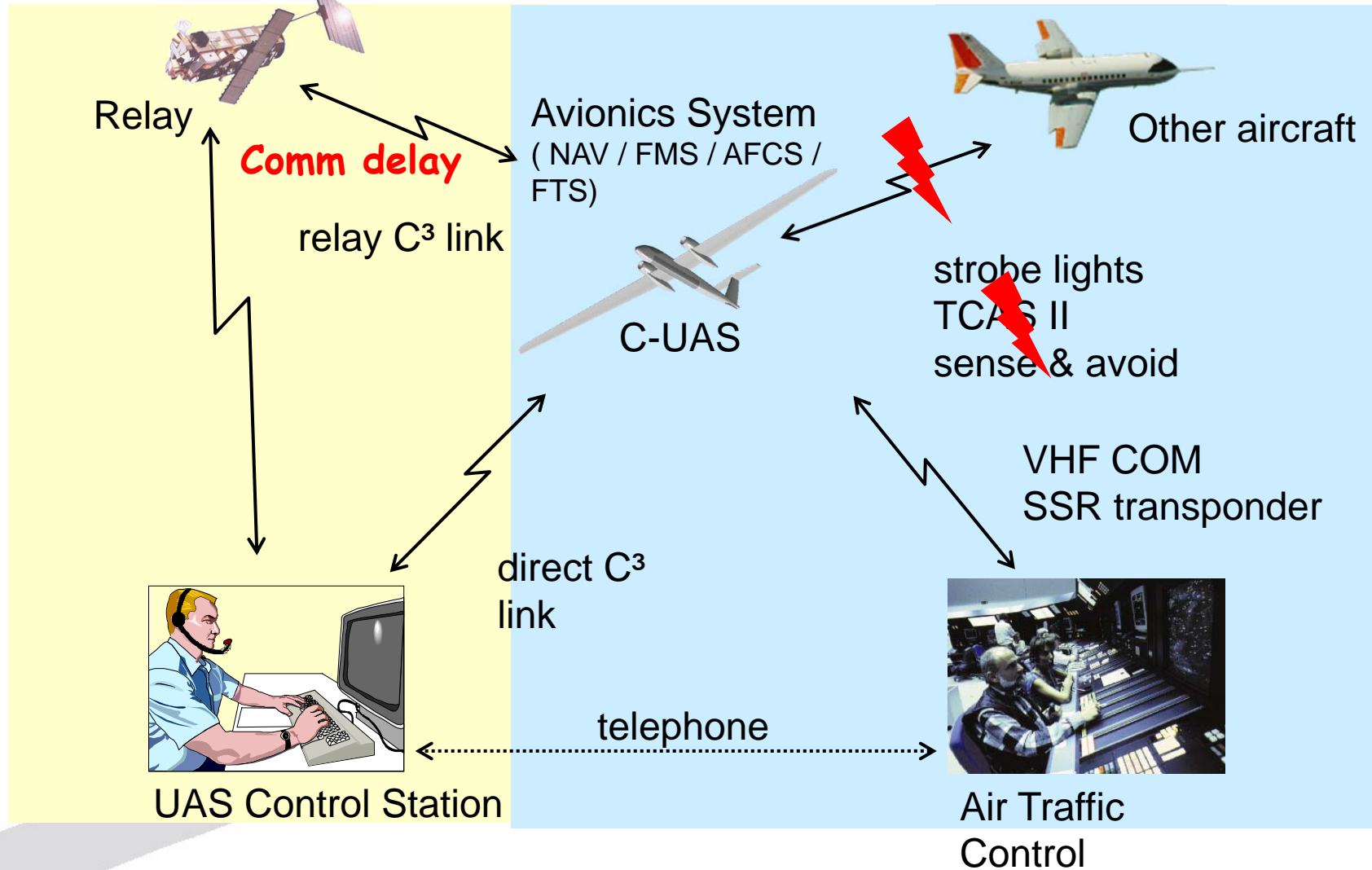
Unmanned Aerial Systems (UAS)
in non-segregated airspace
through real-time simulation of
Beyond Line of Sight (BLOS) scenarios.





The project
SINUE
investigates
satellite
aspects
(BLOS
operations)

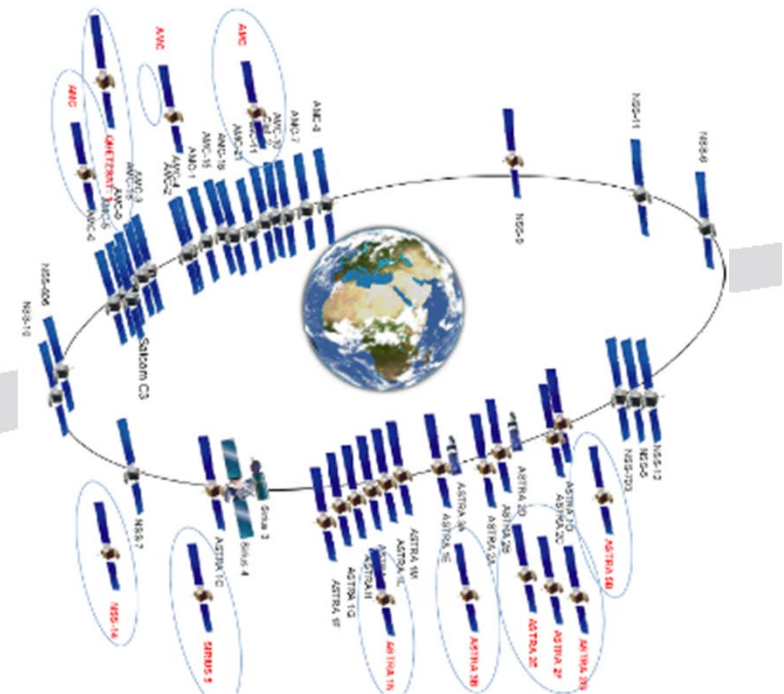


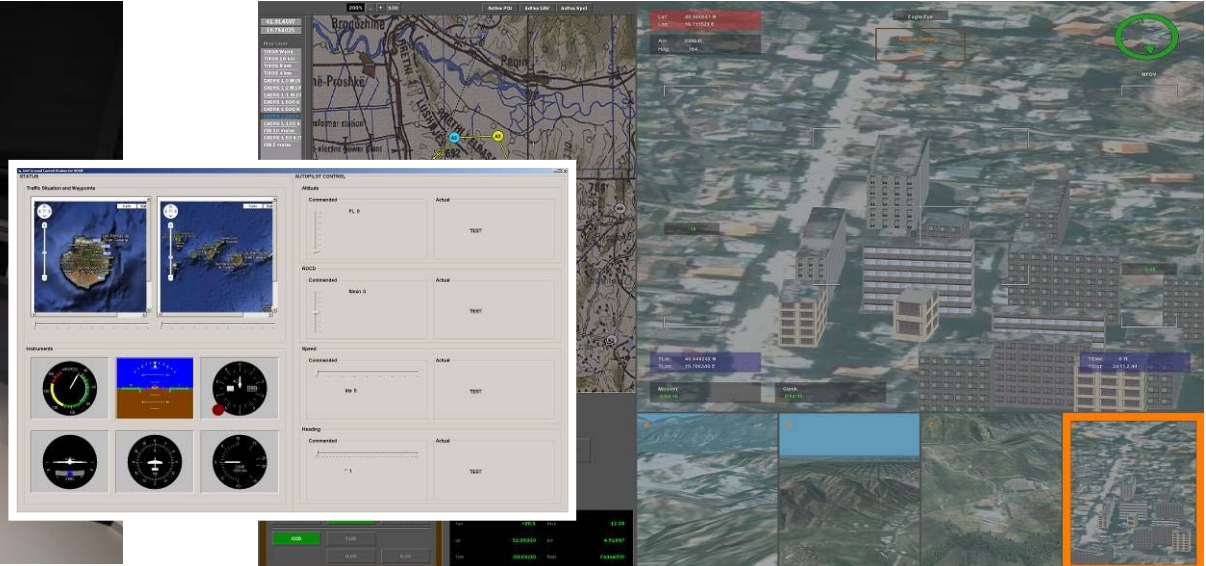


Within the simulation architecture, a satellite model is included

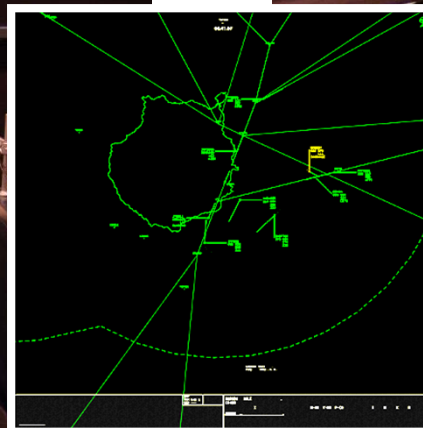
In the underlying scenarios, several satellite issues will be covered:

- temporary comm failure because of satellite constellation
- total comm failure
- C2 failure
- time delay
- bandwidth for real-time surveillance mission
- cost benefit study

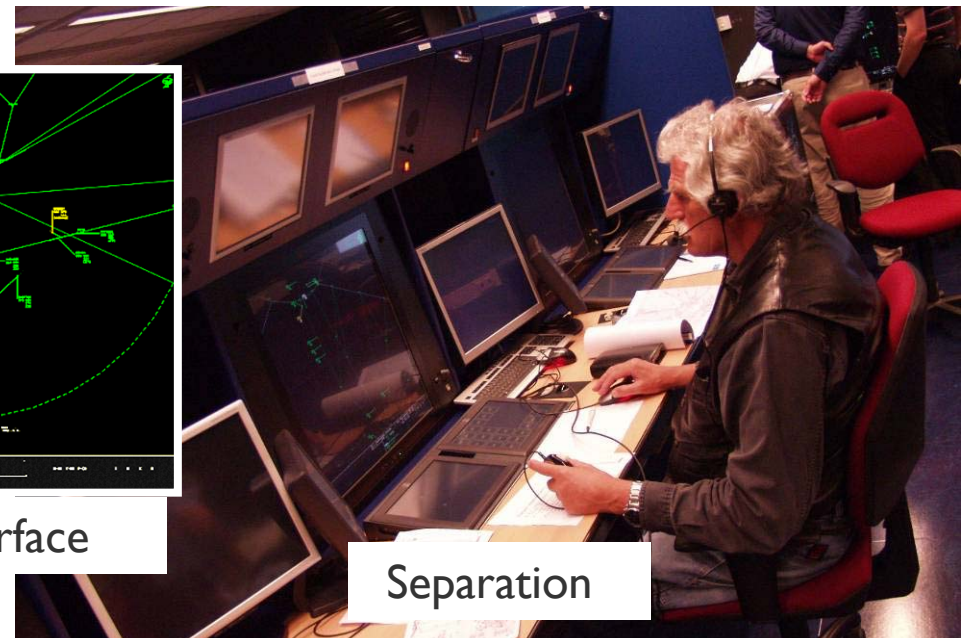




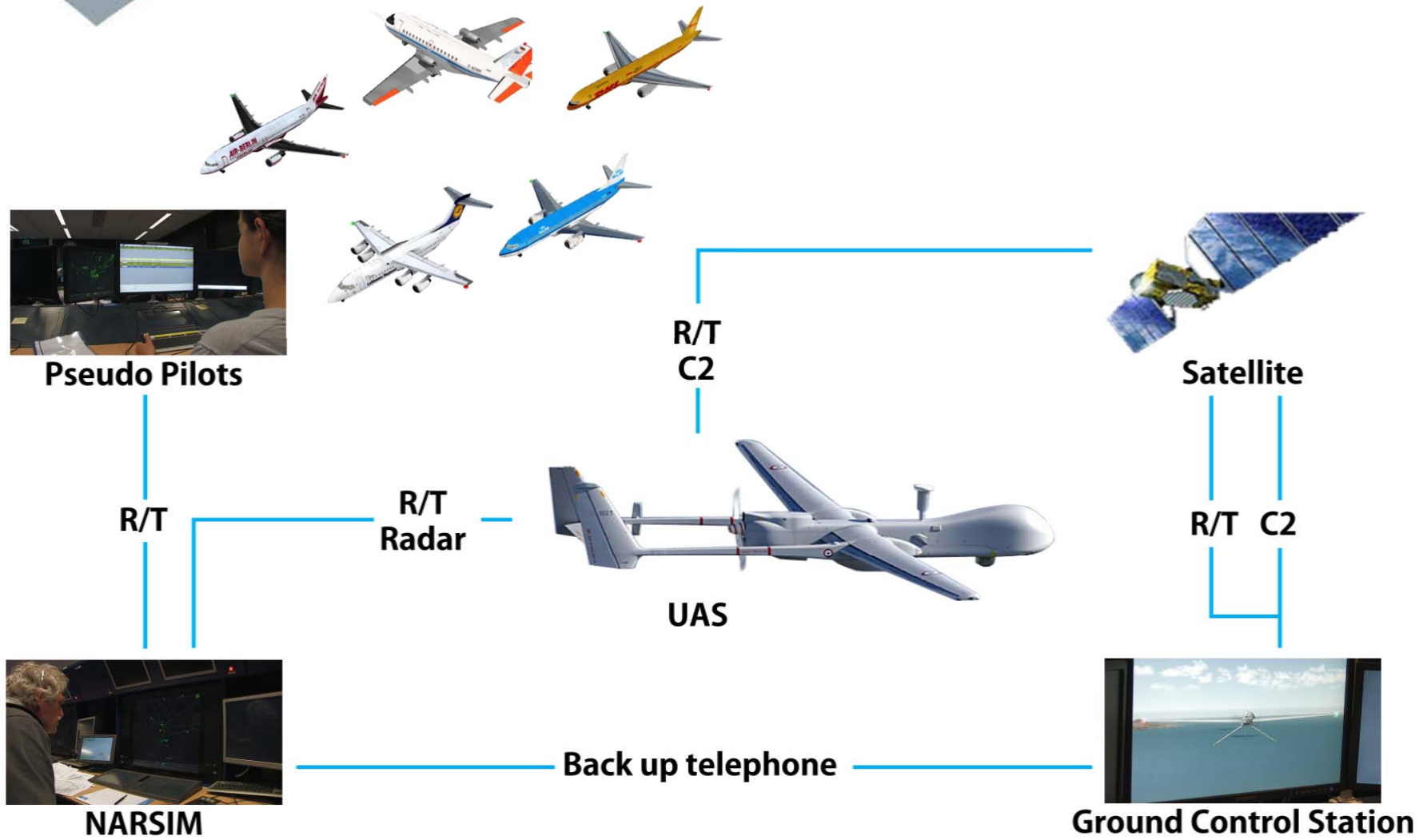
Emergency procedures



ATC Interface



Separation



Communication

- Telephone communication between controller and UAS pilot if requested

Simulated Radio Telephony

- Radio telephony for the controller / pseudo pilot voice communication
- Specially designed intercommunication device operation over wire link
- Communication delay for satellite link is implemented:



Pseudo Pilots



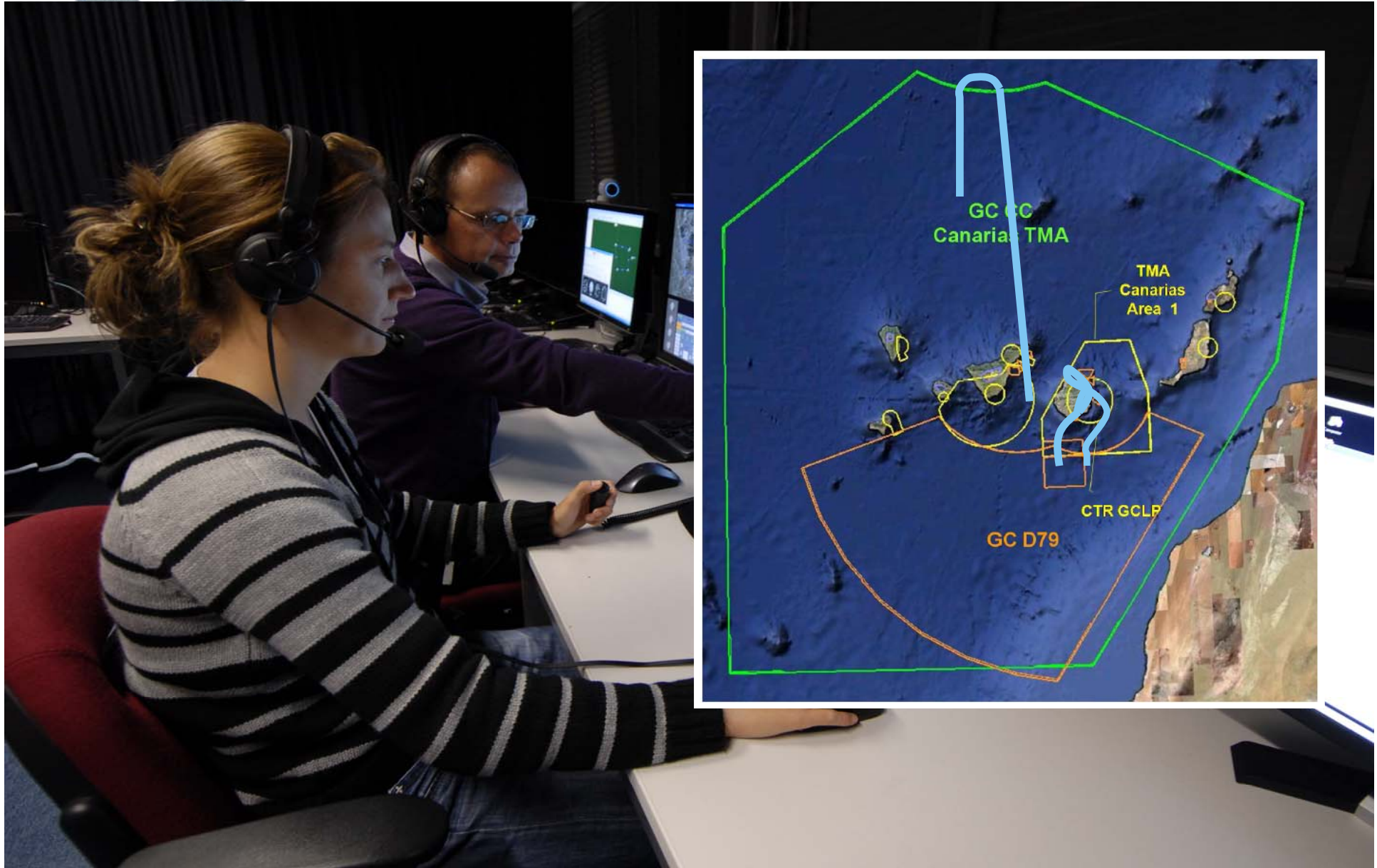
UAS Pilot



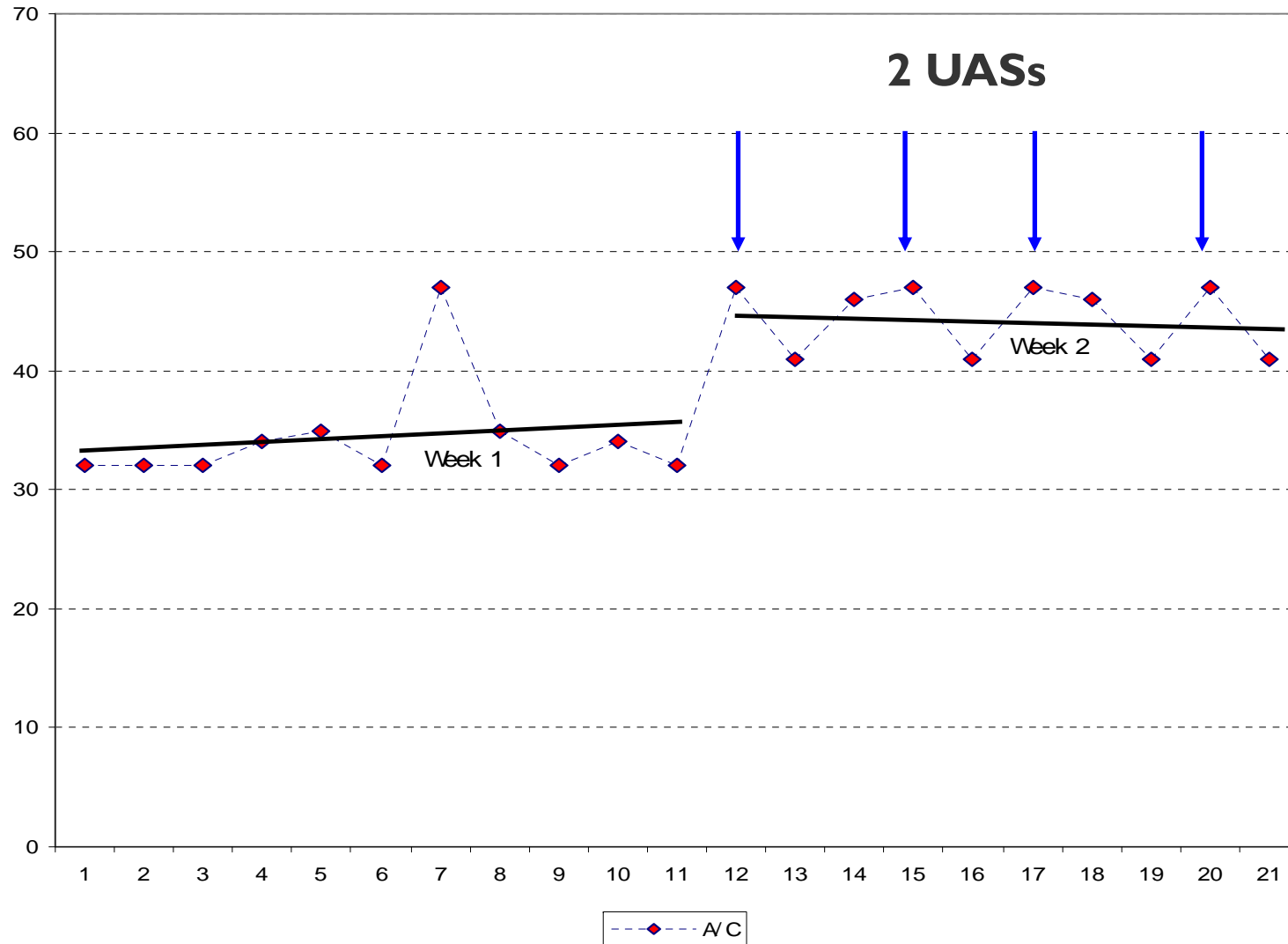
ATC

Evaluation of the UAS integration concept:

- Normal operations
 - Avoidance of severe weather
- Emergency Operations:
 - Standard emergency procedures:
 - Comm Loss
 - Thrust Loss
- Loss of separation



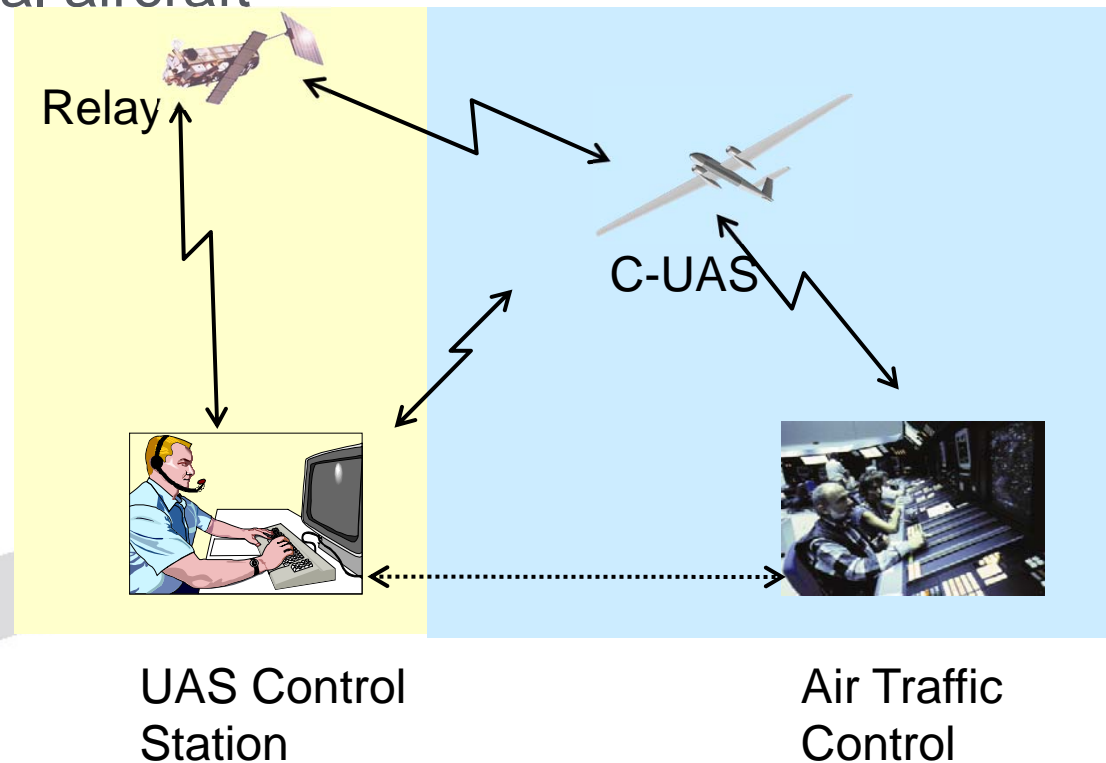
- UAS-pilot to ATCO interactions
- Instantaneous Self Assessment questionnaires
- NASA Task Load Index methodology
- Introduction of 1 UAS into airspace
- Introduction of 2 UAS into airspace



- General

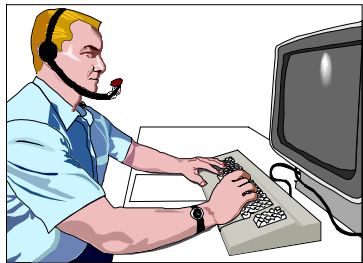
No special problems with UAS in airspace

Integration concept allows treatment of UAS like normal aircraft



- Communication

Telephone comm between controller and UAS pilot could be a benefit compared to manned aircraft



UAS Control Station



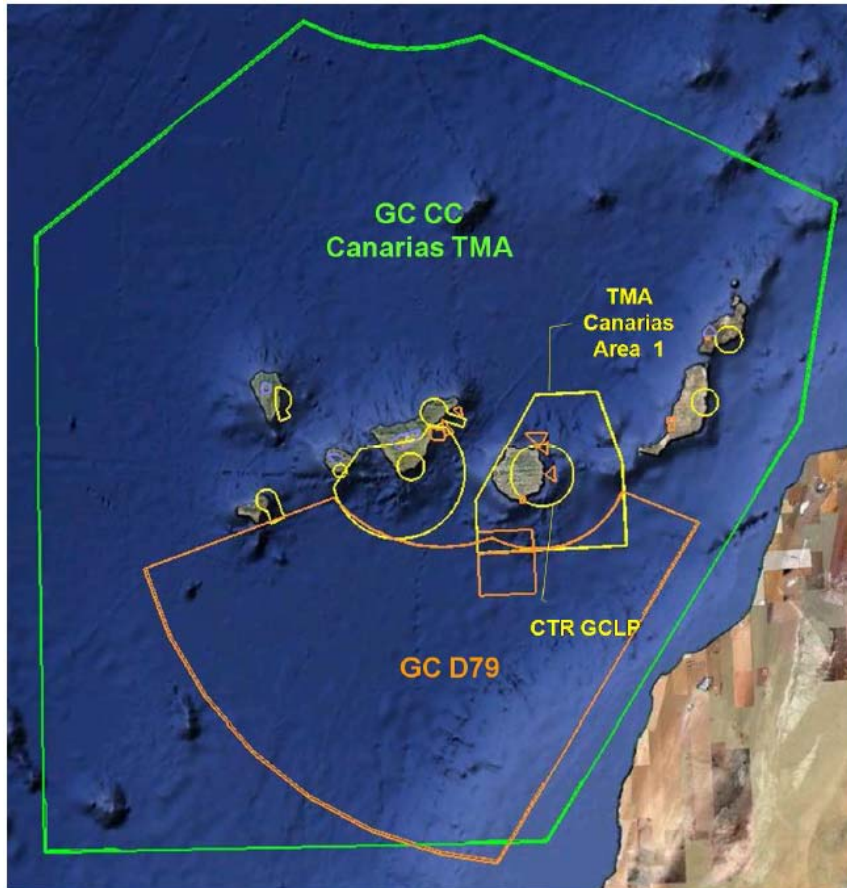
Air Traffic
Control

Workload:

- Workload increased slightly
- Due to unknown behaviour
- Later on workload got to normal

- Sense & Avoid

Sense/See & Avoid is still an issue to be solved with highest priority



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