European Commission

Research and Innovation

Smart airports

and innovations in multimodality

A PROJECTS INFO PACK BY CORDIS

FOREWORD

"Innovation is driven by collaboration – it is the force that enables us to break new ground, delivering smarter, more connected and more efficient solutions."

Andreas Boschen
Executive Director of the SESAR Joint Undertaking

Airports play a pivotal role in the European transport ecosystem, acting as key nodes that seamlessly connect air travel with other modes of transport, such as rail. In an increasingly interconnected and a more environmentally responsible world, ensuring smooth and efficient transitions between these modes is not just an aspiration but a necessity for creating a more integrated and sustainable transport system.

sesar
JOINT UNDERTAKING

At the SESAR Joint Undertaking (SESAR JU), we are bringing together the entire air traffic management community – airports, air navigation service providers, airspace users, industry, professional staff organisations and academia – to advance solutions that will make Europe's transport system more efficient, resilient and passenger-centric. Our ambition is to make Europe the most efficient and environmentally friendly sky to fly in the world. This includes smooth connections with other transport modes.

This publication showcases a selection of projects from our Digital European Sky research and innovation programme that are shaping the future of airport operations and multimodal connectivity. From enhancing collaborative decision-making at airports to improving the integration between air and rail, these projects are harnessing cutting-edge digital technologies, automation and artificial intelligence to optimise traffic flows, enhance operational efficiency and improve the passenger experience. They are also helping to reduce the environmental impact of operations through green taxiing techniques and environmental performance dashboards.

Funded under Horizon Europe and the Connecting Europe Facility, these projects span the full innovation life cycle, from exploratory research to Digital Sky Demonstrators. Their collective aim is to move towards smarter airports with optimised operations and foster a more connected transport network, where air travel is seamlessly linked with other modes of transport.

Over the coming years, we look forward to seeing the results of these projects and the transformative impact they will have on Europe's aviation and mobility ecosystem. No single organisation can achieve this alone – it is through collaboration that we will build the safe, smart, efficient and sustainable transport system of tomorrow.

Enjoy the read!

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EDITORIAL

Connecting the dots: smarter airports and seamless mobility powered by SESAR JU

Airports are at the heart of Europe's transport system. As the European Union works to deliver smarter, more sustainable and connected mobility, transforming airport operations and linking air travel with other transport modes is essential. Research and innovation supported by SESAR JU is helping to make this transformation a reality – enhancing airside efficiency, improving traffic management in and around airports, and enabling seamless multimodal journeys. This transformation aligns with the vision of a Digital European Sky, which aims to make European air traffic management part of a modern, high-performing multimodal transport system by 2045.

Europe's sustainable and smart mobility strategy envisages connected and automated multimodal mobility – where passengers can seamlessly travel door to door. At the same time, it – along with the European Green Deal and Fit for 55 plan – calls for smarter, more sustainable aviation operations on the ground and in the air. Airports sit at the intersection of these ambitions, acting as vital hubs within the transport network.

SESAR JU drives digitalisation in all aspects of air traffic management, including at airports, by integrating advanced technologies, such as artificial intelligence, big data analytics and automation. These innovations enhance the efficiency of airport operations through improvements in collaborative decision-making, situational awareness, managing possible disruptions, and passenger flow management. They also ensure that airports operate as integral components of a broader European transport ecosystem, while preparing for the integration of innovative air mobility (IAM) and urban air mobility (UAM).

The projects highlighted in this Pack, supported through the SESAR JU, work to improve multimodal mobility by linking airports with ground transport modes, in particular rail and emerging forms of connected and automated mobility. They explore how enhanced data sharing allows seamlessness of transfers between air and rail, reducing travel times, improving coordination and connectivity, and enhancing the overall passenger experience.

This transformation is supported by the development of mobility-as-a-service (MaaS) platforms that unify booking, ticketing and real-time updates across different transport providers. These advances are underpinned by efforts across Europe to enable interoperable digital mobility services and shared data spaces, helping to break down silos between transport modes and operators.

SESAR JU is at the forefront of this transformation, promoting smart

infrastructure such as digital twins, which provide real-time simulations of airport operations to support operational planning, and remote towers, allowing air traffic control to be managed off-site using high-definition cameras and sensor data. These solutions help to enhance flexibility, reduce infrastructure costs and support smaller airports with limited resources.

The projects featured also leverage advanced communication, navigation and surveillance (CNS) technologies, and predictive tools to improve the management of aircraft and vehicles on the ground and in the terminal manoeuvring area.

The projects in this Pack further support more sustainable, dynamic and predictable airport operations by developing tools that enable airports to better anticipate, monitor and manage aircraft movements and to steer overall performance. These solutions allow for more accurate departure planning, improved traffic flow information and real-time environmental assessments. By enhancing situational awareness, operational coordination and performance analysis, they support smarter decision-making across the airport ecosystem.

Coupled with efforts to improve connectivity between regional airports across Europe and the European air traffic management network, these innovations help optimise airside operations, reduce emissions and noise, and contribute to a more efficient and environmentally responsible air traffic system.

Research and demonstration projects powered by SESAR JU are instrumental in testing new ideas and concepts in real-world airport environments. These efforts are vital in making Europe's transport system more resilient, efficient and environmentally sustainable, ensuring it meets the demands of the future.

SMART

JARVIS
Just a rather very intelligent system

ORCI
Optimised Runway Centreline Interception

PRIAM
Planning Regional-Scale Multimodal Operations for Innovative Air Mobility Services

TRUSTY
TRUStworthy inTelligent sYstem for remote digital tower

"Our digital assistants don't replace humans but collaborate with them, benefiting passengers and industry."

Stefano Riverso, JARVIS project coordinator

PROJECT ID CARD

Full name: Just a rather very intelligent system

Project dates: 1 June 2023 – 31 May 2026

Coordinated by: Collins Aerospace in Ireland

Funded under: Horizon Europe – Climate, Energy and Mobility

CORDIS factsheet: cordis.europa.eu/project/id/101114692

Project website: research.dblue.it/jarvis

Total budget: EUR 15 762 360

EU contribution: EUR 10 847 806

JARVIS

Increasing the trustworthiness of AI in aviation

Artificial intelligence-powered digital assistants developed by the JARVIS project aim to improve air traffic management, alongside safety and passenger experience.

As with many industries, integrating artificial intelligence (AI)-enabled digital assistants (DAs) into aviation workflows could improve decision-making and operational performance. Inspired by these potential gains, JARVIS is developing three AI-based DAs: one airborne (AIR-DA), one for air traffic control (ATC-DA) and an airport version (AP-DA).

“Our digital assistants don’t replace humans, but collaborate with them, benefiting passengers and industry,” says project coordinator Stefano Riverso, discipline leader autonomous systems at project host Collins Aerospace.

Powered by machine intelligence, the AIR-DA is designed to increase flight deck automation, helping pilots manage complex operational scenarios and reducing their workload. The ATC-DA will increase air traffic control automation, benefiting airspace capacity management by offering tactical recommendations, flight plan error correction and short-term traffic forecasting.

Finally, by expanding airport automation, the AP-DA will enhance safety, with features such as intrusion detection, and operational efficiency by optimising aircraft turnaround and terminal passenger flow.

Increased safety and performance

The SESAR JU-supported JARVIS project is addressing challenges common to all three DAs: ensuring AI decision-making is trustworthy, explainable, safe and ethical; delivering human-centric designs which maximise teamwork with humans; and creating big data and cloud infrastructures for secure and decentralised data management.

“We are collaborating with the European Union Aviation Safety Agency, adopting its AI Roadmap recommendations, and giving feedback intended to push the boundaries of what is achievable,” adds Riverso.

Key to this approach is the creation of an Ethics Advisory Board for independent feedback. All three DA prototypes will be validated during 2025, with aviation experts, such as pilots and air traffic controllers, participating in both simulated and real environments. The aim is to provide evidence of enhanced aviation workflows by mid 2026.

“Initially, the digital assistants will operate in their own environment, but we envision later integration within multi-agent systems for machine-to-machine collaboration and teaming up with humans when needed,” notes Riverso.

"This research wouldn't have been feasible even five years ago, now we have the data and the tools."

Jose-Manuel Risquez, ORCI project coordinator

PROJECT ID CARD

Full name: Optimised Runway Centreline Interception
Project dates: 1 June 2024 – 30 November 2026
Coordinated by: ISA Software in France
Funded under: Horizon Europe – Climate, Energy and Mobility
CORDIS factsheet: cordis.europa.eu/project/id/101167539
Project website: orci.isa-software.com
Total budget: EUR 819 494
EU contribution: EUR 819 494

ORCI

Enhancing final approach management with AI

The ORCI project is exploring how artificial intelligence tools could support real-time decision-making in air traffic management's most crucial moments.

Air traffic managers operate in some of the most high-pressure environments in aviation, and landing approaches are where both workload and complexity are at their peak.

The SESAR JU-supported ORCI project aims to develop advanced automation support tools in the Terminal Management Area (TMA) domain. The goal is to equip controllers in final approach sectors with information on when to issue vectoring instructions, to ensure optimal spacing between consecutive arrivals in high-density, complex TMA operations.

"We wanted to help air traffic controllers manage spacing between aircraft landings, which is cognitively demanding and highly dynamic, using enhanced capabilities that lead to improved operational efficiency, capacity and environmental performance," says Jose-Manuel Risquez, senior ATM-IA expert at INECO.

The project brings together partners from France (ISA Software), Spain (INECO, ENAIRE) and Portugal (NAV-PT) with expertise in air traffic management, artificial intelligence (AI) and aviation technology. It also draws on recent advances in AI-machine learning and leverages large-scale air traffic data to develop practical solutions.

"This kind of research wouldn't have been feasible even five years ago," Risquez explains. "Now, we have the data and the tools to train models that can actually assist human operators in meaningful ways."

From prototype to real-world potential

So far, the team has developed and trained prototype models for two airports – Lisbon and Barcelona – each chosen for their contrasting approach layouts: the point merge system in Lisbon and the trombone layout in Barcelona. By testing across two very different configurations, ORCI aims to confirm that its solution can be adapted to a range of operational environments and layouts.

Early results are promising. The model's average margin of error in predicting separation distances is around 0.4 nautical miles (0.741 km), a figure considered operationally useful. "Controllers told us this was a good starting point," Risquez notes.

Work is now shifting to simulation and validation. The project team is integrating the AI model into a simulation platform ahead of further trials with air traffic controllers later this year. Their feedback will be essential. "Ultimately, we want to know if this tool reduces cognitive workload and helps controllers make faster, safer decisions under pressure," he adds.

Success will mean more than a working algorithm, says Risquez. It needs to be a practical tool that controllers trust, improving spacing accuracy, reducing the need for radio comms and enhancing safety. "If they say it helps, and the simulation backs that up with hard data, then we'll know we've built something that matters," concludes Risquez.

"Our AI-enabled solution will help extend new transport opportunities to more isolated populations, improving quality of life and benefiting local economies."

Lucía Menéndez-Pidal, PRIAM technical coordinator

PROJECT ID CARD

Full name: Planning Regional-Scale Multimodal Operations for Innovative Air Mobility Services

Project dates: 1 September 2024 – 28 February 2027

Coordinated by: Nommon Solutions and Technologies in Spain

Funded under: Horizon Europe – Climate, Energy and Mobility

CORDIS factsheet: cordis.europa.eu/project/id/101167262

Project website: priam-project-sesar.eu

Total budget: EUR 999 625

EU contribution: EUR 999 625

PRIAM

Joining the dots to enhance regional transport

PRIAM uses artificial intelligence tools to enable innovative air mobility services, seamlessly linking remote regions to the heart of multimodal transport networks.

Current innovative air mobility (IAM) opportunities – such as large drones known as 'electric vertical take-off and landing vehicles' (eVTOLs) – promise more efficient, sustainable and accessible air transportation.

"eVTOLs can overcome geographical barriers, better connecting regional populations when rail or roads are not viable," says Lucía Menéndez-Pidal, aviation engineer at project host Nommon and technical coordinator of PRIAM. Yet questions remain about wider coordination with other transport modes, alongside meeting passenger demand and expectations.

Consequently, the SESAR JU-funded PRIAM project is helping to build a more ambitious, passenger-centric, transport system linking European rural and urban hubs, powered by a suite of artificial intelligence (AI) tools.

PRIAM built a virtual representation of Europe's current regional transport network (known as a digital twin), augmented by data analytics and AI modelling. This enables the team to conduct scenario simulations before real-world deployment.

The team's analysis of mobile network data using machine learning offers a deeper understanding of passenger mobility patterns (journeys, transportation modes, frequency and so on). Combined with survey data, PRIAM can estimate likely IAM adoption levels. Optimisation techniques will suggest the best locations for vertiports, alongside how best to integrate IAM services within current multimodal transport networks.

Towards a passenger-centric transport system

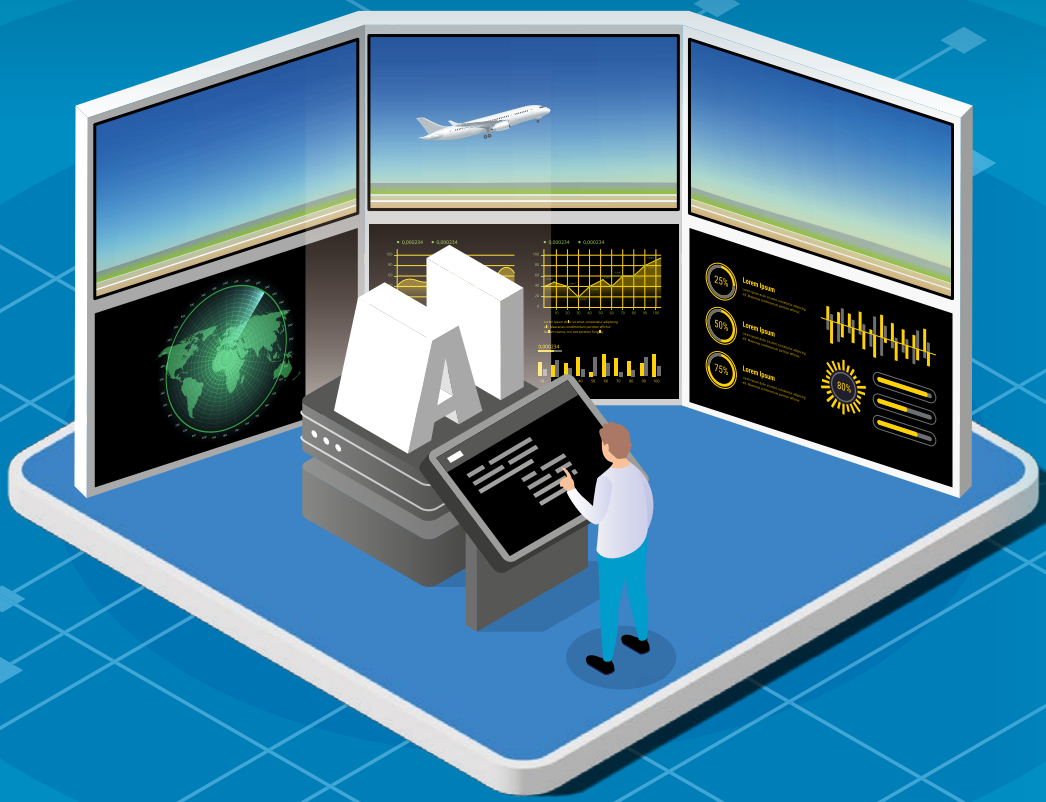
Two case studies will validate PRIAM's tools and algorithms. One will be performed in the La Gomera-Tenerife region of Spain's Canary Islands, a mountainous region reliant on ferry transport, while the other will be run in the Catalan Pyrenees, another sparsely populated mountainous region that is a hotspot for tourism.

"Our AI-enabled solution will help extend new transport opportunities to more isolated populations, improving quality of life and benefiting local economies," adds Menéndez-Pidal.

Alongside an impact assessment framework, building upon work carried out by sister SESAR projects such as TRANSIT, MultiModX and MUSE, PRIAM will develop a digital toolset to support IAM implementation, complemented by deployment recommendations.

"Transforming opaque 'black-box' remote digital tower systems into transparent user-centric 'white-box' systems makes AI understandable, useful and empowering."

Mobyen Uddin Ahmed, TRUSTY project coordinator



PROJECT ID CARD

Full name: TRUStworthy inTelligent sYstem for remote digital tower
Project dates: 1 September 2023 – 28 February 2026
Coordinated by: Mälardalen University in Sweden
Funded under: Horizon Europe – Climate, Energy and Mobility
CORDIS factsheet: cordis.europa.eu/project/id/101114838
Project website: research.dblue.it/trusty
Total budget: EUR 999 968
EU contribution: EUR 999 968

TRUSTY

Trustworthy AI gives remote digital towers a boost

Successful advanced air traffic management systems won't be fuelled by artificial intelligence wizardry, but by trust – which the TRUSTY project aims to provide.

Using cameras and sensors, remote digital towers (RDTs) can centralise air traffic management operations to increase efficiency and safety, while reducing costs. However, most RDTs rely on artificial intelligence (AI) functionality which, alongside being technically complex to integrate, must be trusted by human operators.

The TRUSTY project – supported by SESAR JU – is developing adaptive RDT systems to enhance human-machine interaction. "Transforming opaque 'black-box' RDT systems into transparent user-centric 'white-box' systems makes AI understandable, useful and empowering," explains project coordinator Mobyen Uddin Ahmed, a professor in the Artificial Intelligence and Intelligent Systems group at project host Mälardalen University.

TRUSTY has integrated AI into two air traffic control scenarios. The YOLO-World deep-learning model complements video monitoring technology to detect objects on runways and taxiways, reducing delays, fuel consumption and emissions.

Audio-to-text transcription is used for critical situation management. The system monitors pilot communications, interpreting them using semantic interpretation tools, such as Word2Vec, enabling the system to issue danger alerts.

From the runway to the road

"Regardless of technical efficiency, these tools only work if they are trusted, so we are adopting several explainable AI and human-AI teaming techniques," adds Shahina Begum, project researcher and deputy leader of the Artificial Intelligence and Intelligent Systems group. Interactive dashboards display real-time data, such as aircraft trajectories, while data storytelling narrates the factors that lead to AI predictions.

Field tests with professional and student air traffic managers have already been carried out at project partner ENAC's facilities in France. Simulated operational scenarios have tested the AI's ability to handle complex situations, alongside usability testing to ensure user-friendliness.

The team is also now conducting impact and scalability assessments to evaluate how the system performs across different airport settings.

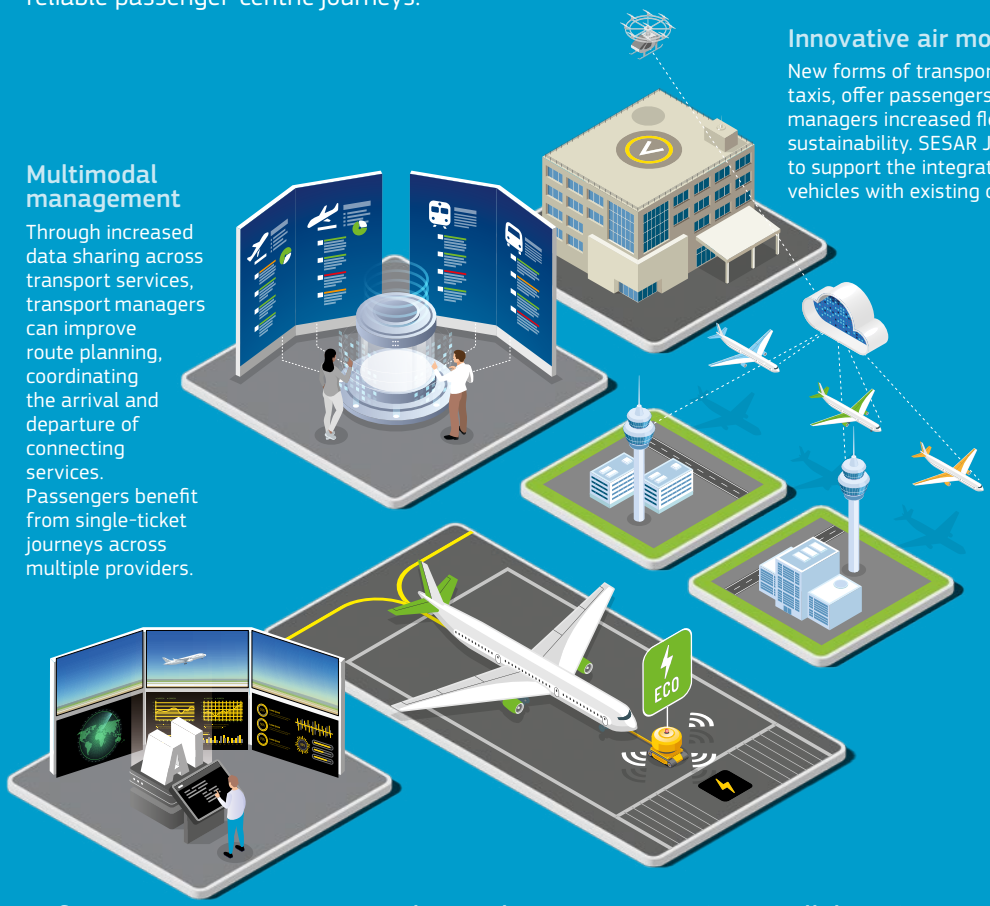
While TRUSTY's explainable AI components and human-centric design address growing demand for (and concerns over) automated systems, especially in safety-critical sectors such as aviation, roll-out will likely be phased, beginning with smaller airports and expanding to larger hubs as the system matures.

"Longer-term, the system could be integrated into multimodal coordination systems, optimising air, rail and road traffic flow, offering more connected, intelligent transport ecosystems," concludes Begum.

Bridging land and air

Europe's sustainable and smart mobility strategy aims to deliver connected and automated multimodal mobility, offering passengers seamless door-to-door journeys. To achieve this, airports must transform into transport hubs that integrate air travel with other transport modes such as rail, bus and autonomous vehicles.

The Single European Sky ATM Research Joint Undertaking (SESAR JU) supports a more integrated and sustainable European transport network via increased digitalisation of services. Through improved airport operations, advanced traffic management and the integration of transportation service providers, travellers across Europe can enjoy robust and reliable passenger-centric journeys.



Innovative air mobility

New forms of transport, such as air taxis, offer passengers and airport managers increased flexibility and sustainability. SESAR JU is working to support the integration of these vehicles with existing operations.

Multimodal management

Through increased data sharing across transport services, transport managers can improve route planning, coordinating the arrival and departure of connecting services. Passengers benefit from single-ticket journeys across multiple providers.

AI for ATM

Air traffic management is a complex and demanding task. Transparent, reliable and trustworthy AI can shoulder the burden by detecting physical obstacles, transcribing pilot and tower communications, filtering data flows, and more.

Ground control

Taxiing with engines running consumes significant fuel and generates emissions, whereas engine-off towing systems deploy tow-bots to eliminate much of this burn. AI-driven routing tools then optimise ground paths and resource allocation to cut idle time, further boosting efficiency and sustainability.

Airport collaboration

A holistic, integrated platform brings together airside and landside stakeholders – from long-term planners to real-time operators – to synchronise every aspect of airport activity and rapidly respond to changing conditions. By linking regional airports to the Network Manager's system, traffic predictability can also be enhanced, capacity is balanced across the network, and arrivals and departures can be planned proactively.

SEAMLESS

FASTNet
Future dAta Services and applicaTions for airports and Network

MAIA
Multimodal Access for Intelligent Airports

MultiModX
Integrated Passenger-Centric Planning of Multimodal Transport Networks

SIGN-AIR
implemented Synergies, data sharing contracts and Goals between traNsport modes and AIR transportation

Travel Wise
TRansformation of AViation and rAilway soLutions toWards Integration and SynergiEs

"Reducing delays through improved predictability and better usage of capacity will make air transport more attractive."

Juan García, FASTNet project coordinator

PROJECT ID CARD

Full name: Future dAta Services and applicaTions for airports and Network

Project dates: 1 June 2023 – 31 May 2026

Coordinated by: Indra in Spain

Funded under: Horizon Europe – Climate, Energy and Mobility

CORDIS factsheet: cordis.europa.eu/project/id/101114718

Project website: sesarju.eu/projects/FASTnet

Total budget: EUR 10 473 705

EU contribution: EUR 4 803 147

FASTNet

Data connectivity to boost airport operations

Through integrated data technologies, the FASTNet project will help airports to collaborate and achieve significant efficiencies.

Airports and air transportation networks need to become more flexible and collaborative if they are to make the most of existing resources while absorbing increased demand safely and securely.

To achieve this, the SESAR JU-funded FASTNet project is pioneering advances in new data services. These will help to fully integrate airport operations into the aviation network, through artificial intelligence (AI) and improved airport-to-airport coordination.

“The project will enhance airport and network integration through two solutions,” says FASTNet project coordinator Juan García from Indra in Spain. “Both integrate datasets available at the local level, such as local restrictions and strategic local information, to ensure efficient planning.”

The first solution aims to enhance the tactical planning of daily operations, while the second aims to strengthen longer-term strategic planning that is carried out months in advance.

“We have defined the operational concept for both solutions,” notes García. “Over the following months, we will be performing validation exercises to measure and evaluate the benefits that each solution provides.”

Collaborative planning

The long-term goal is that FASTNet will bring performance benefits for airports and the global aviation network, including improved flight predictability.

In the tactical phase, machine learning applied to aircraft surface data and weather information will be used to estimate realistic taxi times and potential delays. In the strategic and pre-tactical phases, prediction models will take account of factors such as numbers of passengers with reduced mobility (PMRs) and amounts of baggage.

“These information sharing solutions will allow for more efficient airport operations and the optimised use of airport capacity in all weather conditions,” says García. “Better planning will help airports to avoid delays, blockages and the incorrect usage of resources.”

From the passenger perspective, FASTNet solutions will improve the predictability of operations and lead to better airport experiences. This includes better handling of PMRs, less waiting time at check-in and an overall reduction in stress.

“Reducing delays through improved predictability and better usage of capacity will make air transport more attractive,” adds García. “Passengers will be more confident and European aviation more sustainable.”

"These early-stage solutions will help to shape the direction of upcoming innovation in multimodal airport access."

Juan Blasco, MAIA technical coordinator

PROJECT ID CARD

Full name: Multimodal Access for Intelligent Airports
Project dates: 1 June 2023 – 30 November 2025
Coordinated by: Nommon Solutions and Technologies in Spain
Funded under: Horizon Europe – Climate, Energy and Mobility
CORDIS factsheet: cordis.europa.eu/project/id/101114853
Project website: maiasesarproject.eu
Total budget: EUR 1 000 000
EU contribution: EUR 1 000 000

MAIA

Tools to support more efficient airport multimodality

Advanced data analysis pioneered by the MAIA project will help airports to integrate more efficient and passenger-friendly means of access.

Air passengers rely on ground-based transport to get to and from the airport. These services need to be flexible and adaptive to take full account of fluctuating demand and specific mobility issues.

With this in mind, EU initiatives such as Connected, Cooperative and Automated Mobility (CCAM) and Urban Air Mobility (UAM) aim to improve airport connectivity and increase journey resilience, while reducing environmental impact.

The SESAR JU-supported MAIA project was launched to support the integration of these initiatives into airport access planning, through the development of advanced data analysis and modelling tools. "The project is currently in its final phase," says technical coordinator Juan Blasco, from Nommon Solutions and Technologies in Spain.

Three solutions have been developed to date. MAIA-Engine offers data analytics and modelling capabilities to understand passenger expectations and simulate their behaviour. MAIA-CCAM supports the operation of shared autonomous vehicle fleets for airport access. And MAIA-UAM is designed to facilitate the deployment of unmanned aerial vehicle (UAV) services for airport access, by identifying optimal locations that balance passenger convenience with operational requirements.

Shifting away from private car use

Using these, MAIA aims to maximise the contribution of innovative mobility solutions to the competitiveness and sustainability of the European aviation sector. "The three solutions were trialled in two real-world case studies in Brussels and Madrid," notes Blasco. "We assessed the potential for enhancing passenger experience, increasing capacity and improving environmental sustainability in airport access."

While the tools are not yet ready for industrial deployment, they represent an important foundation for future applied research. "These early-stage solutions will help to shape the direction of upcoming innovation in multimodal airport access," adds Blasco. "They show how CCAM and UAM services can be configured and integrated within existing transport systems."

The ultimate goal is to enable the design of airport access services that offer compelling alternatives to private car use and enhance the passenger experience. "This modal shift will directly contribute to lower CO_2 emissions associated with airport access, supporting broader environmental and climate objectives within the transport sector," says Blasco.

"Transport systems need to reduce emissions and environmental impact without sacrificing efficiency."

Eric Tchouamou Njoya, MultiModX project coordinator

PROJECT ID CARD

Full name: Integrated Passenger-Centric Planning of Multimodal Transport Networks

Project dates: 1 July 2023 – 31 December 2025

Coordinated by: Bauhaus Luftfahrt in Germany

Funded under: Horizon Europe – Climate, Energy and Mobility

CORDIS factsheet: cordis.europa.eu/project/id/101114815

Project website: multimodx.eu

Total budget: EUR 1 305 830

EU contribution: EUR 1 305 380

MultiModX

Bringing multimodal mobility to life

A suite of decision-support tools developed by the MultiModX project will better coordinate Europe's transport systems.

To support the EU's goal of sustainable and smart mobility by 2050, MultiModX set out to create innovative solutions that integrate air and rail planning to enable smoother, more sustainable journeys across the continent.

"Transport systems need to reduce emissions and environmental impact without sacrificing efficiency," says project coordinator Eric Tchouamou Njoya, head of economics & transport at aviation think tank Bauhaus Luftfahrt.

At the heart of the SESAR JU-supported MultiModX project are three integrated solutions: disruption management, schedule design and performance assessment. Together, they will allow for improved coordination across transport modes, especially in times of disruption or delay.

One such tool focuses on real-time disruption management. "It's based on a coordinated air and rail schedule adjustment," explains Tchouamou Njoya. "It enables airlines and other stakeholders to respond quickly to disruptions and reallocate passengers, either to rail or air, minimising travel time, delay and costs."

The second tackles schedule design, merging flight and train timetables to optimise transfer time. The team has developed detailed passenger and regional profiles to model demand and preferences across regions and demographics. "Understanding how people choose between time, mode and price lets us optimise more realistically," he adds.

Smart travel, smarter systems

By analysing flight schedules, rail timetables, infrastructure characteristics and passenger mode choices, the third tool predicts emerging mobility trends and indicates how infrastructure and services can adapt. Additionally, it can simulate operations to support real-time planning and ensure a seamless, efficient traveller experience.

Pilots are under way, focusing on intra-Spain and long-haul connectivity from Spain, with the ultimate goal of replicating the approach across Europe. This will be made possible by defining passenger archetypes and developing models that can be adapted to different regional and national contexts throughout the EU.

As the project comes to a close, success for MultiModX means providing a solid foundation for future developments. "If we can demonstrate that integration of air and rail leads to time and cost savings, this could be developed into higher TRL technology in the future," concludes Tchouamou Njoya.

If successful, MultiModX could revolutionise multimodal mobility, where flight delays don't leave travellers stranded, and changing modes is as simple as crossing a platform.

"Aviation, rail and public transport often operate in silos, which significantly hinders the effective sharing of data needed to achieve multimodal travel."

Ismini Stroumpou, SIGN-AIR project coordinator

PROJECT ID CARD

Full name: implemented Synergles, data sharing contracts and Goals between traNsport modes and AIR transportation

Project dates: 1 June 2023 – 31 May 2026

Coordinated by: Polytechnic University of Catalonia in Spain

Funded under: Horizon Europe – Climate, Energy and Mobility

CORDIS factsheet: cordis.europa.eu/project/id/101114845

Project website: sign-air.eu

Total budget: EUR 5 089 725

EU contribution: EUR 3 562 807

SIGN-AIR

Multimodal travel starts with data sharing

By streamlining the sharing of data between transportation service providers, the SIGN-AIR project aims to make multimodal travel a reality.

The future of travel may be multimodal, but that future will not materialise unless transportation service providers (TSPs) share data. "Aviation, rail and public transport often operate in silos, which significantly hinders the effective sharing of data needed to achieve multimodal travel," says Ismini Stroumpou, project manager at Sparsity Technologies.

The SESAR JU-supported initiative is focused on addressing those roadblocks that prevent efficient collaboration and data sharing amongst TSPs. "Efficient data sharing between TSPs is a prerequisite to offering the integrated services that make multimodal travel a viable and attractive option," adds Stroumpou.

The project looks to streamline the creation and management of Data Sharing Agreements (DSAs) and Smart Contracts (SCs). To do so, it is building a secure web platform where TSPs from different modes can create, monitor and modify signed contracts.

Additionally, the platform supports the integration of multimodal schedules, proposing itineraries with acceptable transfer times that are appealing to passengers. When disruptions occur, it analyses affected journeys, predicts cascading effects on subsequent legs and proposes real-time rerouting options to passengers, thus enhancing resilience and enabling single ticketing across modes.

Reliable and resilient journeys

The project's key goal is to enhance passenger-centric mobility. "Without effective data sharing, a passenger experiencing a delay in their initial train journey might miss their connecting flight, and the airline might not have the necessary information to assist them," explains Stroumpou. "This leads to frustration, inconvenience and a negative perception of public transport."

With SIGN-AIR, the contracts would automate the exchange of relevant information, allowing for a proactive rebooking or alternative travel arrangements to be made, thus significantly improving the overall passenger experience.

The SIGN-AIR platform can also be used to identify sustainable alternatives to replace short-haul flights and enable the introduction of emerging mobility such as 'flying taxis'. "By automating and simplifying the contractual framework, SIGN-AIR is set to transform the total travel experience," concludes Stroumpou.

"The presence of air, rail and maritime stakeholders in the consortium has been a huge asset."

Micol Biscotto, Travel Wise project coordinator

PROJECT ID CARD

Full name: TRansformation of AViation and rAilway soLutions toWards Integration and SynergiEs

Project dates: 1 October 2024 – 30 September 2027

Coordinated by: Deep Blue in Italy

Funded under: Horizon Europe – Climate, Energy and Mobility

CORDIS factsheet: cordis.europa.eu/project/id/101178579

Project website: travelwise-project.eu

Total budget: EUR 6 395 011

EU contribution: EUR 4 999 173

Travel Wise

Designing the future of disruption-proof travel

By integrating air and rail services, the Travel Wise project aims to make Europe's transport systems smarter, faster and more resilient.

Travel Wise aims to improve passenger experience and service continuity by enhancing real-time coordination and collaborative decision-making across air, rail and maritime modes.

Supported by SESAR JU and coordinated by Italian research hub Deep Blue, the project's core challenge is to enable coordination between the air, rail and maritime sectors, which operate within very different ecosystems, infrastructures and operational frameworks.

As well as improved efficiencies, the project serves a growing need for coordinated and adaptable mobility during major disruptions. "These situations often affect multiple transport modes at once, yet responses are still fragmented and siloed," explains project coordinator Micol Biscotto.

Disruption-ready mobility

So far, the project has made solid progress. It has developed its Concept of Operations, mapping out how the solution will function in real-life scenarios. A benchmarking study has reviewed current coordination models revealing areas ripe for improvement. Meanwhile the foundations are being laid for three pilots: the Amsterdam–Paris city pair, Athens International Airport and Bologna's regional airport.

Key to the project's success is its diverse consortium of stakeholders, including transport operators, infrastructure managers, technology providers and user-centred design experts. Their involvement ensures the solution is not only innovative but also practical. "The presence of air, rail and maritime stakeholders in the consortium has been a huge asset," says Biscotto.

Workshops and interviews have also been crucial for capturing exactly what operators and users really need. Early results have delivered a clearer understanding of operational challenges, including the need for real-time decision support, privacy-respecting data sharing, and user-friendly interfaces.

One of the key hurdles will be harmonising standards and procedures across different transport sectors and countries. But this challenge has also strengthened the project so far, pushing it to develop a more robust and widely applicable solution.

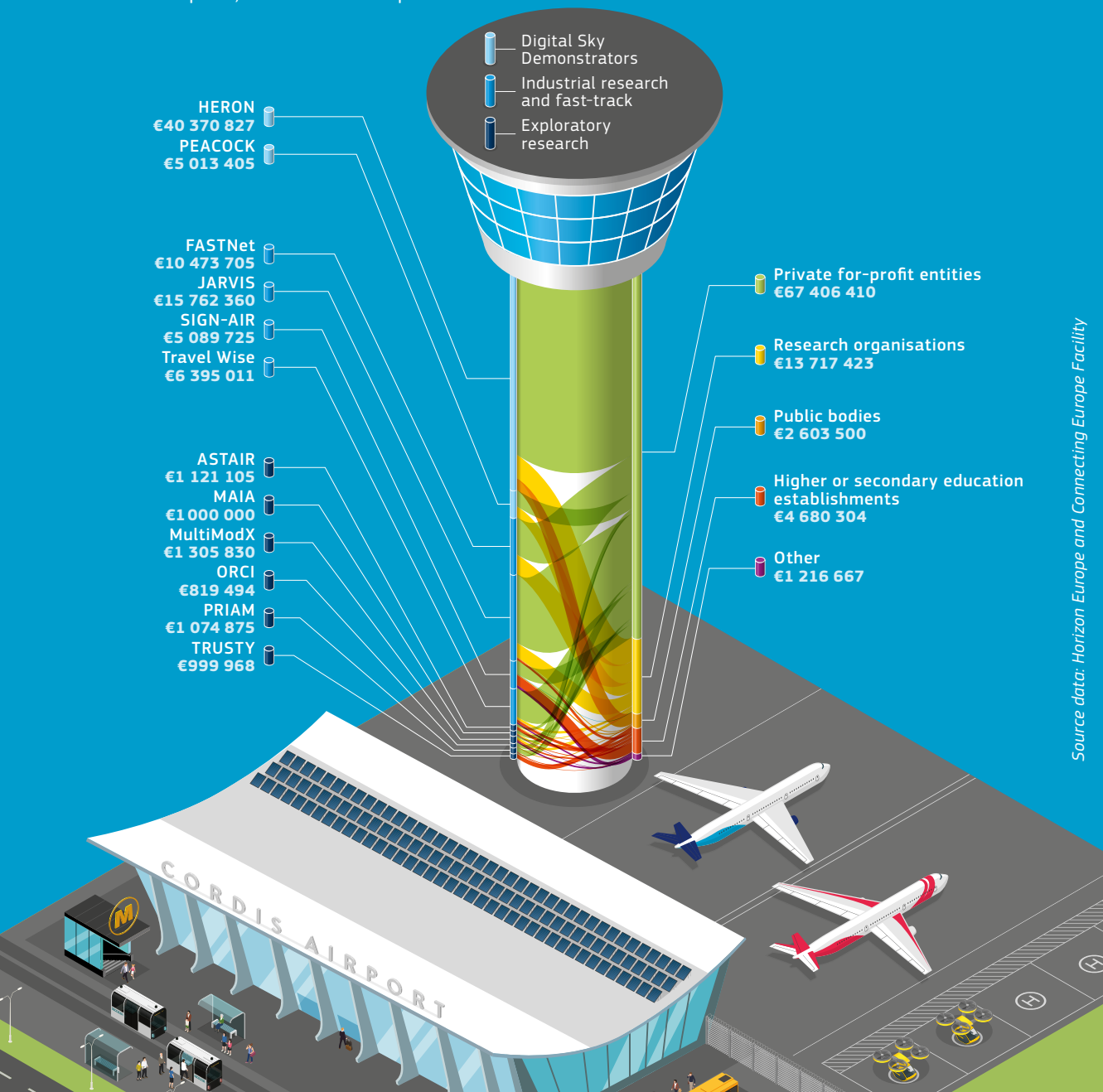
Travel Wise aims to deliver more than a concept, it hopes to create a validated, ready-to-use framework that improves multimodal transport coordination, so that passengers can keep moving, even in the face of the unexpected.

A fleet of opportunities

The Single European Sky ATM Research Joint Undertaking (SESAR JU) is a public-private partnership established to modernise air traffic management in Europe and deliver the Digital European Sky.

Funding by Horizon Europe is matched by industry and Eurocontrol, for a total budget of almost €1.6 billion, with additional funds provided through the Connecting Europe Facility.

Of 78 ongoing projects, the 12 highlighted in this brochure represent an investment of almost €90 million towards the goal of improved multimodal mobility. Beneficiaries include researchers working across more than 100 institutions, including universities, independent research centres, public bodies such as civil aviation authorities and meteorology centres, and industry partners such as airports, airlines and aerospace businesses.



Source data: Horizon Europe and Connecting Europe Facility

SUSTAINABLE

HERON
Highly Efficient Green Operations

PEACOCK
Predictable and Environmentally friendly operations of regional Airports with COnnectivity and Climate as Keyword

ASTAIR
Auto-Steer Taxi at AIRport

"HERON is crucial for advancing a sustainable and integrated European transport system that is fully in line with the EU's Green Deal and climate-neutrality objectives."

Benjamin Tessier, HERON project coordinator

PROJECT ID CARD

Full name: Highly Efficient Green Operations
Project dates: 1 November 2022 – 31 October 2025
Coordinated by: Airbus in France
Funded under: Connecting Europe Facility (CEF) – Transport
Factsheet: europa.eu/!mkRgTQ
Project website: research.dblue.it/heron
Total budget: EUR 40 370 827
EU contribution: EUR 18 108 094

HERON
Raising the bar for sustainable aviation

By making on-ground and in-flight aircraft operations more efficient, the HERON project is helping aviation become more sustainable.

Air traffic management (ATM) is a key piece in the sustainable aviation puzzle. Carbon emissions could be reduced by as much as 10 % through optimised ATM. But beyond sustainability, ATM can also play an important role in developing a truly integrated transport system.

Addressing both aspects is the HERON project. "HERON is crucial for advancing a sustainable and integrated European transport system that is fully in line with the EU's Green Deal and climate-neutrality objectives," says Benjamin Tessier, ATM & engineering project manager at Airbus, the project's coordinating partner.

Now in its final year, the SESAR JU-supported project has been busy deploying over 20 solutions, each of which aims to make on-ground and in-flight aircraft operations more efficient.

One of those solutions is the ADS-C Common Server, which facilitates real-time trajectory sharing between aircraft and ground systems and is vital for enhancing flight predictability and efficiency. Successful trials of this service confirmed its potential to improve predictability and environmental performance during descent phases.

New environmental standards

On the ground, the project has implemented such sustainable taxiing practices as single-engine taxiing and the use of 'taxi-bots'. "These innovative solutions have proven to lower fuel consumption and CO_2 emissions during aircraft movement, complementing HERON's broader green trajectory initiatives," adds Tessier.

The project also produced a solution capable of providing air traffic controllers with real-time wind data, and is preparing the implementation of another solution designed to optimise aircraft separation on approach based on aircraft-specific characteristics.

Not only have these solutions been tested in working airports, they are already delivering results. Airports in Germany are using HERON models to optimise flight trajectories, minimise level flight during descent and offer shorter arrival planning distances.

"By integrating innovations in both airborne and ground operations, HERON has produced practical and scalable solutions to decrease emissions, enhance efficiency and improve safety," concludes Tessier. "In doing so, we're helping set a new standard for environmental responsibility within aviation and contributing to a cleaner and quieter future for the industry."

"Our goal is to develop and demonstrate a simple, low-cost solution that will give regional airports an enhanced level of connectivity with the NM."

Thomas Bengtsson, PEACOCK project coordinator

PROJECT ID CARD

Full name: Predictable and Environmentally friendly operations of regional Airports with COnnectivity and Climate as Keyword

Project dates: 1 November 2024 – 31 October 2027

Coordinated by: Swedavia in Sweden

Funded under: Connecting Europe Facility (CEF) – Transport

Factsheet: europa.eu/!hmcgvjbm

Project website: sesarju.eu/projects/PEACOCK

Total budget: EUR 5 013 405

EU contribution: EUR 1 513 445

PEACOCK

Better connected and more climate-friendly regional airports

Through improved data sharing, the PEACOCK project is helping smaller airports become better connected and more sustainable.

In Europe, air traffic management is delivered by national air navigation service providers and coordinated at EU level by the Network Manager (NM) in close collaboration with Member States. Together, they balance airspace capacity, manage disruptions and optimise performance across the continent.

Performing this important role effectively requires that airports provide the NM with accurate departure estimates, which isn't always the case. It is estimated that the NM only receives accurate departure estimates for about 50 % of the overall air traffic. Small and regional airports make up 83 % of the airports not providing this information.

"These airports simply don't have the resources to invest in the additional IT solutions required to achieve better NM connectivity," explains Thomas Bengtsson, project coordinator at Swedavia. Supported by the SESAR JU, the PEACOCK project aims to address this shortfall. "Our goal is to develop and demonstrate a simple, low-cost solution that will give regional airports an enhanced level of connectivity with the NM," adds Bengtsson.

Smarter and more sustainable

That connectivity will take the form of high-quality predictions of flight departure times. These predictions will be automatically sent from the airport to the NM with an accuracy of around five minutes – a significant improvement on the level of accuracy contained in the flight plan.

"Airports that implement this solution will contribute to capacity management at the network level and, in doing so, will improve air traffic flow across European airspace, resulting in fewer delays," says Alan Marsden, work package leader at EUROCONTROL.

Beyond connectivity, PEACOCK is also focused on noise and emissions monitoring. "A key component to making aviation more sustainable is to ensure airports have the tools they need to make informed decisions about their environmental footprints," notes Bengtsson.

Here, the project is developing and demonstrating integrated tools for monitoring ground operations, which account for a significant proportion of an airport's noise and CO_2. "Airports that use the tools will benefit from having a keen understanding of their environmental performance and be better positioned to implement greener operations," concludes Marsden.

"Managing such routine movements takes up a considerable amount of a controller's time – time that could be better used on more complex, safety-critical manoeuvres."

Mathieu Cousy, ASTAIR project coordinator

PROJECT ID CARD

Full name: Auto-Steer Taxi at AIRport
Project dates: 1 September 2023 – 28 February 2026
Coordinated by: National School of Civil Aviation in France
Funded under: Horizon Europe – Climate, Energy and Mobility
CORDIS factsheet: cordis.europa.eu/project/id/101114684
Project website: sesarju.eu/projects/ASTAIR
Total budget: EUR 1 121 105
EU contribution: EUR 986 484

ASTAIR

AI is coming to a control tower near you

Artificial intelligence from the ASTAIR project is designed to help traffic managers focus on more complex, safety-critical manoeuvres.

Aircraft taxiing is a task typically orchestrated from the air traffic control tower, where air traffic managers give clearances to move aircraft to and from the runway safely. "Although important, managing such routine movements takes up a considerable amount of a controller's time – time that could be better used on more complex, safety-critical manoeuvres," says Mathieu Cousy, a research engineer at the National School of Civil Aviation in France.

According to Cousy, this makes the management of aircraft ground movements a strong candidate for automation. ASTAIR is developing artificial intelligence (AI) algorithms that can collaborate with ground operators and supervise routine taxiing tasks such as allocating tow vehicles.

Supported by SESAR JU, ASTAIR is designing a new concept of human-automation teaming, which combines advancements in autonomous taxiing vehicles with automation technologies, AI and user-centred interactions.

The project is also designing innovative human-machine interfaces that will coordinate the work being done by the air traffic controller with that being done by the algorithm, ensuring they both share a mutual situational awareness of what the other is doing.

Keeping humans in the loop

While AI will handle routine ground operations, it doesn't cut the human factor completely out of the picture. "If an outbound aircraft fails to advise ATC about a departure delay, our solution will automatically handle normal traffic, allowing the human controller to focus their complete attention on efficiently resolving the unexpected issue," adds Cousy.

The project is currently putting the final touches on its human-machine interfaces and AI algorithms. Partners are currently preparing to launch validation exercises simulating several European airports, during which operational feedback on the concept's usability will be collected.

"By combining taxiing solutions with automation technology, ASTAIR is well-positioned to increase airport ground traffic capacity and predictability, giving air traffic control a clear path towards more efficient ground operations and more on-time departures," concludes Cousy.

Policy box

SESAR stands for Single European Sky Air Traffic Management Research. Established by the EU in 2021, the SESAR Joint Undertaking (SESAR JU) is an institutional public-private partnership set up to accelerate the delivery of the Digital European Sky. To do so, it is developing and deploying cutting-edge technological solutions to better manage conventional aircraft, drones, air taxis and vehicles flying at higher altitudes.

Building on the work of the first SESAR JU, this SESAR JU has a 10-year mandate (2021-2031), corresponding to the duration of the Horizon Europe programme (2021-2027), followed by four years to complete the work outlined in its multiannual work programme.

The SESAR JU is integral to several EU policy areas, notably the Single European Sky, of which SESAR is the technological pillar, the sustainable and smart mobility strategy, digital transformation of transport nodes for connected and automated mobility as part of Europe Fit for the Digital Age, and the development of multimodal solutions for rail and aviation with Europe's Rail Joint Undertaking.

The SESAR JU vision, defined in the European ATM Master Plan edition 2025, is to make Europe the most efficient and environmentally friendly sky to fly in the world by 2045.

The JU also offers synergies with several other areas. These include advancing Europe's climate and environmental goals under the European Green Deal and the Fit for 55 package, coordinating efforts to cut CO_2 and non-CO_2 aircraft emissions with the Clean Aviation Joint Undertaking, advancing space-based solutions for European air traffic management with the European Union Agency for the Space Programme (EUSPA), enhancing civil-military coordination in the air domain with the European Defence Agency and collaborating with the European Climate, Infrastructure and Environment Executive Agency on the inclusion of SESAR topics in Connecting Europe Facility calls for proposals for Digital Sky Demonstrators.

Glossary

Air navigation service providers (ANSP) are organisations responsible for providing air navigation services, including air traffic control, navigation aids and communication facilities.

Air traffic management (ATM) refers to the integrated management of aircraft and airspace to ensure safe and efficient transportation. It involves coordination between air traffic control, communication systems, navigation aids and various other elements.

Communication, navigation and surveillance (CNS) collectively refers to the systems and technologies used in aviation for communication between aircraft and ground facilities, navigation for determining aircraft position, and surveillance for monitoring and managing air traffic.

Connected, cooperative and automated mobility (CCAM) refers to transport systems where vehicles and infrastructure communicate and cooperate using digital technologies and automation.

Digital assistants (DAs) are AI-based tools that collaborate with humans to improve decision-making and operational efficiency in aviation. In airports, DAs help optimise aircraft turnaround, manage passenger flow and enhance safety features such as intrusion detection.

A **digital twin** is a virtual model of a physical system, such as an airport, used to simulate and monitor operations in real time. It supports decision-making by providing predictive insights and enabling more efficient planning and coordination.

Electric vertical take-off and landing vehicles (eVTOLs) are aircraft that can take off, hover and land vertically using electric propulsion. They are designed for urban and regional air mobility, offering quiet, efficient and flexible transport solutions without the need for traditional runways.

Innovative air mobility (IAM) refers to the broader concept of integrating new types of air vehicles and operations into the airspace system. This includes both passenger and cargo transport using drones, eVTOLs and other emerging technologies, across a range of environments – urban, suburban, rural and interregional. IAM encompasses urban air mobility, but also extends to services such as emergency response, infrastructure inspection, logistics and regional air mobility.

Mobility-as-a-service (MaaS) is a digital platform that combines various transport services – public and private – into a single application. It allows users to plan, book and pay for multimodal journeys, offering real-time updates and streamlined ticketing.

Multimodal mobility is the integration of different transport modes, such as air, rail and road, into a single, coordinated journey. It enables passengers to travel seamlessly from door to door using connected and interoperable transport systems.

The **Network Manager (NM)** is responsible for coordinating and optimising the flow of air traffic across Europe's airspace. It manages network operations to improve efficiency, reduce delays and support the capacity and safety of the European aviation system.

Remote towers are a digital solution that enables air traffic control to be managed from a location other than the airport, using high-definition cameras, sensors and communication technologies. They help reduce infrastructure costs and extend services to regional airports.

Transportation service providers (TSPs) are companies or organisations that offer mobility services to passengers or goods. They manage and operate various transport modes such as buses, trains, taxis, ride-sharing or multimodal platforms, often integrating digital tools to facilitate seamless travel.

Urban air mobility (UAM) refers to the use of innovative aircraft, such as drones or eVTOLs, to transport passengers or cargo in urban areas. It is part of broader efforts to integrate new forms of air travel into the transport network.

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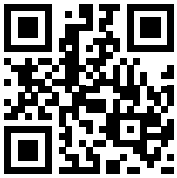

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CORDIS PROJECTS INFO PACK ON AIR TRAFFIC MANAGEMENT AND THE GREEN DEAL

Introducing new technologies and procedures into air traffic management can significantly reduce aviation's impact on the environment. This Projects Info Pack showcases the work of the SESAR Joint Undertaking to advance the sustainability of air transport in the European Union through 10 groundbreaking projects.

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