

GEOSAFE

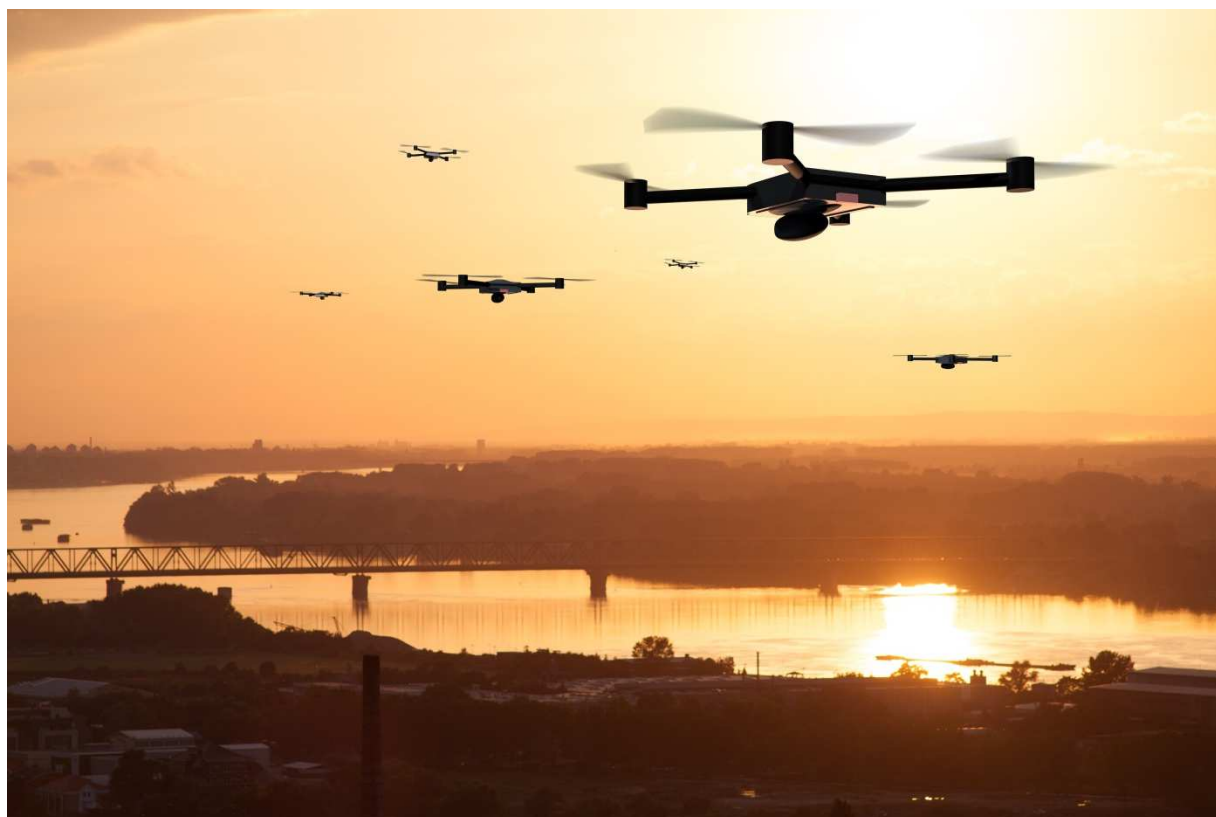


GEOSAFE PROJECT ATM CONGRESS PRESENTATION

13th of March 2019



THE ISSUES OF THE CIVILIAN DRONES MARKET



Extend the use of
civilian drones to
professionals



Automated drone flight
in rural & urban
airspace



Guarantee a safety &
security rate

THALES

SDH INNOVATION
INNOVATION IN AIR & SPACE

AIR MARINE



AEROMAPPER
SIMULATION FOR NEW BUSINESS

techsys

AIRMAP



INTRODUCTION TO U-SPACE



U-SPACE SERVICES

U-space is defined in the U-space blueprint document as a set of services designed to support safe, efficient and secure access to airspace for large numbers of drones. The deployment of U-space is foreseen in an incremental manner:

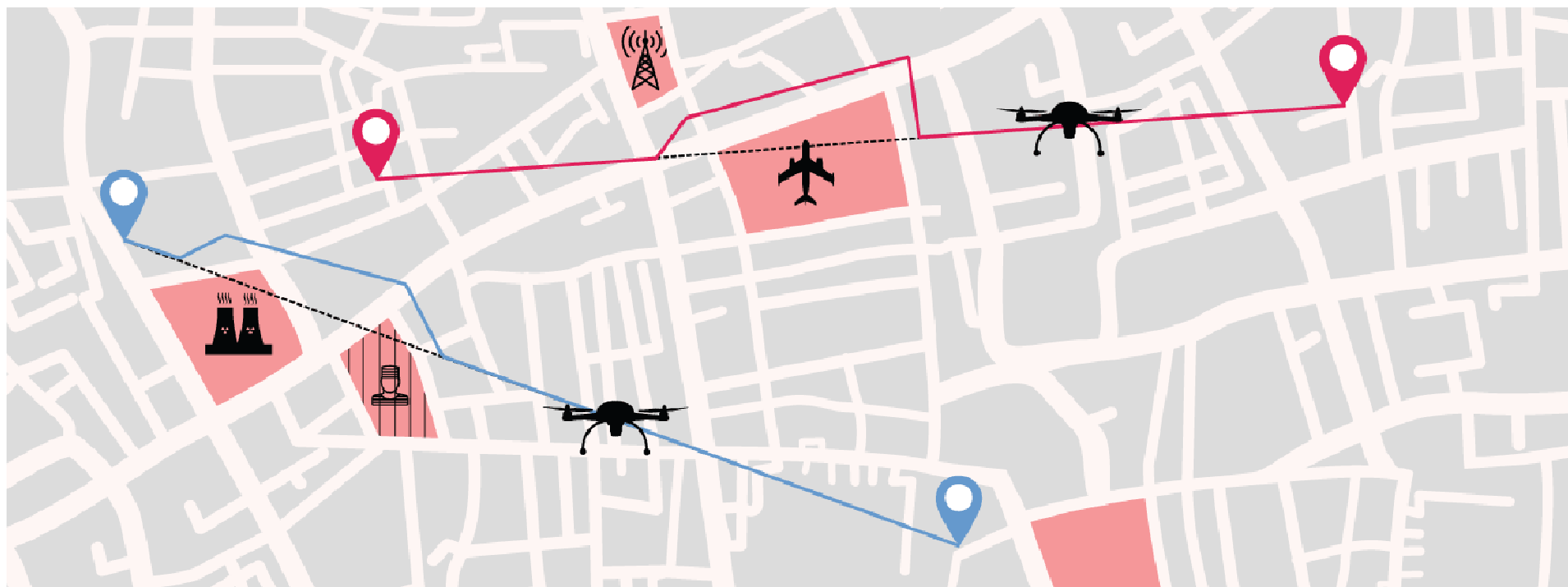
- U1 : U-space fondation services
- U2 : U-space initial services
- U3 : U-space advanced services
- U4 : U-space full services

FUNCTIONS

These services will be based on these functions:

- E-identification
- **Geofencing**
- Security
- Telemetry
- Tracking
- V2V (Vehicule to Vehicule Communication)
- V2I (Vehicule to Infrastructure Communication)
- Communication, Navigation and Surveillance
- Detect And Avoid
- Emergency Recovery
- Command and control
- Operations management

GEOFENCING SOLUTION



THALES

SPH Innovations
ENERGY, TRANSPORT & INFRASTRUCTURE

ATR MARINE



AEROMAPPER
SIMULATING YOUR BUSINESS

Atechsys
TECHNOLOGY

AIRMAP



DESCRIPTION OF THE GEOFENCING SERVICES LEVEL



U1 LEVEL

Pre-tactical geofencing

The service provides the operator with geo-information about predefined restricted areas (prisons, airports, etc.) used **during the flight preparation**

U2 LEVEL

Tactical geofencing

The service brings the possibility to update the operator with geofencing information even **during the flight**

U3 LEVEL

Dynamic geofencing

The service targets the drone itself and then this service requires connectivity to a geofencing system that allows the data to be **updated during the flight**

U4 LEVEL

Full services

Extract from European ATM Masterplan

THALES

SPH

ATR MARINE



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DESCRIPTION OF THE GEOSAFE PROJECT



WHAT ?

To establish state-of-the-art geofencing solutions regarding U-space regulation

HOW ?

One-year long flight-test campaign

WHY ?

Propose recommendations for future geofencing system definition (CORUS), Sustain technological improvements for enhanced geofencing system.

THALES

SPH Technologies
SMART FLIGHT & U-SPACE



AEROMAPPER
SMART FLIGHT & U-SPACE

Atechsys
TECHNOLOGICAL INNOVATION

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CORUS : Concept of Operations for U Space

GEOSAFE TEST OBJECTIVES



Objectives

Assessment of available flight planning solution available
Drone operation near a Restricted Area / within a geofenced volume / in degraded environment
Assessment of restricted area data update during the flight / UTM tracking
Assessment of navigation system performance



Functional test

Assessment of geofencing feature available on the market



Technical test

UTM services, in flight data update, assessment of navigation system performance



Real test

Evaluate the Geofencing solutions on operational drone mission

THALES

SDH SMART DRONES & REMOTE PILOTS



AEROMAPPER PERFORMANCE. NOT JUST FLIGHTS.

Atechsys

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Schedule & VLD (Very Large Demonstration)



Jan 2019

July 2019

Tests realization

Results and Recommendations

VLD preparation

VLD



VLD : September 2019
Atechsys, Pourrières, France



Final demonstration will show
several drones from different
types flying near restricted area
in a UTM context



Final demonstration focus:

- Highlight the results obtained during the test period
- Show the technology readiness level of existing geofencing solution
- Show link between active geofencing services and UTM services

THALES

SDH

ATR



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GEO SAFE

The background of the slide is a photograph of a river at sunset. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water. A bridge is visible in the distance. Several drones are flying in the sky. A large blue circle with a white grid pattern is centered over the image, containing the title text. Above this circle are three green circles of increasing size. At the bottom center of the slide is the European Union flag.

**GEO SAFE
GEOFENCING
FOR SAFE
AUTONOMOUS
FLIGHT IN EUROPE**



ATM Master Plan & CORUS



U1 – U-space foundation services

Pre-tactical geofencing

The service provides the operator with geo-information about predefined restricted areas (prisons, etc.) and available aeronautical information (NOTAM, AIRAC cycle) used during the flight preparation.

This service requires the identification of accredited sources and the availability of qualified geo-information related to restricted areas.

This service provides information that allows the drone operator to make use of the geofencing capability of the drone.

U2 – U-space initial services

Tactical geofencing

Compared to U1 pre-tactical geofencing, tactical geofencing brings the possibility to update the operator with geofencing information even during the flight.

U3 – U-space advanced services

Dynamic geofencing

Compared to tactical geofencing in U2, the dynamic geofencing targets the drone itself and then this service requires data-link connectivity to a geofencing system that allows the data to be updated during the flight.

[SESAR JU]: European ATM Master Plan: Roadmap for the safe integration of drones into all classes of airspace

Service or Capability	level	Features
Pre-Tactical Geo-Fencing	U1	Information provided before flight. The user should have access to AIP and NOTAM defined geo-fences in a form that can be used when planning and that can be loaded onto the drone if it has geo-fence features in its navigation system
On-drone Geo-Fencing	U1	The ability of the drone to keep itself on the correct side of a geo-fence by having geo-fence definitions (location, time, height) within its navigation system
Tactical Geo-Fencing	U2	This service delivers to the pilot and /or drone operator updates to and new definitions of Geo-Fences occurring at any time, including during flight. The creation of geo-fences with immediate effect <i>may</i> (tbd) require that they are defined outside the AIP. (See below)
Drone Aeronautical Information Management	U2	U2 <i>may</i> (tbd) include a non-AIP repository of Geo-Fences. The Drone Aeronautical Information Management service includes all information coming from such a source, combined with information from the AIP and NOTAMS together with any other drone relevant sources.
Dynamic Geo-Fencing	U3	This service delivers updates and new definitions of geo-fences directly into the drone, even in flight. This service relies on capabilities of the drone in U3 to receive communications from U-space and to deal with geo-fence updates.

Table 8 Geo-fencing in U-space

CORUS





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SESAR 2020 PJ08-AAM

Advanced Airspace Management

Giuseppe MURGESE
Project Manager PJ08

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EUROCONTROL Airspace Strategy



*“The ‘packaging’ of en route and terminal routes, optimized trajectories, airspace reservations and ATC sectors into **Airspace Configurations** which are designed and **dynamically** managed together **to respond** flexibly to **different performance objectives** that **vary in time and place**”*

The Dynamic Airspace Configurations (DAC) Concept in S2020



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Advanced Airspace Management: What is the DAC



- DAC - part of DCB Operations – Capacity Management Toolbox
- Dynamic Sectors design and non predefined Sectors Configurations, including Cross-border Airspace Configurations
- Civil/Military Coordination: Dynamic Mobile Areas of two types - DMA type 1 and 2
- CDM process based on Integrated ASM/ATFCM services (managed both at Local and Network Level)
- Automation/system support for integrated Airspace design and management
- Performance oriented
- Full Free Route Airspace Operations



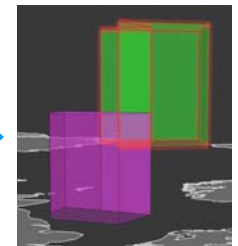
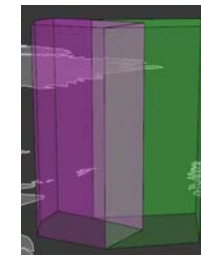
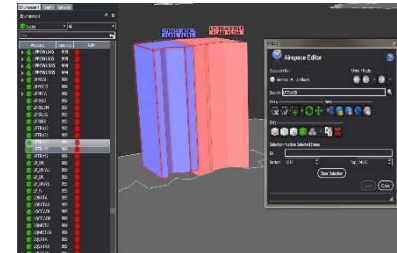
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AAM: Solution 1 – Management of Dynamic Airspace Configurations



- Enhance the functions building sectors and configurations that can be dynamically adapted in response to changes in traffic patterns
- Develop Flexible Airspace designed to predict the resources (ATCOs) needed for meeting the forecasted AUs' traffic demand
- Activation of Airspace configurations through an integrated collaborative decision making process,
- Develop the Dynamic Mobile Areas, temporary volumes of airspace designed to separate the activities performed inside from civil traffic



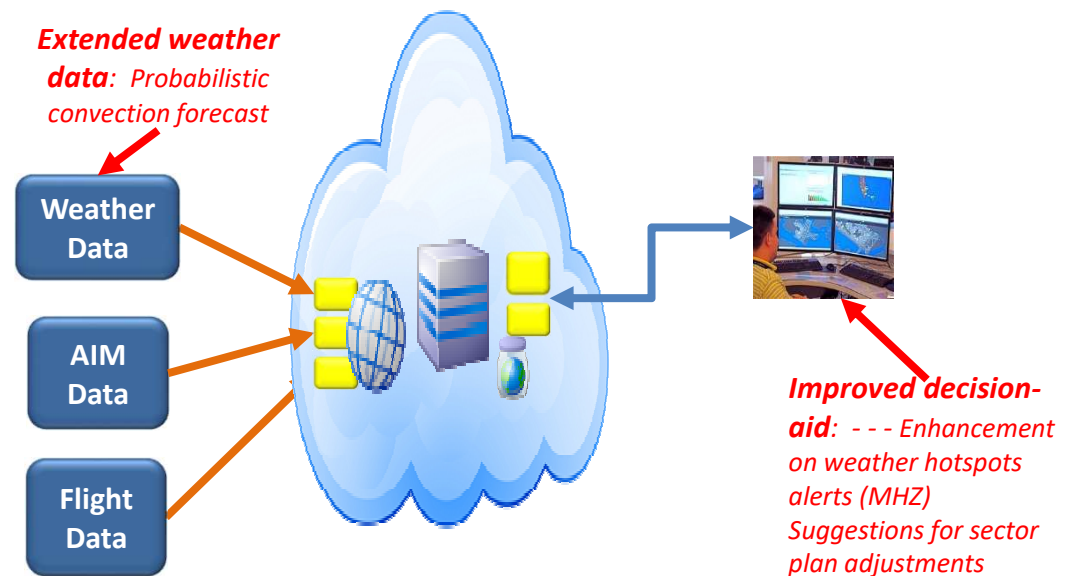
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AAM: Solution 2 - Dynamic Airspace Configuration supporting Moving Areas



- Impact assessment of hazard zones due to weather phenomenon (evolving in 4D), and their integration in the DAC process
- Introduction of Dynamic Mobile Areas type 3



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AAM: Concept Validation in PJ08-01



- Performance Assessment of Dynamic Sectorization and DMAs type 1 and type 2
- Initial acceptance and workability of DAC from ATCOs' perspective
- DAC in a flow-centric approach
- Operational feasibility of the DAC CDM process at Regional and Local level



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AAM: Benefits for the Users



- Improved management of available airspace and coordination between Military authorities and Airspace Users
- Effective and secure exchange of information (collaborative decision making in planning and execution)
- Flexible use of airspace and increase of airspace Capacity through Dynamic Airspace Configurations including DMAs (supported by automated tools)
- Improved Efficiency through ATFCM/ASM integration
 - Cost Efficiency through optimum use of available human resources
 - Increased Fuel Efficiency
- Military flight and operational efficiency improved by performance improvements to civil stakeholder



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Local ASM Tool

A part of Dynamic Airspace Configuration (DAC) process



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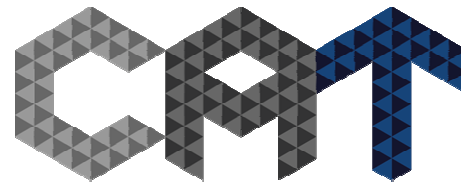
PANSA in PJ08 – Advanced Airspace Management



pansa



PJ08
AAM



COMMON
AIRSPACE
TOOL by PANSA



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Dynamic Airspace Configurations

CDM process
based on **Integrated**
ASM/ATFCM services

Dynamic Mobile Areas
of two types:
DMA type 1 and 2

ATC volumes

Dynamic Sectors design
and
non predefined
Sectors Configurations

Utilisation of **flexible**
parameters



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Functionalities for ASM/ATFCM CDM Process

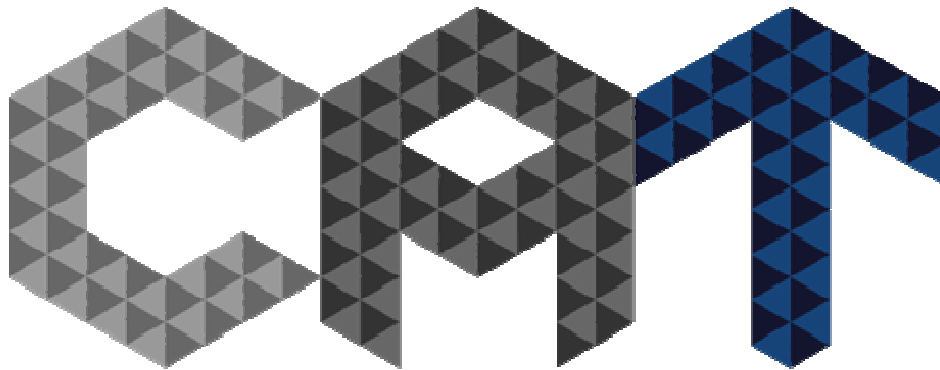


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CAT – Common Airspace Tool

A part of Dynamic Airspace Configuration (DAC) process



COMMON
AIRSPACE
TOOL by PANSA



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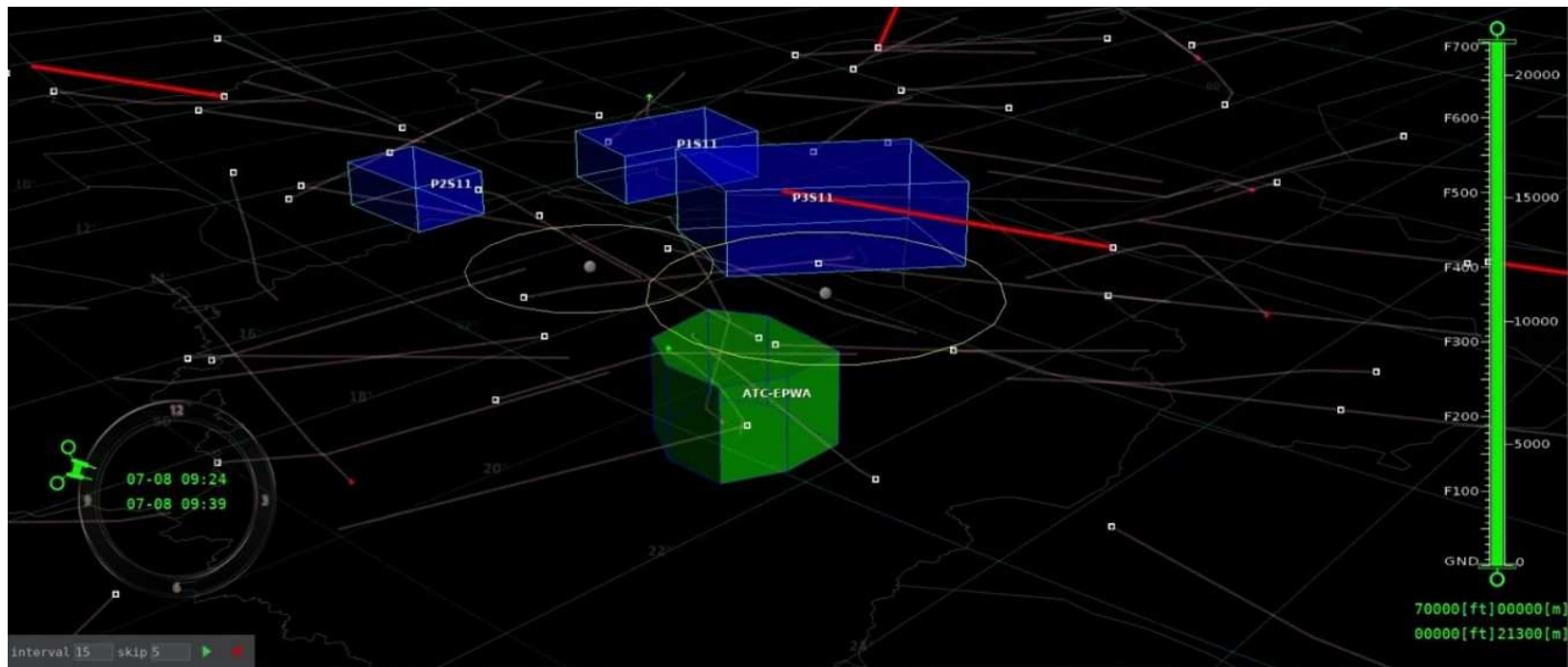
DMA optimal allocation



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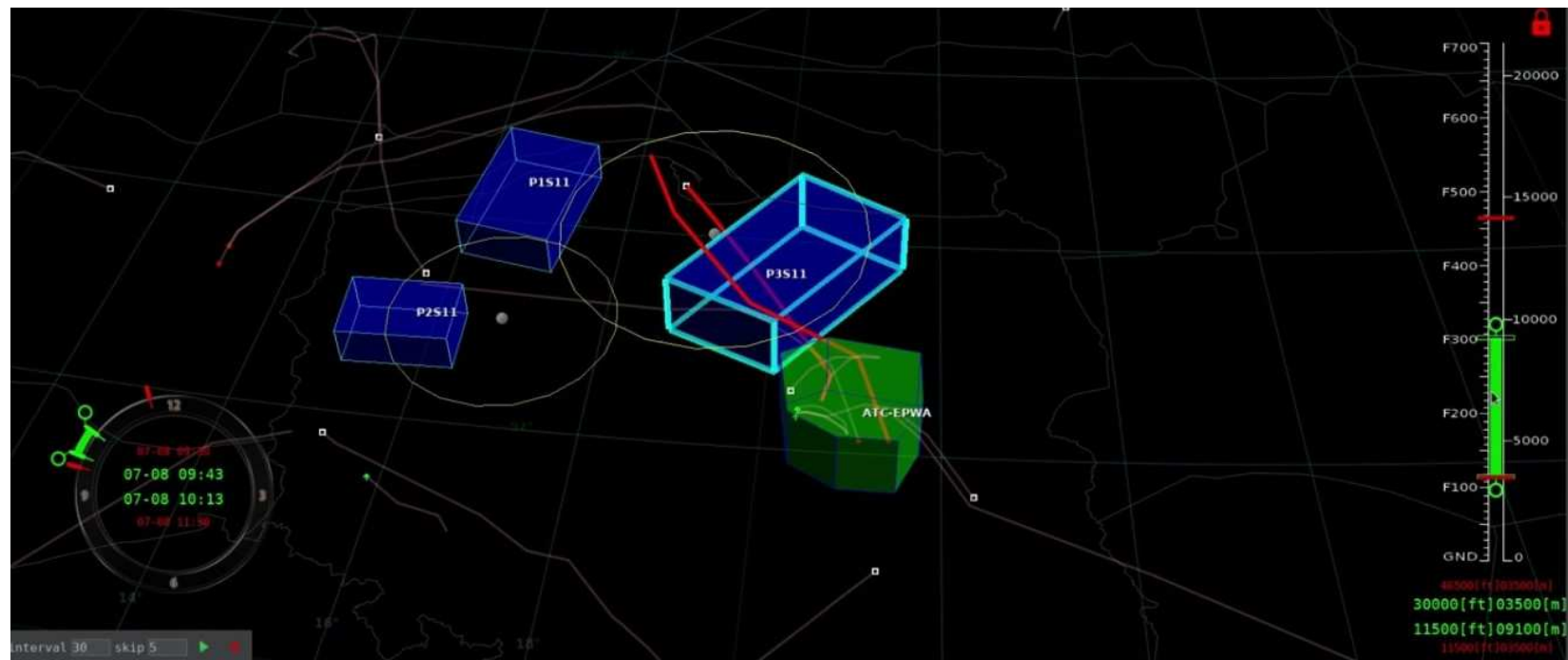
DMA vs ATS volume/Trajectories



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DMA optimisation – flexible parameters



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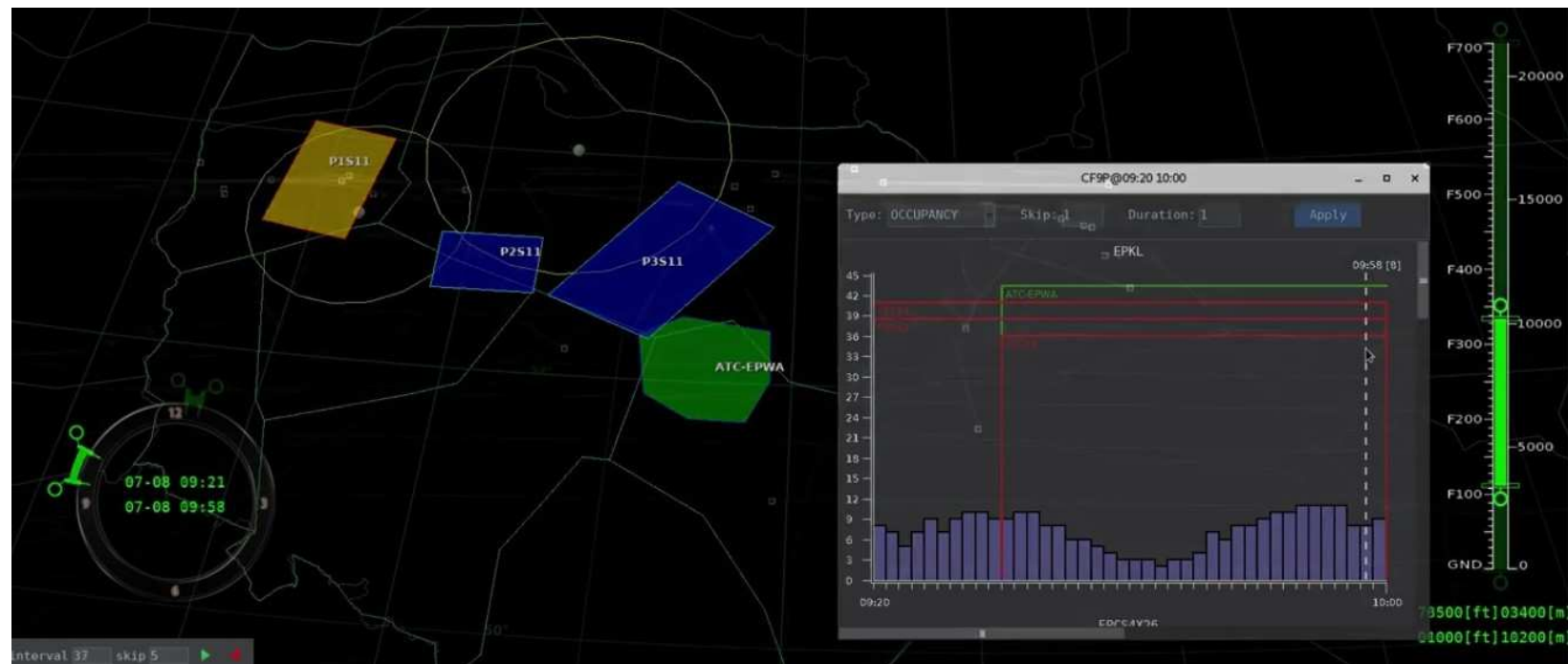
DMA vs ACC sectorisation



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DMA vs entry loads/occupancy



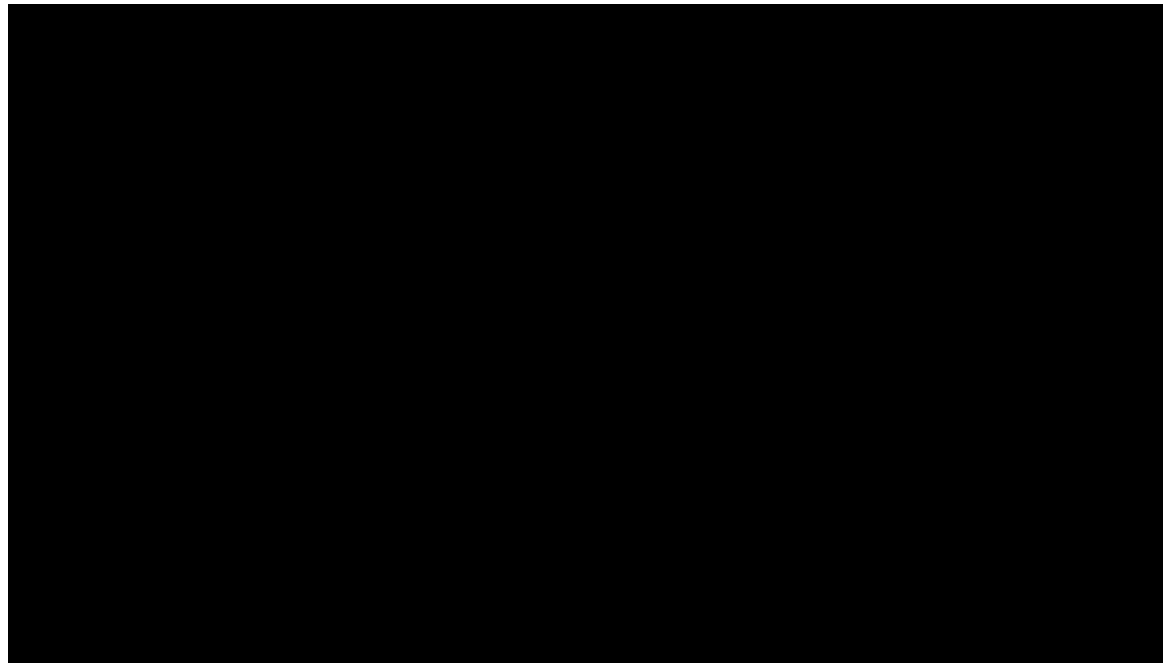
The screenshot displays the ATIS Visualizer application interface. The main 3D visualization shows a top-down view of a flight area with a grid. Several blue rectangular volumes represent flight paths or sectors, labeled P1511, P2511, and P370. A yellow line with markers indicates a specific trajectory, with timestamps ranging from 09:42 to 10:33. A vertical scale on the right side of the 3D view shows altitude in feet (F700 to GND) and meters (20000 to 0). A green vertical bar indicates a specific altitude range. The bottom status bar shows 'Interval 30', 'skip 5', and 'Messages'.

The 'Trajectories' window is open, displaying a table of flight data:

Id	Callsign	Origin	Destination	EOBT
AA03346844	CSN467	ZGGG	EODF	2018-07-07 23:30
AA03341675	NAX3FC	ENVA	EPKK	2018-07-08 08:11
AA03338964	LOT454	ESSA	EPWA	2018-07-08 08:30
AA03354183	LOT480	ENWH	EPWA	2018-07-08 08:40
AA03360221	RVR174K	EPMD	EGPH	2018-07-08 09:45

The table lists flight data including Id, Callsign, Origin, Destination, and EOBT (Estimated Off-Block Time). The 'Close' button is visible at the bottom of the window.

CAT – Live presentation



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This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 699238

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with our experts at stand **no.239**
www.wac2019PANSA.pl



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SESAR 2020 PJ 07-03 and PJ 18-01a iOAT FPL as the first instantiation of the Mission Trajectory (MT)

KUREN, Igor
REUBER, Edgar
EUROCONTROL
DECMA/CMC/ARD



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Content

- Introduction iOAT FPL
 - Why?
 - How?
 - What?
- iOAT FPL concept
- iOAT FPL validation results

WHY?

OAT not visible to IFPS



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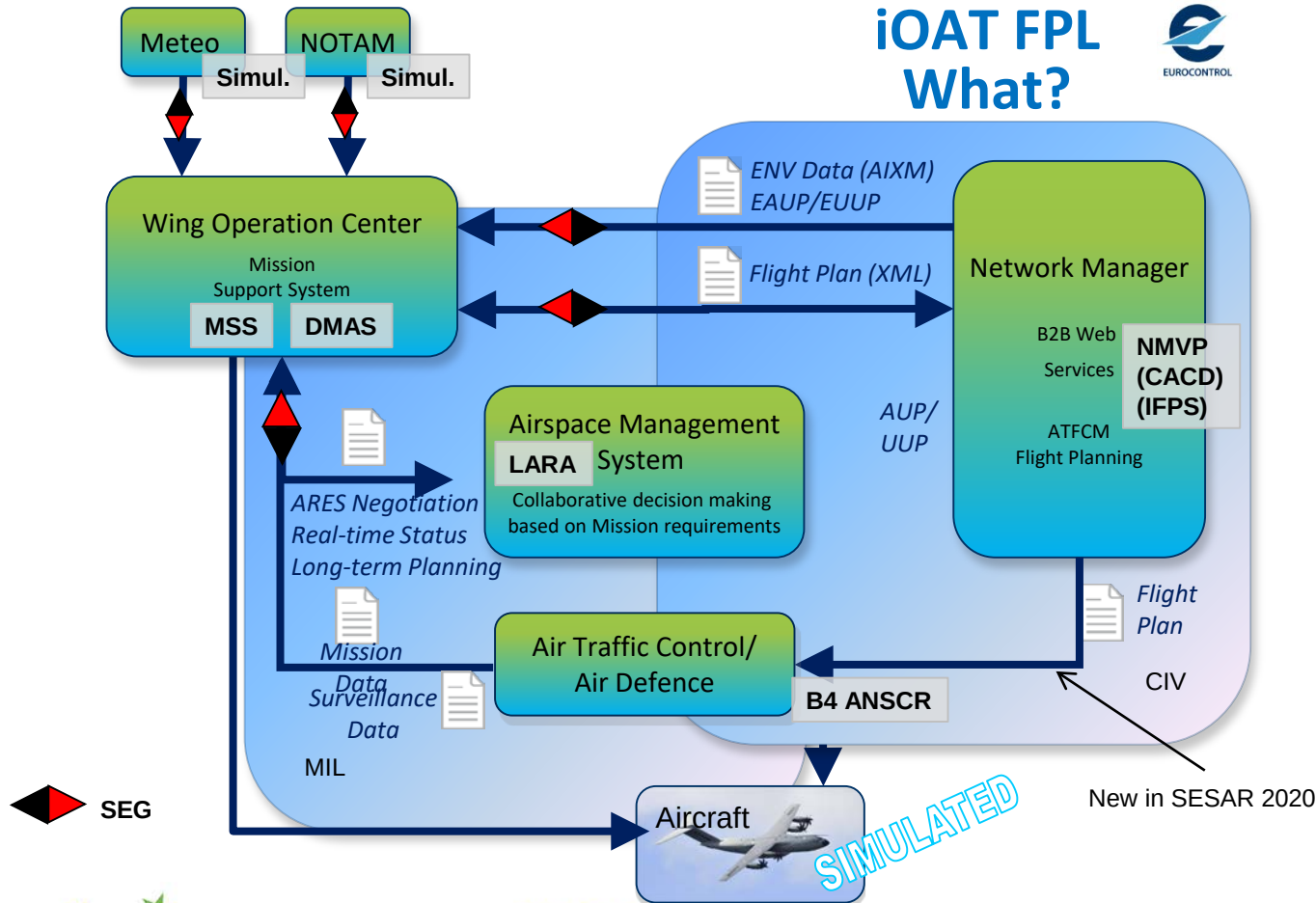
iOAT FPL Why?

- OAT flights are nearly not known in the planning phase by the Network Manager
- OAT flights are flights without data, as they are ignored by IFPS
 - Lacking in impact assessments on regional, sub regional and local level
 - Lacking for Performance measurements and improvements
 - Not precisely plannable
- OAT needs are specific and require very high potential of being flown as filed (mainly Military defence needs, sovereignty)

iOAT FPL How?

- iOAT FPL will use ICAO 2012 format
- Entries into item 8, 15 and 18 will ensure military specific needs accepted by IFPS
- iOAT FPL will be prepared and submitted by WOC to NM for validation, processing and distribution to ATC and back to WOC Full scope validation in IFPS
- Potential integration / validation into ETFMS
- Transfer into FDPS and display of CWP

iOAT FPL What?



PJ 07-03 & 18.01 V2 validation results

- V2 validation exercise outcome
 - Performed January 16th to 18th 2018 in Prague
 - Systems well connected, no interoperability issues
 - Quality of data (consistency and correctness) proven
 - Navigation infrastructure harmonized creating baseline for further validation
 - No human performance issues
 - All processes and procedures executed correctly without problems
 - Human errors well noted and corrected by automated notification mechanisms
 - Workaround solutions detected and considered as subject for improvement for next validation exercise
 - e.g. Change message to submitted flight plan was rejected because system was requiring one more time information of EET over ARES

Thank you very much for your attention!



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SESAR 2020 PJ08-AAM Advanced Airspace Management

Giuseppe MURGESE
Project Manager PJ08
DECMA/RTD/NET



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Advanced Airspace Management



- I. General Introduction
 - a. PJ08 AAM Positioning
 - b. Benefits for the Users
- II. Dynamic Airspace Configurations – DAC - Concept
 - a. Automated Creation of Elementary Sectors
 - b. Analyse Consistency of Sector Volumes
 - c. Create Collapse Sectors and Configurations
- III. Dynamic Mobile Areas Type 1 and 2
 - a. Define the position and create the DMA
 - b. DMA activation
- IV. DAC CDM Process
 - a. Model A and Model B
 - b. PJ08.01.02 Example



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Advanced Airspace Management



*“The ‘packaging’ of en route and terminal routes, optimized trajectories, airspace reservations and ATC sectors into **Airspace Configurations** which are designed and **dynamically** managed together **to respond** flexibly to **different performance objectives** that **vary in time and place**”*

=> The Dynamic Airspace Configurations (DAC) Concept in S2020



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Advanced Airspace Management



- Advanced Airspace Management: What is the DAC?
 - DAC - part of DCB Operations – **Capacity Management Toolbox**
 - Dynamic Sectors design and non predefined Sectors Configurations, including Cross-border Airspace Configurations
 - **Civil/Military Coordination: Dynamic Mobile Areas of two types - DMA type 1 and 2**
 - **CDM process based on Integrated ASM/ATFCM services (managed both at Local and Network Level)**
 - Automation/system support for integrated Airspace design and management
 - Performance oriented
 - Full Free Route Airspace Operations



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Advanced Airspace Management



- AAM: Solution 1 – Management of Dynamic Airspace Configurations
 - Enhance the functions building sectors and configurations that can be dynamically adapted to fulfil Airspace Users' demand in response to changes in traffic patterns
 - Develop Flexible Airspace designed, for long term planning, to predict the resources (ATCOs) needed for meeting the forecasted AUs' traffic demand
 - Activation of Airspace configurations through an integrated collaborative decision making process, at national and regional levels
 - Develop the Dynamic Mobile Areas. Regarding coordinated Military Airspace demand, Dynamic Mobile Area (DMA) are temporary volumes of airspace designed to separate the activities performed inside from civil traffic. DMAs aim at satisfying Users' needs whilst minimizing impacts on the network.



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Advanced Airspace Management



- AAM: Solution 2 - Dynamic Airspace Configuration supporting Moving Areas
 - Impact assessment of hazard zones due to weather phenomenon (evolving in 4D), and their integration in the DAC process
 - Introduction of Dynamic Mobile Areas type 3



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Advanced Airspace Management



- AAM: Concept Validation in PJ08-01
 - Performance Assessment of Dynamic Sectorization and DMAs type 1 in FRA Airspace (ENAV Milan ACC and EUROCONTROL)
 - Performance Assessment of Dynamic Sectorization and DMAs type 2 in FRA Airspace (EUROCONTROL MUAC Airspace)
 - Initial acceptance and workability of DAC from ATCOs' perspective in FRA Airspace (ENAV Rome ACC and SINTEF, human-in-the-loop)
 - DAC in a flow-centric approach in preparation of integration within INAP (DSNA, human-in-the-loop involving Aix-en-Provence and Bordeaux ACCs)
 - Operational feasibility of the DAC CDM process at Regional and Local level (EUROCONTROL NM, PANSA, DFS, AIRBUS DS, human-in-the-loop)
 - Operational feasibility of DAC CDM process (planning and execution) (ENAIRE/CRIDA Madrid ACC)



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Advanced Airspace Management



- AAM: Benefits for the Users
 - Improved management of available airspace, and coordination between Military authorities and Airspace Users (impact of Military Users Operations on the Network Capacity)
 - Improved Efficiency through ATFCM/ASM integration
 - Optimized use of airspace and increase of airspace Capacity through Dynamic Airspace Configurations including Dynamic Mobile Areas type 1 and type 2 (supported by automated tools)
 - Cost Efficiency through optimum use of available human resources
 - Increased Fuel Efficiency
 - Increased Flexibility on use of airspace on a day-to-day basis
 - Improved Civil/Military coordination through effective and secure exchange of information (collaborative decision making in planning and execution)
 - Military flight and operational efficiency improved by performance improvements to civil stakeholders



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