

Innovations in air traffic services

Session introduction

Oznur Uygur

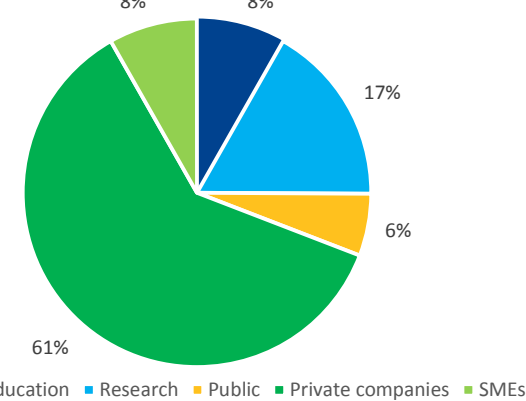
SESAR Joint Undertaking

SESAR: Technological pillar of Single European Sky and key enabler for the Aviation Strategy

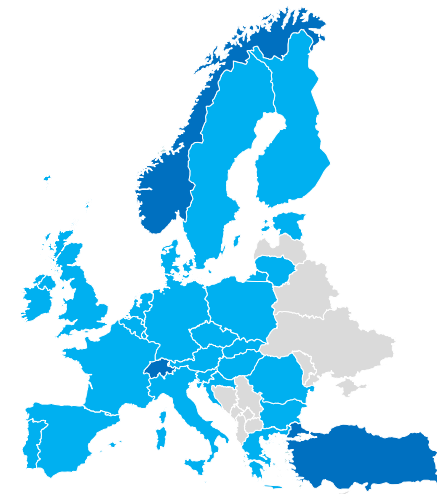


SESAR 2020 projects:
blended academic & industrial expertise

Types of beneficiaries (Sept. 2018)



26 EU Member States participating



■ EU Member States with SESAR 2020 funding

■ Third-countries with SESAR 2020 funding (also incl. Israel, Australia, United States, Canada...)

SESAR Innovation Pipeline: integrated approach



SESAR INNOVATION PIPELINE

*Air traffic management
research & innovation
2018 highlights*

SESAR
JOINT UNDERTAKING

EXPLORING THE
BOUNDARIES OF
ATM RESEARCH

DELIVERING
SESAR
SOLUTIONS

DEMONSTRATING
SESAR
SOLUTIONS

ENABLING
SAFE AND
SECURE
INTEGRATION
OF DRONES



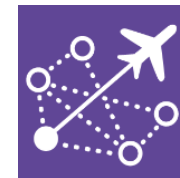
Explores new concepts beyond those identified in the European ATM Master Plan or emerging technologies and methods. The knowledge acquired can be transferred into the SESAR industrial and demonstration activities.



Assesses and validates technical and operational concepts in simulated and real operational environments according to a set of key performance areas. This process transforms concepts into SESAR Solutions.

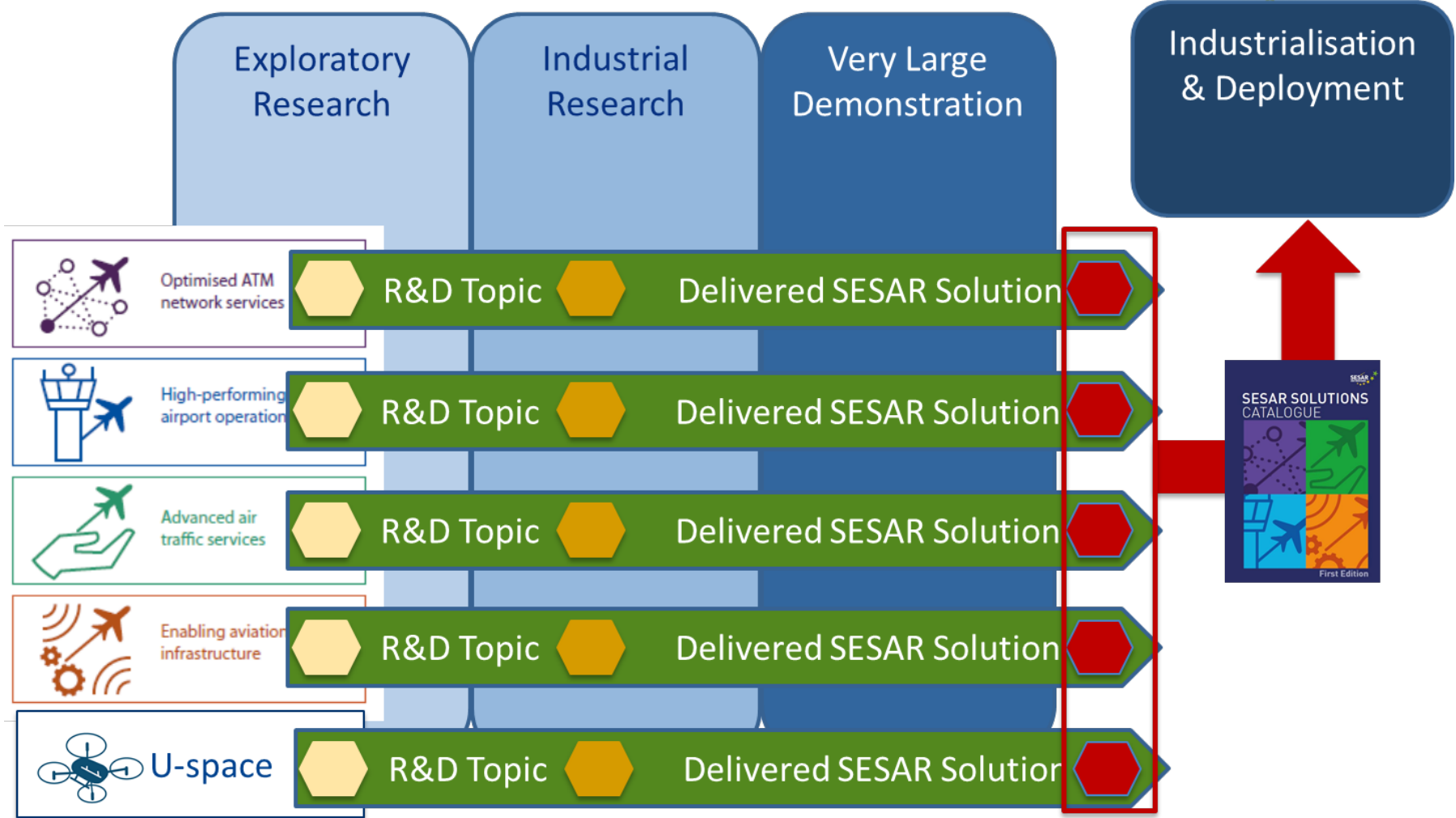


Tests SESAR Solutions on a much larger scale and in real operations to prove their applicability and encourage the early take-up of solutions.



Solution –oriented approach

What is a SESAR Solution?



Solution –oriented approach

What is a SESAR Solution?



SESAR Solution: Programme output of R&I activities which relates to either an operational or a technological improvement which have been designed, developed and validated in response to performance needs identified in the European ATM Plan.

There are two type of SESAR Solutions:

- SESAR ATM Solutions
- SESAR Technological Solutions



DELIVERING TIMELY SOLUTIONS

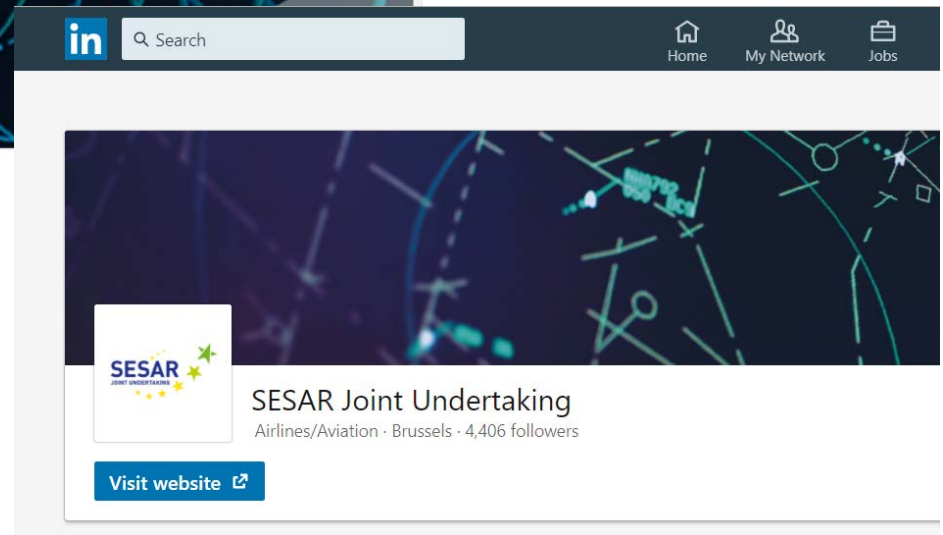
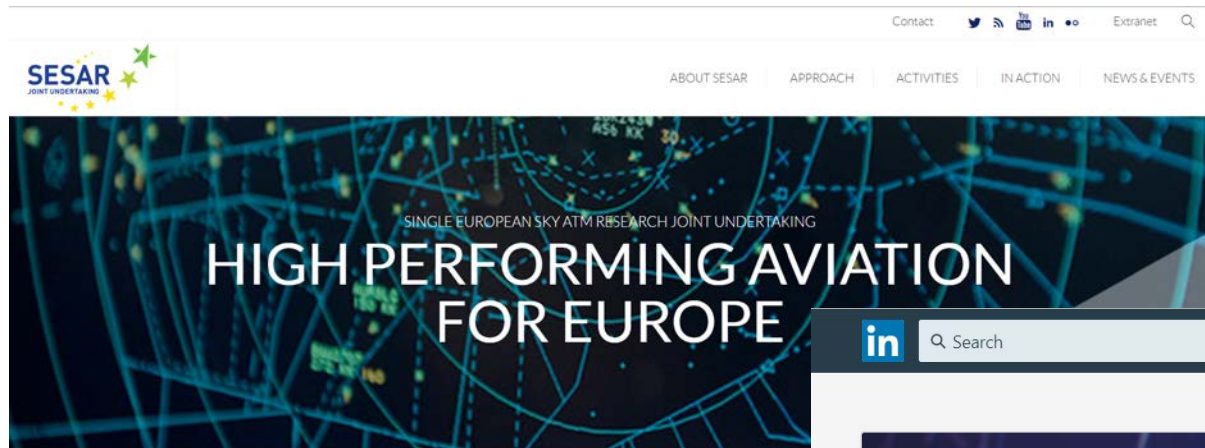
- **63 SESAR Solutions** and **candidate solutions** in the pipeline
- **40+ already under deployment** across Europe
- Disseminated through **EU aviation standards**
- Clear associated benefits: **safety, efficiency, capacity and the environment**
- **Globally applicable**



Communication



<https://www.sesarju.eu>



SESAR 2020 Projects to be presented in this session





Thank you !



Towards virtualisation in air traffic management

SESAR PJ16 CWP HMI

Technical perspective
Operational perspective

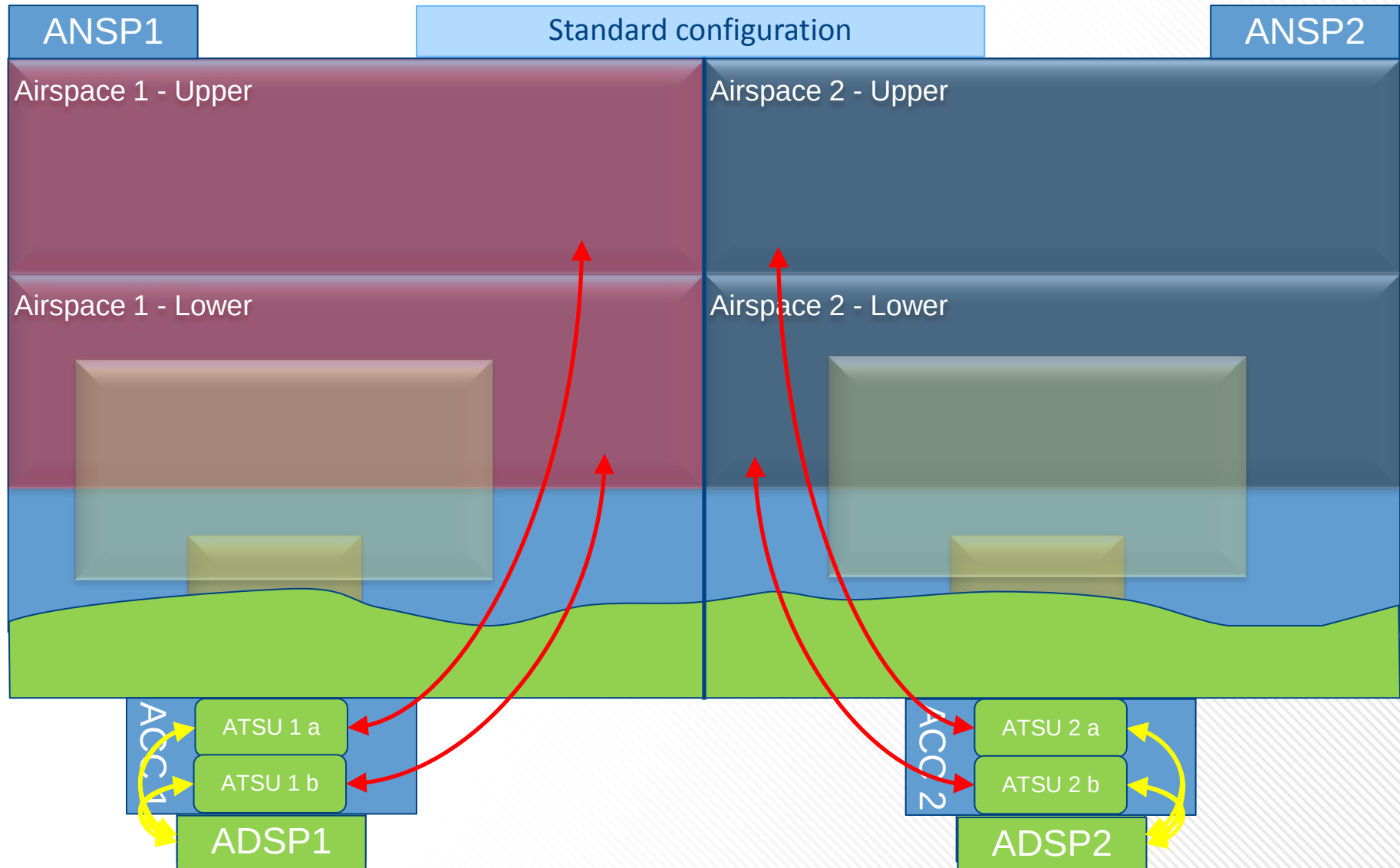
Thomas Buchanan, Skyguide
Maurizio Romano, Technosky

What is a virtual centre?

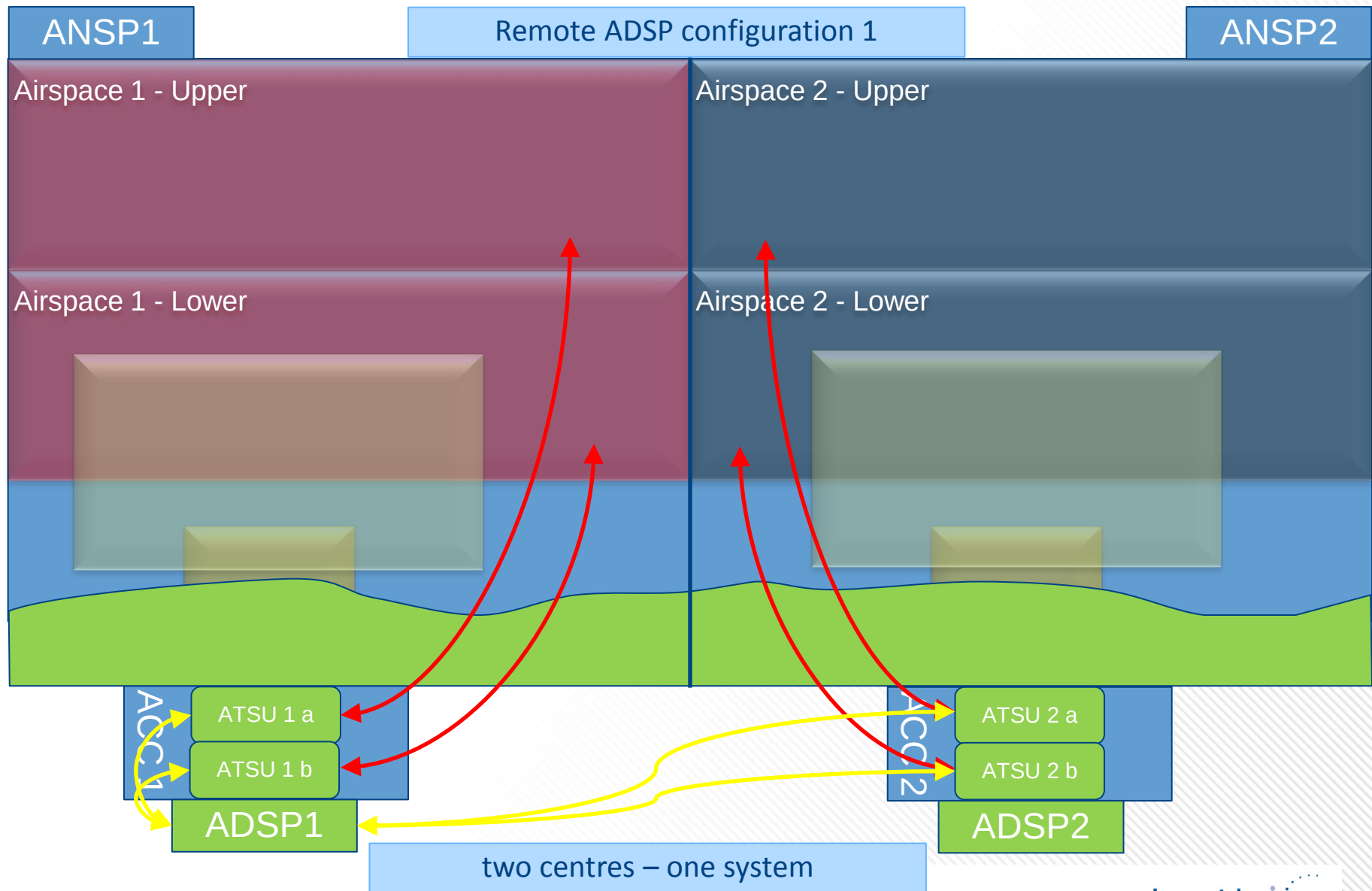


- *A virtual centre is a single ATSU or a grouping of collaborative Air Traffic Service Units (ATSU) using data services provided by an ATM Data Service Provider (ADSP). The concept integrates at least geographical decoupling between ADSP (s) and some ATSU (s), through service interfaces defined in Service Level Agreements. One ATSU may use data services from multiple ADSPs, just as an ADSP may serve multiple ATSUs*
- *The objective of a virtual centre is to allow decoupling that could deliver the flexibility and performance aspects of the services to ensure the ability of the virtual centre solution to, at least, support or to improve the operational performance.*

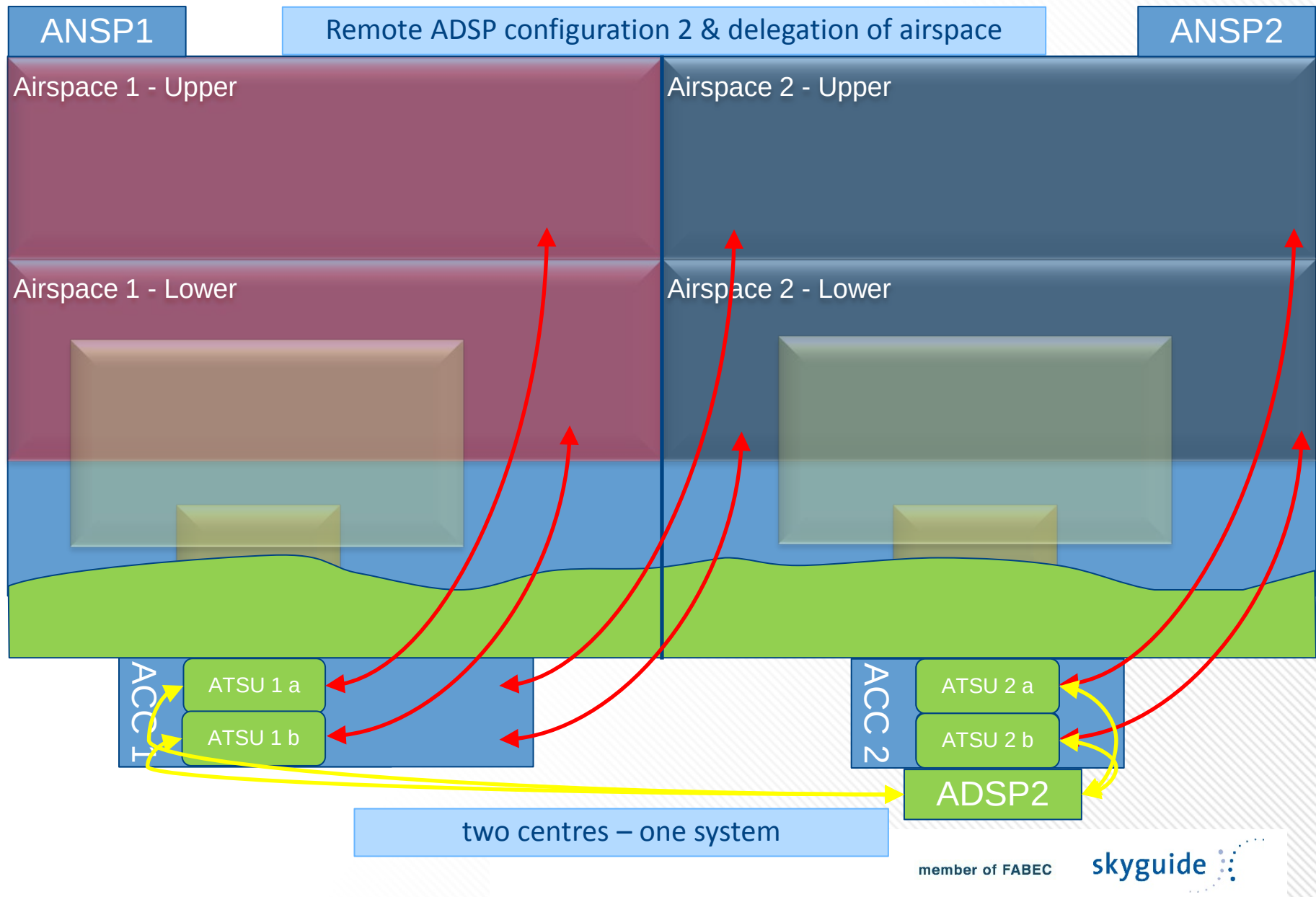
A picture is worth more than 1000 words



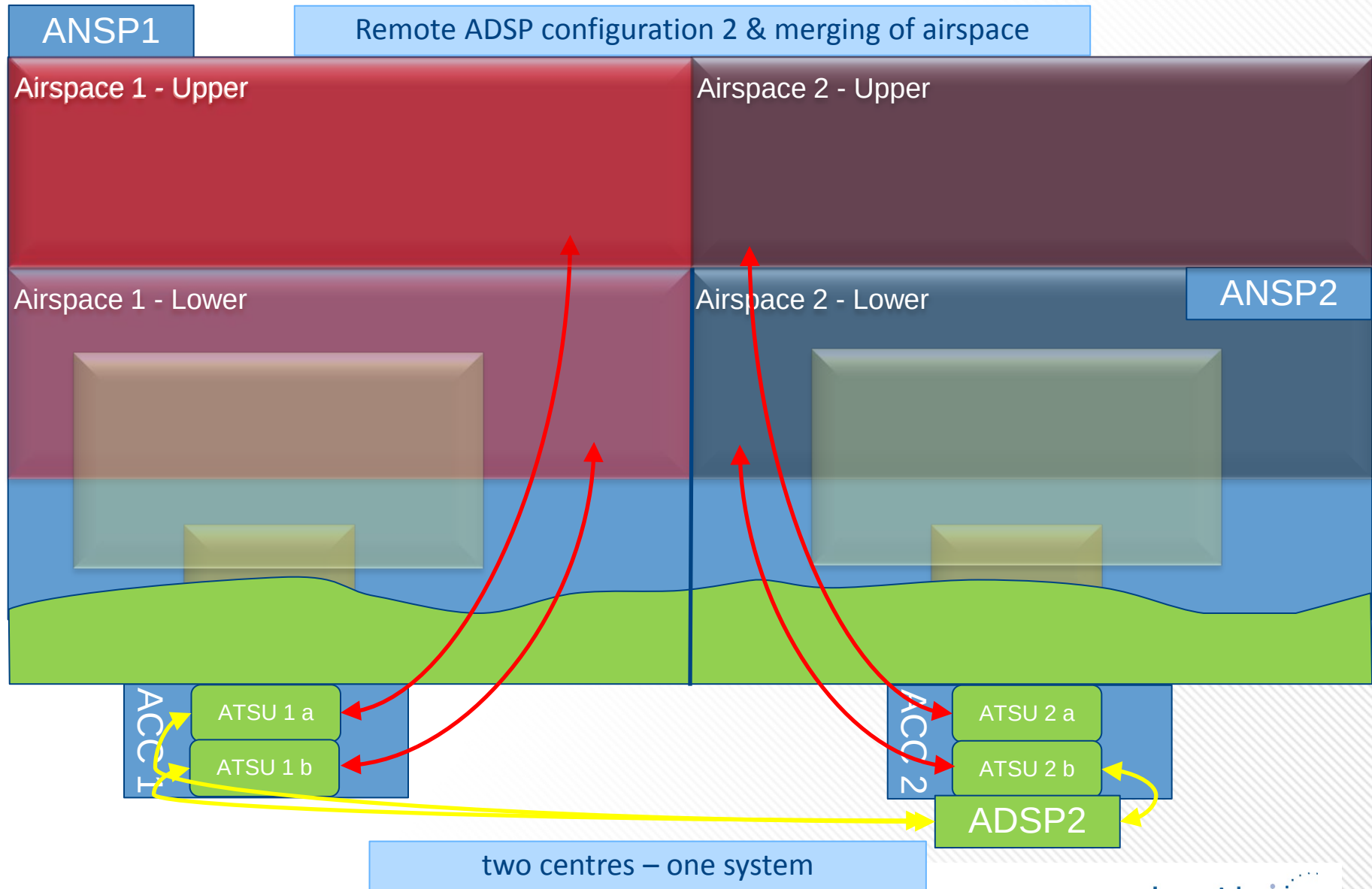
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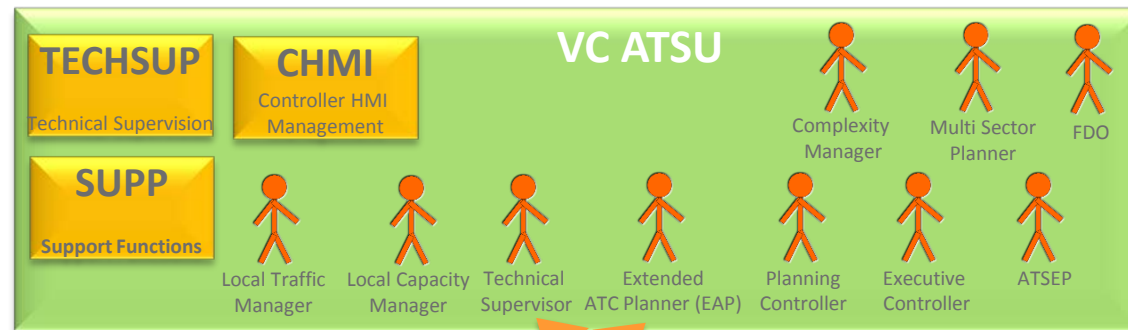
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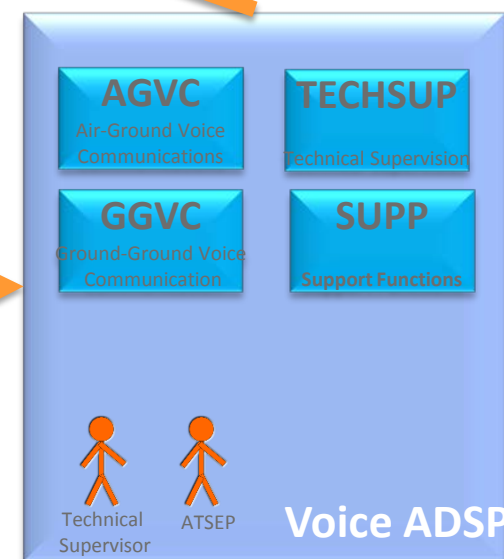


Architecture view from a SESAR perspective



ATCaaS

VoiceaaS



= Data Management only (i.e. not HMI)

VC from various angle



Virtual Centre

Cross-border service provision

Business drivers & use cases

- A. Cost effectiveness
 - Rationalization of infrastructure
 - Competition in technical evolution
 - Shared ATCO training
- B. Business continuity
 - Data center outage
 - ATCOs not available
- C. Operational flexibility
 - Static delegation of airspace
 - Dynamic cross-border ATCO resource allocation

Standardized: Methods of operation

Standardized: Operational information

Standardized: Operational procedures

Standardized: Technical means

Standardized: Equipment

En-route

TMA

Tower

ATFCM

Roadmap

- A. System life cycle
- B. Scope
- C. Architecture
 - Quality of service
 - Security
- D. Legal
 - Military ATC cross border delegation (sovereignty)
 - Data storage abroad
- E. Training
 - Recurrency training
 - ATCO certification
 - Harmonization
- F. Business models

Performance driven

Model driven

Fragmentation to integration

Virtualization

ATSU

ADSP

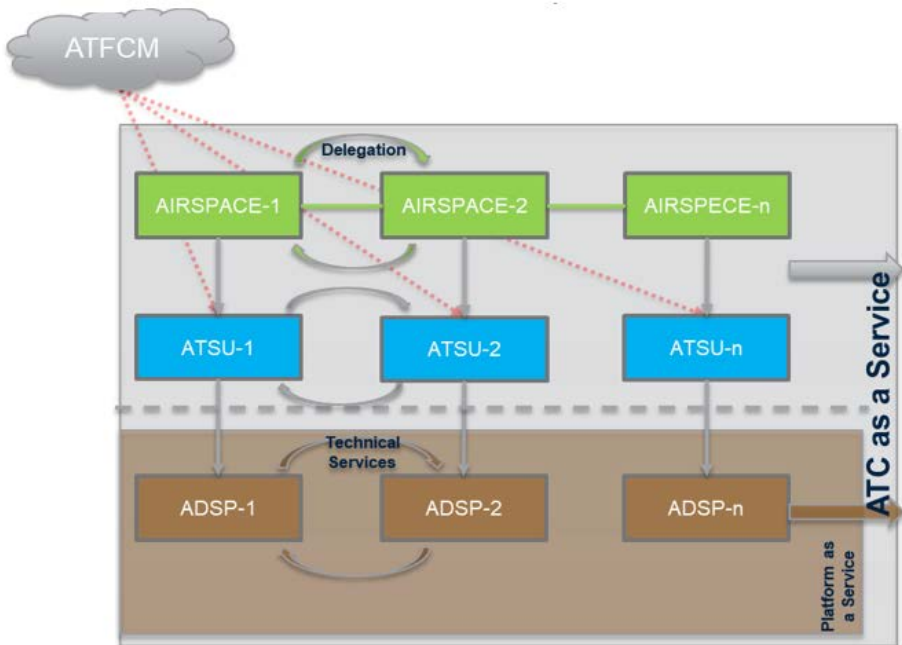
Open standards
Vendor independent

SOA

Quality of service

Security

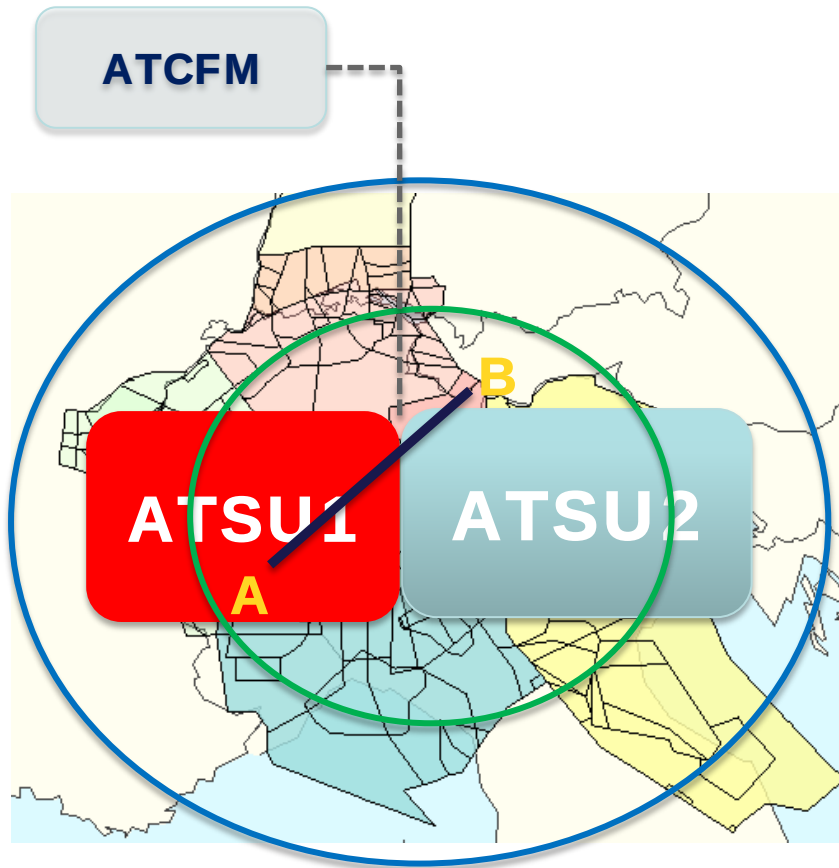
Delegation of Airspace among ATSU



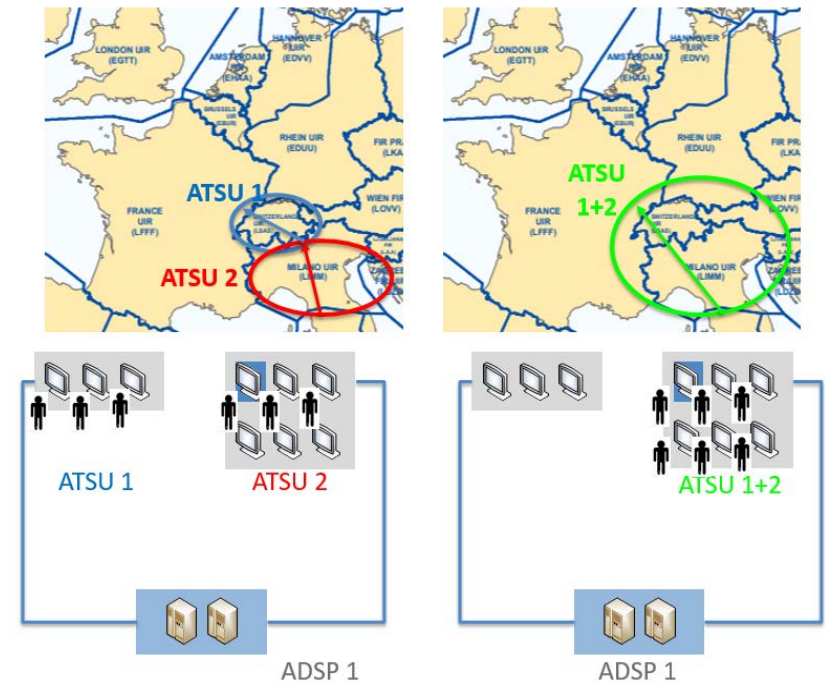
Potential Uses case for Delegation of Airspace



Delegation of Airspace based on Traffic / NM

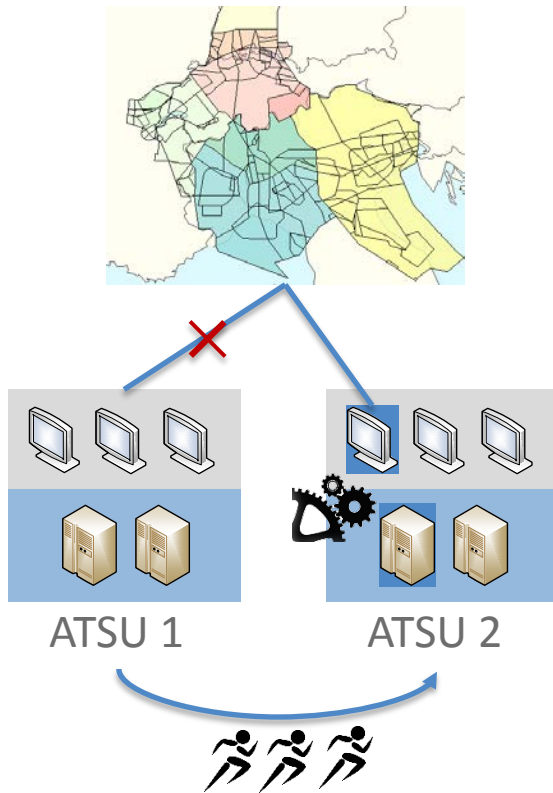


Delegation of Airspace Cross Border



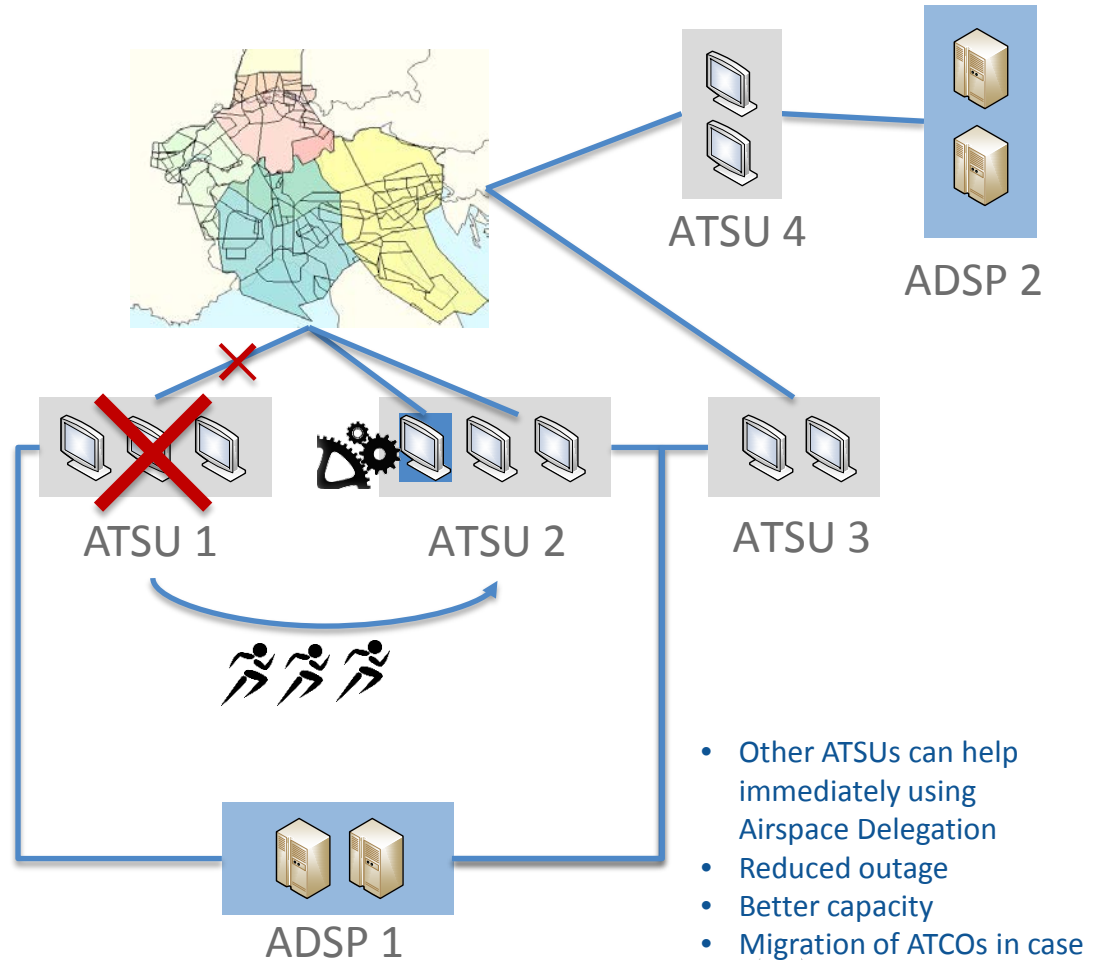
Contingency Uses Cases

Todays Contingency solutions



- Outage due to travelling of ATCOs and system setup at aiding unit
- Less capacity: less positions, maybe different system

Contingency in a Virtual Centre Environment



- Other ATSUs can help immediately using Airspace Delegation
- Reduced outage
- Better capacity
- Migration of ATCOs in case of long-term failure



Thank you !



Cross-border Free Routing in very high complexity environments

SESAR PJ06



Florence Serdot-Omer
DSNA

Technical goals



*The Free Routing concept enables **Airspace Users** to fly as close as possible to their **preferred trajectory**, without being constrained by fixed airspace structures or fixed route networks.*



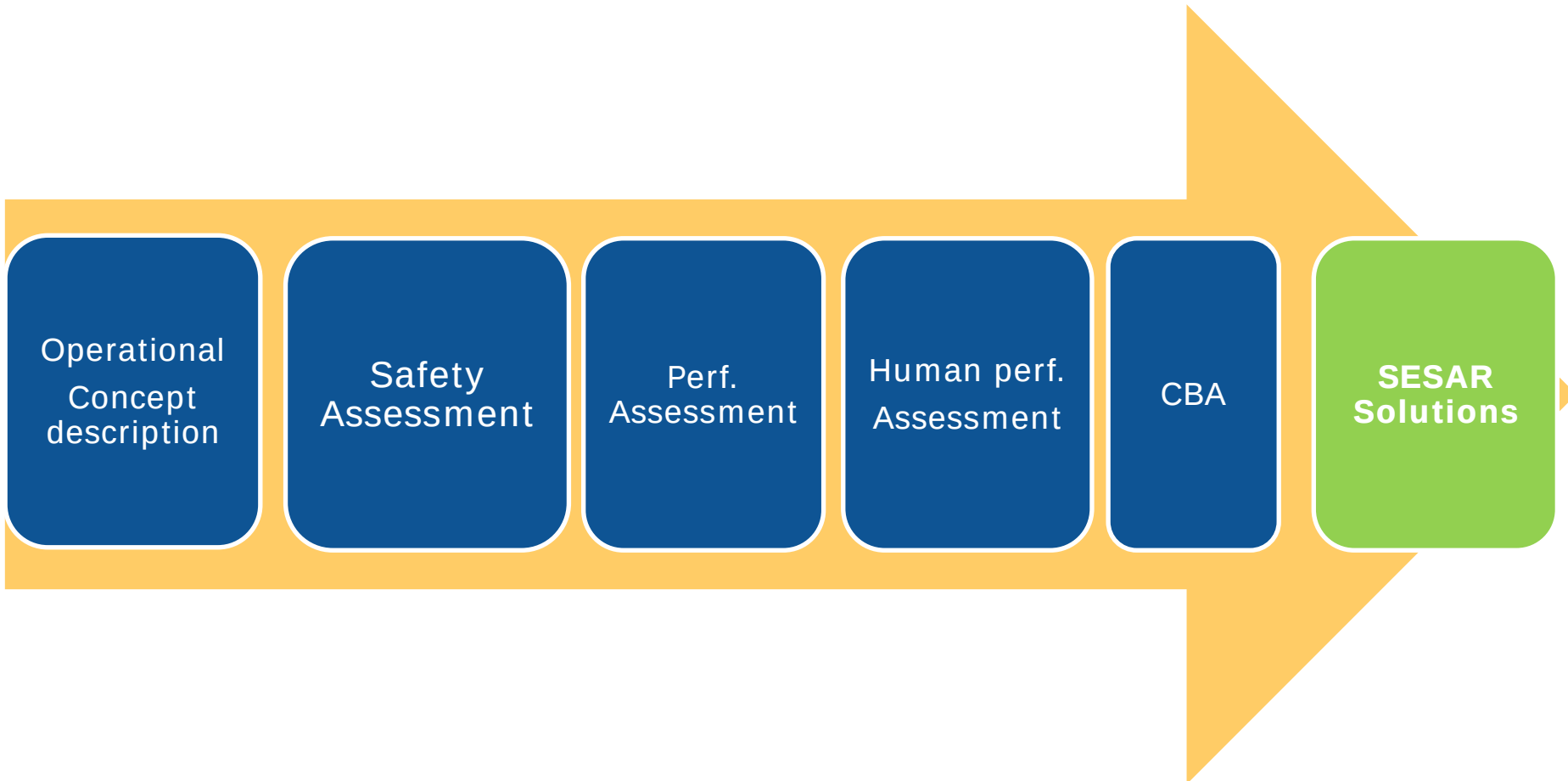
Technical goals



Develop and validate the Free Routing concept within cross-border high & very high-complexity environments

- *Support implementation of European Regulation IR No 716/2014 - PCP AF#3 - Free routing available at and above FL310 in ICAO EUR region*
- *Research the benefit and impact of expanding the Free Routing concept to the lowest limit possible while accommodating all Airspace Users concerned.*

The main achieved & expected results



The main achieved & expected results



Improve fuel efficiency



Reduce CO2 emissions



Improve flights predictability



No negative effect on airspace capacity and safety

Potential gaps and challenges



Find the balance !

https://www.ambiance-sticker.com/sticker-zen-equilibre-de-galets-xml-420_256_3424-10539.html

*Maximum freedom and performance for Airspace users
VS
safety/capacity*

Cross-cutting issues (tech & non-tech.)



Allow the largest possible FRA in Europe with minimum structural constraints

- *Improve systems' interoperability*
- *Manage airspace complexity*
- *Optimize traffic management with minimum Free Routing Airspace constraints*
- *Improve Air Traffic Controllers tools*
- *Improve flight planning for wide range of airspace users*

Impact



- *Improves ATM performance*
- *Reduces airspace user's costs*
- *Supports a less fragmented European airspace*
- *Improves accessibility and equity for a wider range of Airspace Users.*
- *Allows a greener airspace*

Useful info and acknowledgements



Bucharest, 27-30 May 2019



Useful info and acknowledgements



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<http://www.sesarju.eu>



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Bucharest, 27-30 May 2019





Thank you !



Demonstrating GNSS navigation solutions for increased general aviation and rotorcraft airport accessibility

SESAR GRADE large scale demonstration

Antonio Vitale

Centro Italiano Ricerche Aerospaziali (CIRA)

Scientific & technical goals

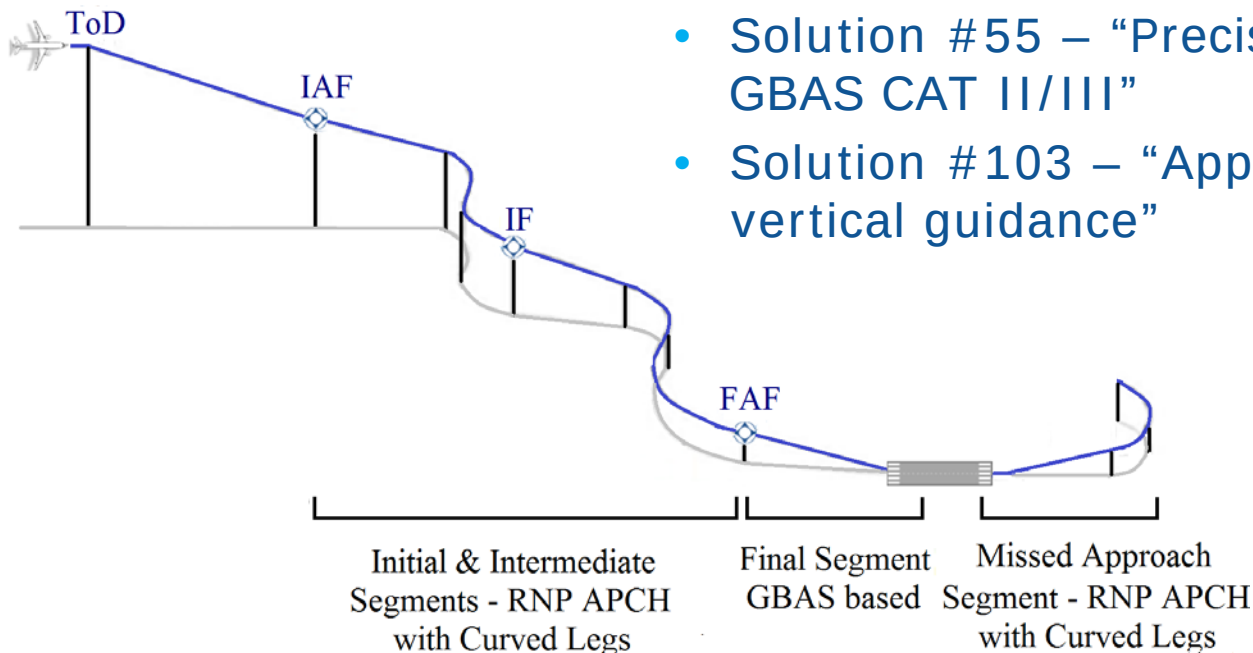


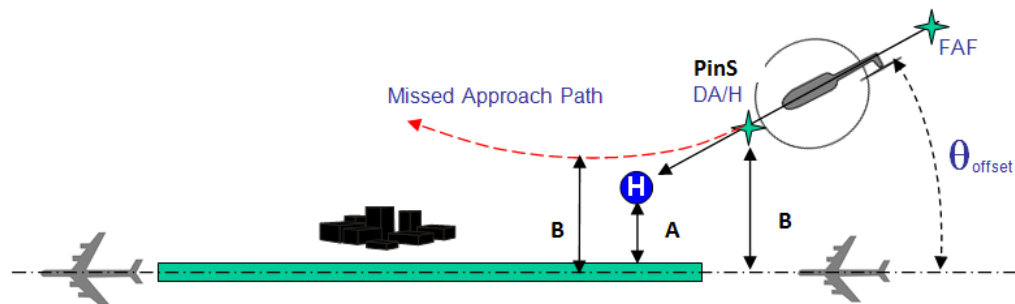
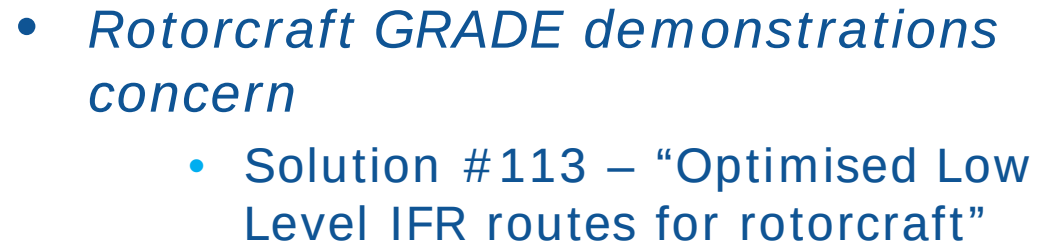
- *SESAR to date has targeted improvements that mainly address the needs of Commercial Aviation sector*
- *General Aviation and Rotorcraft shall benefit from improvements developed by SESAR, too*
- *GRADE goal is to demonstrate the capability of GA and RC to exploit SESAR Solutions based on GNSS technology*
- *This capability will allow defining flexible procedures for:*
 - **an efficient and non-discriminatory use of the sky**
 - **an improvement of the airports capacity**
 - **a reduction of the air transport environmental impact**

Scientific & technical goals



- *Fixed wing GRADE demonstrations concern*
 - Solution #51 – “Enhanced terminal operations with LPV procedures”
 - Solution #55 – “Precision approaches using GBAS CAT II/III”
 - Solution #103 – “Approach Procedure with vertical guidance”





Scientific & technical goals



The GRADE demonstrations consist of:

- **Flight Trials to be conducted at 2 sites and by using 3 aircraft equipped with non-certified on-board avionics**
- **Preparatory Real-Time Simulations with Hardware and Human in the loop**



The GRADE demonstrations aim to:

- **assess the operational acceptability of the SESAR Solutions from the perspective of both pilots and ATCOs**
- **show the capability of the proposed system to provide all the info needed to conduct safely the flight**



Expected results



- *Provide more accurate positioning of GA and RC in the TMA*
- *Increase pilot situational awareness*



Improve safety & equity (non-discriminatory use of the sky)

- *Reduce approach minima for GA w.r.t. NPA procedures*
- *Reduce GA runway occupancy time and spacing between arrival aircraft*
- *Displace IFR rotorcraft from active runways*



Improve airport capacity

- *Allow shorter approach range and more flexible arrival paths for GA*



Reduce environmental impact

The main achieved results



- *2 Real Time Simulation exercises completed*
- *75 GA approaches on Capua airport (Italy) and 12 RC patterns on Braunschweig area (Germany)*
- *Several flight conditions tested, involving:*
 - **5 test pilots**
 - **4 ATCOs + 1 ATC Supervisor**
 - **3 human factors experts**
 - **2 pseudo pilots**
 - **Several technical experts**
- *Big amount of data collected*

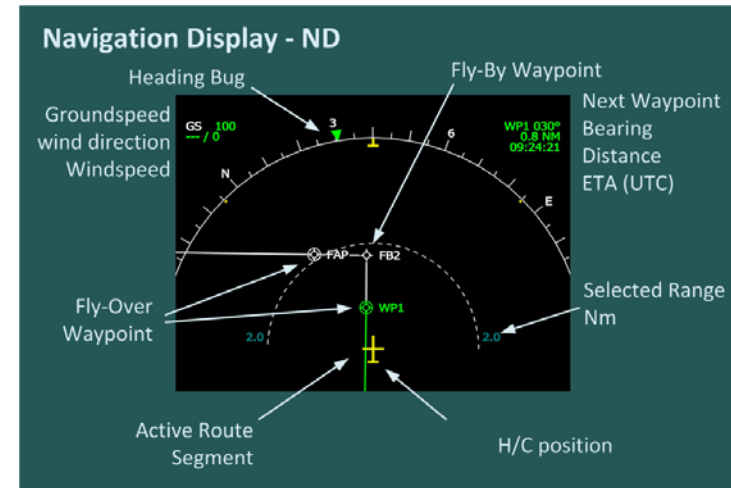
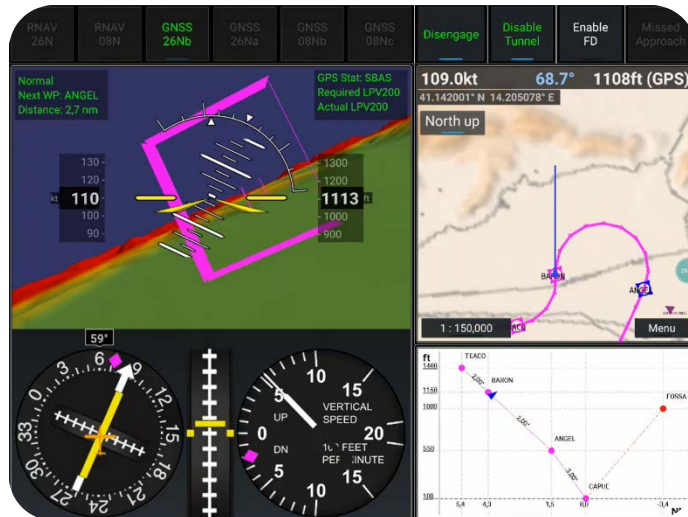


The main achieved results



Preliminary validation of:

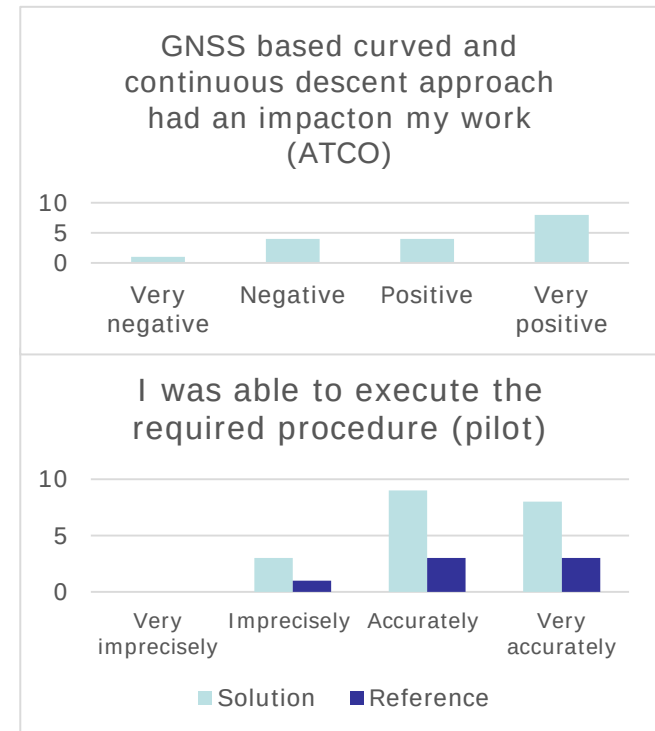
- *GNSS based navigation algorithms able to guarantee the RNP*
- *Portable non-certified Primary Flight Display to support pilot decisions and operations*



The main achieved results



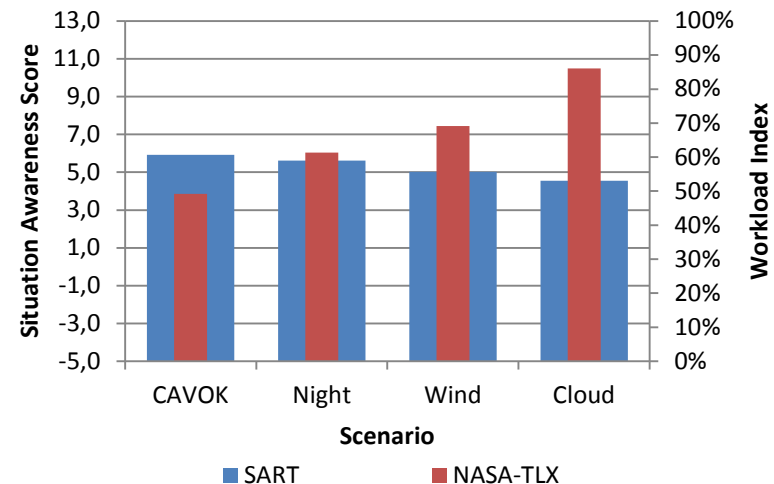
- *Preliminary finding from the analysis of RTS:*
 - **SESAR Solutions feasible and acceptable**
 - **Navigation precision always within RNP 0.3**
- *GA RTS demo*
 - **Positive affect on workload and situational awareness of pilots and ATCOs**
 - **Reduction of the fuel burn and increased airport throughput w.r.t. RNAV**
 - **Adequate training for pilots and ATCOs is mandatory**



The main achieved results



- *Preliminary finding from the analysis of RTS:*
 - **SESAR Solutions feasible and acceptable**
 - **Navigation precision always within RNP 0.3**
- *RC RTS demo*
 - **Large variation of subjective workload**
 - **Pilots skeptical about safe separation in turn phase during approach and missed approach**
 - **Mitigation by using advanced PinS for manual flight**



Potential gaps and challenges



- *Development and implementation of GBAS GAST-D service for providing signal integrity to deliver the performance necessary for Cat II/III minima in airport environment*
- *Regulatory adaptations with the certification authorities to enable wider deployment of GNSS technologies for GA & RC*
- *In-flight demonstration of GA and RC capability to integrate efficiently in the TMA with Commercial Aviation (in spite of different aircraft performance)*
- *GRADE is sharing experiences and lessons learnt with other SESAR co-financed projects (GAINS, PJ01 EAD) that are facing these challenges, to increase the overall impact of SESAR*

Expected impact



- *Improve airport accessibility of GA and RC, while reducing environmental impact, guaranteeing safety and requiring minor affordable changes to the current on-ground infrastructure*
- *Provide recommendations on regulation and standardization initiatives, industrialization and deployment of technologies enabling the GNSS exploitation by GA and RC*
- *Contribute to increase the relevance of the GA and RC sectors in Europe, by improving passengers' mobility and by using the airspace in flexible, balanced and optimized way*

Useful info and acknowledgements



GRADE Project

<http://www.gradeproject.eu>

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Thank you !

