

SESAR INNOVATION PIPELINE

Air traffic management research and innovation
2024 Highlights



About SESAR JU

The SESAR Joint Undertaking is an institutionalised European partnership between private and public sector partners set up to accelerate through research and innovation the delivery of the Digital European Sky. It is harnessing, developing and accelerating the take-up of the most cutting-edge technological solutions to manage conventional aircraft, drones, air taxis and vehicles flying at higher altitudes.

The SESAR JU partnership brings together the EU, Eurocontrol, and more than 50 organisations covering the entire aviation value chain, from airports, airspace users of all categories, air navigation service providers, drone operators and service providers, the manufacturing industry and scientific community.

The partnership also works closely with the regulatory and standardisation bodies, notably EASA and Eurocae, as well as key stakeholders, such as professional staff organisations, the space and military communities and global partners.

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The SESAR Innovation Pipeline

The SESAR JU's Digital European Sky research and innovation programme leverages the latest digital technologies ("SESAR Solutions") to increase the levels of automation, cyber-secure data sharing and connectivity in air traffic management, as well as to enable the virtualisation of its infrastructure and air traffic service provision in all types of airspace, including for very-low and high-altitude operations. In doing so, these technologies enable the system to become more scalable and agile, while building resilience to disruptions, changes in traffic demand and diversity of air vehicles. These attributes are all key to future proofing the system in a smart and sustainable way.

To deliver the Digital European Sky, the programme is designed as an innovation pipeline, made up of exploratory research, industrial research and validation, fast-track and demonstrators, where ideas are transformed into tangible solutions.

The research takes place in test beds across Europe (simulation platforms, on-board commercial flights, dedicated airport testbeds and air traffic control centres), which validate concepts and candidate solutions. The testing is not limited to a specific location but can be used to test multiple environments irrespective of the location where the physical validation is held..



SESAR Innovation Pipeline



2024 project portfolio update

In 2024, the Digital European Sky research and innovation programme continued to accelerate progress, with significant milestones achieved across all strands of the innovation pipeline.

Exploratory research

In September, 18 new exploratory research projects were launched, bringing the total to 36 projects. These initiatives aim to push the boundaries of air traffic management (ATM) innovation, exploring cutting-edge ideas and fostering knowledge exchange to cultivate a highly skilled future workforce. *See page 13 for highlights from this strand of this research.*

Industrial research and fast-track validation

Work intensified for the 32 industrial research and fast-track projects, which are now actively validating a new catalogue of solutions. These projects target critical transformation areas, such as emissions reduction, artificial intelligence-enabled automation, resilient ATM service provision, and the seamless integration of drones (U-space), urban air mobility, multimodality, and climate-neutral operations. *See page 25 for highlights from this strand of this research.*

Digital Sky Demonstrators

The Digital Sky Demonstrators (DSDs) were expanded further. In July 2024, a new demonstrator, PEACOCK, was launched, raising the total number of DSDs to nine. Digital Sky Demonstrators take place in live operational environments with the main objective to implement the technological solutions necessary to deliver the Digital European Sky. *See page 37 for highlights.*

Synergy projects

For the first time, SESAR JU and Europe’s Rail selected a joint synergy project, TRAVEL WISE, which addresses multimodality and the integration of rail and air transport systems. This collaboration underscores the commitment to a more connected and sustainable European transport ecosystem.

Overall portfolio

In total, the SESAR Joint Undertaking now manages 78 active projects across its nine flagship areas, showcasing the comprehensive effort to achieve the vision of a Digital European Sky. These projects represent a collective investment of over EUR 650 million through Horizon Europe and the Connecting Europe Facility.

The portfolio’s growth and advancements reflect a step-change in European ATM, reinforcing its role as a global leader in delivering cutting-edge, sustainable, and resilient aviation solutions.

FLAGSHIPS	FUNDAMENTAL RESEARCH	ATM APPLICATION-ORIENTED RESEARCH		INDUSTRIAL RESEARCH			FAST TRACK INNOVATION AND UPTAKE	DIGITAL SKY DEMONSTRATORS			
	ASTAIR HYPER SOLVER	CODA ANTENNAE	ASTONISH SATERA	FCDI	MIAR			ESMA			
		ATMACA RESPONSE	TADA	SOLO ECHO 2	NETWORK ATC-TBO	TBO IRINA FCA					
	HUCAN ANTICIPATE	DEEPFLOW	SMARTS	ISLAND			FASTNET KAIROS				
	IMAFUSA MUSE	CORUS FIVE U-AGREE	AI4HYDROP				EUREKA OPERA	SAFIR-READY ENSURE	SPATIO	BURDI EALU-AER	U-ELCOMME
	SEC-AIRSPACE	VISORS		ISNAP		IFAV3	CNS DSP	VITACY		EXODUS	DEVICE
	MAIA	PRIAM	MULTIMODX	TRAVEL WISE			SIGN-AIR				
	AEROPANE E-CONTRAIL	F4ECLIM	GREEN-GEAR STEPLESS	CICONIA CONCERTO	GALAAD	GEESE DYN-MARS			ECHOES HERON PEACOCK		
	SYNTHAIR TRUSTY	ORCI	ASTRA AWARE	DIALOG	JARVIS		DARWIN				
	ATM-EXCITE			MITRANO	HARMONIC						
Knowledge transfer	ENGAGE 2	Transversal			AMPLE3	PEARL					



Europe unveils new plan to modernise critical infrastructure for aviation

In December, the SESAR JU released the European ATM Master Plan 2025, the roadmap for modernising air traffic management and making Europe the most efficient and environmentally friendly sky to fly in the world by 2045.

The result of extensive stakeholder collaboration, the ATM Master Plan 2025 provides important strategic direction for investments and regulatory decisions. The plan outlines 10 investment priorities for the next decade, supporting the twin transitions of digitalisation and sustainability. A major change is the adoption of a data-driven, [cloud-based service-delivery model](#), enabling faster deployment of new features and better interoperability.

The plan also underscores the need for continued research and innovation, outlining 12 development activities that must be prioritised to help accommodate new users like drones and higher airspace operators, introduce higher levels of automation, and strengthen the security posture of ATM.

The transformation outlined in the plan holds significant value for the economy and society at large. A more efficient and reliable air transport system will enhance connectivity, boosting economic growth and development across the continent. It will also play a key role in the sector's green transition. By 2040, there should be a return on investment of EUR 7 for every euro spent and up to 200 million tonnes of CO₂ emissions will be saved. By 2050 those figures rise to EUR 17 for every euro spent, and up to 400 million

tonnes of CO₂ emissions saved – equivalent to nearly three years of Europe's total aviation emissions.

Welcoming the plan, the European Commissioner for Sustainable Transport and Tourism, **Apostolos Tzitzikostas** said: *"I envision transport leading Europe's transition to a sustainable and competitive future, benefiting all Europeans. Aviation faces significant challenges, including security threats, increasing demand for flights, the urgent need to cut emissions, and inefficiencies in air traffic management. This new Master Plan is a united, forward-looking response, propelling the sector into the digital age while building a more resilient and efficient air transport network."*

Andreas Boschen, Executive Director, SESAR JU added: *"Today marks the beginning of more focussed and urgent work on ATM modernisation. This roadmap is a game-changer. For the first time, it prioritises deployment objectives to guide investments and accelerate uptake. And in another first, it looks in detail at the remaining development priorities to achieve the Digital European Sky. We are aware of the challenges that lie ahead. To achieve our goal, we need a fit-for-purpose economic and technical regulatory framework, support for early movers, and the involvement of the entire ATM workforce in managing the transformation."*

"The next ten years are crucial because without real progress, particularly on the service delivery model, the system will not cope with the expected traffic demands. So, let's seize this opportunity to move forward together with clarity and conviction, ensuring Europe becomes the most effective and environmentally friendly sky to fly in the world by 2045, he added."

View the Master Plan online. www.seasrju.eu/MasterPlan2025

SESAR among the pathways to boost Europe's competitiveness, confirms Draghi Report

The accelerated implementation of SESAR Solutions and the continued digitalisation of air traffic management are among the pathways identified to boost the future competitiveness of Europe, according to the Draghi Report published on 9 October.

The report released by Mario Draghi, *The future of European competitiveness* details three main areas for action to spur sustainable growth:

- closing the innovation gap with other world regions, especially in advanced technologies;
- seizing opportunities to accelerate decarbonisation and competitiveness;
- increasing security and reducing dependencies.

The nearly 400-page report makes recommendations both sectoral (e.g. AI, transport) and horizontal (innovation, skills, governance) to ensure the EU remains competitive in the future.

In the area of air transport, and more specifically, air traffic control services, the report notes that *"Of the existing technologies developed which could be used to optimise air traffic control, only a limited number have been rolled out due to technical, coordination and regulatory challenges."* It goes on to say that, *"the implementation of the technology pillar of the EU's Single European Sky (SESAR Solutions) is forecast to bring a EUR 419 billion boost to GDP during the 2013-2030 period. Yet, these benefits will be lost if efforts are not stepped up to bring the air transport network up to date."*



The report states that the air transport industry should be required and incentivised to take up SESAR Solutions and technologies defined in the European ATM Master Plan to accelerate digitalisation and to better integrate air traffic management with airline and airport operations.

The report also estimates that EUR 100 billion are required on an annual basis as from 2030 to decarbonise aviation, only a fraction of which (approx. EUR 26 billion for the period 2025 to 2050) will be needed for the implementation of SESAR Solutions.

The findings of the report will contribute to the Commission's work on a new plan for Europe's sustainable prosperity and competitiveness.

Read the [report](#)

Industry leaders commit to new way of delivering services in air traffic management

In 2024, CEOs from the A6 Alliance of air navigation service providers, COOPANS, DFS, DSNA, ENAIRE, ENAV, NATS, PANSAs, Skyguide, and general managers from industry manufacturers, Indra, Leonardo, Frequentis and Thales, signed a joint statement committing to transition to a new service



delivery model for air traffic management in Europe, as defined in the context of the European ATM Master Plan 2025 edition.

This joint statement is an expression of commitment of the signatories to work together to implement as rapidly as possible a new core ATM service delivery model for all operational environments that enables:

- Open ATM patterns enabling integration of components provided by various system providers to facilitate multi-vendor solutions using open platforms and interfaces
- Decoupling of service and infrastructure layers as defined in the ATM Master Plan through Cloud Computing (including the various system components)
- A cloud native architecture of components with standardised and open interfaces that can be deployed on commodity cloud technologies

Read about the call to action: <https://www.sesarju.eu/servicedelivery>

New SESAR JU members to bolster European air traffic management modernisation

In June, NATS and Lilium have officially become members of the SESAR Joint Undertaking (SESAR JU), joining forces with stakeholders from across the aviation industry to deliver the Digital European Sky. The new members joined the 55 existing members for the SESAR JU Governing Board meeting on 25 June.

Filip Cornelis, Director of Aviation DG MOVE and the Chair of the SESAR JU Governing Board shared the positive sentiment of two new members joining the Governing Board of the SESAR JU, saying: *"SESAR JU has now 57 members. It shows the continued attractiveness of the SESAR cooperative environment. NATS and Lilium will bring valuable expertise and a strong commitment to the group."*

Andreas Boschen, Executive Director of the SESAR JU, welcomed the new members, stating, *"The addition of NATS and Lilium to the SESAR Joint Undertaking marks a significant milestone in our journey towards a modern, digitalised European sky. Their expertise and innovative spirit are invaluable as we work together to enhance the safety, capacity, and sustainability of European air traffic management."*

"As a longstanding contributor to the SESAR programme, we are delighted to have our associated membership of the SESAR 3 JU confirmed," said **Martin Rolfe, CEO of NATS.** *"We're grateful to all members of the SESAR JU for the spirit of cooperation they have shown, and we are excited to play a pivotal role in advancing ATM technologies for the benefit of the entire European aviation community."*



"We are very thankful to become a new member in this great initiative. Research and development are very important elements of our business strategy, SESAR projects play an important role," says **Stephen Vellacott, CTO of Lilium.** *"Since 2023, Lilium is actively contributing to two major SESAR projects in the field of eVTOL – OperA and EUREKA. Becoming a SESAR JU member is confirmation of our collaboration over the last years and strongly supports our industry to establish air operations and our own path to entry into service."*

More about SESAR JU members: www.sesarju.eu/members

Market uptake for SESAR AI-based speech recognition technology

An AI-based speech recognition technology developed within the context of SESAR will soon be available on the market for air traffic control at airports, following the licensing of the product by SESAR JU member, the German Aerospace Center (DLR). The technology is set to bring environmental and efficiency benefits, in addition to enhancing the safety of air traffic management.

Pilots and air traffic controllers (ATCOs) rely on voice communications to exchange critical messages affecting flight safety, such as altitude and speed. In current operations, this important information has to be entered manually into the digital assistant tools, which takes time and represents additional workload for the already busy controllers. AI-derived systems that automatically analyse radio communication with

the controller's instructions and the pilot's confirmations can provide effective support for air traffic controllers.

Within the framework of SESAR, the DLR Institute of Flight Guidance in Braunschweig led the [MALORCA](#) and [HAAWAI](#) exploratory research projects to develop a system capable of analysing the words of the radio communication traffic and then understanding the semantic content. This work led to the development of two technology solutions on [automatic speech recognition and understanding](#) and [improving controller productivity](#), as part of two SESAR industrial projects, [Digital Technologies for Tower](#) and [PROSA](#).

Simulation studies using both laboratory and real data demonstrated that these systems could reduce the number of manual inputs required by controllers by a factor of 30. This improvement applies to several air traffic control environments, including en-route flights, approach and departure control,

and the management of aircraft taxiing. The result is a reduced controller workload and increased situational awareness. The research also showed that this reduction in workload enables more efficient traffic management, achieving savings of up to 60 litres of aviation fuel per approach in airport vicinities.

"Our speech understanding system can reduce the workload of air traffic controllers," says **Hartmut Helmke**, the **DLR scientist** in the field of speech understanding in air traffic control who led the SESAR projects. *"In times of a skilled-labour shortage and increasing traffic demand, the relief provided by speech understanding can contribute to more efficient flight guidance and more environmentally sustainable air traffic."*

"SESAR and our long-term involvement in this ambitious programme have been instrumental in bringing our speech understanding to maturity. To see this technology turned into a product which soon may become operational is an exciting development for us," says **Dirk Kügler**, **Director of the DLR Institute of Flight Guidance**.

EML Speech Technology GmbH, an IT product and service provider in Heidelberg, is now taking over this innovative technology under licence from DLR, with a first planned application for the technology for Frankfurt apron controllers.



Read the [full story](#)

About the SESAR Solutions:

[Automatic speech recognition](#)

[Improving controller productivity by ASR at the TWR CWP](#)

About the projects:

[MALORCA](#), [HAAWAII](#), [PROSA](#), [Digital Technologies for Tower](#)

Aircraft equipage paves way for more efficient air traffic management

In February, SESAR JU founding member, Airtel ATN, announced the equipage of 10,000 aircraft with an airborne router to facilitate communications by datalink between pilots and air traffic controllers. The milestone for Airtel ATN is paving the way for the uptake of key SESAR trajectory management solutions, enabling more efficient and safe air traffic operations.

Data communications between pilots and air traffic controllers are designed to replace routine voice exchanges and to link air traffic control ground systems with flight deck avionics to support air traffic clearances, instructions, traffic flow management inputs, and flight crew requests.

Specifically, the equipage will make possible the use of automatic dependent surveillance – contract (ADS-C), allowing aircraft to downlink and share their predicted trajectory (extended project profile, speed schedule) from the flight management system (FMS) to the ground system tools. The data is fed into controller support tools, allowing controllers greater situation awareness, and the ability to better detect and resolve possible trajectory conflicts. Controller-pilot data link communications, CPDLC, allow for a fast exchange of text messages via datalink between air traffic controllers and pilots.

"We are delighted to announce that we have reached another important Data Link milestone," said **Santi Ibarz**, **CEO at Airtel ATN**. *"We now have 10,000 Data Link enabled aircraft, many of which are now flying with latest ATS B2 technology (CPDLC, ADS-C) developed with SESAR support meeting the Commission implementing regulation (EU) 2021/116 of 1 February 2021, the so called Common Project One (CP1) mandate. It's a real testament to the continued commitment and support from our OEM community. Our dedication to shaping the future of aviation communications remains unwavering."*

The SESAR JU is developing technical and operational solutions to meet the [Common Project #1](#) requirement for European air navigation service providers (ANSPs) to exchange trajectory data with flights in Europe from 2027.

Much of this work was done within the context of the now completed [ADSCENSIO large-scale demonstration and 4DSkyways industrial research projects](#), which addressed:

- ground trajectory prediction and separation management/ monitoring tools by using aircraft trajectory data, more precise meteo data, improved algorithms and machine learning techniques.
- complex CPDLC clearances sent in advance of the horizontal, vertical and longitudinal trajectory change to enhance the synchronisation of the airborne trajectory with the ground trajectory.

- ground-ground and air-ground exchanges between the European ATM actors by consolidating the different initiatives and bridging the gaps.
- A trajectory common service as an alternative architecture for trajectory exchanges between ground ATM actors.

Already delivered:

- [ADS-C common service](#)
- [Extended Projected Profile \(EPP\) availability on ground](#)

More about ongoing work on trajectory management and related solutions:

- [ATC TBO project](#)
- [Network TBO project](#)
- [NM profile improvement using ADS-C](#)
- [Air/Ground trajectory synchronisation via lateral and vertical complex CPDLC clearances to support TBO](#)



SESAR at ICAO

Over the course of August-September, the SESAR JU participated in several events at the International Civil Aviation Organization (ICAO), contributing to discussions on the future development of air traffic management and showcasing the innovations on offer through SESAR to make aviation smarter and more sustainable.

14th ICAO Air Navigation Conference (AN-Conf)

26 August – 6 September

The 14th ICAO Air Navigation Conference (AN-Conf), themed “Performance Improvement Driving Sustainability”, brought together over 800 delegates from 110 countries and 28 international organisations. The SESAR JU participated

as part of the EU delegation together with officials from the European Commission (DG MOVE) and the European Union Aviation Safety Agency (EASA).

Discussions focused on working papers presented by the ICAO Secretariat and member states, with Europe contributing seven papers addressing critical topics such as higher airspace operations (HAO) and trajectory-based operations (TBO). The conference outcomes aligned with SESAR JU strategic priorities, particularly the agreement to advance HAO development and establish a comprehensive approach for TBO.

Additionally, the SESAR JU participated as part of the EU delegation in bilateral meetings with representatives from the USA, Canada, Brazil, Singapore, Japan, and China. These discussions reinforced SESAR JU’s commitment to fostering international collaboration in aviation safety and efficiency.



Advanced Air Mobility (AAM) Symposium

9-12 September



The inaugural symposium attracted 1,400 attendees, with a very strong and visible presence from European partners. During a key session, SESAR JU and its project partners presented progress in Europe on advanced air mobility, discussing the critical interrelationships between airspace design, operating rules, and service providers. Robin Garrity from SESAR JU underlined the need to be pragmatic, building on existing procedures to accommodate traffic safely and efficiently, while learning from experience and developing the new advanced ecosystem for AAM as demand increases.

During the symposium, the SESAR JU stand attracted plenty of visitors who had an opportunity to meet experts and learn about innovative projects, such as EALU-AER, OperaA, AI4HyDrop, U-ELCOM, SPATION, BURDI, ENSURE, CORUS five, U-AGREE, SAFIR-Ready, EUREKA

More about the [participating projects](#)

Symposium on Non-CO₂ Aviation Emissions

16-18 September

The three-day event focused on the latest scientific insights into aviation's climate impacts beyond CO₂ emissions and options for addressing them. While the effects of aviation's CO₂ emissions are well understood, uncertainties about the effects of the various non-CO₂ emissions persist. The symposium served to discuss these challenges and explore mitigation strategies.

SESAR JU welcomed ICAO Secretary General Juan Carlos Salazar to its stand, where he learned about the innovations aimed at making European skies the most efficient and environmentally friendly in the world. SESAR JU Programme Manager, Stella Saldana participated in a panel alongside industry leaders, highlighting ongoing SESAR research focused on innovative operations to reduce non-CO₂ emissions.

At the SESAR JU stand, attendees had the chance to meet experts from several SESAR JU projects addressing non-CO₂: AEROPLANE, CICONIA, E-CONTRAIL, CONCERTO, ECHOES.

More about the [participating projects](#)



SESAR Innovation Days 2024: A catalyst for ATM transformation

The 14th SESAR Innovation Days (SIDs), held from 11-15 November in Rome, brought together over 600 researchers, industry experts, and policymakers to explore advancements in air traffic management (ATM) research and innovation. Organised by SESAR Joint Undertaking (JU) and hosted by Aeroporti di Roma, ENAV, and Leonardo, the event featured 37 posters, 54 technical papers, and sessions on topics including climate-optimised trajectories, innovative air mobility, and quantum computing.

Discussions focused on making aviation more efficient and environmentally-friendly, integrating new entrants like drones, and the potential impact of quantum technology on ATM. Site visits to Aeroporti di Roma and ENAV showcased practical innovations in sustainability and digital air traffic control.

The event also featured the SESAR Young Scientist Award, recognising groundbreaking contributions from students and early-career researchers. Yutong Chen from Cranfield University won the PhD category for his research on conflict management in crewed and uncrewed operations, while Samuel Christian Heilein from DLR won the student category for his work on radar altimetry.

SESAR JU concluded the event by announcing plans for the 2025 SIDs in Slovenia.

Andreas Boschen, SESAR JU Executive Director said: *"Events like SESAR Innovation Days are essential for pushing the boundaries of what's possible in air traffic management,"* said Andreas Boschen, Executive Director of the SESAR JU. *"They provide a unique platform for knowledge exchange, bringing together*

academia and industry to collaborate on solutions to our sector's most pressing challenges. This collaboration is vital as we work towards delivering a Digital European Sky—one that is efficient, sustainable, and resilient. By fostering these connections, we are able to transform ambitious ideas into practical innovations, bringing us ever closer to our shared vision."



Trajectory-based operations take centre stage at global symposium in Brussels

The first-ever Global Trajectory-Based Operations (TBO) Symposium, organised by the European Commission, European Union Aviation Safety Agency (EASA), EUROCONTROL, SESAR Deployment Manager, and SESAR Joint Undertaking, took place in Brussels from 4 to 6 June 2024. The event gathered 300 participants from 90 organisations across 36 countries to explore the potential of TBO in enhancing aviation with greater predictability, increased capacity, and a reduced environmental footprint.

The discussions covered enabling technologies, real-world applications, and the regulatory efforts required for global TBO implementation. Experts from regions such as the US, Japan, Canada, and Singapore shared their experiences, emphasising that TBO implementation is a gradual process, tailored to regional needs.

In Europe, TBO progress is being driven by the SESAR deployment programme, with expected significant gains in emissions, productivity, and capacity once fully scaled. Ongoing SESAR research focuses on optimising trajectory prediction, flight planning, and leveraging AI and automation to enhance operations.



The symposium concluded with a call for a comprehensive roadmap to implement TBO in Europe, which is outlined in the European ATM Master Plan published later in December 2024, aiming for full TBO implementation by 2040. The event also featured exhibits showcasing innovative TBO technologies, highlighting the future of air traffic management.

[Read Andreas Boschen's blog about TBO](#)

More about our TBO projects

[NETWORK TBO](#)
[ATC-TBO](#)

Aeroporti di Roma wins SESAR JU-ACI Europe digital transformation award



In July, Aeroporti di Roma was awarded the SESAR JU-ACI Europe Digital Transformation Award. The airport was recognised at the annual ACI EUROPE Best Airport Awards during the ACI EUROPE Annual Congress & General Assembly, which took place in Istanbul.

This is the second time that Aeroporti di Roma has been awarded the prize, which celebrates airports which have successfully embraced digitalisation, adopting innovative technologies and procedures to improve the safety, capacity, efficiency and environmental footprint of its airside operations.

Aeroporti di Roma impressed the judges with its strong track record when it comes to digital transformation, making use of AI and other technologies to enhance connectivity with other modes of transport and improve operational efficiency. The airport has a robust innovation strategy with an incubator supporting 50 startups and is an early mover in urban air mobility with new services to be launched by the end of 2024.

Aeroporti di Roma is a founding member of the SESAR 3 Joint Undertaking.

[Full details of the awards ceremony](#)

SESAR at Airspace World 2024

Nearly 7,000 delegates attended the Airspace World event in Geneva from 19-21 March, where SESAR JU showcased the latest from the Digital European Sky programme as part of the “Europe for Aviation” team. The event featured briefings, exhibits, and demos highlighting collaboration between European aviation organisations working on the Single European Sky. SESAR JU and the SESAR Deployment Manager also signed a memorandum of cooperation.



Additionally, 10 SESAR Walking Tours, organised in partnership with SESAR DM, attracted 500 participants. The tours provided an opportunity to explore a variety of air traffic management solutions and enabling technologies across Europe, from innovation to deployment.



Digital European Sky showcased at Transport Research Arena (TRA)

The SESAR JU joined forces with Europe's Rail, Clean Hydrogen, and Clean Aviation at the Transport Research Arena (TRA) in Dublin from 15-18 April, showcasing the power of partnership. The event highlighted mobility trends, best practices, and how research and innovation could reshape transport systems.



On 14 April, SESAR JU arranged a visit for **Magda Kopczyńska, Director-General for Mobility and Transport**, to SESAR JU member, AirNav Ireland, and its air traffic control tower. She discussed the importance of advancing technical solutions for air traffic safety and climate change mitigation. *"Collaborative efforts are crucial to ensure the aviation sector is future-ready and capable of meeting its critical climate objectives,"* she remarked.

The conference featured various sessions on topics such as multimodality, urban air mobility, and synergies between funding streams. SESAR JU also met with its Irish members and showcased projects like the SESAR Digital Sky Demonstrator. The event included an educational session for students, highlighting career opportunities in air traffic management.

More [about the event](#)

SESAR innovation in the spotlight at FLY AI Forum

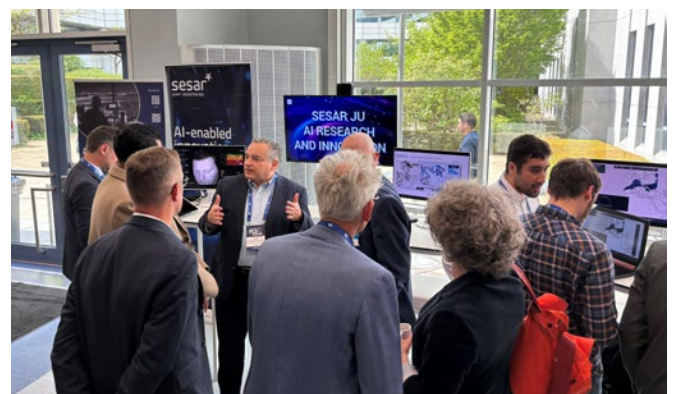
[SESAR Joint Undertaking | SESAR innovation in the spotlight at FLY AI Forum](#)

On 29-30 April, FLY AI partners* organised a two-day conference to explore the latest developments and deployments of artificial intelligence (AI) and machine learning (ML) in aviation. Hosted by FLY AI partner, EUROCONTROL, the conference included updates from the European Commission on AI regulatory matters, the discussion of practical-use cases of AI benefits to aviation, an exhibition of projects and success stories, and an overview of ongoing research and training activities.

Research and innovation continues in the SESAR Digital European Sky programme with a portfolio of projects, many of which presented their activities during the main conference and exhibition. Some applications include airport and tower surveillance (**TRUSTY**), certification (**HUCAN**), traffic hotspots

(**ASTRA**, **HARMONIC**), smart sectorisation (**SMARTS**), drone operations (**AI4HyDrop**) digital assistants (**JARVIS**, **DARWIN**), dynamic reconfiguration of airport resources (**FASTNet**), multimodality (**MAIA** and **MULTIMODX**), and forecasting (**KAIROS**), just to name a few.

[More about AI in SESAR](#) research and innovation



SESAR at CANSO drone exhibition in European Parliament

SESAR projects supporting urban air mobility and drone traffic management had a chance to showcase their work to members of the European Parliament from 19-23 February. Organised by CANSO Europe with the support of European Parliament MEP Vice-President [Jan-Christoph Oetjen](#), the exhibition demonstrated the collaborative efforts to ensure the safe and secure integration of drones and electric vertical take-off and landing (eVTOL) aircraft into European airspace.

Speaking about the exhibition, **European Parliament Vice-President, Mr Oetjen** said: *"The EU drone eco-system must closely work together to unfold the sector's full potential. The Drone Strategy 2.0 is a good basis, but we need more efforts from the EU Member States in its implementation and harmonised solutions that do not undermine drone operations at borders. Sufficient funding in the future is a priority to ensure scaling-up of the market and development of the technology. A European drone label could create more trust and acceptance amongst users when operating."*





SESAR EXPLORATORY RESEARCH

Kick-off for 18 new SESAR exploratory research projects

In September, 18 exploratory research projects officially kicked off. Selected for funding within the framework of its ambitious Digital European Sky research and innovation programme, the projects address a wide range of topics aimed at generating innovative concepts, methodologies and technologies, all with a view to making air traffic management in Europe smarter and more sustainable.

The projects represent a total investment of EUR 26 million by the aviation industry and the European Union through Horizon Europe.

The aim with the selected projects is to foster new and innovative ideas connected to EU policy to transform air traffic management in Europe, as well as encouraging coordinated exchange of knowledge and stimulating the future ATM skilled workforce. It is composed of two work areas, namely "ATM excellence science research and outreach" and "ATM application-oriented research".

The call topics are part of the research and innovation priorities outlined in the SESAR JU's [multi-annual work programme](#) and in the more recently published [bi-annual work programme](#). They cover a wide range of areas that are needed in order to deliver the Digital European Sky, according to the timeframe of the [European ATM Master Plan](#).

The projects were selected as a result of a call for proposals launched in 2023 followed by a rigorous evaluation of the submitted proposals by independent experts.

See page X for a full list of the ongoing exploratory research projects.



New projects for smart & sustainable air traffic management

18 EXPLORATORY RESEARCH PROJECTS

26 MILLION EUR IN FUNDING

SESAR Young Scientist award 2024 celebrates Europe's rightest emerging minds in air traffic management

Europe's most promising young talent in air traffic management (ATM) research were honoured at the SESAR Young Scientist Award ceremony, held during the closing plenary of the SESAR Innovation Days conference on 15 November in Rome.

Awarded annually, the SESAR Young Scientist Award aims to recognise early-career researchers who have excelled in ATM and aviation-related fields. The award not only celebrates scientific excellence but also supports young researchers by offering them further professional development opportunities. Another goal of the award is to highlight the potential of young talent to bring fresh perspectives and solutions to the challenges facing ATM and aviation.

EUROPEAN PARTNERSHIP

Co-funded by the European Union

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JOINT UNDERTAKING

The top honour in the PhD category went to **Yutong Chen** from Cranfield University for his groundbreaking research on strategic and tactical conflict management, addressing both crewed and uncrewed operations. The jury praised his innovative use of reinforcement learning (RL) to tackle complex conflict resolution (CR) challenges in air traffic. *“The research significantly advances the state of the art, offering innovative techniques that align closely with SESAR’s mission to modernise and enhance European air traffic management systems,”* noted the jury.

Second place in the PhD category was awarded to **Andreas Dilan Jean Guitart** from École Nationale de l’Aviation Civile. His thesis on the development of algorithms for generating flight trajectories during critical conditions received high marks for its novel use of robotics-based path planning methods in trajectory management, adding a fresh dimension to established research in the field.

Raquel Delgado-Aguilera Jurado from Universidad Politécnica de Madrid (UPM) took third place for her thesis on predicting separation minima infringements, a vital area in air traffic management. The jury commended her work for its well-structured analysis and comprehensive research methodology.



In the student category, the top prize went to **Samuel Christian Heilein** from the German Aerospace Center (DLR), for his research addressing radar altimetry characterisation and the augmentation of ground-corrected barometric vertical navigation in uncrewed traffic management. The jury lauded his work as an impactful solution to a real-world problem, significantly contributing to the evolving framework for handling new aviation complexities.

Second prize in the student category was awarded to **Manuel Lombardi** from La Sapienza University of Rome, who investigated an algorithm for managing Call Sign Similarity (CSS) to improve air traffic safety. His thesis received positive comments for its relevance and innovative approach.

Third place went to **Julia Schön** from Friedrich Schiller University Jena and DLR for her work on creating a virtual reality tower workstation for small uncontrolled aerodromes, studying its ergonomics and usability. The jury noted the thesis’s strong foundation in relevant literature and the valuable practical insights from involving air traffic controllers.

Andreas Boschen, Executive Director of SESAR JU, congratulated the winners and all participants, saying: *“Congratulations to all our winners, Chen Yutong and Samuel Christian Heilein, as well as to all applicants and shortlisted candidates. Young talent breathes new life into our industry—bringing bold ideas, creativity, and an unyielding drive to push the boundaries of what’s possible. These are the essential ingredients in our journey to build the Digital European Sky.”*

[More about the prize](#)



A new era in synthetic data generation



A new era in synthetic data generation in aviation is on the horizon with the SynthAIR project. As Massimiliano Ruocco, coordinator, explains, the project is a response to the scarcity of relevant data for aviation and the inherent limitations of AI models in handling diverse datasets.

What is synthetic data and why is it needed? Why is it so important in automation?

Synthetic data is artificially generated data that mirrors real-world data, offering a powerful, privacy-compliant tool for training AI systems. Essential in automation, it enriches data diversity, bypasses privacy issues, and accelerates AI development.

What risks are there in using synthetic data and how can they be derisked?

The risks associated with synthetic data do often reflect its benefits. Among them I believe the most relevant are those related to 1) bias and privacy issues and 2) validation challenges and overfitting. In the first case, synthetic data can inadvertently replicate biases from the original dataset, leading to skewed AI models. It may also risk leaking sensitive information. To tackle this, implementing privacy-preserving techniques and rigorous validation checks are crucial to ensure that synthetic data does not contain sensitive information or inherent biases. In the second case, ensuring the accuracy and reliability of synthetic data is challenging, as it may not fully capture real-world complexity. Overfitting

is another concern, where models excessively tailor to synthetic data and perform poorly on real data. Employing robust validation strategies can help mitigate these risks.

What is the rationale of the SynthAIR project and what are its main objectives?

The SynthAIR project aims to enhance the automation of air traffic management (ATM) systems through innovative AI-based methods for synthetic data generation. Its main objectives include overcoming challenges like data access, scarcity, privacy issues, and bias in data, and leveraging synthetic data to improve efficiency, robustness, and resilience in AI adoption. The project seeks to develop high-fidelity, diverse, privacy-preserving synthetic data generation methods and validate its impact through various operational use cases such as turnaround time, flight delay, and passenger flow prediction.

How is this project building on the work of previous SESAR innovation projects?

SynthAIR aligns with the trajectory set by previous exploratory research projects in the area of AI, while at the same time coming with novel elements. In addition to drawing inspiration from previous SESAR innovation projects, SynthAIR actively seeks to establish connections and foster collaborations with ongoing SESAR projects. This strategic alignment aims to identify synergies and maximize the impact of SynthAIR's outcomes. By engaging with current projects and stakeholders within the SESAR framework, SynthAIR not only builds upon the legacy of past research but also ensures its findings are complementary and integral to the evolving landscape of ATM innovation. This approach enhances the potential of SynthAIR to contribute significantly to the broader objectives of the Digital European Sky programme, particularly in utilising AI for higher levels of automation in ATM systems.

More about the project: www.sesarju.eu/projects/synthair

Transforming altimetry for a safer, more efficient aviation future

Accurate altitude measurement is a critical challenge in ATM, where even small errors can affect safety and efficiency. John Godsell, NATS, is leading work in the Green-GEAR project that is exploring the transition from barometric to geometric altimetry. In this interview he explains how the project is addressing the transition to improve airspace management for a safer, more sustainable aviation future.

Could you explain how barometric altimetry works and its limitations?

Since the early days of aviation, barometric altimetry has been the primary method for determining an aircraft's altitude. It works by measuring the difference between atmospheric pressure at the aircraft's current position and a standardised sea-level pressure. This system is based on the principle that atmospheric pressure decreases predictably with increasing altitude.

However, in real-world conditions, atmospheric pressure can fluctuate due to changing weather systems, temperature gradients, and local variations, leading to deviations from the International Standard Atmosphere (ISA) model. To account for these variations, pilots must periodically adjust their altimeters to reflect either local pressure (QNH) or the standard pressure setting (1013.25 hPa). These adjustments are particularly important when crossing the transition layer on descent and on climb, which marks the boundary between using local and standard pressure settings.

While aviation is already extraordinarily safe, even minor errors in these manual adjustments can result in altitude discrepancies. These might affect terrain clearance or vertical separation between aircraft. To mitigate this, strict safety buffers are maintained, but these constraints also limit airspace capacity and

reduce the flexibility of ATM to optimise fuel-efficient approach and descent trajectories, especially in the busy TMA.

How could geometric altimetry address these challenges?

Geometric altimetry offers the potential to enhance safety even further by providing more accurate and consistent altitude data based on satellite navigation rather than atmospheric pressure. This consistency reduces

the risk of altitude deviations caused by pressure fluctuations or manual setting errors, enabling tighter vertical separation between aircraft while maintaining high safety standards.

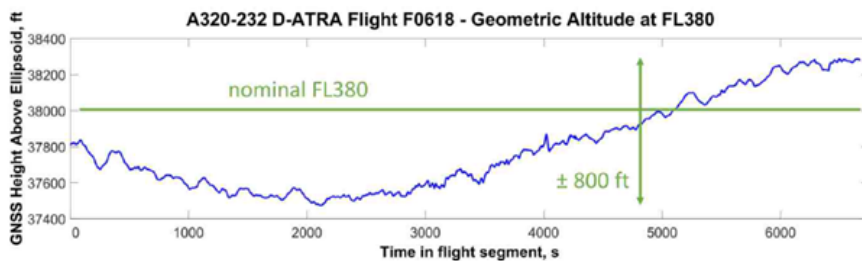
Moreover, geometric altimetry simplifies flight procedures by eliminating the need for manual pressure adjustments and the transition between local and standard pressure settings. This reduces pilot workload and the chance of error during critical phases like approach and

descent. With reliable, real-time altitude data, Air Traffic Management could plan and implement more efficient flight paths, improving airspace capacity and supporting the industry’s sustainability goals without compromising safety.

If Green-GEAR’s solutions demonstrate clear benefits, what steps would follow?

At this stage, our focus is on observing and validating the fundamental principles of the GeoAlt concept through experimental research. If the results show significant potential, the next step would involve advancing these concepts through Industrial Research, primarily focusing on further developing aircraft systems to fully integrate geometric altimetry. This progression would bring us closer to widespread adoption, unlocking its

More about the project: www.sesarju.eu/projects/green-gear



Air traffic flow management: AI solutions to prevent airspace congestion

The ASTRA project is developing an artificial intelligence algorithm to assist flow management positions in predicting and managing congestion well in advance.

There are several factors that can cause headaches for an air traffic controller, leading to a flight plan not proceeding as scheduled: suddenly adverse weather conditions, technical problems, and unexpected delays which lead to additional ones. Each of these unforeseen events affects air traffic, sometimes causing congestion in a specific sector of the air navigation space. These hotspots are anticipated and “addressed” by the flow management positions (FMP), whose role is precisely to monitor the flow of aircraft by communicating to

the air traffic controller supervisor (air traffic control officer supervisor or ATCO Supervisor) the need to delay departures or open new sectors, in order to avoid managing too many aircraft simultaneously, increasing the workload and the risk of accidents.

With the tools currently available, FMPs can predict and resolve hotspots with only 20 minutes notice. Is it possible to improve upon this procedure, without adding to the workload of operators, while enhancing the efficiency, safety, and sustainability of air traffic flow management?

The [ASTRA](#) project (an acronym for AI-enabled tactical FMP hotspot prediction and resolution) is set to prove it.

The concept in focus is an algorithm named ASTRA, designed to identify air traffic congestion areas one hour in advance. *“The machine-learning algorithm that we will develop with our technical partners, the University of Malta and Skysoft-ATM, will not only predict hotspots*



but will also be able to suggest to FMPs how to avoid them”, explains François Brambati, psychologist, company project manager, and [Human Factors](#) consultant at Deep Blue. This is the truly innovative part of the project: ASTRA will present flow management positions with optimal solutions, considering operational efficiency and safety, while also evaluating environmental impacts such as flight paths and aircraft fuel consumption.

FMPs operate within the control centres, known as ACC (area control centres), for designated airspace sectors. *“For example, the airspace over Switzerland is divided into two sectors, Zurich and*

Geneva, each hosting its FMPs," explains Brambati. Typically, FMPs of adjacent sectors communicate with each other, but the project wants to "optimise" the network of communications. By analysing air traffic control data from one sector ahead, the algorithm will be able to proactively warn of impending aircraft congestion. "For instance, FMPs at the Geneva ACC will be alerted if incoming flights from Germany could congest their sector's air traffic," the psychologist explains. "This allows them, rather than coordinating with the next sector, such as Zurich, to directly collaborate with their German colleagues. Thus, it will no longer be necessary to go through Zurich for a problem that from Germany will affect Geneva, while keeping Zurich informed of the entire process".

The following phase will consist of the development of the algorithm, which will be "trained" with historical data (from 2018 to today) provided by [EUROCONTROL](#) concerning traffic flow in Swiss airspace, as well as the development of the interface, which will be designed taking into account operators' feedback regarding the type and quantity of information to display on the screen, the notifications to present, and so on.

Another important consideration: how explainable must the solutions offered by the algorithm be, without compromising the usability and effectiveness of the tool?

Once developed, the interface will be tested with its end-users: the FMPs.

The project will conclude in 2025, when the final phase of the ASTRA validation exercises will take place: a real-time simulation in Geneva. "We will try to conduct this validation with the same Flow Management Positions who participated in the earlier phases of the project so that they can have the opportunity to test the concept they helped to develop", Brambati concludes. The concept that, if implemented and developed, will contribute to increasing the capacity of the airspace sectors (i.e., the number of flights) without compromising safety and without affecting the workload of those who monitor and manage traffic in the skies.

More about the project: www.sesarju.eu/projects/astra

More sustainable and resilient aviation through climate metrics

Aviation and climate are intricately linked. Emissions from air transport contribute to climate change, and in return the changing climate impacts air travel too. Extreme weather events such as heatwaves, blizzards, high winds, and heavy precipitation can affect infrastructure and aircraft performance, causing delays and cancellations.

"Traditionally, the concepts of mitigation — of the impact of aviation on climate — and adaptation — of aviation operations and infrastructure to make them more resilient to climate change — are investigated separately but they are very much intertwined," says **Carlo Abate, Head of Environment & Energy at Deep Blue in Italy**, and AEROPLANE project coordinator.

In the AEROPLANE project, funded by the SESAR Joint Undertaking, researchers are using theoretical and computational



modelling to investigate the aviation industry's impact and resilience in relation to climate change. The project will also create a toolset to visualise the model's predictions and help air traffic controllers, airport operators, manufacturers and airlines better understand the impact of their decisions.

"AEROPLANE will help air traffic controllers visualise the climate impact of flight trajectories, for example, or tell airport

operators the consequences of high temperatures on operations, so they can plan countermeasures," explains Abate.

Simulated environments

The team will develop a set of metrics that combine the effects of CO₂ and non-CO₂ emissions, and measure the impact of contrails formed within existing cirrus clouds on the climate — an aviation contribution to climate change that has

never been quantified. AEROPLANE will also develop a set of services to evaluate the effects of heatwaves on reduced aircraft performance and noise in the surrounding area.

“One obvious solution to the temperature problem would be to postpone flights until night, when the air is cooler,” says Abate. However, night flights typically have a greater warming effect on climate, as

contrails formed in the late evening trap outgoing radiation from Earth. *“Thus, this is not a good solution,”* he explains.

The findings will be validated in an exercise at the end of the project. Members of the advisory board will use the toolkit in a simulated but realistic environment, and evaluate how the tool predictions can be used to inform their decision-making processes. “One

of the strengths of AEROPLANE is the stakeholder-centred approach,” says Abate. “We aim to produce innovative and scientifically sound results, but we want to make sure that they address real needs of aviation stakeholders,” he adds.

More about the project: www.sesarju.eu/projects/aeroplane

Ongoing projects

AEROPLANE

Advancing Measures to Reduce Aviation Impact on Climate and Enhance Resilience to Climate-Change

Aviation and climate are inextricably linked. Air traffic emits greenhouse gas emissions that alter the atmosphere globally. These changes increasingly result in extreme weather phenomena, which can adversely affect aircraft performance, leading to rerouting, delays, and cancellations. AEROPLANE is developing proof-of-concept climate services for aviation to improve resilience to climate change.

Web: www.sesarju.eu/projects/aeroplane

AI4HyDrop

An AI-based Holistic Dynamic Framework for Safe Drone Operations in Restricted and Urban Areas

Drones are widely used in agriculture, construction, surveillance, and healthcare. As drone operations scale in complexity, a holistic approach to airspace management is essential. AI4HyDrop develops a framework incorporating AI tools and information flows to enable drone operations at scale, supporting automated U-space services.

Web: www.sesarju.eu/projects/AI4HyDrop

ANTENNAE

Data-Driven Cost-Effective 5G Integrated CNS As A Service

A new generation of small, highly automated aircraft operating at low altitude are on the horizon, alongside helicopters and general aviation. The coordination and deconfliction of these aircraft operating in primarily urban environments requires new communications, navigation, and surveillance (CNS) infrastructure. The project aims to develop an integrated CNS-as-a-Service model supporting both low-altitude piloted and U-space operations. The project is leveraging technologies such as 5G new Radio (NR), modern IP-based software-defined networking, and distributed computing capabilities propose a solution that is flexible and resilient.

Web: www.sesarju.eu/projects/antennae

ANTICIPATE

Absorb Nearby Tidy Identified Candidates for Ideal Parteking Available Temporal Extra-Capacity

En-route air traffic is challenging to manage due to fast-changing conditions brought about by traffic density, complex routes, weather and many other factors. A dynamic approach is needed to air traffic flow management in order balance the traffic with demand when and where it is needed. The project aims to enhance current short-term ATFCM measures (STAMs) mechanisms with “capacity-on-demand” measures at operational level, paving the way to new airspace capacity management mechanism considering the constant increment on traffic demand through the pairwise adjacent-sector balancing mechanism to longer adjacent-sector chains.

Web: www.sesarju.eu/projects/anticipate

ASTAIR

Auto-Steer Taxi at Airport

ASTAIR aims to create an operational environment integrating manual and autonomous taxiing, enhancing efficiency, safety, and sustainability. By applying AI tools, ASTAIR reduces human workload while augmenting airport ground operations.

Web: www.sesarju.eu/projects/ASTAIR

<p>ASTONISH <i>Alternate Surveillance Technologies for Innovative Solutions</i></p>	<p>Surveillance is essential for ensuring safety and improving airspace and airport capacity. ASTONISH develops new airborne and ground-based surveillance technologies, including airport-based sensing systems for ground operations and alternate surveillance solutions.</p> <p>Web: www.sesarju.eu/projects/ASTONISH</p>
<p>ASTRA <i>AI-enabled Tactical FMP Hotspot Prediction and Resolution</i></p>	<p>Today, air traffic congestion is identified pre-tactically using flight plan data, but real-time trajectory deviations still cause tactical hotspots. ASTRA uses AI tools to predict and resolve hotspots earlier, optimizing capacity and enabling greener, more efficient aircraft trajectories.</p> <p>Web: www.sesarju.eu/projects/ASTRA</p>
<p>ATMACA <i>Air Traffic Management and Communication Over ATN/IPS</i></p>	<p>Air-to-ground communication technology is at the heart of the end-to-end air traffic management concept, which requires the global integration of current, future, and emerging communication networks. The project addresses an innovative solution enabling effective, seamless, interoperable air-to-ground datalink communication technologies and digital flight monitoring and management environment through aeronautical telecommunication (ATN) based on internet protocol suite (IPS) within all domains of flight. The project proposes a beyond the state-of-the-art IP-based datalink communication solution by introducing an application-layer mobility management for ATN and enabling the use of commercial of-the-shelf equipment.</p> <p>Web: www.sesarju.eu/projects/atmaca</p>
<p>ATM-EXCITE <i>Advancing Civil-Military Interoperability and Coordination through Excellence in Science and Technology</i></p>	<p>The project will identify the requirements for civil-military aviation coordination and cybersecurity and develop a set of solutions. The project is engaging with stakeholders throughout the solution development phase to ensure that the proposed solutions meet their needs. The proposed solutions aim to directly address these vulnerabilities by introducing methods for verification of ADS-B data and selective encryption and model the interaction between civil and military systems in an efficient manner.</p> <p>Web: www.sesarju.eu/projects/atm-excite</p>
<p>AWARE <i>Achieving Human-Machine Collaboration with Artificial Situational Awareness</i></p>	<p>The goal of the project is to enable human-machine collaboration by using an artificial situational awareness system which is enabling AI to anticipate and respond to human needs by understanding human intent and goals. While humans are extensively trained to understand the capabilities, limitations, and functionality of the machines they are using, further improvements in human-machine collaboration are currently hindered by lack of awareness of human's intent on the side of machines. The project is developing and testing an AI assistant application providing adaptable human-centric support to enhance air traffic controllers' (ATCO) performance and to reduce ATCO's workload despite high task complexity.</p> <p>Web: www.sesarju.eu/projects/aware</p>
<p>CODA <i>Controller Adaptive Digital Assistant</i></p>	<p>Air traffic control is one of the most stressful professions. CODA addresses controller mental workload by developing a digital assistant that predicts future traffic, assesses stress levels, and adapts automation strategies. It can activate AI-based tools or adjust airspace configuration to reduce workload.</p> <p>Web: www.sesarju.eu/projects/CODA</p>

CORUS five

Development of the Extended U-space Concept of Operations CORUS V5.0

Through SESAR, Europe now has a concept of operations (ConOps) for the safe and secure integration of drones (U-space). Most operations to date have taken place in segregated airspace yet the need to integrate U-space into controlled airspace is increasingly recognised as an enabler to widespread use of unpiloted vehicles. Building on the success of CORUS and CORUS XUAM, the project is extending and maturing the ConOps to include airspace that is not presently covered, e.g above very low level and in the vicinity of controlled airports.

Web: www.sesarju.eu/projects/corusfive

DEEP FLOW

Enabled Dynamic Air Traffic Flow Configuration for Flow-Centric Airspace Management

Facing the air traffic growth and the challenges in balancing air traffic between geographical sectors, the air traffic control paradigm is shifting from local sector-based solutions to cross-border flow-based approaches. Such flow-centric approaches can be promising to overcome the scalability limits of geographical sectors and optimize the traffic at a regional level. Under this paradigm, this project proposes to develop a dynamic air traffic flow configuration method to assess, predict, manage, and optimize the evolving air traffic flows to enable more efficient flow-centric ATFCM and airspace management.

Web: www.sesarju.eu/projects/deepflow

DIALOG

Deciphering Intentions of Air Traffic Controllers, Workload Assessment, and Gaze Analysis to Enable Their Efficient and Trustworthy Collaboration with AI

DIALOG is developing an AI-based digital assistant called Teamwork Assistant that uses speech recognition and understanding of pilot-controller exchanges to infer ATCOs' intent and goals. It also utilizes machine learning-based methods to assess ATCOs' workload and attention in real-time based on voice, physiology, and behavioral data. The actions of the digital assistant are determined based on the ATCOs' current state, attention allocation, traffic situation, and general context. The project is developing prototypes and conducting validation exercises in close collaboration with end-users to assess the performance and usability of the proposed solutions.

Web: www.sesarju.eu/projects/dialog

E-CONTRAIL

Artificial Neural Networks for the Prediction of Contrails and Aviation-Induced Cloudiness

Contrails and cloudiness caused by aviation trap heat, leading to a net warming effect. Their impact varies with weather and regional factors. E-CONTRAIL blends AI and climate science to predict and mitigate aviation's non-CO₂ effects on global warming, reducing uncertainties for greener aviation.

Web: www.sesarju.eu/projects/E-CONTRAIL

Engage 2

The SESAR 3 Knowledge Transfer Network

Engage shares SESAR research findings to inform future research and application-oriented work. It hosts the Engage Wiki for completed SESAR project data and runs open days, summer schools, PhD calls, and mentorship programs for aviation students.

Web: www.sesarju.eu/projects/engage2

F4ECLIM

Flying ATM for Environment Climate

The project aims to address uncertainties tied to CO₂, contrails, ozone, methane, and water vapor climate effects. To do so, it involves improving algorithmic climate change functions (aCCFs) by integrating diverse weather and seasonal patterns, and incorporating various climate metrics. These advancements will feed into a climate service for the aviation community. Additionally, the project is exploring aviation's potential to reduce its climate impact through the development of robust flight planning algorithms.

Web: www.sesarju.eu/projects/f4eclim

Green-GEAR

Green Operations with Geometric Altitude, Advanced Separation, and Route Charging Solutions

Since barometric pressure-based altimetry lacks terrain reference, Green-GEAR explores geometric altimetry for safer, greener climb and descent operations. It also investigates environmentally driven route charging to reduce climate impact and optimize airspace capacity.

Web: www.sesarju.eu/projects/GREEN-GEAR

HUCAN

Holistic Unified Certification Approach for Novel Systems Based on Advanced Automation

The adoption in ATM of increasingly automated technologies, enabled by artificial intelligence, raises new challenges around liability and certification that must be addressed at the point of design. The project is also developing a set of suitable design guidelines and associated toolkit for streamlining the development of automation and AI-powered technologies, targeting manufacturers. A parallel analysis of certification approaches, legal and regulatory features and critical issues of such technologies will be carried out.

Web: www.sesarju.eu/projects/HUCAN

HYPER Solver

Artificial Intelligence controller able to manage Air traffic Control (ATC) and Air Traffic Flow Management (ATFM) within a single framework

In air traffic flow management (ATFM), measures are issued when traffic demand exceeds capacity usually in advance of take-off. Controllers then give different aircraft instructions to separate them when airborne. The challenges facing ATFM and air traffic control may differ and solutions to them are often developed in isolation of one another. The project is developing a "hyper solver" based on an advanced artificial intelligent reinforcement learning method with continuous reassessment and dynamic updates. The tool is a holistic solver from end-to-end, covering the whole process to manage density of aircraft, complexity of trajectories, interactions (potential conflict in dynamic capacity balancing timeframe) of trajectories, conflict of trajectories at medium-term and conflict of trajectories at short-term.

Web: www.sesarju.eu/projects/hypersolver

ImAFUSA

Impact and capacity Assessment Framework for U-space Societal Acceptance

Citizens' confidence and acceptance is critical to the further development of the drone services market in Europe, especially urban air mobility (UAM). The project is developing an impact and capacity assessment framework for U-space societal acceptance to assist local authorities, other U-space stakeholders and users with the implementation of socially acceptable and beneficial urban air mobility in cities. The framework and its tools will address matters which influence public opinion, such as the environment, and safety and socio-economics.

Web: www.sesarju.eu/projects/imafusa

MAIA

Multimodal Access for Intelligent Airports

Cooperative, connected and automated mobility and urban air mobility are the next big trends in transport, and represent viable and innovative solutions to expand mobility choices for getting to, from and around airports. The project is developing a set of data analytics and modelling tools to support the implementation of multimodal airport access solutions based on two passenger mobility innovations: shared autonomous vehicle fleets and unmanned aerial vehicle fleets. The tools will monitor and anticipate passenger behaviour changes due to these new options, optimise vehicle dispatching under multimodal disruptions and recommend appropriate locations for vertiports, with the aim of maximising the contribution of these mobility innovations to the competitiveness and sustainability of the European aviation sector.

Web: www.sesarju.eu/projects/MAIA

MultiModX

Integrated Passenger-Centric Planning of Multimodal Transport Networks

Air and rail are natural multimodal partners and their collaboration is key to assuring a more efficient, predictable, and environmentally sustainable door-to-door passenger journey. The project is developing a set of innovative solutions and decision-making tools to support the coordinated planning and management of multimodal transport networks. Specifically, the project is also developing a modelling and evaluation framework, and a solution to enable the coordinated design of air and rail schedules according to expected demand behaviour.

Web: www.sesarju.eu/projects/MultiModX

MUSE

Measuring U-Space Social and Environmental Impact

The project is developing a set of key performance indicators, methods and tools for the comprehensive and rigorous assessment of the impact of urban air mobility (UAM) operations on the quality of life in European cities, with particular focus on drone-generated noise and visual pollution. The project is developing a new toolset capable of generating accurate drone 4D trajectories in urban areas, modelling UAM's noise and visual footprints, high-resolution dynamic population mapping and calculation of population exposure indicators segmented by type of day and time of the day, citizens' sociodemographic profile, type of activity being performed and other relevant variables.

Web: www.sesarju.eu/projects/MUSE

ORCI

Optimised Runway Centreline Interception

The project is exploring innovative AI-based solutions to help increase runway throughput using advanced automation support tools in the TMA domain. Specifically, the objective is to provide key information to controllers in final approach sectors, to support informed decisions on when to issue vectoring instructions to aircraft for optimal spacing between consecutive arrivals during medium, high, very high-density and increasingly complex TMA airspace operations. The project is working on an AI model to optimise delivery of vectoring instructions, leading to enhanced capacity, efficiency, environmental performance, and overall improvements to arrival air traffic management.

Web: www.sesarju.eu/projects/orci

PRIAM

Planning Regional-Scale Multimodal Operations for Innovative Air Mobility Services

Within next decade, regional-scale innovative air mobility (IAM) services will be part of the European mobility ecosystem, helping to address regional connectivity challenges. That is the vision that the project aims to support by developing a data analytics and modelling toolset for planning the integration of IAM infrastructure and services into regional multimodal transport networks. The project aims to provide set of recommendations for the implementation of regional IAM services, based on a cost-benefit analysis that anticipates the impacts of a large-scale deployment of IAM services across Europe.

Web: www.sesarju.eu/projects/priam

RESPONSE

REduced or Single Pilot Operation iNcapacitation Safety Enhancement

Under current EU regulations, at least two pilots must be present within the cockpit of commercial flights. But new advances in technologies open up the possibility to certify single pilot operations (SPO), either for certain portions of the journey, such as when cruising, or for the whole flight once the technology is mature. The project focuses on pilot cognitive state monitoring and an air-to-ground integration SPO concept of operations. The proposed solutions directly support pilots' incapacitation transition monitoring and deliver an integrated air-to-ground SPO CONOPS to enhance safe return to land operations.

Web: www.sesarju.eu/projects/response

SATERA

Space-based composite AdS-b and multilateral system validation through scalable simulations

ADS-B is a surveillance technique that relies on aircraft broadcasting their identity. Space-based ADS-B systems allow aircraft to broadcast their identity and position in oceanic and remote areas where it would be difficult or impossible to install ADS-B ground stations. As a result, space-based ADS-B allows for reduced separation and increased airspace operational efficiency via more direct routing and increased availability of optimal altitudes. But space-based ADS-B broadcasts can get distorted and lose their integrity. The project is developing an integrity estimator for space-based ADS-B systems based on crosschecking positions reported in ADS-B messages with position estimations provided by space-based multilateration (MLAT) systems. The aim is to deliver a prediction tool to compute the theoretical performance of a MLAT system whose receiving stations are onboard of a constellation of low-orbit satellites.

Web: www.sesarju.eu/projects/satera

SEC-AIRSPACE

Cyber Security Risk Assessment in virtualized AIRSPACE scenarios and stakeholders' awareness of building resilient ATM

The digitalisation and modernisation of air traffic management will bring many advantages to aviation, but these will come with challenges in managing cyber vulnerabilities. The project aims to introduce cyber security components into the state-of-the-art security risk assessment methodology (ies) currently already in use in ATM. The project is also investigating the potential of applying the concept of people analytics (PA) to increase cyber security awareness in ATM organisations. The project results will be validated and demonstrated through two real use cases, involving relevant stakeholders.

Web: www.sesarju.eu/projects/sec-airspace

SMARTS

Smart sectors

Optimising airspace capacity is a key to accommodating current and future air traffic, while maintaining safety, improving efficiency and reducing aviation's environmental impact. The project focuses on dynamic airspace configuration and the design of "smart sectors". This covers the design of basic volumes of airspace with optimal distribution of workload, tailored around specific safety and operational requirements, including complexity. As a by-product, the application of cost-efficient capacity actions allows for more accurate demand and capacity balancing planning, thus reducing the number of required demand measures.

Web: www.sesarju.eu/projects/smarts

STEPLESS

Stepless High-Lift Configurations for Optimised Aircraft Energy Management in the TMA

The project aims to minimise the flight environmental footprint during final approach under operations with conventional and increased glideslope angles (IGS). IGS is intended to reduce the noise perception on ground by a higher flight altitude. Steeper approach angles however, also reduce the aircraft's capability to decelerate to final approach speed. Therefore, the risk occurs that pilots are forced to configure the aircraft too early, which can have deteriorating effects on noise and fuel consumption. The proposed solution enables the increase of the glideslope angle for the sake of the reduction of the noise perception on ground but by avoiding deteriorating effects on fuel consumption because of non-optimal high-lift configurations. It is predicted to bring operational improvements to the flow of arriving traffic as well as to provide greater fuel efficiency and environmental sustainability together with a further reduced noise perception on ground and even slight capacity gains through the avoidance of drawbacks in the energy management of approaching aircraft because of a steeper glidepath.

Web: www.sesarju.eu/projects/stepless

SynthAir

Improved ATM automation and simulation through AI-based universal models for synthetic data generation

The availability of a wide variety of labelled data (e.g. safety related) is major bottleneck impeding the accuracy of AI models developed for ATM. One possible solution is to generate synthetic data from original data and a model that is trained to reproduce the characteristics and structure of the original data. The project is defining AI-based methods to generate synthetic data. These methods are attractive since they require less user knowledge expertise and better generalisation capabilities. The project takes advantage of advances in computer vision and language technology to develop a universal time series generator (UTG). The generator can be trained on a certain set of data obtained from a small number of airports in order to generate synthetic data about a new airport.

Web: www.sesarju.eu/projects/synthair

TADA

Terminal Airspace Digital Assistant

Terminal airspace (TMAs) especially those serving major airport hubs and/or multi-airport systems can get very busy, putting pressure on air traffic controllers. The project will make use of controller generated historical data and machine learning to develop a digital assistant controllers in their decision making and manage certain delegated tasks. The overall aim is to capacity, flow and trajectory efficiency and safety.

Web: www.sesarju.eu/projects/tada

TRUSTY

Trustworthy intelligent system for remote digital tower

Remote digital towers are capable of delivering affordable air traffic services as safely and efficiently as physical towers. The project aims to harness the power of artificial intelligence (AI) to enhance the capabilities of digital towers in terms of resilience, capacity and efficiency. The overall goal is to enhance the trustworthiness of AI-powered decisions in the context of remote digital towers on specific tasks, such as runway and taxiway monitoring. The project is applying information visualisation techniques like visual analytics, data-driven storytelling, and immersive analytics in human-machine interactions (HMI). In doing so, the project is at the crossroads of trustworthy AI, multi-model machine learning, active learning, and UX for human and AI model interaction.

Web: www.sesarju.eu/projects/trusty

U-AGREE

U-space Air and Ground Risk modELs Enhancement

The project aims to develop an integrated risk model linking the operations of unmanned aircraft (UAS) with some negative effects they may have with regard safety, security, privacy and environment. This risk model is intended to support the airspace risk assessments required by U-space European regulation as well as an amendment to SORA methodology so that risk can be quantitatively estimated, enabling digital implementations leading to swifter operational approval processes.

Web: www.sesarju.eu/projects/u-agree

VISORS

Validation Infrastructure Supporting Remote Simulations

Real-time simulations (RTS) are widely recognised as a means to support the validation process of systems and procedures up to the highest operational readiness levels and are therefore widely used to support validation campaigns in the SESAR context. With the development of new ATM concepts in recent years and those expected in the near future (e.g. innovative air mobility,) verification and validation processes have become increasingly complex, with increasing demands on the infrastructures for validating these concepts and operational conditions. The project aims at supporting a wide diffusion of interoperability standards among ATM validation platforms. An economic analysis of performing validation processes for ATM/AAM/U-space interoperability concepts and solutions through a multi-site validation architecture will be performed. An experimental demonstration test will be defined and performed to collect data for this analysis.

Web: www.sesarju.eu/projects/visors



INDUSTRIAL RESEARCH AND FAST TRACK

Turning CNS infrastructure into a service

If communication, navigation, and surveillance infrastructure is the backbone of air navigation services, then data services are its blood. Putting the two together is the CNS DSP project.



Communications, navigation and surveillance (CNS) is a system of technologies, procedures, and programmes that help pilots and air traffic controllers manage aviation. Specifically, CNS is used to establish aircraft location, enable airspace capacity, and improve decision-making.

"Without CNS, air transport would simply not exist," says **Vojislav Milosavljevic, CNS Data Service Provision Project Leader at the European Satellite Service Provider (ESSP)**. The challenge is that the airspace is evolving, with new players being added, new threats emerging, and new technologies coming into play. As such, CNS must evolve too, moving from being a physical asset and towards a service-based approach.

"Historically, the communication, navigation and surveillance data service provision has been inherently constrained by the infrastructure that generates the data," adds Milosavljevic. *"Today, with the regular increase in air transport demand*

and the ongoing quest for optimisation, more sophisticated ATM solutions are being implemented and the need for data as a service has emerged."

Helping to answer this need is the CNS Data Service Provision (CNS DSP) project.

One platform, many different users

The **SESAR JU**-funded project is developing a single platform to connect input data providers (e.g., ANSPs) with data service users. *"The platform aims to offer a convenient, one-stop-shop where data can be entered, transformed into relevant services, and then made available to authorised aviation and non-aviation users,"* explains Milosavljevic.

To use the platform's services, each end user must be registered and sign a service provision contract with the data service provider. Once authorised, the end user only needs to submit their request via the platform. They will then receive the needed data service via the same central CNS DSP platform.

"Because the platform has access to each end user's user type, agreed service level, data access rights, and other relevant parameters, it can provide services tailored to the user's specific needs while also guaranteeing security and data protection," remarks Milosavljevic.

Three core services

Initially, the platform will provide three core services: a multi-sensor surveillance tracking service, an ATM data service provider for tactical and post operations solution, and a real-time Global Navigation Satellite System (GNSS) monitoring and interference service.

According to Milosavljevic, the multi-sensor surveillance tracking service is designed to provide users with a consolidated, cross-border picture of a situation in the airspace, such as the Alpine region of France, Italy and Switzerland. It does this by aggregating data from various surveillance sources, including secondary radars and Automatic Dependent Surveillance–Broadcast (ADS-B).

"Thanks to its use of diverse data sources and the sharing of this data through standardised mechanisms, this service offers users a cohesive surveillance picture of the surrounding airspace," notes Milosavljevic.

The ATM data service provider for tactical and post ops solution, on the other hand, is designed to deliver critical information to ATM stakeholders for use during the tactical and post-operation phases.

"By integrating the multi-sensor surveillance tracking service, this solution augments surveillance data with trajectory prediction, flight data from the network manager, meteorological data, and data from other sources, resulting in improved situational awareness and decision making," says Milosavljevic.

Navigating around GNSS interference

The third service, for GNSS monitoring and interference, is of particular importance in light of an increase in spoofing and jamming incidents. Whereas jamming intentionally interferes with a GNSS receiver's ability to lock on to an authentic GNSS signal, spoofing creates a false GNSS signal to suggest that a receiver is someplace that it is not.

"With aircraft increasingly depending on GNSS-based positioning, both types of interference pose an imminent threat to airspace safety," explains Milosavljevic.

One way to avoid such interference is to know where the spoofing and jamming is taking place, which is exactly what the CNS DSP GNSS monitoring and interference service does.

The service provides users with a range of tools for monitoring GNSS signal performance, position integrity, and interference. The service also provides both real-time and offline GNSS status per area, route, and related performance-based navigation (PBN) application.

"This service allows an airline to quickly see which flights are or will likely experience GNSS issues and at what time and location those issues will occur," remarks Milosavljevic. *"The airline can then recommend switching the aircraft navigation source and time reference from GNSS to internal or manual mode to preserve navigation performance and ATC capabilities."*

Future-proofed for the challenges of tomorrow

While each of these services are important, the airspace is always evolving, and today's solutions may not be able to answer the challenges of tomorrow.

"That's why CNS DSP is focused on future proofing our platform, ensuring that it is flexible enough to be upgraded to support new data types, new users, and new functionalities all while maintaining the core advantages of a one-stop-shop configuration," concludes Milosavljevic.

Read more about the project: www.sesarju.eu/projects/CNS-DSP



Innovative air mobility starts with safe and efficient vertiports

By creating an integrated vertiport ecosystem, the EUREKA project is helping ensure an exciting future for innovative air mobility in Europe.

While there's a lot of excitement about air taxis, the focus tends to be on the vertical take-off and landing (VTOL) capable aircraft (VCA). But getting these vehicles off the ground first requires having both critical infrastructure like vertiports and relevant VCA traffic management procedures in place.

Enter the EUREKA project.

"Basically, if there are no vertiports, there is no take-off, no landing, no

innovative air mobility," says **Iliyana Simeonova**, EUREKA project manager at EUROCONTROL.

The SESAR JU-funded and [EUROCONTROL](http://www.eurocontrol.eu)-led project looks to make innovative air mobility (IAM) a reality by paving the way towards the safe and efficient integration of vertiports – defined areas that support the take-off and landing of VCA – into European airspace.

"Our goal is to integrate vertiports into the airspace and to extend the current ATM, air operations, and U-space regulatory framework specifically for vertiport stakeholders," adds Simeonova, who is coordinating the project.

The project is developing tailored requirements for approach, departure, and en-route procedures to and from vertiports. It is also working on a

comprehensive vertiport ecosystem by implementing and evaluating vertiport collaborative traffic and vertiport network flow, capacity, and operational management systems.

Building a vertiport ecosystem from the ground up

The challenge is achieving these goals requires that the project start from square one.

“Not only does Europe lack any historic experience in innovative air mobility operations in low level, urban airspace, there is also a limited amount of quality vertiport reference materials or software/hardware solutions available,” explains Simeonova.

Even if such experience and resources were available, there’s still the challenge of harmonising vertiports with legacy ATM and airport procedures.

These are big challenges for sure, but they are being addressed head on by the project thanks to its close collaboration with industry stakeholders, regulators, national authorities, and other U-space related projects.

Together, the project’s 35 partners are planning to deliver procedure and airspace design recommendations, validate a vertiport collaborative traffic management system, and build a vertiport network manager capable of coordinating traffic at the local network level.

The project is also working to develop a new U-space service for managing any disruptions and emergencies happening in the immediate vicinity of the vertiport, such as those caused by disruptive drones or crewed aircraft experiencing a critical failure for performance. When such an event is detected, the service will initiate tactical changes to the U-space airspace configuration and create robust procedures for safely handling – and resolving – the issue.

A pioneer in vertiport solutions

According to Simeonova, these innovations will help create a scalable vertiport ecosystem that ensures safety and efficiency and promotes adaptability to different operating environments and timeframes.

“We are particularly proud of EUREKA’s pioneering role in developing solutions for vertiports, as it is the first SESAR project working to extend the current scope of the existing ATM, air operations, and U-space regulatory framework for vertiport stakeholders,” she says.

Looking ahead, Simeonova says the project will provide policymakers and regulators with recommendations for establishing uniform safety standards and operational procedures for vertiports. As the project continues to advance the technology readiness level of its various solutions, it will also launch validation exercises, including flight tests.

“By creating a safe, efficient, and scalable vertiport ecosystem and integrating that system and its crewed and uncrewed users into traditional airspace, EUREKA is laying the foundation from which we can build an exciting future for innovative air mobility in Europe,” concludes Simeonova.

Read more about the project: www.sesarju.eu/projects/CNS-DSP



Unlocking the potential of AI-based weather forecasts

By providing more accurate digital weather forecasts with longer lead times, the KAIROS project aims to help aviation better manage how weather impacts operations.

It's no secret that weather can wreak havoc on one's travel plans. In fact, 25% of delays in the air traffic network can be attributed to weather.

But bad weather's impact goes well beyond delays and cancellations.

"Bad weather at one airport can have a trickledown effect, quickly impacting flights across the airspace," says **Aniel Jardines, CEO at AI METHODS.**

Take for example thunderstorms. Because a thunderstorm can create unsafe conditions, ATM will often rightfully error on the side of caution and close the entire airspace. This in turn translates into delays, rerouting, and cancellations across airports.

But it doesn't necessarily have to be this way.

As Jardines explains, the problem is that air traffic controllers do not have sufficient weather information as their disposal to make important operational decisions.

"While today's aviation weather products can often accurately predict the presence of hazardous weather, these forecasts lack the spatial and temporal resolution needed to take meaningful action to mitigate the impact on the operations," he says. *"With climate change increasing the frequency and intensity of hazardous weather, the aviation community faces a difficult challenge in growing an air traffic system that is resilient to weather."*

According to Jardines, having access to higher resolution forecasts that provide more detail on the timing and location of thunderstorms would enable air

traffic controllers to make decisions to minimise the impact on air traffic operations.

Artificial Intelligence (AI) could be the key to providing such accuracy.

AI METHODS, together with a consortium of aviation and technology partners, look to unlock the potential of AI-based weather forecasts for operational benefits.

"By providing more accurate digital weather forecasts with longer lead times, we aim to help aviation stakeholders better manage how weather impacts their operations," adds Jardines.

Enhanced accuracy, longer lead times

Although a work-in-progress, the project has already achieved some important results.

One of those results is the use of AI algorithms to improve the prediction of convective weather, such as thunderstorms. *"We successfully demonstrated that our algorithms offer enhanced accuracy and longer lead times compared to existing weather information,"* remarks Jardines.

The project team is currently working on additional AI models to predict such weather phenomena as dust, high altitude crystals, turbulence, and low visibility.

All these models will eventually be integrated into an end-user platform, with demonstrations in an operational setting expected in 2025. The ultimate goal is to reach a Technology Readiness Level (TRL) 7.

The importance of a strong consortium

This success is not to say that the project hasn't experienced any turbulence itself.

Early in the project, researchers faced several challenges, including an issue with the quality of the data used to

create the algorithms. *"Observational data on weather phenomena is not perfect, and combining various data from different sources into a holistic representation was anything but easy,"* notes Jardines.

The key to overcoming this challenge, and others, was cooperation from across the project's partners. *"We are proud to have support from partners representing all areas related to aviation weather forecasting and who excel at integrating AI-based forecasts into existing operational tools,"* says Jardines.

Looking ahead, the project expects to confront a number of regulatory and certification related challenges – challenges that will once again be addressed through collaboration, iterative problem solving, and adaptability.

Digitising Europe's airspace

Once finalised, the KAIROS solution has the potential to initiate a paradigm shift in the digitisation of European airspace.

For one, it could position AI-based weather forecasting as a crucial component of airspace management, unlocking operational efficiencies and automation opportunities for air navigation service providers (ANSPs), airports, and airlines.

The uptake of AI would also drive the development of a highly skilled workforce, possibly creating new business opportunities and high paying jobs.

"Based on our early and exciting results, the entire project team is confident that our work will have a transformative impact on the aviation industry, revolutionising how weather-related challenges are managed and mitigated," concludes Jardines.

More about the project: www.sesarju.eu/projects/KAIROS

Wising up about seamless air-rail travel

The Travel Wise flagship project, a EUR 4.9 million synergy between SESAR and Europe's Rail Joint Undertakings with 37 partners, focuses on enhancing the integration of air and rail transport systems. In this interview, Micol Biscotto, Deep Blue, the project's coordinator, discusses the key objectives, challenges, and anticipated milestones, including demonstrations in Amsterdam, Athens, and Bologna, as well as the benefits for passengers seeking seamless multimodal journeys.

What are the main objectives of the Travel Wise project and why are they important?

Travel Wise's main goal is to support the shift from managing rail and air traffic in silos to intermodal traffic orchestration. This will be achieved by delivering a methodology, a roadmap, and related technologies that enable: i) information sharing between air and rail operators—while including maritime and road transport, ii) intermodal collaborative decision-making for both normal operations and disruptions, and iii) passenger experience optimisation. A key focus of the project is on solutions addressing transport disruptions by defining the interface and information exchange between the Air Transport Management System (ATM) and the rail traffic management system (TMS), particularly for airport-rail connections, planning, and operations management. Additionally, Travel Wise aims to develop an intermodal ecosystem for aviation and rail sectors, alongside a collaborative decision-making (CDM) solution to support integrated air-rail operations management. An important objective is to create a common air-rail data space while fostering the evolution and adoption of a Common European Mobility Data Space.



What are the main challenges the project will have to overcome?

The main challenges in achieving the previously mentioned objectives are related to rail-aviation interoperability and the lack of standardisation for the interfaces between the two, as well as the multimodal disruption management. Another significant challenge to be addressed by Travel Wise is the articulation of the data space enabling the air-rail relevant data exchange and its validation in the demos for the three scenarios proposed by Travel Wise project.

What will be the main outputs of the project and how will they contribute to shaping the future of multimodal transport?

The main output of the Travel Wise project will be the design and development of a single air – rail intermodal CDM and interconnected operations plan solution including real-time information exchange between stakeholders. This will provide additional information to support the management of both rail and aviation operations and react in a timely and effective manner in case of unforeseen events. More importantly, this solution will aim to improve the multi-modal passenger experience by supporting optimised door to door transport services and more effective disruption management across modes. These benefits will also support a passenger behavioural shift

towards using trains instead of cars to reach airports, hence contributing to a reduction in CO2 emissions in line with the EU Sustainable and Smart Mobility Strategy.

Why is the work done in the project important for the end users?

The Travel Wise solution seeks to fill these gaps by providing rail and aviation operators with a digital platform that facilitates efficient air – rail information exchange and operations, ultimately aiming to improve the overall multimodal travel experience.

When can we expect to see the first results coming from the project and what will be the impact of these results?

The first steps of the project will be the identification of end users' needs, the definition of the Concept of Operations and technical requirements, followed by demonstrations in three scenarios: the city pair (Amsterdam-Paris), the international hub (Athens) and the regional airport (Bologna). These deliverables will also address the impact of the Travel Wise solution on the existing ATM system and rail TMS. The first project results are expected in the first half of 2025 and include user requirements, and benchmarking, followed by the preliminary demonstrations in 2026 and the final validation and CBA in 2027.

Read full interview Travel Wise:

www.sesarju.eu/projects/travel-wise

**Blues skies ahead:
Sustainable innovation
powered by SESAR**

In 2024, the SESAR JU collaborated with CORDIS to produce a Projects Info Pack on the the role air traffic management has to play in Europe’s transition to carbon neutrality, through new technologies, procedures and practices. The pack features a selection

of ten SESAR research projects. Their focus includes improved air traffic management for more efficient flights ([GALAAD](#) and [CONCERTO](#)), better aircraft positioning technology to allow dynamic approach patterns, advanced route planning ([DYN-MARS](#)) and low-fuel profiles ([Green-GEAR](#)), better understanding of the conditions that lead to persistent contrails ([E-CONTRAIL](#) and [CICONIA](#)), wake energy retrieval ([GEESE](#)), as

well as broad investigations into how climate change will impact aviation – and vice versa ([AEROPLANE](#)). Two demonstrators, [ECHOES](#) and [HERON](#), look to enable energy-efficient flying, in oceanic or remote regions and gate to gate respectively.

Download the [Projects Info Pack on Air traffic management for the Green Deal](#).



Ongoing projects

<p>AMPLE3</p> <p><i>SESAR3 ATM Master Planning and Monitoring</i></p>	<p>The Master Planning and Monitoring project (AMPLE3) is supporting the planning and reporting in ATM evolution deployment and in updating the European ATM Master Plan. The project provides content integration services to support the SESAR programme management to deliver a coherent set of SESAR Solutions aligned at content level with the direction and ambitions set by the Strategic Research and Innovation Agenda and the European ATM Master Plan.</p> <p>Web: www.sesarju.eu/projects/ample3</p>
<p>ATC-TBO</p> <p><i>Air Traffic Control Trajectory Based Operations</i></p>	<p>The project proposes to validate solutions that support trajectory-based operations for flights in the tactical execution phase for en-route and TMA operations, thus contributing to the finalisation of the SESAR Phase C developed in SESAR 2020 and the realisation of the Digital European Sky vision in SESAR Phase D. The results are expected to contribute to capacity, operational efficiency, safety, environment and cost efficiency.</p> <p>Web: www.sesarju.eu/projects/ATC-TBO</p>
<p>CICONIA</p> <p><i>Climate effects reduced by Innovative Concept of Operations - Needs and Impacts Assessment</i></p>	<p>As much as the goal of reducing aviation's carbon emissions is critical, the warming impact of aviation caused by other chemicals emitted by jet engines should not be overlooked. In this respect, the project focuses on the non-CO₂ effects of aviation and how they can be measured. The project works closely with airlines, the network, and air traffic control to ensure these effects are taken into account in operational planning and design.</p> <p>Web: www.sesarju.eu/projects/ciconia</p>
<p>CNS DSP</p> <p><i>Demonstration of a CNS data service provision</i></p>	<p>Communication, navigation, and surveillance (CNS) infrastructure is the foundation for the provision of air navigation services. To make CNS more resilient and efficient, the Digital European Sky is moving away from CNS as physical assets towards a service-based approach. Mindful of this needed change, the project develops digital platforms and services leveraging state-of-the-art technologies to enable future data-sharing service delivery models. It aims at sharing CNS data between air navigation service providers (ANSPs) and other aviation stakeholders (e.g. civil and military airspace users, airports, national authorities, etc.). The project carries out tests using data from several ANSPs for the use by third-party application/service developers.</p> <p>Web: www.sesarju.eu/projects/CNS-DSP</p>
<p>CONCERTO</p> <p><i>Dynamic Collaboration to Generalize Eco-friendly Trajectories</i></p>	<p>The project aims to make eco-friendly trajectories an everyday occurrence to reduce the CO₂ and non-CO₂ impact of aviation. The project aims to integrate green ATC capacity into the system, with the appropriate level of automation, and support stakeholders in balancing regularity and environmental performance at local and network levels. The project is leveraging state-of-the-art climate science and data to allow ATM stakeholders to take their "eco-responsibility" to the next level. At the same time the project aims to demonstrate that mitigation measures can be deployed progressively at network level, in sync with scientific progress.</p> <p>Web: www.sesarju.eu/projects/concerto</p>
<p>DARWIN</p> <p><i>Digital Assistants for Reducing Workload Increasing collaboration</i></p>	<p>AI-based automation for cockpit and flight operations are the key enabler for single pilot operations (SPO). The project develops digital assistants to support SPO operations, assuring the same (or higher) level of safety and same (or lower) workload as operations with a full crew today. The project delivers solutions that enable operational efficiency and route flexibility, taking into account the complexity of the future airspace. The results support the commercial and operational viability of those new airspace users.</p> <p>Web: www.sesarju.eu/projects/DARWIN</p>

DYN-MARS

Dynamic Management of Aircraft Configuration and Route Structures

The way an aircraft climbs or descends can make a significant difference to the environment, from reducing fuel burn, to minimising gaseous emissions and noise over the surrounding airport communities. The project aims to minimise the environmental footprint of flights during climb, descent and approach through novel avionics functions and improved arrival routes and procedures. It provides, for the first time, a holistic solution that combines airborne and ATM improvements enabled by enhanced communication capabilities.

Web: www.sesarju.eu/projects/DYN-MARS

ECHO 2

European Concept for Higher Altitude Operations Phase 2: Towards the integration between Air Traffic Management and Higher Altitude Operations

The project builds on research from the ECHO project on developing a concept of operations (CONOPS) for higher airspace. Specifically, the project focuses on introducing to the CONOPS a module on space launch real-time monitoring and packages covering ground and air-ground operational integration procedures.

Web: www.sesarju.eu/projects/ECHO2

ENSURE

ATM-U-space Interface and Airspace Reconfiguration Service

Ensuring an interoperable and effective interface between unmanned and conventional traffic and air traffic control is critical for the delivery of the future Digital European Sky. This project refines and completes the definition of a common interface and services for U-space and ATM. The project develops a standardised data model, architecture, and an operational methodology. It also develops a dynamic airspace configuration service to help ATC actors in charge of airspace reconfigurations maintain traffic segregation and to avoid proximity between manned and unmanned aircraft within the designated U-space airspace.

Web: www.sesarju.eu/projects/ensure

EUREKA

European Key solutions for vertiports and UAM

Air taxis are an exciting development in air mobility, but to get off the ground, these vehicles rely on infrastructure like vertiports and accompanying air traffic management procedures. The project develops four solutions to pave the way for vertiports and Innovative Air Mobility in tomorrow's cities: the complete arrival, departure, and turnaround process for vertiports; collaborative traffic management; how to deal with emergencies and disruptions; and the network flow, capacity, and operational management. The project provides recommendations for regulation and standardisation, as well as any information that will accelerate and harmonise the development of UAM, VTOL operations, and vertiports across Europe.

Web: www.sesarju.eu/projects/EUREKA

FASTNet

Future Data Services and Applications for airports and Network

Every flight begins and ends at airports, making them essential nodes in the aviation network. The project uses advances in data technologies to fully integrate airport operations into the network (AOP-NOP integration). The project focuses on pre-tactical and strategic planning, using artificial intelligence to enable airport-to-airport collaborative planning within the network operations plan. It also aims to extend the timeframe of the AOP-NOP integration from months to days in advance of departure. The project relies on state-of-the-art technologies to integrate new datasets available at the local level, such as local restrictions, pre-tactical flight information, and strategic local information, in order to enrich demand and capacity balancing information and ensure efficient planning from the strategic phase.

Web: www.sesarju.eu/projects/FASTnet

<p>FCA <i>Flight Centric ATC Project</i></p>	<p>European airspace is divided into flight information regions, which are subdivided into sectors to provide safe separation services for aircraft travelling through the airspace. Changing this to a flight-centred structure without reference to geographical sectors opens up the opportunity to distribute the traffic more evenly, and to avoid lost productivity in under-loaded sectors. The project develops the flight-centric concept for an ECAC-wide implementation in medium density traffic areas, considering the existing national boundaries. Furthermore, the project includes the development of ECAC-wide deployment scenarios, which are consistent with the limitations of the VHF spectrum for voice communications.</p> <p>Web: www.sesarju.eu/projects/FCA</p>
<p>FCDI <i>Future Connectivity and Digital Infrastructure</i></p>	<p>The project is developing the future communications, navigation and surveillance technologies to support and manage the operational services, like the four-dimensional trajectory management, in the future ATM system. Performance requirements for CNS systems are becoming increasingly complex and demanding and need to be considered as part of an integrated and holistic system of systems, which includes air and ground CNS solutions considering convergence towards a common infrastructure, and a unified concept of operations, where possible. In parallel, CNS systems and infrastructure for both airborne and ground must take a more business- and performance oriented approach with efficient use of resources delivering the required capability in a cost-effective and spectrum efficient manner.</p> <p>Web: www.sesarju.eu/projects/FCDI</p>
<p>GALAAD <i>Green Aviation – Lean Arrivals And Dynamicity</i></p>	<p>The project develops and validates a concept for dynamic required navigation performance (RNP) route allocation in the terminal area to make air traffic control operations more sustainable, resilient, responsive, and adaptive to changes in operational conditions and variations in traffic demand. The aim is to deliver an end-to-end concept, including relevant decision-support tools evolution and taking into account cross-border operations. A move to dynamic routing is expected to result in improved fuel efficiency and environmental sustainability without negatively impacting capacity, while improving safety and cost efficiency.</p> <p>Web: www.sesarju.eu/projects/GALAAD</p>
<p>GEESE <i>Gain Environmental Efficiency by Saving Energy</i></p>	<p>The project seeks to introduce the notion of wake energy retrieval (WER) into air traffic operations within Europe. Specifically, the project elaborates an initial concept of operations (CONOPS) to enable Europe to North Atlantic WER operations, analysing safety aspects and the impact on legacy systems. The project also provides operational solutions for the extension of WER operations within European domestic airspace. As an enabler to operations, the project investigates non-CO₂ potential benefits of formations, in addition to the better-known CO₂ benefits.</p> <p>Web: www.sesarju.eu/projects/GEESE</p>
<p>HARMONIC <i>Harmonised network through smart technology and Collaboration</i></p>	<p>The project completes key aspects of the demand and capacity balancing (DCB) operational concept in those areas where improvements would make the implementation of the operational concept more efficient. Solutions will cover automatic support for spot analysis and resolution, integration of constraints and dynamic airspace configuration (DAC). The overall aim prepare these solutions for early deployment, integrating the new architecture of integrated Network Management (iNM).</p> <p>Web: www.sesarju.eu/projects/HARMONIC</p>

IFAV3

Increased flexibility of ATCO validations - V3

Air traffic controllers are a key resource in air traffic management. Deploying controllers more flexibly to specific portions of en-route airspace, sectors and working positions, when and where needed, can help ATM become more resilient and responsive to unexpected events, changes in traffic demand or staff shortages. The project aims to advance the concept behind increased flexibility of controller validations (IFAV) based on technical enablers, such as specific controller assistance systems that provide support on sector specific procedures and rules. The project focuses on the use of IFAV in upper area control and in remote tower centres.

Web: www.sesarju.eu/projects/IFAV3

IRINA

IFR RPAS Integration into European Airspace

Remotely-piloted aircraft System (RPAS) is a specific set of unmanned aircraft, which is remotely operated by a pilot in a control station. Managing RPAS traffic is challenging for controllers since RPAS fly significantly slower than conventional jet airliners and experience latency in communicating or loss of communications link with the ground. The project builds on the results of the ERICA project to continue the research work on the integration of IFR RPAS into the airspace, addressing the required infrastructure, services, and detect and avoid functionalities.

Web: www.sesarju.eu/projects/IRINA

ISLAND

Intelligent suite for local and network demand and capacity balance

Managing demand for access to the airspace and available capacity is a balancing act in ATM. The project develops dynamic airspace configuration solutions by leveraging artificial intelligence (including machine learning), various virtualisation models, digital integrated network and ATC planning (INAP) applications, as well as network-wide monitoring. The project addresses the need for on-demand air traffic services reflective of traffic demand, and the continuity of ATM services despite disruptions. The solutions enable increased en-route capacity and improved cost-efficiency of air traffic service provision, without compromising current safety levels.

Web: www.sesarju.eu/projects/ISLAND

iSNAP

iTEC SkyNex ATC Platform

iSNAP aims at evolving the current iTEC SkyNex platform to support the virtual centre concept, mainly in terms of architecture and technology. The main objective is to allow the decoupling of ATM service provision from the infrastructure. The platform evolution consistently contributes to enhancing the safety, resilience and scalability of the ATM network, allowing a more flexible provision of ATM services.

Web: www.sesarju.eu/projects/isnap

JARVIS

Just a rather very intelligent system

Digitalisation holds great promise, especially for complex ecosystems like the aviation value chain (aircraft, air traffic control – ATC, airports). By teaming up with their human counterparts (pilots, ATC operators, airport operators), digital assistants (DAs) support the execution of tasks to ensure safe and efficient operations in complex scenarios. The project develops three AI-based solutions: an airborne digital assistant to support crew and single pilot operations; an ATC digital assistant to support more efficient and green tower operations; and an airport digital assistant to increase the level of automation in airports, enhancing safety and security for intrusion detection scenarios.

Web: www.sesarju.eu/projects/JARVIS

KAIROS

Unlocking the potential of AI-based Weather forecasts for Operational Benefits

The project aims to improve the quality of meteorological information through the use of artificial intelligence. Specifically, it integrates live weather information from AI forecasts with existing decision support tools and platforms to assess the operational benefits to several end-users. The aim is to improve the management of demand and capacity balancing across the network level, as well as for local flow management and urban air mobility.

Web: www.sesarju.eu/projects/KAIROS

<p>MIAR <i>Making I-CNSS a Reality</i></p>	<p>The L-band digital aeronautical communication system - LDACS – is a digital broadband radio link that enables a connection between an aircraft and the terrestrial infrastructure, just like in cellular telephony. This secure, scalable and spectrum efficient data link also boasts of having navigation and surveillance capabilities, thereby offering an attractive integrated CNS solution for the sector. The project carries out flight tests to demonstrate how LDACS can enable optimised separation between aircraft in real time and the use of multiple non-GNSS technologies to provide an integrated navigation solution.</p> <p>Web: www.sesarju.eu/projects/MIAR</p>
<p>MITRANO <i>Mission Trajectory in ATC and Network Management Operations</i></p>	<p>Europe’s armed forces operate more than 150,000 flights per year. To accommodate these flights, the airspace is often closed, sometimes at short notice, to civil traffic. Given the growth of air traffic demand and complexity, SESAR is developing operational and technical solutions that allow more flexible civil-military cooperation to maximise the use of airspace. Key to this cooperation is the integration of military operations. The project aims to advance solutions to manage mission trajectories and collaborative decision-making at network level and in ATC operations, including advanced design principles for military access to the airspace.</p> <p>Web: www.sesarju.eu/projects/MITRANO</p>
<p>NETWORK TBO <i>Network Trajectory Based Operations</i></p>	<p>Trajectory-based operations (TBO) is a cornerstone of the SESAR vision paving the way for more predictable air traffic management. TBO is about sharing a common plan for a flight’s trajectory; matching that trajectory to the performance needs of the circumstances; and delivering the trajectory via ATC clearances. The project aims to deliver several solutions to enable trajectory-based operations during the planning and execution phases, taking a network view. Specifically, solutions will address flight and flow in a collaborative environment, making use of downlinked data from the aircraft (EPP) and improving both ATC and network processes through synchronisation of network and local trajectories.</p> <p>Web: www.sesarju.eu/projects/NetworkTBO</p>
<p>OperA <i>Operate Anywhere</i></p>	<p>Innovative Air Mobility (IAM) has the potential to revolutionise last-mile transportation. To pave the way and accelerate market uptake, the project validates complex IAM operations (piloted air taxi and unmanned cargo) in real-life air traffic control conditions, including contingency and non-nominal situations. It specifically addresses air/ground integration and the critical transition from piloted to automated flights, using several key autonomy-enabling technologies. In addition, it ensures environmental sustainability compared to the next-best transport alternative and enhances it by optimising flight routing for minimum noise footprint and aircraft energy utilisation.</p> <p>Web: www.sesarju.eu/projects/OperA</p>
<p>PEARL <i>Performance Estimation, Assessment, Reporting and simulation</i></p>	<p>Performance is at the heart of the SESAR research and innovation programme. In support of this, The project is currently carrying out the SESAR performance management process, under the leadership of SESAR JU. The project is assessing every solution and research outcome, evaluating how they contribute to meeting the overall performance ambitions of the European ATM Master Plan. The project maintains the SESAR Performance Framework and related material, as well as provide support to project maturity gates.</p> <p>Web: www.sesarju.eu/projects/pearl</p>

<p>SAFIR-Ready</p>	<p>The project aims to develop new U-space advanced services together with a central command and control centre (C2C), as well as an automated ground integration (Drone Cargo Port - DCP) to facilitate automated time-critical drone-based services for medical and non-medical use cases. Specifically, research will focus on a dynamic capacity management system (U3), detect and avoid algorithms (U3) and machine to machine communication and decision making (U4). The project extends use cases to non-medical critical missions, such as shore-to-ship for the transport of materials and the inspection of railway and electric grids in case of unforeseen issues with the infrastructure (e.g. a tree fallen on a high tension cable).</p> <p>Web: www.sesarju.eu/projects/SAFIR-ready</p>
<p>SIGN-AIR</p> <p><i>Implemented Synergies, data sharing contracts and Goals between transport modes and AIR transportation</i></p>	<p>The project develops and pilots a new platform for the sharing of data in multimodal travel. The platform provides the means for transport service providers (TSPs) to register, reach data sharing agreements with other TSPs, and manage their contractual relationships. The project addresses contract templates to simplify the legal management, the electronic management, and information provision about each specific contract, routing information for travel companions (TCs) with enriched information about the specific contracts for their customers. The ultimate aim is to facilitate single ticketing through a comprehensive understanding of the contracts and the data managed, among others.</p> <p>Web: www.sesarju.eu/projects/sign-air</p>
<p>SOLO</p> <p><i>Single pilot Line Operations</i></p>	<p>Under current EU regulations, at least two pilots must be present within the cockpit of commercial flights. But new advances in technologies open up the possibility to certify single pilot operations (SPO), either for certain portions of the journey, such as when cruising, or for the whole flight once the technology is mature. The introduction of greater levels of automation in the cockpit would therefore allow the pilot to focus on more strategic and safety-critical tasks. The project aims to develop a concept for single pilot operations, ensuring minimal changes to current ATC tools and procedures. The aim is to feed standardisation and regulatory developments on SPO.</p> <p>Web: www.sesarju.eu/projects/SOLO</p>
<p>SPATIO</p> <p><i>U-Space Separation Management</i></p>	<p>Keeping aircraft safely separated is one of, if not the core function of air traffic management today. As larger numbers of unmanned aerial systems (UAS) take to the skies, separation management becomes more important to avoid mid-air collisions. The project addresses separation between unmanned air vehicles, in particular, strategic and tactical conflict resolution services and the relationship between separation and capacity in U-space airspace.</p> <p>Web: www.sesarju.eu/projects/SPATIO</p>
<p>TRAVEL WISE</p>	<p>The project is developing a single air – rail intermodal collaborative decision making and interconnected operations plan solution including real-time information exchange between stakeholders. The aim is to provide additional information to support the management of both rail and aviation operations and react in a timely and effective manner in case of unforeseen events.</p> <p>Web: https://www.sesarju.eu/projects/travel wise</p>
<p>VITACY</p> <p><i>Virtual center with Triangle Architecture and Cyber-resilience</i></p>	<p>The project develops a “triangle architecture”, a powerful type of architecture based on disaggregating services currently offered by one main ATM data service provider (ADSP) into new specific functionality-oriented ADSPs for arrival management, time-based separation and conflict detection and resolution. The project also develops cyber-resilience tools focused to monitor attacks and display alerts if detected.</p> <p>Web: www.sesarju.eu/projects/VITACY</p>



DIGITAL SKY DEMONSTRATORS

Green light for new Digital Sky Demonstrator on more sustainable airport operations

In July, the PEACOCK Digital Sky Demonstrator got underway with EUR 1.5 million from the Connecting Europe Facility and total investment of just over EUR 5 million.

The project was selected following a call issued in September 2023 by the European Climate, Infrastructure and

Environment Executive Agency (CINEA). The demonstrators are a key tool to support the SESAR JU's vision of delivering the Digital European Sky, matching the ambitions of "sustainable and smart mobility" and "Europe fit for the digital age" initiatives, and the EU Green Deal.

Led by Swedavia, the project will implement a dashboard to analyse and quantify the environmental impact (both noise and emissions) of landing, taxiing and take-off operations at airports around Europe. The aim is to trigger

improvements to make these operations more sustainable.

Over 36 months, the demonstrator will focus on advanced collaborative decision-making processes within a total airport management context, and will specifically:

- Link the Network Manager with an additional 20 airports, including regional airports in Belgium, Czechia, France, Greece, The Netherlands, Poland, Romania and Sweden;



- Implement a quasi-automatic turn-around milestones surveillance process, to increase the predictability of flight departure estimates and therefore time accuracy;
- Exchange departure planning information (DPI) messages and information on traffic flows within the air traffic management (ATM) network.

Digital Sky Demonstrators take place in live operational environments with the main objective to implement the technological solutions necessary to deliver the Digital European Sky. The demonstrators are part of an innovation pipeline designed to bridge the gap between applied/industrial research and

deployment, and to accelerate market uptake. Critical to their success are the involvement of early movers, as well as a strong close connection with relevant standardisation and regulatory activities and bodies.

PEACOCK consortium: Swedavia (coordinator), Aéroports de Paris, Brussels Airport, Bucharest Henri Coandă International Airport, Eindhoven Airport, Fraport, Václav Havel Airport Prague, Wrocław Airport, Gdansk Airport.

More details coming soon!

Read about the full funding package announced by the European Commission: <https://europa.eu/!9qC8Bj>

New call launched for SESAR 3 JU Digital Sky Demonstrators to get started in 2025

In September, the European Climate, Infrastructure and Environment Executive Agency (CINEA) launched a new EUR 2.5 billion call under the Connecting Europe Facility, containing provisions for a series of SESAR JU Digital European Sky Demonstrators in the areas of automation, virtualisation and support for the Green Deal. The Demonstrators are a key tool to support the SESAR JU's vision of delivering the Digital European Sky, and making Europe the most efficient and environmentally-friendly sky to fly in the world. The Demonstrators, when selected, are expected to be launched in 2025 and to run until 2027.

The Demonstrators match the ambitions of several key EU policy initiatives, such as the "sustainable and smart mobility strategy" and "Europe fit for the digital age". They aim to accelerate the implementation of operational measures and technological innovations to improve the fuel efficiency of flights, reduce CO₂ emissions, reduce aircraft noise impact, and improve air quality in and around the airports. Furthermore, the Demonstrators also support the move to a more flexible, scalable, resilient, safe, and secure ATM that can withstand disruptions in the aviation system.

Proposals may address one or more of the following SESAR-related topics:

- Alerts for reduction of collision risks on taxiways and runways
- Optimising airport and TMA environmental footprint
- Dynamic airspace configuration
- Increased automation support
- Transition towards trajectory-based operations (TBO)
- Virtualisation of operations

Supporting the Digital European Sky

#CEFTransport

PEACOCK Digital Sky Demonstrator

Greener ATM operations at European airports



#ConnectingEurope #DigitalSky
#SESARJU #Synergies

sesar
JOINT UNDERTAKING



- Transition towards high performance of air-ground connectivity (multilink)
- Service-oriented delivery model (data driven and cloud based)
- CNS optimisation, modernisation and resilience
- Implement innovative air mobility (IAM) & drone operations

The Demonstrators take place in live operational environments with the main objective to prepare the technological solutions for implementation. As such, the demonstrators are part of an innovation pipeline designed to bridge the gap between applied/industrial research and deployment, and to accelerate market uptake. Critical to their success are the involvement of early movers, as well as a close coordination with relevant standardisation and regulatory activities and bodies.

CEFTransport 2024 Call

#CEFTransport

Support available for **Digital European Sky Demonstrators**

#ConnectingEurope #Synergies
#SESARJU #DigitalSky

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JOINT UNDERTAKING

The graphic features a dark blue header with the text 'CEFTransport 2024 Call' and the hashtag '#CEFTransport' next to a stylized circuit-like logo. Below this is a light blue and green gradient background. A circular inset on the right shows a white airplane flying through a clear blue sky with green tree branches in the foreground. At the bottom, there are several hashtags: '#ConnectingEurope #Synergies #SESARJU #DigitalSky', the 'sesar JOINT UNDERTAKING' logo, and the European Union flag.

Demonstrator on reducing noise and emissions gets going in Brussels



On 1 October, Brussels Airport and Belgian air navigation service provider (ANSP) skeyes commence demonstration flights as part of the HERON Digital Sky Demonstrator. The aim of these flights is to assess whether landings with a steeper approach than usual could offer

benefits in terms of reducing noise impact for surrounding communities, as well as lowering CO₂ emissions and fuel consumption.

The purpose of the demonstrations is to assess the environmental impact of the 'Increased Second Glide Slope' solution, which specifically aims to reduce noise disturbance during the aircraft approach phase. By initiating landings at a steeper angle, aircraft will remain at a higher altitude for a longer time and will also fly at lower speeds, resulting in reduced noise impact for surrounding residents.

During the test period, aircraft will use new procedures with steeper descent angles of 3.2 and 3.5 degrees, instead of the usual 3.0 degrees, on the most frequently used runways, 25R and 25L. These adjustments required the development of specific RNP

(required navigation performance) flight procedures for these demonstrations. An important milestone in the implementation of these new procedures was achieved a few months ago with a successful validation and calibration flight. In the meantime, the necessary publications have been released and approved by the relevant aviation authorities.

Demonstration flights in two phases

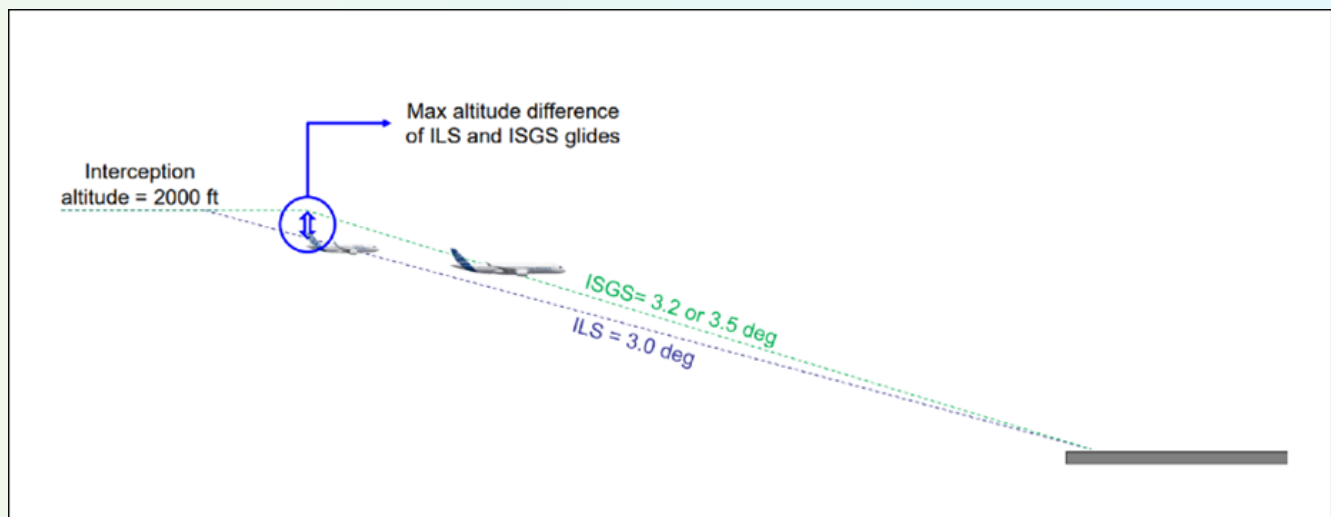
The first phase will run from October to December 2024, focusing on a descent angle of 3.2 degrees. During the second phase, from February to April 2025, flights with a 3.2 degrees angle will be conducted on runway 25R, while the descent angle on runway 25L will be increased to 3.5 degrees.

The demonstration will take place in two phases, with airlines such as DHL, Brussels Airlines, TUI, and Vueling participating in the tests, while other airlines will continue to use the standard descent angle of 3.0 degrees.

The 'Increased Second Glide Slope' (ISGS) SESAR solution is developed in partnership with SESAR JU members, Eurocontrol and Airbus. This project is supported by CINEA - the European Climate, Infrastructure and Environment Executive Agency - and is one of the flagship projects within SESAR JU's Digital Sky Demonstrators.

With these demonstration flights, skyes and Brussels Airport are taking a major step towards cleaner, quieter, and more efficient aviation.

More about HERON: www.sesarju.eu/projects/heron



Testing to get underway in 2025 on low-orbit satellite communication technology



Partners in the CINEA/SESAR JU ECHOES Digital Sky Demonstrator will begin trials of low-orbit satellite VHF data and voice communications technology in May 2025 in Cabo Verde.

The Atlantic archipelago, strategically located along major Europe-South America air routes, will serve as the testing ground for these groundbreaking exercises. The trials will gather vital data to assess the performance of the use of low-orbit satellites for VHF communication and ADS-B surveillance in regions that lack ground-based infrastructure.

These trials are a key milestone for ECHOES, designed to enhance air traffic management across oceanic and remote areas, with the potential to reduce aircraft separation, optimise routes, cut CO₂ emissions, and boost operational safety.

"This project will be a turning point in air navigation, where for the first time, actual VHF communication tests over oceanic areas will be carried out between pilot and controller without the need to

modify avionics or ATM systems. We are bringing communication to space in a transparent way for our professionals," said **Juanjo Cornejo, Director of Business Development, Startical, the ECHOES' coordinator.** He was presenting the plans at the recent CANSO Africa Conference in Sal, Cabo Verde, alongside Margaret Marques, Operations Director at ASA, also participating in the project.

In addition to Cabo Verde, ECHOES will conduct a series of use cases in the South Atlantic corridor, including other oceanic airspaces at both sides of the Atlantic, such as Canarias, Azores-Santamaría, Dakar Oceanic and Brazil Atlantic with other participant ANSPs, such as ENAIRE, NAV Portugal, ASEENA and DECEA.

All this data and information gathered will be used to assess various and decisive system capabilities which



could enable operational improvements such as increasing airspace efficiency by reducing separation minima, the possibility to use User Preferred Routes (UPR), enabling contingency and delegation capabilities, among others.

The importance of ECHOES for oceanic and remote regions

The potential impact could be transformative for oceanic and remote regions where traditional ground-based communication systems are limited. By deploying satellite-based systems, ECHOES paves the way to provide efficient VHF voice and data link and determine end-to-end service parameters (availability, latency, data rate), in combination with satellite-based ADS-B in remote continental areas or also in areas where ground infrastructure deployment is difficult.

What's next for ECHOES?

In the coming months, the focus will be on the launch of the IOD.1 satellite, scheduled to be launched aboard SpaceX's Transporter 13 mission in

March 2025, followed by the launch of IOD.2 on the Transporter 14 mission in July. This will enable ECHOES system to perform exercises under real-world conditions.

More about the demonstrator: www.sesarju.eu/projects/ECHOES

A giant leap for virtual ATM services

Building a virtual centre demonstrator, the EXODUS project represents an important first step towards a future federated ATM operating model.



Europe's air traffic management (ATM) is composed of country-based systems and processes – a fragmentation that has resulted in a lack of interoperability and more costly air navigation services.

Working to overcome these challenges is COOPANS. An international partnership between the air navigation service providers (ANSPs) of Austria (Austro Control), Croatia (Croatia Control), Denmark (Naviair), Ireland (AirNav Ireland), Portugal (NAV Portugal) and Sweden (LFV), COOPANS acts as a single organisation operating a world class, safe and cost-effective ATM system based on the Thales TopSky ATC solution.

With over a decade of efficient cooperation amongst its members, COOPANS is ready to take the next step in ATM harmonisation and federated solutions.

The next step in this journey is the EXODUS project—a Digital Sky Demonstrator co-funded by the EU's Connecting Europe Facility, managed by CINEA.

*"SESAR envisions a future single European airspace system that optimises airspace structures and harmonises operations to become more cost efficient," says **Palle Gericke, COOPANS Innovation Manager at Naviair.** "EXODUS aims to turn that vision into a reality."*

The virtual centre as a first step towards a future federated operating model

At the heart of this effort is the virtual centre concept – a model that moves away from today's geographically-based systems and towards a service-oriented, location independent one. It achieves this by decoupling ATM data services, such as flight data, radar and weather information, from the physical location of the air traffic controller.

The EXODUS project is our first step towards a future federated operating model. *"Having a virtual centre-based system will enable greater flexibility when it comes to organising air traffic control*

operations,” adds Gericke. *“It will also provide a seamless and more cost-effective service provision to airlines and other airspace users.”*

To create such a system, the project is focused on developing and installing a shared infrastructure. This includes building at least two central data centres at two different ANSP locations, along with controller, pilot and supervisory working positions at each COOPANS ANSP member site. All COOPANS partners will also install the necessary local components and connect via a shared infrastructure.

The system will add to the increased flexibility, cost-effectiveness, a more resilient approach to airspace management, with enhanced coordination and interoperability among independent centres.

Changes ahead

The virtualisation of ATM is more than just a technical change, it’s a groundbreaking evolution in how ANSPs provide ATM services. As such, it requires completely new business and operating models and a change in the organisation’s culture.

“Making the necessary cultural changes within COOPANS is an ongoing process, but one that is absolutely necessary to both the project’s success and the success of the future federated model,” explains Gericke.

For example, the EXODUS concept requires organisations to shift from a localised, monolithic approach—where all scenarios are managed independently—to a cooperative model that involves international dependencies. This transition also necessitates that organisations adopt and master new technologies.

“Seeing is believing, and many experts and managers who are comfortable with familiar technologies and concepts will need to see the EXODUS concept in action before they agree to adopt it,” adds Gericke.

A case study on the benefits of using federated air navigation solutions

Knowing this, the project is currently building out the virtual platform to launch demonstrations using live data at ANSP premises. Once operational, the virtual centre demonstrator will provide COOPANS partners with an operating environment where they can learn how

to use the new platform and test new business continuity concepts across ANSPs. A total of five demonstrations are planned.

“The goal is to show how decoupling the ATM data service provider and the air traffic service provider will improve ANSP capabilities and enable an air navigation service provision everywhere from anywhere inside the community,” explains Gericke.

In addition to the virtual centre, the project is also working with the likes of SESAR, EUROCAE and EASA to get the necessary standards and regulations in place within the system’s targeted 2030 – 2035 deployment timeframe.

If successful, EXODUS will position COOPANS as an early adopter of this exciting new service delivery model. But more importantly, it will serve as a case study on the benefits of using federated solutions as a means of increasing flexibility and scalability while also reducing overall costs.

“More than a new step for COOPANS, EXODUS is a giant leap for virtual ATM services,” concludes Gericke.

More about the project: www.sesarju.eu/projects/exodus



Ongoing projects

BURDI

BeNe U-space Reference Design Implementation

The project aims to implement a U-space airspace concept able to manage various, dense and complex UAS operations in controlled, uncontrolled and UAM environment, make this implementation a reference to develop best practices, standardisation, harmonisation and/or interoperability requirements fostering operational deployment of U-space airspaces in Europe, ensure that solutions to be deployed are economically sustainable and socially acceptable/supported for the benefit of the general public.

Web: www.sesarju.eu/projects/BURDI

DEVICE

DElegation through Virtual Centres

The project showcases the delegation of airspace using a virtual centre setup between air traffic service units operating in the same flight information region. It also demonstrates data exchange and interoperability between vendors.

Web: www.sesarju.eu/projects/DEVICE

EALU-AER

Enhanced Automation for U-Space/ATM integration

The project aims to prove feasibility, reliability and operational efficiency of transport services provided by various eVTOL (electric vertical take-off/landing) aircraft for a variety of use cases and applications; foster and accelerate the development of autonomous software solutions for the control, monitoring, data gathering/ orchestration and overall interaction and safety of eVTOL aircraft; develop, deploy, and continually test/optimize the use of UAM (urban air mobility), rural/remote air transport/freight delivery, and UTM (unmanned air traffic management) systems in support of eVTOL services; develop, deploy, and refine operational systems in general eVTOL-based services across multiple use cases and political jurisdictions; define possible Separation Standards Aircraft and UAVs in Controlled Airspace (CAS) through partnership with IAA ANSP (future Air Nav Ireland).

Web: www.sesarju.eu/projects/EALU-AER

ECHOES

Extended Communications in VHF Over Enhanced Satellite segment

The overall objective of ECHOES is to demonstrate the feasibility of space-based solution for very high frequency (VHF) communications (voice and datalink) in air traffic management. Building on initial technical proofs of concept carried out by the VOICE project, the ECHOES Digital Sky Demonstrator investigates some key functionalities, such as inter-satellite links, on-board processing of data in the satellite, or simultaneous transmission and reception of VHF communications. In addition, the Demonstrator focuses on operational aspects of the technologies, including operational topics, involving more stakeholders (airlines and ANSPs), and contributing to the regulatory and standardisation of the space-based VHF technology based on the analysis of end-to-end system performances.

Web: www.sesarju.eu/projects/ECHOES

ESMA

European Sky Multilink ATN

ESMA addresses the need to increase the level of automation in air traffic management (ATM) through the implementation of a multi-link communications infrastructure, focusing on datalink using satellite communication (SATCOM Datalink) alongside VHF Data Link (VDL) Mode 2.

The demonstration focuses on long-term data collection in an operational multi-link environment to demonstrate that technology meets the technological requirements and business needs of air navigation service providers and airspace users.

Web: www.sesarju.eu/projects/ESMA

EXODUS

EXODUS demonstrates the viability of a common system for members of the COOPANS Alliance based on a virtual centre (VC) model that geographically separates the ATM data service provider (ADSP) from the location of the air traffic service unit (ATSU). The goal is to prove the operational and business viability of a future common COOPANS operating model based on two SESAR Solutions: the rationalisation of infrastructure (PJ.16-03) and delegation of ATM services (PJ.10-W2-93A) for testing and training, including supervisory positions.

Web: www.sesarju.eu/projects/EXODUS

HERON

Highly Efficient Green Operations

Climate change will shape many aspects of citizens' lives in the 21st century and beyond. Major ATM changes, in the way energy is used or wasted, are required to limit global warming and its environmental and social impacts. The HERON project aims to foster deployment of a set of ambitious targets to mitigate CO₂ emissions from air transport and offer mitigation through the development of meaningful and sustainable activities including more efficient aircraft operations both in the air and on the ground.

Web: www.sesarju.eu/projects/HERON

PEACOCK

The project is implementing a dashboard to analyse and quantify the environmental impact (both noise and emissions) of landing, taxiing and take-off operations at airports around Europe. The aim is to trigger improvements to make these operations more sustainable.

Web: www.sesarju.eu/projects/PEACOCK

U-ELCOME

U-space European COMMon dEpLoyment

U-ELCOME project is aiming at the fully scalable market uptake of U1 and U2 U-space services through a set of tests and demonstrations in various operational environments and European locations. To do so, U-ELCOME develops, tests and demonstrates SESAR solutions in various across 15 locations distributed in Spain, Italy and France.

Web: www.sesarju.eu/projects/U-ELCOME



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