SESAR 3 JU snapshot

Accelerate through research & innovation the delivery of an inclusive, resilient & sustainable Digital European Sky

Timeframe: 2022 – 2031

50+ founding members representing entire aviation value chain (incl. new entrants)

- Horizon Europe - EUR 600 million
- Eurocontrol – EUR 500 million (in-kind & financial contributions)
- Industry - EUR 500 million minimum (in-kind & financial contributions)

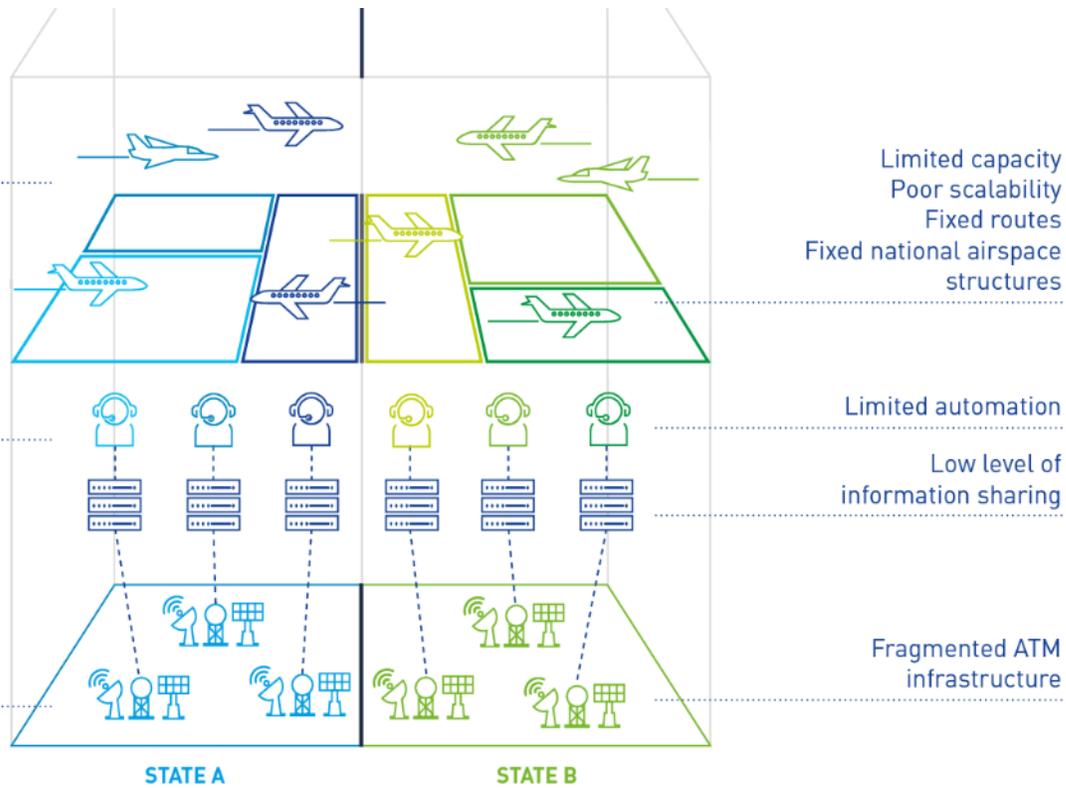*Additional funds via the Connecting Europe Facility (in coordination with CINEA)*
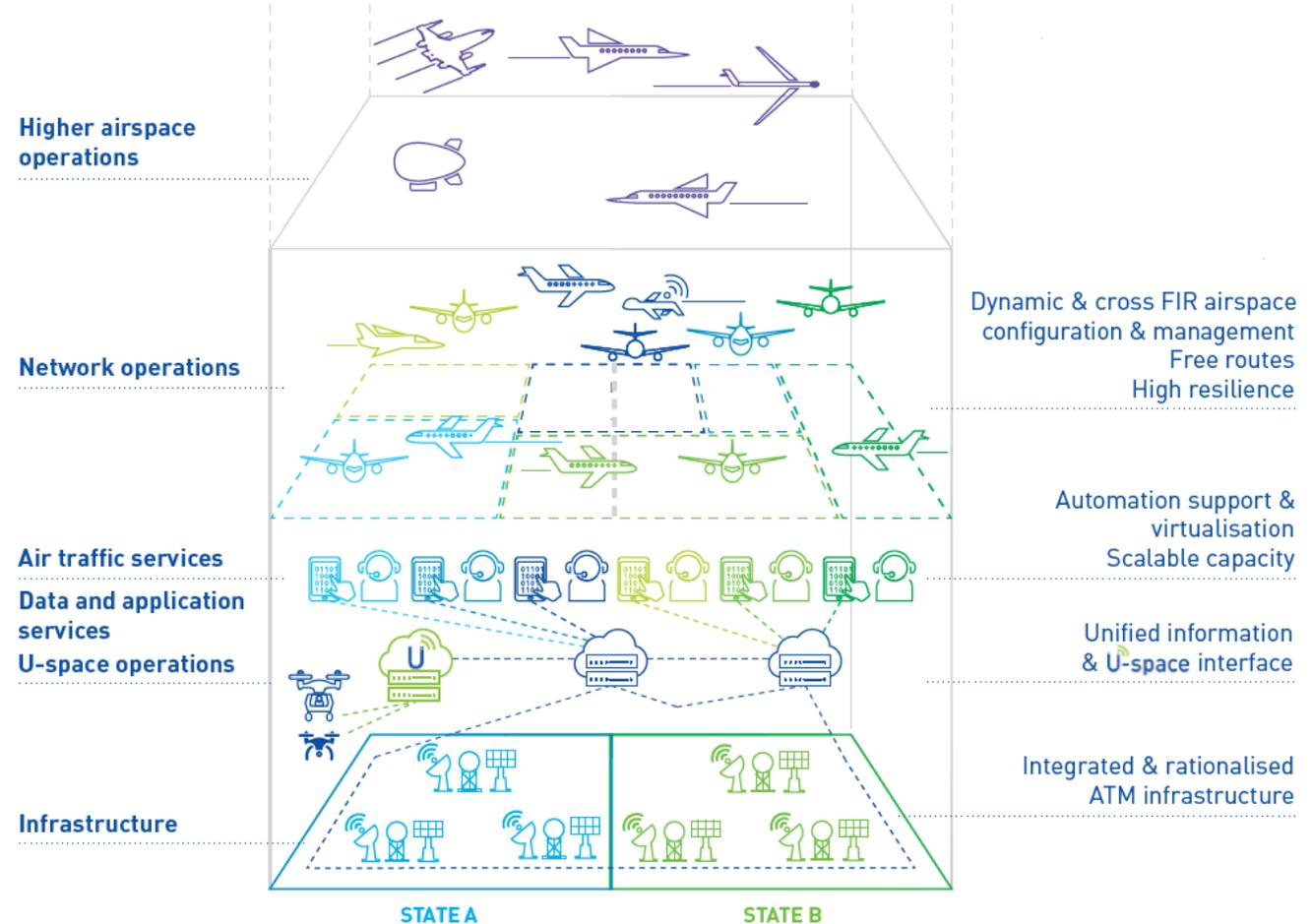
Regulatory Bodies

EU States

ICAO and Non-European States and Regions

Air Navigation Service Providers

Standardisation Bodies

Academia, R&D Community

Civ/Mil Airspace Users

Drone Industry

SMEs and Start-ups

Professional Staff Associations

Airports

Ground Industry

Airborne Industry

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SESAR 3 JU founding members & partners

Towards a Single European Airspace system

Today

Tomorrow

Limited capacity
Poor scalability
Fixed routes
Fixed national airspace structures

Limited automation

Low level of information sharing

Fragmented ATM infrastructure

STATE A **STATE B**

Higher airspace operations

Network operations

Air traffic services

Data and application services

U-space operations

Infrastructure

Dynamic & cross FIR airspace configuration & management
Free routes
High resilience

Automation support & virtualisation
Scalable capacity

Unified information & U-space interface

Integrated & rationalised ATM infrastructure

STATE A **STATE B**

Key performance objectives

Key performance area	SES high-level goals 2005	Key performance indicator	Relative improvement
Capacity	Enable 3-fold increase in ATM capacity	**Departure delay[3]**,min/dep	10-30%
		IFR movements at most congested airports[4], million	5-10%
		Network throughput IFR flights[5], million	~60%
		Network throughput IFR flight hours[6], million	~75%
Cost efficiency	Reduced ATM services unit costs by 50% or more	**Gate-to-gate direct ANS cost per flight[1]·** EUR(2012)	30-40%
Operational efficiency	-	**Gate-to-gate fuel burn per flight**, kg/flight	5-10%
		Additional gate-to-gate flight time per flight, min/flight	50-55%
		Within the: Gate-to-gate flight time per flight[3], min/flight	
Environment	Enable 10% reduction in the effects flights have on the environment	**Gate-to-gate CO_2 emissions**, tonnes/flight Includes additional and unimpeded emissions	5-10%
Safety	Improve safety by factor 10	**Accidents with direct ATM contribution[5]**, #/year Includes in-flight accidents as well as accidents during surface movement (during taxi and on the runway)	100%

Delivering results and preparing for the future

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🏁 **70 projects** completed bringing to a close SESAR 2020

💡 **127 solutions** delivered for implementation

💡 **59** more solutions in the innovation pipeline

💡 **More on the horizon** with SESAR 3 JU

🚩 **53** new projects running in 2023 covering **all strands of research**

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Digital
SESAR solution catalogue
Now live!

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Delivering solutions that yield real and timely benefits

53 projects in operation
Representing a total investment of over
EUR 450 million

- Connected and automated ATM
- Air-ground integration and autonomy
- Capacity-on-demand and dynamic airspace
- U-space and urban air mobility
- Virtualisation and cyber-secure data sharing

- Multimodality and passenger experience
- Aviation green deal
- Artificial Intelligence for aviation
- Civil/military interoperability and coordination

Smart   **Sustainable**   **Resilient**

Supporting net zero aviation

Connected and contributing to strategy on net-zero policy for aviation at ICAO and European levels;

Digital European Sky programme has dedicated flagships on environment, focusing on reducing CO_2 and non-CO_2 emissions;

Very large-scale demonstrators focusing on quick wins and eliminating inefficiencies at all phases of flight.
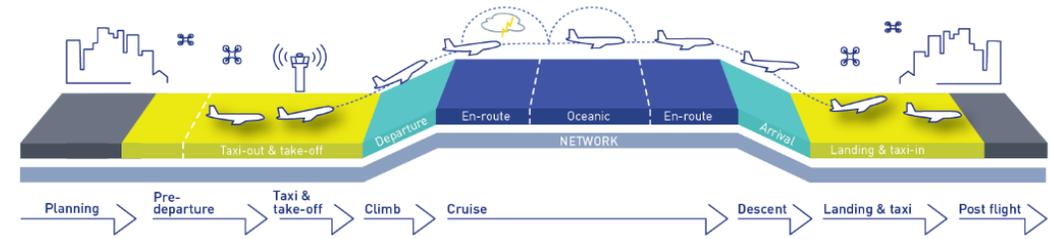
100 out of the 127 delivered SESAR solutions have positive effects on the environment and more solutions are in the pipeline.

The estimation is that **the mature SESAR solutions could already enable a reduction of 4% in CO_2 emissions.**

Ambition to go up to **10%** with **new innovations**.

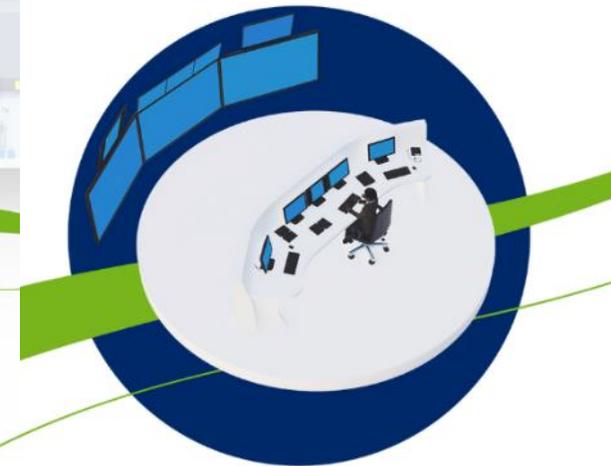# "green" trajectory enabled by ATM

Focused on **gate-to-gate efficiency gains** through combining SESAR solutions:
- European airspace design and utilisation
- Flight planning and network operations
- Civil-military coordination
- Integration of new energy-efficient / zero emission aircraft into ATM
- Airport: surface management and taxiing
- Take-off/landing
- Climb, en-route and descent operations

- Designed to be **interoperable** and **adaptable** to diverse operating environments;

- Large-scale **demonstration** – flight trials

- Available for **market uptake** and implementation.

SESAR green solutions (I)

Optimised climb and descent operations

What: A move away from staircase descent and climb operations, where aircraft repeatedly level off and power up the engines, which burns more fuel.
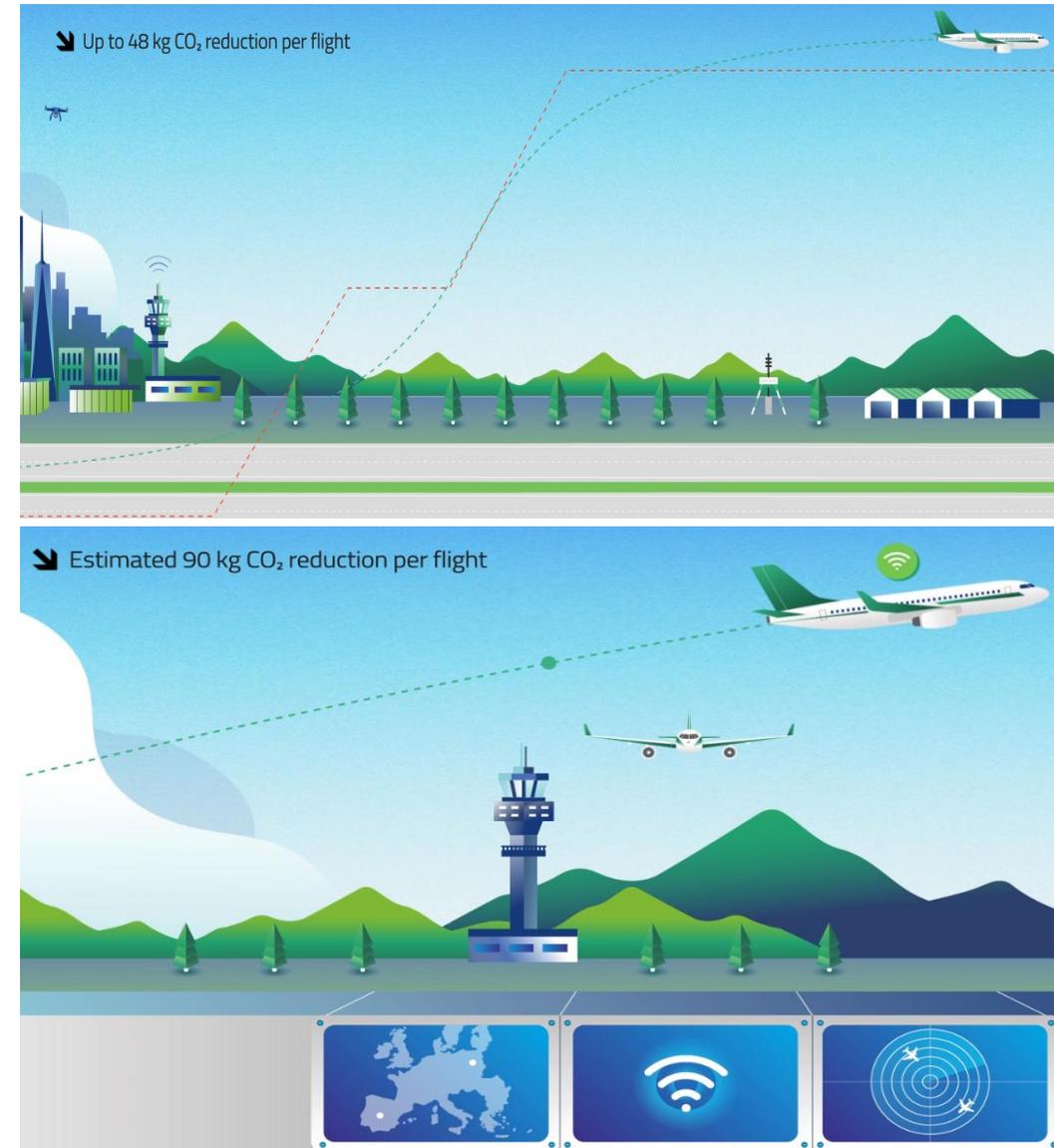
Benefits:
Reduction of 180 Kg of CO2 per flight *(Descent)*
Up to 48 Kg of CO2 per flight *(Climb)*

Advanced use of datalink for enhanced vertical clearances – trajectory-based operations

What: Takes advantage aircraft performance data downlinked via datalink to the ground to allow longer vertical clearances, avoiding the need for intermediate level-offs.

Benefits: Estimated 90 Kg CO2 reduction per flight
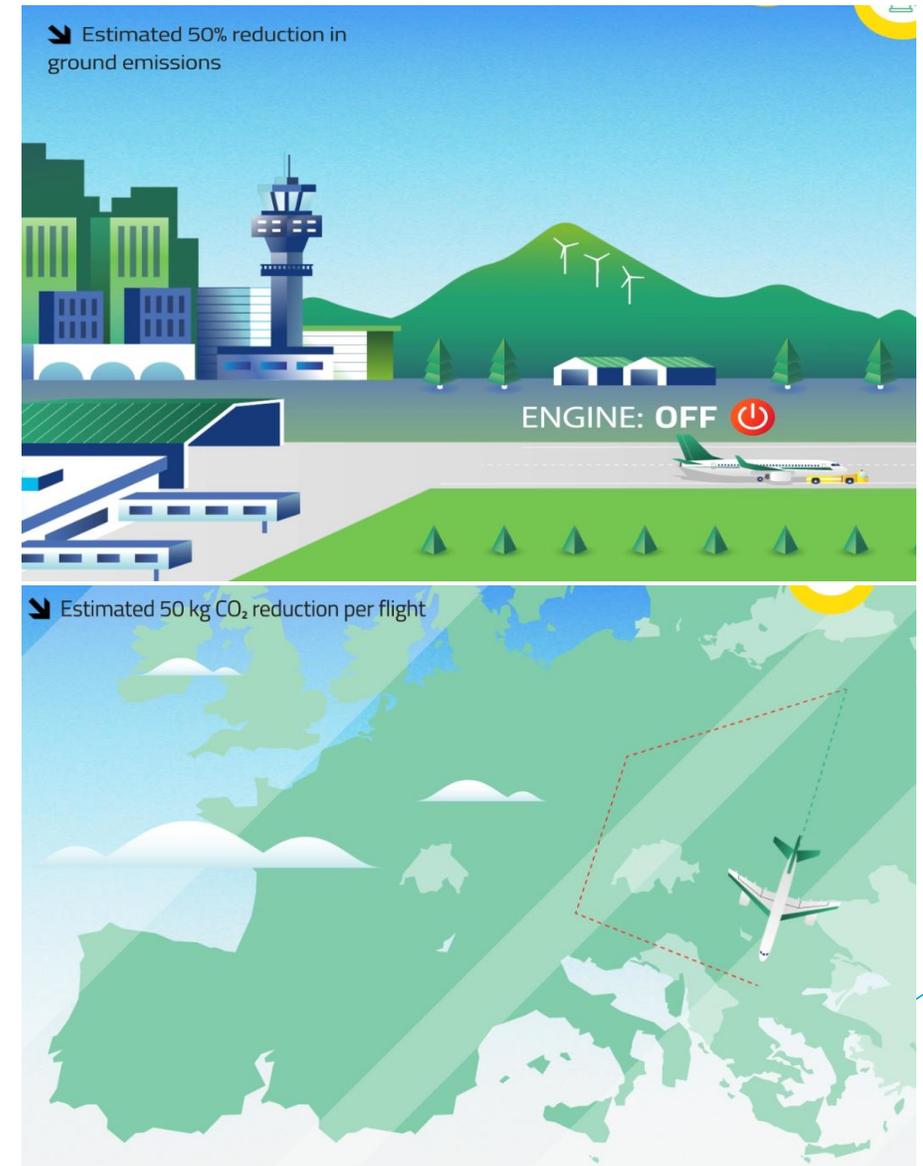

Up to 48 kg CO₂ reduction per flight

Estimated 90 kg CO₂ reduction per flight

SESAR green solutions (II)

E-taxiing techniques

What: Enables aircraft to switch of one or both engines during taxiing.
Benefits: Estimated 50% reduction in ground emissions

Free routing

What: Airlines do not have to follow a fixed route network, but fly the optimised route in terms of flight time and fuel efficiency.
Benefits: Estimated 50 Kg CO_2 reduction per flight

Non-CO2 emissions

What: The warming effect of non-CO2 emissions can be dramatically reduced by aircraft avoiding climate-sensitive areas. SESAR is investigating ways to reroute aircraft around these areas, thereby enabling more eco-efficient flights.

Estimated 50% reduction in ground emissions

ENGINE: **OFF**

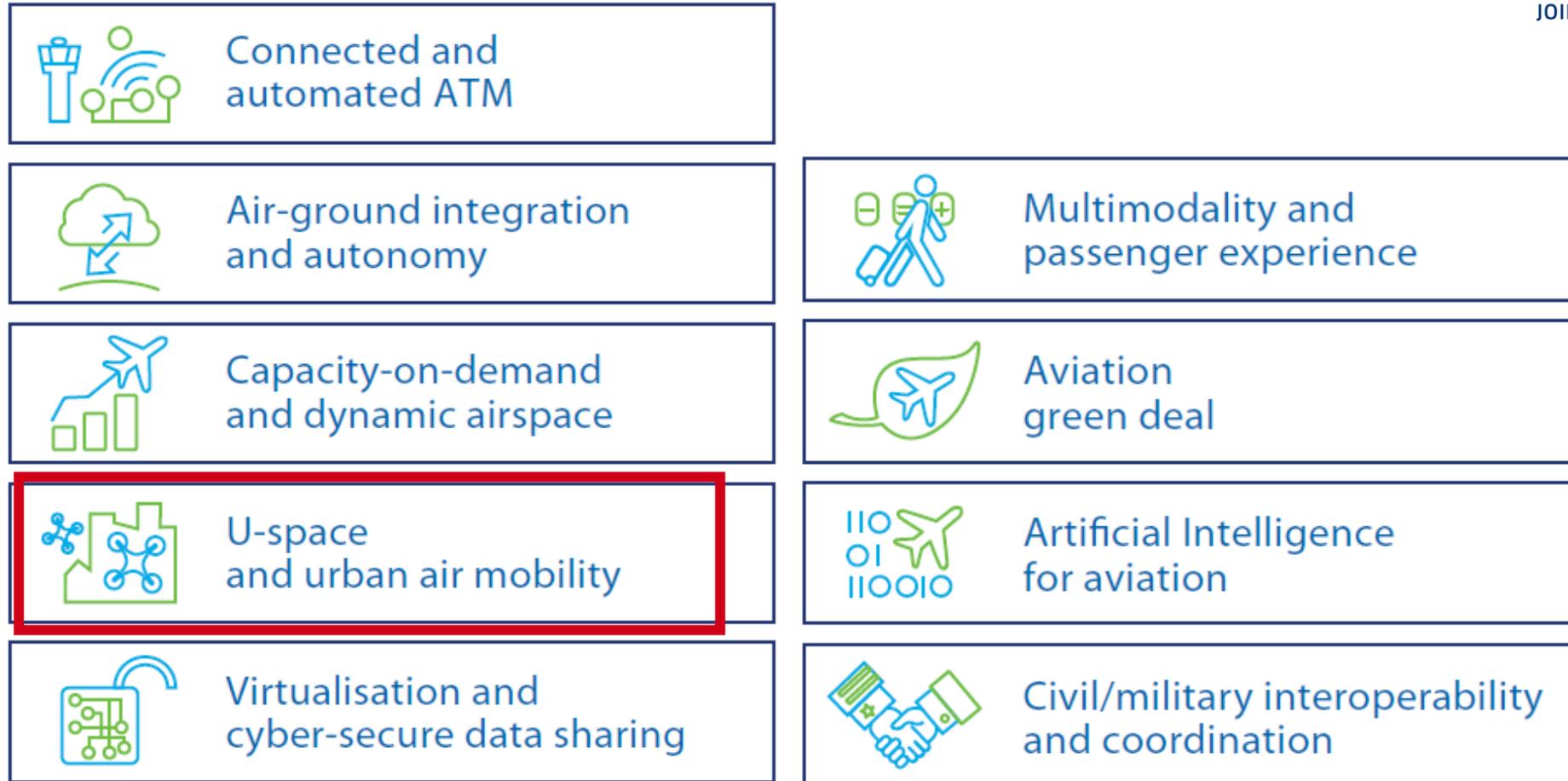Estimated 50 kg CO_2 reduction per flight

Impact of future zero-emission aircraft on ATM

- Define **scenarios of future fleet** composition & model the resulting air traffic demand
- Analyse **impact on airspace structure**
- Explore **implications for airline operations**
- Consider **network management processes** & changes to **airport capacity**

SESAR 3 JU active in the Alliance for Zero-Emission Aviation (Working Group 5)

Delivering solutions that yield real and timely benefits

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Smart   **Sustainable**   **Resilient**
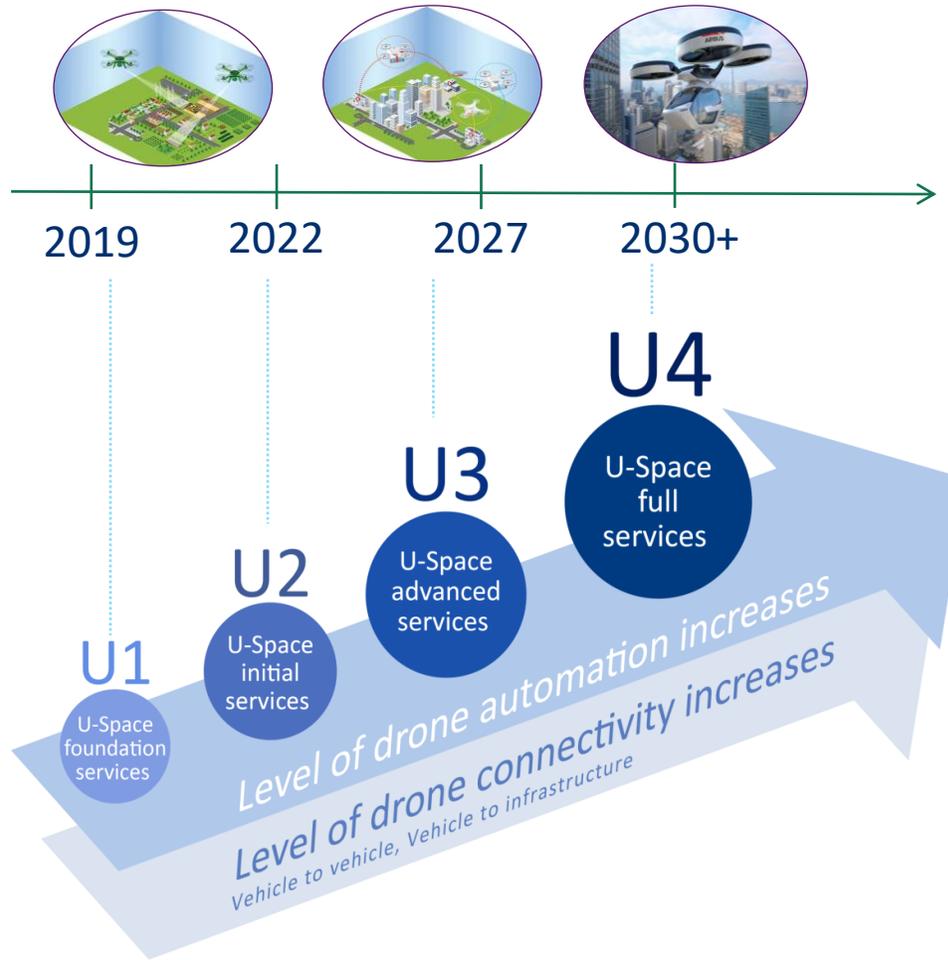
U-space and urban air mobility

An enabling framework for the safe and secure integration of unmanned vehicles

U·space

U-SPACE CONCEPT OF OPERATIONS (CONOPS)

FOURTH EDITION

Updated in 2023!

Co-funded by the European Union   EUROPEAN PARTNERSHIP   sesar JOINT UNDERTAKING

2019   2022   2027   2030+

U4 U-Space full services

U3 U-Space advanced services

U2 U-Space initial services

U1 U-Space foundation services

Level of drone automation increases

Level of drone connectivity increases
Vehicle to vehicle, Vehicle to infrastructure

U1

Foundation services
- e-identification
- e-registration
- geo-awareness

U2

Initial services
- Flight planning and approval
- Tracking
- Traffic information

U3

Enhanced services
- Dynamic capacity management
- Tactical conflict resolution

U4

Full services
- Collaborative interface with ATC
- Additional new services

U-space research and innovations challenges

- Mature, validate and deploy across Europe the basic U-space services
- Enable urban air mobility (UAM) / Innovative Air Mobility (IAM)
- Support ATM/U-space integration
- Transfer of U-space automation technology to ATM
- Advance CNS and separation minima
- Address financial, legal, social aspects and provide safety assurance
- Support the development of the U-space regulatory framework and required standards
- Develop U-space performance framework
- Explore applications above VLL airspace

U-space projects underway in SESAR

3 — Exploratory Research

- Social acceptance framework
- Environmental impact metrics
- AI-based tools

5 — Fast Track Innovation and Uptake

- Vertiport operational processes
- Environmental impact metrics
- Air-ground integration
- Standardised data models and architecture
- Dynamic airspace configuration service
- Separation management
- Dynamic capacity management
- Detect and avoid

3 — Digital Sky Demonstrators

- Demonstrations planned in Belgium, France, Italy, Ireland, Spain, the Netherlands advancing U-space services and urban air mobility.

Get updates at www.sesarju.eu/u-space

Research community - participation in SESAR

SESAR 2020

583 Higher education establishments (HES) & Research organisations (REC)

Digital European Sky
Exploratory research
168 HES & REC

Industrial research
109 HES & REC

SESAR 3 JU Scientific Committee

Mission: Advising the SESAR 3 JU about the scientific priorities including scope of calls for proposals

Composition: Chaired by Tatjana Bolic, University of Westminster

Dr. Rosa Maria Arnaldo Valdes, Universidad Politécnica de Madrid

Dr. Sara Bagassi, Università di Bologna

Dr. Juan Besada, Universidad Politécnica de Madrid

Dr. Tatjana Bolic, University of Westminster

Dr. Daniel Delahaye, Ecole Nationale de l'Aviation Civile

Dr. Peter Hecker, Technical University of Braunschweig

Dr. Efstathios Malakis, Hellenic Civil Aviation Authority

Dr. Fedja Netjasov, Faculty of Transport and Traffic Engineering

Dr. Rita Somogyi, Asura Technologies

A taste of our new exploratory research projects

18 Exploratory Research

Green-GEAR

- investigate environmental potential of geometric altimetry enabled by satellite navigation.
- investigate the potential of incentives to opt for climate optimised routes

ASTRA

- to predict and resolve hotspots much earlier than today using an AI-enabled tool.
- to optimise capacity while enabling aircraft to adhere to more efficient and green trajectories.

MultiModX

- to develop a set of data analytics and modelling tools to support the implementation of multimodal airport access solutions based on shared autonomous vehicle fleets and unmanned aerial vehicle fleets.

Funding opportunities

- Second exploratory research call is open (HORIZON-SESAR-2023-DES-ER-02).
- Two work areas: "**ATM excellence science research and outreach**" and "**ATM application-oriented research**".
- The deadline for submitting proposals is **15 November 2023**.

More info: https://www.sesarju.eu/news/new-call-proposals-launched

Knowledge transfer & networking opportunities

13th SESAR Innovation Days

- Papers
- Presentations
- Posters
- SESAR Young Scientist Awards

More info: https://sesarju.eu/SIDS2023

SESAR 3 JU Knowledge Transfer Network - Engage 2

- Thematic challenges
- PhD funding
- Catalyst project funding
- Knowledge sharing

More info: https://engagektn.com/engage2/

Update of European ATM Master Plan

- The agreed roadmap on delivering the Digital European Sky.

- Contains vision, operational concept, research priorities, performance view, business view and deployment aspects.

- Campaign to update the Master Plan starts **10 October 2023**.

- Overall theme: **"establish Europe to become the most efficient and environmentally friendly sky to fly in the world"**.

- Adoption by the SESAR 3 JU Governing Board in December 2024.

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YOUR ATTENTION