DigitalSky

SESAR research and innovation digest – 2025

Embracing innovation: key to a sustainable and competitive European aviation sector

European Commissioner for Transport on SESAR innovation

Invest Now, Lead Tomorrow

Industry leaders on transforming air traffic management

The Human Touch in a Digital Sky

Air traffic controllers on human-machine teaming

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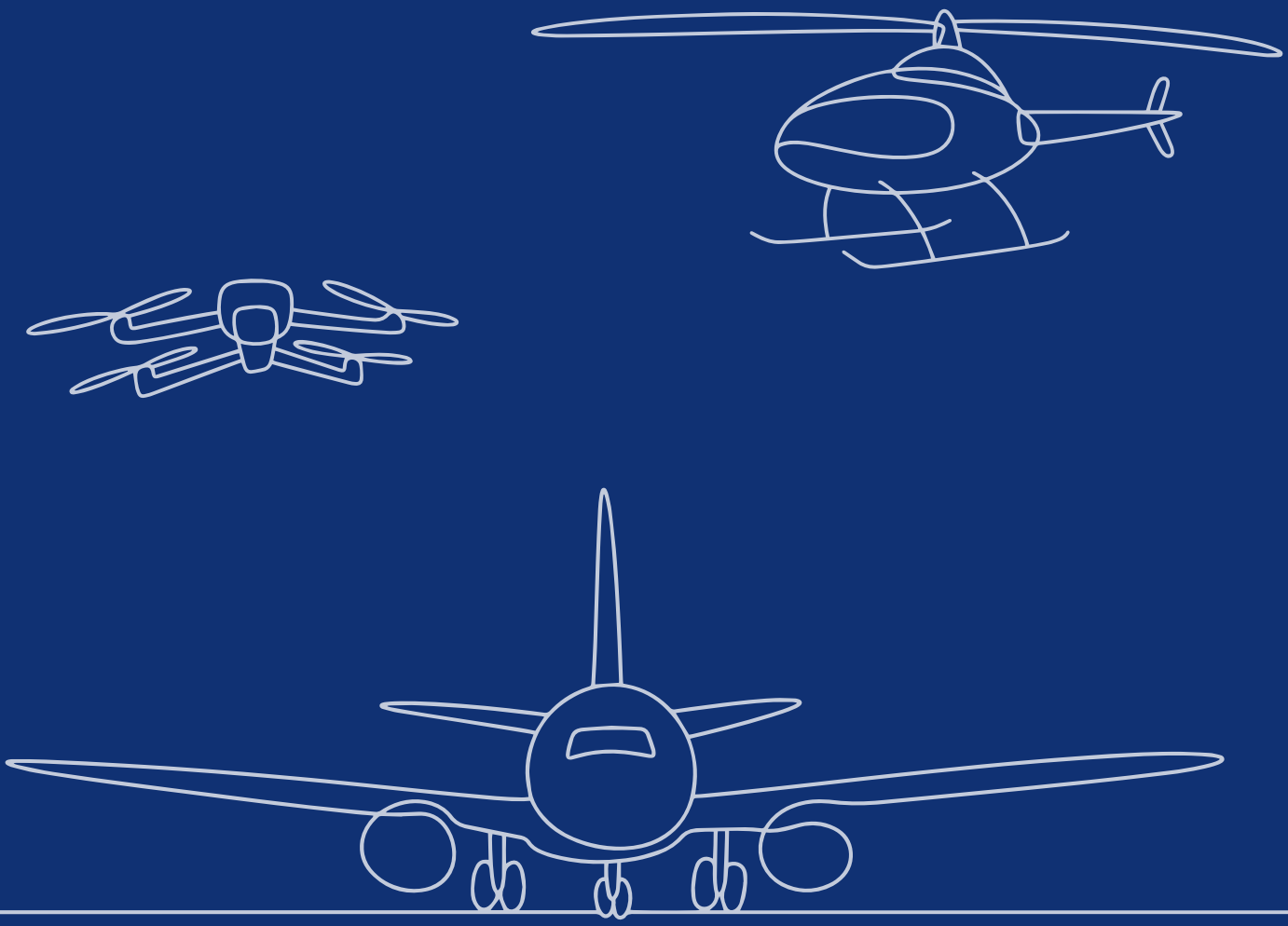

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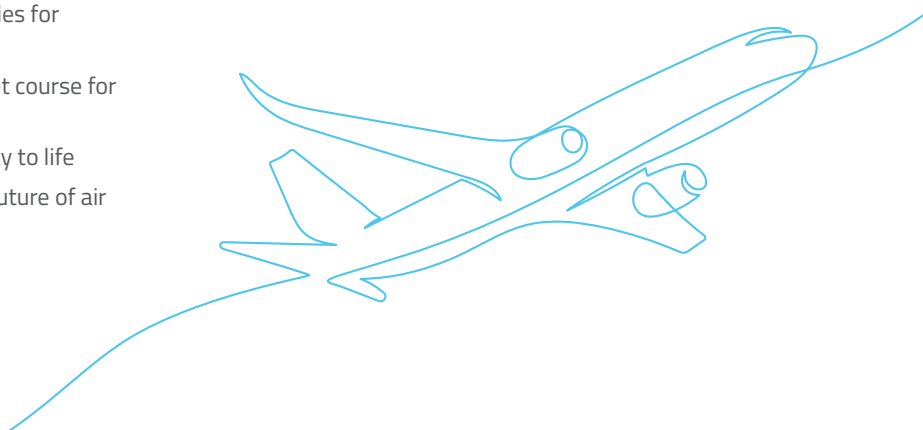

ABOUT SESAR JOINT UNDERTAKING (JU)

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.

ABOUT 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.

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JOINT UNDERTAKING

SESAR Innovation Pipeline

PERSPECTIVES

A LOOK BACK AT A **REMARKABLE YEAR**

Andreas Boschen, Executive Director,
SESAR Joint Undertaking

Welcome to the first edition of *Digital Sky: SESAR Research and Innovation Annual Digest*, bringing together the perspectives, achievements, and research themes that have shaped our work over the past year. You will find viewpoints from the European Commissioner for Sustainable Transport and Tourism, Apostolos Tzitzikostas, leading industry voices, and the air traffic control community, alongside highlights from across the full SESAR innovation pipeline — from exploratory research through industrial research and fast-track activities to demonstrators.

The research themes featured in the digest tackle many of the challenges facing air traffic management today, including strengthening resilience and flexibility, enhancing cybersecurity, and improving operational and environmental performance. Several of the contributions also underline the critical importance of SESAR's work for Europe's competitiveness and technological sovereignty.

The year 2025 showed real momentum behind our shared long-term ambitions. We kicked off the year with the adoption of the European ATM Master Plan, setting out our shared vision to make Europe the most efficient and environmentally friendly sky to fly in the world by 2045. At our annual conference in February, Commissioner Tzitzikostas, characterised the plan as "*a new era for ATM*," underscoring the need for sustained innovation to maintain Europe's leadership.

In May, Airspace World saw strong support for the new service delivery model for ATM, marking a shift towards data-driven, cloud-enabled operations. At the Paris Air Show, we presented ARIS — the Aviation Research and Innovation Strategy — to Commissioner Tzitzikostas, highlighting the socio-economic value of investment in aviation research and its importance for Europe's strategic autonomy. In October, a meeting with European Commissioner for Startups, Research and Innovation, Ekaterina Zaharieva confirmed this direction, with the "clean and smart aviation moonshot" in the next EU financial framework signalling support for CO_2-free aircraft and more automated ATM. In 2026, we will continue contributing to making this vision a reality.

Over the course of the year, our project portfolio expanded with a new Digital Sky Demonstrator, AMEA, while our calls attracted a record number of proposals, reflecting the strong engagement of the aviation community and leading to 42 new projects being selected. We also deepened cooperation by signing memoranda of cooperation with the Galicia and Campania regions, and with the EU Agency for the Space Programme. Across our 79 ongoing projects, research teams continued delivering concrete results, while solutions progressed towards deployment and market uptake. We also started working on a proposal for a Common Project 2, which we plan to hand over to the Commission in 2026. A Common Project defines technologies to be implemented by a given deadline across Europe to progress on the Digital European Sky.

2025 concluded in Slovenia with the SESAR Innovation Days, bringing together Europe's research community to share results, spark new ideas, and celebrate emerging talent through the 2025 SESAR Young Scientist Award.

We hope this digest gives you a flavour of the key milestones achieved by our partnership in 2025.. Enjoy the read and let's stay in touch!

EMBRACING INNOVATION: **KEY TO A SUSTAINABLE AND COMPETITIVE EUROPEAN AVIATION SECTOR**

Apostolos Tzitzikostas, European Commissioner for Sustainable Transport and Tourism

As we reflect on our achievements and look to the future of European aviation, one thing is clear: innovation is everywhere. It has been, and will always be, the driving force behind our successes. In this respect, the SESAR Joint Undertaking is synonymous with innovation. This unique partnership between the European Union and the aviation industry has enabled Europe to build cooperation at scale and deliver solutions with tangible, real-life impact.

As European Commissioner for Sustainable Transport and Tourism, I have had the privilege of witnessing firsthand the remarkable progress being made across the sector. Over the past year, the SESAR Joint Undertaking has played a pivotal role in developing and deploying cutting-edge technologies that are transforming Europe's air traffic management (ATM) system, making it more efficient, more resilient and more sustainable. I am particularly proud that SESAR has succeeded in making ATM truly European, bringing together the best minds and expertise from across the continent around a shared goal of modernisation.

The impacts of SESAR are both measurable and impressive. For every euro invested, we see returns of €6.70, translating into €24.2 billion in industry benefits by 2035. These figures speak volumes about the value of collaboration and the strategic importance of sustained investment in research and innovation.

But SESAR is not just about numbers. It is also, above all, about people. SESAR solutions have already saved passengers 260 million minutes of travel time, reduced CO_2 emissions by 13.6 million tonnes and cut fuel consumption by 4.3 million tonnes. These are concrete benefits for European citizens and for our environment. Indeed, SESAR solutions are putting European aviation firmly on track to achieve its net-zero objective by 2050.

We are modernising air traffic management — and we must accelerate this effort. Europe's aviation sector faces growing capacity and environmental challenges. Air traffic is expected to grow by around 5% annually, reaching 15.4 million flights by 2050. Meeting this demand safely and sustainably will only be possible if we continue to modernise ATM at pace.

A faster implementation of SES2+, making full use of modern digital technologies, must therefore be our first step. This will allow the sector to unlock further efficiency gains and improve performance across the network. It is also a matter of competitiveness and strategic autonomy: around 70% of global ATM technologies are managed by European companies. Deploying these technologies more widely not only delivers a more efficient aviation system, but also strengthens Europe's industrial leadership.

These are compelling reasons to support the Aviation Research and Innovation Strategy (ARIS), unveiled this summer, which calls for €66 billion in investment between 2028 and 2034. It sets out a clear roadmap for Europe to remain at the forefront of aviation innovation.

> ***I am particularly proud that SESAR has succeeded in making ATM truly European, bringing together the best minds and expertise from across the continent around a shared goal of modernisation.***
>
> Apostolos Tzitzikostas, European Commissioner for Sustainable Transport and Tourism

Looking ahead, I also look forward to receiving an ambitious proposal for a Common Project Two next year. This initiative should include innovative ATM technologies deployed in a coordinated and synchronised manner across Europe. Such an approach will be essential to building more agile, dynamic and interconnected systems, fully embracing new developments in artificial intelligence and cloud-based computing.

Partnerships will remain central to achieving these objectives. The European Commission's proposal for the next multiannual financial framework, currently under negotiation by the co-legislators, includes a "smart and clean aviation moonshot" as a flagship measure. This initiative aims to support the development of the next generation of CO_2-free aircraft and automated air traffic management systems. Delivering on this ambition will require close cooperation between the Union, industry and the research community — and I am fully committed to working with all partners to turn this vision into reality.

Going forward, synergies and collaborative approaches must be at the heart of our work. This is how we will unlock the full potential of cross-border ATM solutions and dual-use technologies. A strong example is the Commission's Military Mobility package, adopted in November, which sets out ambitious air mobility objectives — from a cross-border framework to facilitate military operations to the creation of a network of dual-use airports.

As we move into 2026, I encourage the SESAR research and innovation community to continue pushing the boundaries of what is possible. We are entering the final years of implementation of the current SESAR 3 Joint Undertaking, while at the same time negotiating the next multiannual financial framework. Europe needs a clear, ambitious plan for ATM modernisation — and we must be bold in shaping it.

I look forward to continuing our close partnership and working together to secure Europe's position as a global leader in aviation. By embracing innovation, we can build a sustainable and competitive aviation sector that delivers real benefits for all Europeans.

CEO VOICES FOR A DIGITAL SKY: **INVEST NOW, LEAD TOMORROW**

Guillaume Faury, CEO of Airbus, Norbert Haslacher, CEO of Frequentis AG, José Vicente de los Mozos, CEO of Indra Group, Roberto Cingolani, CEO and General Manager of Leonardo, Patrice Caine, CEO of Thales

Europe's air traffic management (ATM) is a strategic infrastructure that underpins the continent's competitiveness, security and connectivity. To secure its future, continued investment is essential — not only to manage rising traffic and meet climate commitments, but to reinforce resilience and maintain Europe's global leadership. This view is shared by Europe's leading ground and airborne manufacturers, who stress the need for sustained investment, coordinated action and a strong deployment strategy to ensure that Europe continues to lead in ATM.

In a video series "*Voices for a Digital Sky: Invest now, lead tomorrow*" industry leaders Airbus, Frequentis, Indra, Leonardo and Thales, all members of the SESAR JU, have reaffirmed their support for the public-private partnership, outlining the critical role it plays in pooling resources and expertise to deliver next-generation ATM technologies. By accelerating innovation and market uptake, they say, SESAR can further strengthen Europe's industrial leadership and strategic autonomy and safeguard its technological edge.

Ensuring Europe's competitive edge

"*SESAR is our strategic advantage*," stresses **Guillaume Faury, CEO of Airbus**. "*For Airbus, it ensures our aircraft operate at their full potential, ultimately bringing more connectivity and growth to Europe and cementing our industrial leadership for the decades to come.*"

SCAN ME

"*To remain competitive in the future, Europe must succeed on three fronts: investment, coordination and global ambition*," says **Patrice Caine, CEO of Thales**, who added that, "*To keep our leadership, our innovations must be designed to be adaptable worldwide That's how Europe will protect its competitiveness and its positive influence in the global aviation sector.*"

This view is shared by **Indra's CEO, José Vicente de los Mozos**, who notes that Europe's leadership today is the result of long-term commitment: "*Thanks to the investments made through SESAR, European ATM solutions are significantly ahead of non-European competitors — a position we must now consolidate by accelerating deployment.*" He warns against losing momentum: "*We need to make better use of the full potential of technology by bringing innovations into operation faster. This is how we will strengthen Europe's performance, efficiency and global competitiveness in the years to come.*"

"*ATM modernisation is a strategic enabler for the future of Europe*," agrees **Roberto Cingolani, Leonardo CEO**, who sees two key pillars to guarantee future success: "*ensuring SESAR R&D and reinforcing the synchronised deployment through common projects, bringing SESAR innovations into everyday operations*".

This emphasis on sustaining Europe's leadership is shared by **Norbert Haslacher, CEO of Frequentis**, who underlines the value of SESAR's collaborative approach: "*Thanks to SESAR all relevant stakeholders in the sector contribute to the further development and modernisation of ATM. This collaboration within SESAR enables the creation of consensus-based standards, which then lead to standards that are recognised globally.*"

Delivering a sustainable European sky

Investing in SESAR and ATM modernisation is not only about gaining a competitive edge, notes **Cingolani**, it also represents a "*fundamental contribution to Europe's wider climate goals, decarbonisation and Green Deal*". **De los Mozos** agrees: "*Air traffic management is a strategic accelerator for decarbonisation. Its effective implementation enables faster and safer emission reductions, amplifying the impact of the most disruptive technologies and measures*".

The need to act is reinforced by Europe's objective of carbon neutrality by 2050. For **Caine,** it is clear that near-term gains are already within reach: "*Sustainable fuels are going to be widespread someday, but smarter ATM can already reduce emissions by 10% by 2030. Optimising flight paths reduces distance, flight time and altitude, which directly lowers emissions.*" A view also shared by **Faury**, who sees ATM as a "*low-hanging fruit*" and one of the "*most powerful and immediate actions*" that can be taken in aviation to address decarbonisation. It is estimated that up to 400 million tonnes of CO_2 could be saved by 2050 can be saved from more efficient operations as outlined by **Frequentis CEO, Norbert Haslacher**: "*Modern ATM systems, many of which are deployed and validated through SESAR, enable, for example, optimised flight trajectories that reduce fuel consumption, continuous climb and descent operations that avoid inefficient level-offs, or dynamic airspace management, reducing delays and airborne holding of aircraft* ".

> ***Driving SESAR forward is therefore a strategic imperative. It's how we ensure that Europe has full control over its critical infrastructure.***

Securing our skies

There is no doubt that ATM is a strategic asset for Europe requiring secure, sovereign and resilient digital infrastructure. As traffic grows and new airspace users emerge, this becomes increasingly critical. "*In today's complex geopolitical landscape, a sovereign European sky depends on a secure, resilient and unified ATM system*," stresses **Faury**. SESAR's digital transformation efforts are intended to make Europe's airspace more resilient to cyber and geopolitical challenges with interoperable systems across Member States. "*Driving SESAR forward is therefore a strategic imperative. It's how we ensure that Europe has full control over its critical infrastructure*," adds the Airbus CEO.

Key to technological autonomy and greater resilience will be the transition to virtualised, interoperable ATM services: "*Offering air traffic management as a software-as-a-service solution breaks down silos and fosters collaboration across Europe, while respecting national sovereignty. It will help our ATM network to be more resilient and also able to shift quickly to a hardened state. All that while remaining open, agile and data-driven*," **Caine** points out.

However, with this transition also comes the risk of vulnerabilities: "*A crucial task for the industry is to embed robust cybersecurity into ATM systems, ensuring that data is managed and stored in compliance with EU standards and avoiding dependency on non-European infrastructures*," says **Haslacher.**

For **de los Mozos**, this is ultimately a matter of strategic follow-through. "*The European Union has a strategic interest in shaping an efficient and sustainable airspace [...] We must take advantage of this position and get things done by continuing with the SESAR programme, which has been crucial to this success.*"

Cingolani agrees noting the dual need for strong industrial leadership and firm political commitments. "*Industry must play a key role in safeguarding a secure, sovereign and future-ready European sky, built on an integrated digital architecture able to perceive, understand and act across all operational domains. [...] We expect that with the forthcoming multi-annual financial framework 2028–2034, which is under negotiation, the EU will confirm resources and priorities for ATM modernisation, recognising modernisation as a strategic enabler for the future of Europe.*"

AIR TRAFFIC CONTROL: A HUMAN-MACHINE PARTNERSHIP

Marc Baumgartner, Frederic Deleau, Philippe Domogala, Nicola Ni Riada, Helena Sjostrom, air traffic controllers International Federation of Air Traffic Controllers' Associations (IFATCA)

Keeping flights safe might be the most exciting job in the world, but will robots be controlling our aeroplanes any day soon? In this interview, experts considered the role of people managing the flow of aircraft and the challenges they face, including working with emerging Artificial Intelligence (AI) systems.

"*Air traffic control is the best profession in the world. I am sure it will change but I can only recommend it*," said **Helena Sjostrom, air traffic controller, International Federation of Air Traffic Controllers' Associations** (IFATCA). "*You never know what's going to happen during the day. It's problem solving on your feet.*"

"*From the moment the plane door closes at the airport until the moment the door opens at its destination, the pilot can't do anything without air traffic control telling them to do it*," explained **Marc Baumgartner, air traffic controller, IFATCA.**

Meaning "*We keep planes away from each other. We keep them safe*," as **Nicola Ni Riada, air traffic controller, IFATCA**, put it. "*You never get bored. Every day is a little bit different and every day you learn something new.*"

Each air traffic controller is typically given 30 to 40 months' training, enabling them to perform at the highest level, like an athlete or a musician, speakers explained, in response to questions from teenagers. This includes the use of radar monitoring and vision, watching planes from an air traffic control tower.

> ***Automation will obviously drastically change my job, but this is progress and it is a good thing. I am more enthusiastic about seeing how AI can help me to improve that I am afraid of it.***
>
> Philippe Useo, air traffic controller

The human factor

As for all jobs today, changes for air traffic controllers include the potential impact of using computer technologies to mimic human intelligence: automation support, AI, or in the popular imagination: robots. As the teenagers asked, "Will AI ever replace air traffic controllers?"

"*We are very keen to understand the ins and outs of AI*," **Frederic Deleau, air traffic controller, IFATCA**, said. He and other expert speakers agreed, however, that AI will be a tool to help people to make better decisions and improve processes, rather than a replacement for human work.

"*AI will definitely be helping as a tool, not a decision maker*," said **Philippe Domogala, air traffic controller, IFATCA**. AI could help air traffic controllers to cope with, for instance, environmental, sustainability and punctuality challenges, as well as increases in traffic. "*Air traffic controllers will not be replaced by AI. It will be a teaming*," agreed Marc Baumgartner.

Olivia Nunez, ex-air traffic controller, SESAR JU, said AI could be an air traffic control support system, offering a broad range of functions including communication, navigation and surveillance. But psychology and "the human factor" will remain very important. SESAR JU works closely with air traffic controllers at all stages of research and innovation from the definition of new technologies through to their validation.

The European ATM Master Plan 2025 foresees "human–machine teaming," in which the role of humans will evolve significantly, focusing on tasks and situations too complex for AI to handle and teaming up with automation to address emerging traffic challenges. This means "automation makes processes better, so humans only intervene where they add value," Olivia Nunez explained. "Automation will adapt to us."

For instance monitoring situations is not something humans are always good at, when traffic is low or late at night. Humans can get bored, always looking at the same screen, while machines do not.

Philippe Useo, air traffic controller, Air Traffic Controllers European Unions Coordination (ATCEUC), said, "*Automation will obviously drastically change my job*," he added. "*But this is progress and it is a good thing. I am more enthusiastic about seeing how AI can help me to improve that I am afraid of it.*"

At the same time, in Europe, air traffic regulations say AI must always be under human control, because if something goes wrong AI cannot be prosecuted or explain its decisions. "*There is so much at stake and aviation is so safety critical. I can't see the human being taken out of that system any time soon*," agreed Nicola Ni Riada.

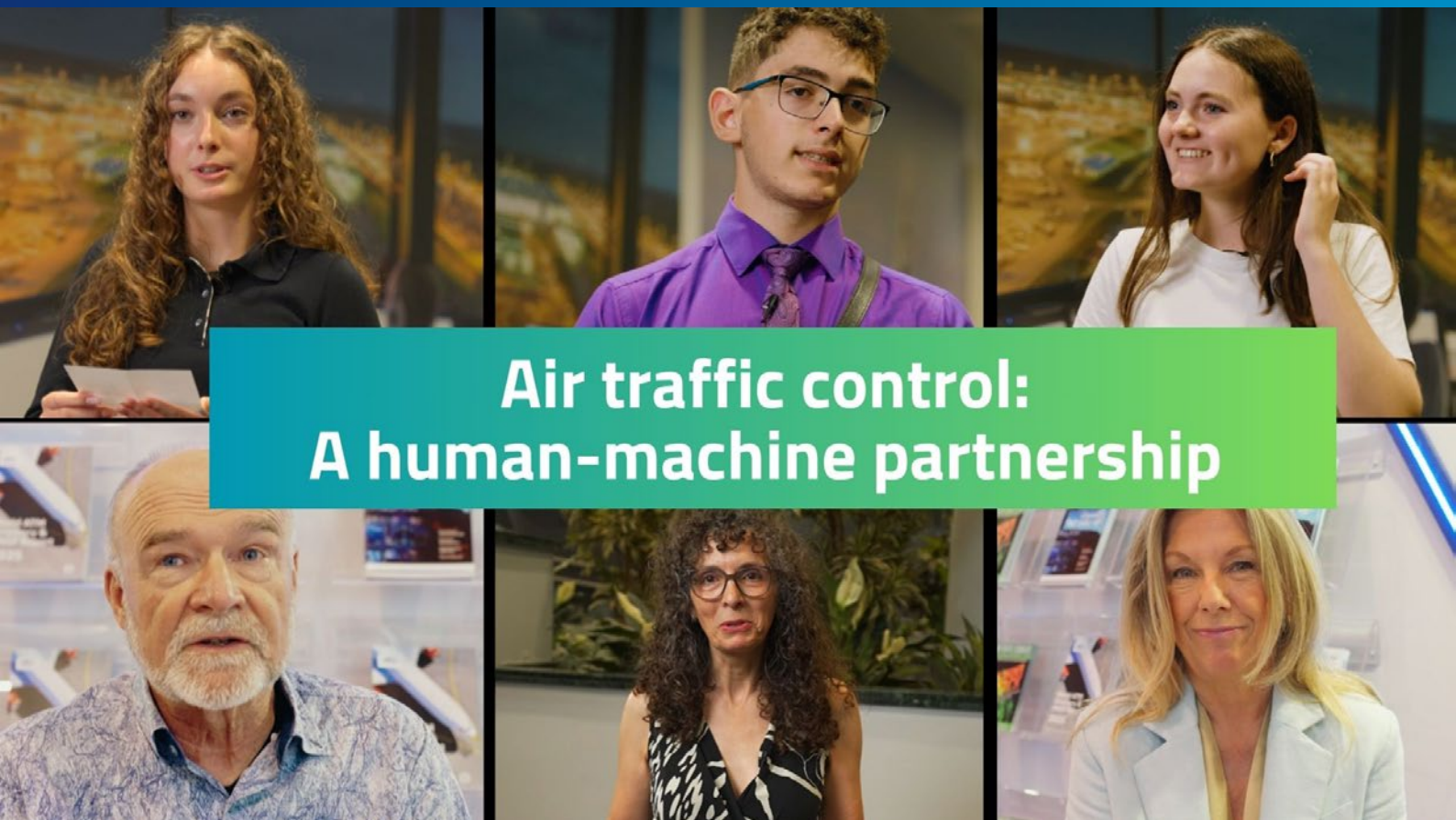
Gaming the skies

"*It's a bit like a very complex video game*," said Philippe Domogala. "Preventing aircraft from hitting each other." Experts were however divided over how useful "gaming" skills are for 21st century air traffic controllers. "*To be tech-curious is a benefit for a young person coming to this job*," said Marc Baumgartner. "*A person with gaming skills will probably be able to use new technologies more intuitively, but I'm not saying all future air traffic controllers need gaming skills.*"

The people we recruit are "not superheroes, but they can manage the pressure," said Frederic Deleau. "*There's no brake in the air once the plane is flying.*"

"*Air traffic controllers are there to the end.*"

SCAN ME



HIGHLIGHTS

Leaders back plan to tackle emissions and delays in air traffic management

The year began with the launch of the updated European ATM Master Plan on 18 February at the SESAR JU's annual conference at Brussels Airport, where over 500 stakeholders gathered to discuss how ATM modernisation can address growing congestion, reduce emissions, and enhance Europe's global competitiveness.

The Plan provides important strategic direction for investments and regulatory decisions, outlining 10 strategic deployment objectives for the next decade, supporting the twin transitions of digitalisation and sustainability. It also defines the last phase of the Digital European Sky (Phase D), by detailing 12 development priorities to address challenges. These include the further integration of innovative air mobility and the next generation of aircraft for zero/low-emission aviation.

Apostolos Tzitzikostas, **European Commissioner for Sustainable Transport and Tourism**, opened the conference, saying, "*The ATM sector already leads the way in using modern technologies and innovative solutions. To protect this frontrunner status, it is very important to set out an agenda for continuous development.*"

Andreas Boschen, **Executive Director of SESAR JU**, emphasised: "*We have a plan and we're delivering it—transforming Europe's skies with cutting-edge technology. SESAR is where ATM modernisation is happening through EU-level collaboration.*"

Held under the patronage of the Polish EU Presidency, the conference heard from **Dariusz Klimczak**, **Minister of Infrastructure of Poland**, who stated, "*Air traffic management is strategic for Europe's economy and security... These initiatives are critical for enhancing Europe's competitiveness as well as ensuring that our airspace is the safest in the world and meets the demands of the future.*"

Growing momentum for new service delivery model

The shift towards a transformative service delivery model for air traffic management (ATM) in Europe gathered further momentum in 2025, as ADB Safegate, Airtel ATN, Collins Aerospace, IFATSEA, and Tern Systems became the latest organisations to sign the joint statement supporting the initiative. Their commitment was formally announced at Airspace World 2025 in Lisbon on 13 May 2025, reinforcing the industry's collective drive to realise a Digital European Sky.

The new service delivery model—centres on a data-driven, cloud-based, and service-oriented architecture (SOA)—represents a cornerstone of the European ATM Master Plan. It is designed to unlock greater flexibility, resilience, and scalability, making the aviation system more adaptable to change and capable of integrating new services rapidly. By decoupling infrastructure from services, the model fosters openness, interoperability, and innovation, enabling modular, multi-vendor solutions.

Andreas Boschen, Executive Director of the SESAR JU, emphasised the significance of these new signatories: "*Their endorsement adds critical weight to the joint effort to reshape Europe's ATM landscape. By committing to a shared vision for open, modular, and cloud-native ATM systems, they are helping to lay the technical foundation for a more flexible, resilient system that is ready to meet the evolving needs of Europe's airspace users, citizens, and economy.*"

This latest wave of support builds on the joint statement launched in 2024, which initially united the A6 Alliance of air navigation service providers (COOPANS, DFS, DSNA, ENAIRE, ENAV, NATS, PANSA, and Skyguide) and leading ATM technology providers (Frequentis, Indra, Leonardo, and Thales). In early 2025, additional backing came from LVNL (Netherlands), Oro Navigacija (Lithuania), Avinor (Norway), EUROCONTROL, and IFATCA.

Aviation industry urges bold action to secure Europe's competitiveness and sovereignty

Europe must invest boldly in aviation research and innovation to safeguard its sovereignty, competitiveness, and resilience. This message was reinforced in 2025 through the launch of the Aviation Research & Innovation Strategy (ARIS) at the Paris Air Show in Le Bourget and subsequent discussions with European Commissioner for Startups, Research and Innovation, Ekaterina Zaharieva.

The European aviation sector is a major socio-economic driver, supporting 15 million jobs and contributing EUR 1.1 trillion to the economy. Europe accounts for a 58% global market share in new civil aircraft, 47% of the order book as of 2024, and 70% of global airspace is managed by European ATM technologies. This technological edge is central to Europe's strategic autonomy and global influence. Yet, this leadership is not guaranteed. To preserve its position, the EU must adopt a bold, forward-looking R&I strategy. Developed jointly by industry, research bodies, and academia and supported by the Clean Aviation and SESAR JUs, ARIS makes the case for strategic investment to build the world's most competitive, safe and sustainable aviation ecosystem, supporting Europe's security and sovereignty.

> *The aviation sector is vital to our economy and our daily lives. We warmly welcome this valuable input, which will contribute to the ongoing discussions on the next Multiannual Financial Framework. We will continue working closely with all partners to ensure that European aviation remains a cornerstone of Europe's competitiveness and a pillar of our strategic autonomy.*
>
> Apostolos Tzitzikostas, European Commissioner for Sustainable Transport and Tourism

The strategy calls for a total investment of EUR 66 billion between 2028 and 2034, covering both research and innovation as well as the crucial step of bringing new technologies to market. Of this, EUR 22.5 billion is requested from the EU, with the remainder provided by Member States and the private sector. ARIS identifies three priority areas: next-generation aircraft technologies, efficient air traffic management, and cutting-edge enablers such as advanced manufacturing, digitalisation, automation, and workforce upskilling.

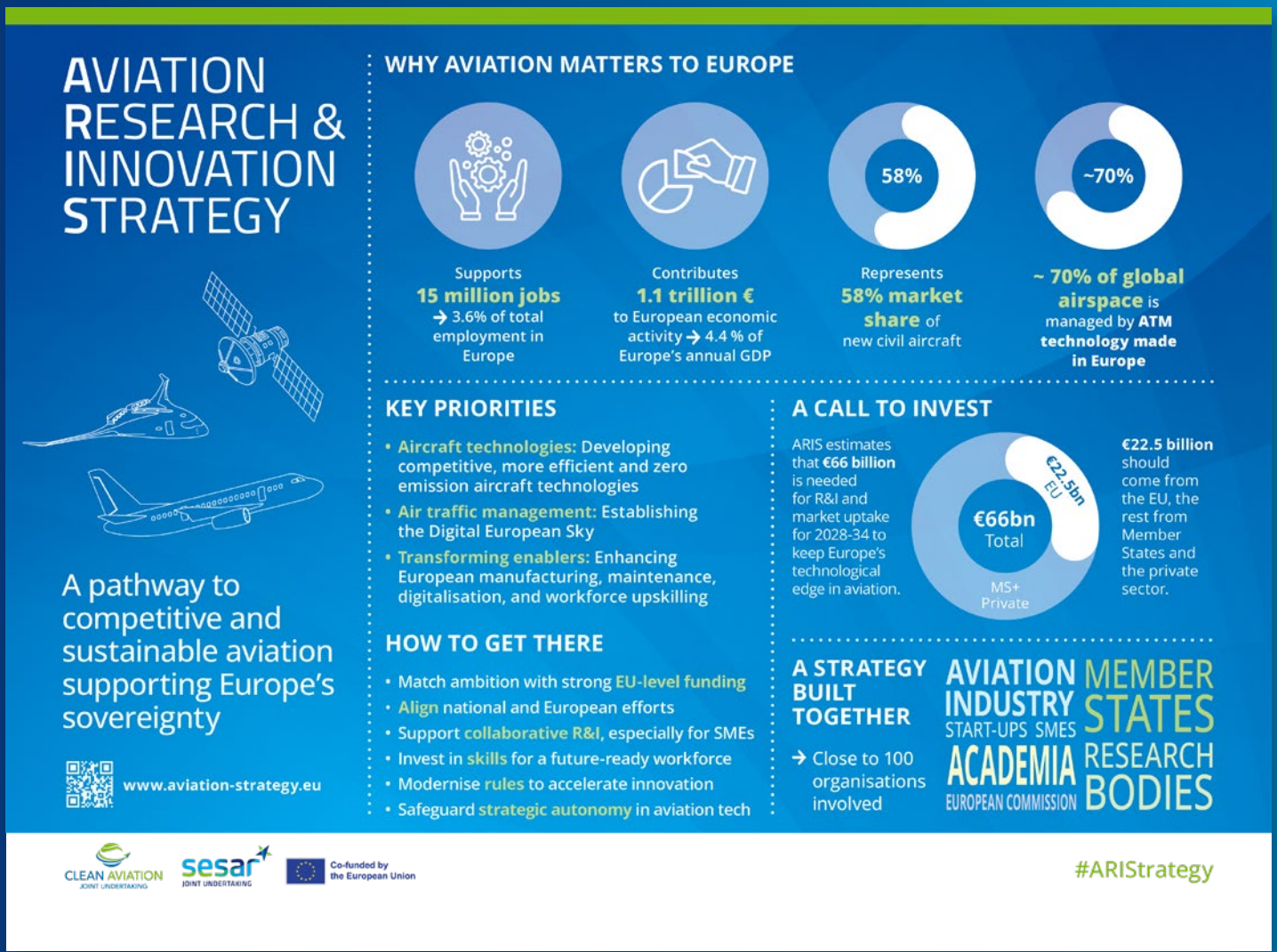
At the Paris Air Show, ARIS was handed over to **European Commissioner for Sustainable Transport and Tourism, Apostolos Tzitzikostas**, who said. "*The aviation sector is vital to our economy and our daily lives. We warmly welcome this valuable input, which will contribute to the ongoing discussions on the next Multiannual Financial Framework. We will continue working closely with all partners to ensure that European aviation remains a cornerstone of Europe's competitiveness and a pillar of our strategic autonomy.*"

The strategy was handed over to the European Commission by **Sabine Klauke** (Airbus) and **Arndt Schoenemann** (DFS), representing the aviation manufacturing and air traffic management industries on behalf of the broader stakeholder community.

In October, a high-level meeting with **European Commissioner for Startups, Research and Innovation, Ekaterina Zaharieva** brought together SESAR JU, Clean Aviation, and DFS to discuss

the strategy's ambitions and the importance of continued investment. The Commissioner highlighted that the "clean aviation moonshot," included in the Commission's upcoming financial framework, will support the development of the next generation of CO_2-free aircraft and automated air traffic management. Investment for research could be supported through Horizon Europe, while deployment could be provided through the European Competitiveness Fund. Additional opportunities for start-ups could also be explored through the European Innovation Council.

www.aris-strategy.eu



Europe's skies to get digital upgrade thanks to EUR 350 million innovation investment

A call for proposals in 2025 led to the selection of 42 new research and innovation projects within the framework of its Digital European Sky programme, representing a total investment of just over EUR 350 million by the European Union and the aviation industry.

With the financial backing of the European Union through Horizon Europe matched by industry, the projects mark the first steps in executing the European ATM Master Plan.

The 17 selected exploratory research projects, with a budget of just under EUR 24 million, will explore a wide range of novel concepts and applications, from quantum computing for real-time trajectory optimisation and quantum sensing for precise navigation, to AI-driven climate impact modelling, automated decision-support systems, and explainable AI for safe, resilient operations. Other areas to be addressed include the integration of mixed fleets of conventional, hybrid, and fully electric aircraft, and the development of digital flight rules and tools to manage multiple simultaneous drone operations in U-space.

Meanwhile, the 25 industrial research projects, with a total investment of EUR 326 million, will advance critical transformation levers such as trajectory-based operations, automation, next-generation ATM service provision, as well as the swift uptake of solutions that boost resilience to GNSS jamming and spoofing, improve climate-neutral operations, and provide situational awareness and conflict detection of drones.

The official launch of the projects is subject to the completion of grant preparation in the first half of 2026.

More about the selected projects

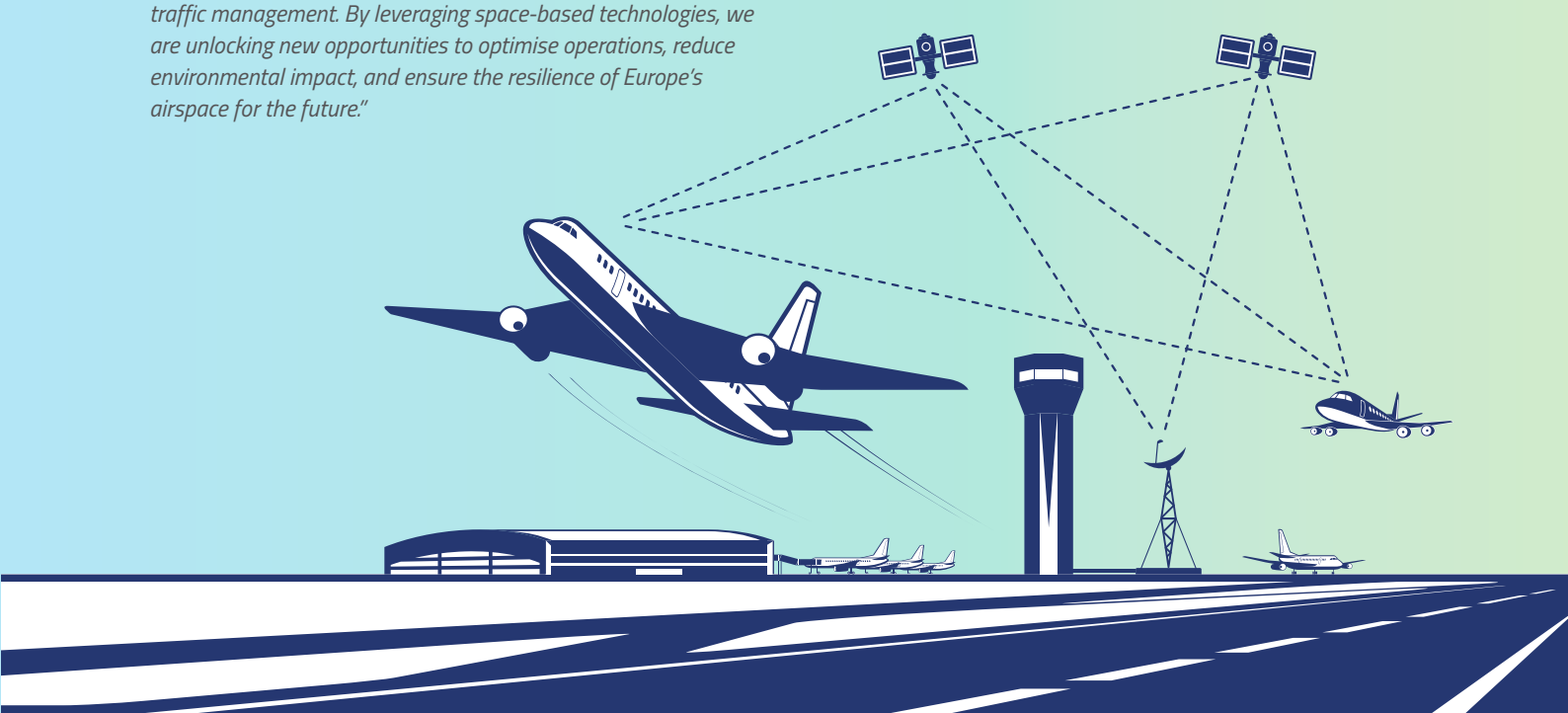
New agreement to advance satellite-based solutions for air traffic management

In January 2025, the SESAR JU and the European Union Agency for the Space Programme (EUSPA) signed a Memorandum of Cooperation (MoC), agreeing to work together to better integrate satellite-based technologies into Europe's air traffic management (ATM) systems.

The agreement prioritises information sharing and joint research initiatives to advance satellite technologies for aviation. It also seeks to align EU funding programmes and incorporate space data into future ATM and aviation projects. Central to the partnership is the development of space-based solutions, including precise satellite navigation for commercial aircraft—such as performance-based navigation—and drone traffic management (U-space).

Andreas Boschen, **Executive Director of SESAR JU**, highlighted the significance of the agreement: "*This partnership with EUSPA represents a critical milestone in our efforts to modernise air traffic management. By leveraging space-based technologies, we are unlocking new opportunities to optimise operations, reduce environmental impact, and ensure the resilience of Europe's airspace for the future.*"

Rodrigo da Costa, **Director General of EUSPA**, echoed these sentiments: "*This Memorandum of Cooperation is a key step in integrating EU space technologies like Galileo and Copernicus into Europe's air traffic management. Partnering with SESAR JU allows us to enhance the safety, sustainability, and resilience of European airspace while fostering innovation and creating new opportunities for growth across the aviation sector, supporting the vision of the Digital European Sky.*"



SESAR strengthens regional collaboration

In 2025, the SESAR JU signed Memoranda of Cooperation with the Italian Region of Campania and the Xunta de Galicia to boost regional contributions to the Digital European Sky. These agreements mark the first formal collaborations of their kind between SESAR and European regions, highlighting the important role of regional innovation ecosystems in modernising air traffic management and supporting Europe's environmental and connectivity goals.

The partnerships create frameworks to align research and innovation priorities, identify additional funding, and engage local stakeholders, including SMEs and academia. Campania's focus includes advanced air mobility, autonomous systems, human-machine interfaces, cyber security, and electric aviation, while Galicia aims to serve as a regional testbed for innovative ATM solutions, leveraging expertise in aeronautical communications, UAV integration, flight simulation, and airport facilities.

"*By joining forces with regions, we can create the synergies needed to turn the vision of a Digital European Sky into a reality. This cooperation will help accelerate innovation, support skills development, and bring SESAR solutions closer to deployment,*" said **Andreas Boschen, Executive Director of SESAR JU**.

Regional leaders emphasised that the collaborations will attract investment, support skills development, and ensure local research and industry actively contribute to Europe's technological leadership in aviation.

"*This agreement recognises Campania's longstanding commitment to innovation and its industrial strengths in aerospace,*" said **Vincenzo De Luca, President of the Region of Campania**. "*It will allow us to work more closely with Europe's flagship air traffic management programme, attract investment to the region, support our SMEs and research centres, and ensure our workforce is equipped with the skills needed for the future of aviation.*"

*"Galicia has long recognised aerospace as a strategic sector for our economy," said **María Jesús Lorenzana Somoza, Regional Minister of Economy and Industry of Xunta de Galicia**. "Through this cooperation with SESAR, we aim to position Galicia as a testbed for innovation and to ensure that our research and industrial capabilities actively contribute to Europe's technological leadership in aviation."*

SESAR 'pairwise' separation solution goes into operation at Heathrow cutting delays and emissions

Pairwise separation, a solution developed by SESAR JU member NATS and other partners, has been deployed at Heathrow Airport, marking a world first in air traffic control. This innovation is designed to boost on-time performance and reduce carbon emissions.

Pairwise separation works by introducing a new method for calculating the minimum separation between arriving aircraft. While traditional separation is based on a small number considering aircraft weight and wake turbulence, pairwise separation tailors the gap calculation to the specific characteristics of each individual aircraft type. This more granular approach allows air traffic controllers to safely reduce separation gaps for certain pairs of aircraft, increasing traffic flow.

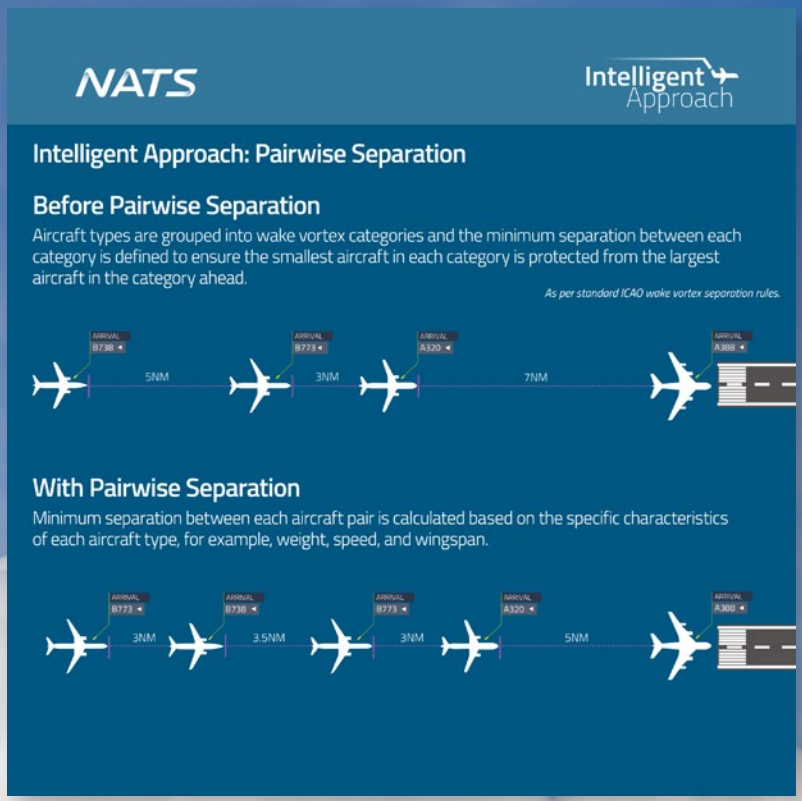
Since implementation in December 2024 at NATS' Swanwick air traffic control centre, the pairwise enhancement has reduced arrival holding, and associated fuel burn and carbon emissions, by 19.3%, while also supporting a small increase in the landing rate.

This is in addition to the benefits produced time-based separation, which had already reduced headwind delays by 60% and airborne holding by 230,000 minutes annually, saving over 45,000 tonnes of CO_2 at London Heathrow. A SESAR solution, TBS was first introduced at Heathrow in 2015 as part of the NATS Intelligent Approach product, co-developed by Leidos. It has been subsequently deployed at Amsterdam Schiphol and Toronto Pearson.

As a major hub in the European aviation network, Heathrow's efficiency is vital not only for the UK but also for the smooth functioning of air traffic across the continent. NATS, which handles 24% of European air traffic, plays a critical role in ensuring the resilience and efficiency of the overall network.

Extensive research and validation work on pairwise separation were conducted by NATS and European partners as part of the SESAR 2020 research and innovation programme. Kelly Stone, Head of Airport Operations at Heathrow, commented, "Deploying innovative technology like Pairwise separation at Heathrow makes a real difference to our operation's overall resilience. Passengers will benefit from an optimised landing process, ensuring aircraft hold for the shortest time possible, which directly supports our commitment to being a responsible neighbour to those living closest to Heathrow. NATS' ongoing commitment to continuous improvement is warmly welcomed, and it's fantastic to see the latest iteration of the Intelligent Approach tool land at Heathrow."

Chris Norsworthy, NATS Director of Airspace & Future Operations, added, "The introduction of Pairwise as part of Intelligent Approach is another world first and testament to our continuous efforts to improve the quality of service we provide to our airport and airline customers. Delivering additional operational resilience for Heathrow will make a real positive difference to airline punctuality, helping to improve the passenger experience and reduce carbon emissions."



SESAR JU members deploy smart air traffic management solution in France to reduce emissions

In 2025, SESAR JU members, Thales and DSNA, deployed a new solution developed within the ongoing SESAR JU CONCERTO research project, supporting more sustainable air traffic management.

Using advanced decision-making algorithms, the decision-support tool helps air navigation service providers identify opportunities to relax certain airspace constraints—such as altitude or routing restrictions—allowing airlines to optimise flight paths, reduce fuel consumption, and lower CO_2 emissions without compromising safety or capacity.

Following its initial implementation in Brest, the solution is now operational at the Reims Area Control Centre, enabling a reduction of up to 300 kg of fuel consumption per optimised flight and supporting greener air traffic management.

This deployment is part of the CONCERTO project, which focuses on integrating new technologies and concepts to reduce CO_2 emissions and introduce non-CO_2 impact management into daily operations. As part of this project, all CONCERTO partners are working to integrate more sustainable air traffic control capabilities into the system, balancing capacity and environmental performance.

This relatively quick development and rollout—starting only in 2023— showcases how SESAR JU brings together industry and research partners to accelerate innovation and enable quicker market uptake of eco-efficient technologies. The deployment highlights SESAR JU's commitment to transforming research into real-world benefits for European skies. It also underscores the commitment to making European skies smarter and more sustainable in line with EU climate ambitions.

Munich Airport wins 2025 SESAR JU–ACI EUROPE Digital Transformation Award

In June 2025, Munich Airport was named the winner of the annual Digital Transformation Award, a joint initiative between the SESAR JU and ACI EUROPE. The award recognises a European airport that has successfully embraced digitalisation, adopting innovative technologies and procedures to improve the safety, capacity, efficiency, and environmental footprint of its operations.

The award was announced during the ACI EUROPE Annual Congress and General Assembly on 19 June in Athens. The jury was impressed by Munich Airport's "Premium Innovation Hub" strategy – a wide-reaching programme that combines automation, data-sharing and artificial intelligence to create future-proof operations and an enhanced passenger experience.

Notable developments include service robots, remote-operated jet bridges, AI-supported turnaround management, predictive incident management, digital allocation systems, and innovations in security control. Munich Airport was praised for fostering a strong internal digital community and for its collaborative ecosystem, which includes key partners such as Lufthansa, research institutes, IT providers, and other airports.

Athens International Airport was also highly commended in this category for its continued efforts to harness digital technologies for improved airport performance.

Accelerating innovation in ATM gains traction at the ICAO Assembly

The importance of accelerating innovation to boost ATM service provision was among the key topics discussed at the 42nd ICAO Assembly (23 September – 3 October, Montreal), where the SESAR JU participated as part of the European Union delegation. The Assembly brought together States and international organisations to set the direction for the future of global aviation, including endorsement of the 8th edition of the Global Air Navigation Plan (GANP).

A standout European contribution—*Accelerating innovation in ATM service provision (A42-WP/225)*— proposed adopting a service-oriented architecture (SOA) to create a more flexible, scalable, and sustainable air traffic management system. This approach, aligned with the European ATM Master Plan and the Digital European Sky vision, was later reflected in the Assembly's Resolution on the GANP, marking a significant step in embedding innovation into global air navigation. Four European papers, including topics like GNSS resilience (A42-WP/204), space launch integration (A42-WP/226), and aviation resilience to hazardous weather (A42-WP/215), themes at the heart of SESAR's research and innovation programme. The Assembly's decision to update the GANP every six years and establish a roadmap for modernising global air navigation further reinforced the commitment to long-term innovation.

Beyond the Assembly, the SESAR JU participated in the ICAO Innovation Fair, where Executive Director Andreas Boschen joined a high-level panel discussing how innovation, sustainability, and safety can advance together, alongside the role of AI and innovation "sandboxes" in accelerating emerging technologies like advanced air mobility (AAM). Mohamed Ellejmi of EUROCONTROL highlighted SESAR's work on advanced surface movement guidance systems and the PEACOCK demonstrator, which tests low-cost solutions for regional airports. The SESAR JU also visited NAV CANADA's facilities, exchanging insights on trajectory-based operations and showcasing the global relevance of SESAR Solutions, such as the deployment of time-based separation at Toronto Pearson International Airport in 2022.

Progress towards the Digital European Sky on show at Airspace World 2025

With over 7,000 attendees, Airspace World 2025 in Lisbon in May united the global ATM community to explore aviation's future. As part of the Europe for Aviation team, the SESAR JU joined leading European organisations to showcase advancements in the Digital European Sky and the Single European Sky.

EVENTS

The SESAR JU organised 17 walking tours with the SESAR Deployment Manager, showcasing innovations like drone integration, AI, virtual centres, and sustainability solutions. A high-level panel discussed the new service delivery model from the ATM Master Plan, with industry leaders emphasising its potential to create a more agile, service-oriented ATM system. The SEC-AIRSPACE project, funded by SESAR JU, won an ATM Award for its work on cybersecurity in virtualised airspace. On the final day, SESAR JU announced the 2025 Young Scientist Award, reinforcing its commitment to fostering innovation and young talent in ATM.

2025 SESAR Innovation Days

Over 450 researchers, industry leaders, and policymakers gathered in Slovenia for the 15th SESAR Innovation Days (1–4 December 2025), hosted by Pipistrel and supported by the University of Ljubljana. The event demonstrated how collaboration is the secret sauce driving Europe's ATM transformation—turning bold ideas into real-world solutions for a Digital European Sky.

Andreas Boschen, SESAR JU Executive Director, opened the conference by highlighting that "*collaboration powers progress*," enabling breakthroughs in service delivery models, human-machine teaming, and satellite-based navigation. Gabriel Massey of Pipistrel reinforced this, noting that "*no single company can transform aviation alone*"—partnerships across industry, regulators, and academia are essential. Flor Díaz Pulido of the European Commission added that innovation must translate into impact, with safety, sustainability, and talent development at its core.

A fireside chat with Violeta Bulc, former EU Transport Commissioner, explored U-space, Europe's initiative to integrate drones and advanced air mobility. Bulc stressed the need for regulatory agility, industry collaboration, and public acceptance to scale these solutions. The event also celebrated the SESAR Young Scientist Award, recognising research on airport safety and AI-driven visibility forecasting (see page X for more details).

Slovenia's contributions took centre stage, with leaders from Slovenia Control, Pipistrel, and the University of Ljubljana showcasing advancements in ANSP innovation, electric aviation, and interdisciplinary research. Plenary sessions tackled service delivery models, human-machine teaming, and future-proofing aviation with GNSS and virtual operations. Over 56 technical papers, 8 demonstrations and 40 posters were presented, covering topics from climate-optimised trajectories to quantum computing.

The conference closed with the announcement that SESAR Innovation Days 2026 will be held in Cork, Ireland, hosted at University College Cork during Ireland's EU Presidency.

More about SESAR Innovation Days

Engaging audiences and raising visibility across Europe's aviation events

Throughout 2025, SESAR JU connected with the aviation community and wider audiences at major events across Europe, highlighting its role in modernising air traffic management and fostering innovation. From AI solutions at the FLY AI Forum to strategic discussions on CNS technologies at ICNS 2025, SESAR JU brought its expertise to dynamic platforms where industry, academia, and policymakers converged.

At the Paris Air Show 2025, SESAR JU underscored the importance of modernising air traffic management alongside aircraft advancements, in line with the Aviation Research and Innovation Strategy (ARIS). The EASN Conference in Madrid focused on sustainable aviation, civil-military coordination, and U-space development, while Aerodays 2025 in Warsaw showcased SESAR JU's latest research and innovation achievements. The R&I Days and EIC Drone Day featured drone integration and satellite connectivity, demonstrating how SESAR JU's projects are moving from research to real-world application. The U-space Digital Sky Demonstrators event further illustrated the progress of U-space services toward operational deployment in Europe.

Engage 2 Winter School: fostering the next generation of ATM researchers

In January, the Engage 2 Winter School gathered a diverse group of 36 young researchers—including seven Engage 2-funded PhD students and 29 selected participants from 13 countries—in Belgrade, Serbia, for an intensive five-day programme. Focused on cutting-edge ATM research, the event combined expert-led lectures with peer-to-peer learning, allowing students to present their projects, receive feedback, and refine their methodologies in a collaborative environment.

PIPELINE IN ACTION

In 2025, the Digital European Sky research and innovation programme continued to accelerate progress, with significant milestones achieved across all strands of the innovation pipeline.

In July, a new demonstrator, AMEA, was launched while calls published earlier in the year attracted a record number of proposals, reflecting the strong engagement of the aviation community and leading to the selection of 42 new projects.

Across our 79 ongoing projects, teams continued delivering concrete results, while solutions progressed towards deployment and market uptake. Additionally, several projects (highlighted in blue) concluded their lifecycle this year, conducting final validation exercises and delivering results through targeted dissemination activities.

Advancing the future of ATM certification: HUCAN achieves key milestones in its first year

The HUCAN project is developing a holistic approach to certify AI-enabled systems in ATM. By integrating regulatory requirements from the earliest stages of development, HUCAN aims to bridge the gap between advanced automation and aviation safety standards.

Over the course of its first year, the project delivered three state-of-the-art reports - Advanced Automation in Aviation, Certification methods and automation: benefits, issues, and challenges and Innovative approaches to approval and certification - outlining the emerging innovation challenges in civil aviation, examined existing certification methods, and investigated innovative regulatory approaches for a trustworthy AI. Key analyses:

- Regulatory alignment: explores the evolution of the current regulatory framework and detects the main issues that urge the attention of the rule makers, within the context of EASA's AI Roadmap and the EU AI Act.
- Holistic framework: The project addresses technical, human, and ethical dimensions—including accountability and transparency—to build trust in human-AI collaboration. This includes promoting transparency and trust in human-AI collaboration while tackling accountability and liability challenges.
- Beyond AI: While AI is a primary driver, the research emphasises that higher automation levels introduce broader safety and dynamic interaction challenges that existing methods cannot fully address.

To harmonise communication between AI experts and aviation professionals, the project also released a glossary of essential terminology for AI and advanced automation in aviation. The document brings together in a single framework the official definitions from key regulatory initiatives for AI in aviation at the European level, including the AI Act (2024), GDPR, and the EASA AI Roadmap, while also integrating insights from the SESAR AI Framework and the EU HLEG-AI Ethics Guidelines for Trustworthy AI.

The project is developing a methodology to support the gradual alignment of advanced automation concepts and solutions, testing the relevance and applicability of EASA objectives across various stages of the SESAR pipeline development. A preliminary analysis has already mapped: automation levels and operator responsibilities, human factors and liability impacts and ambiguities in current decision-support and automated detection functions.

More about HUCAN

EXPLORATORY RESEARCH

E-contrail: advancing mitigation strategies for aviation's climate impact

The E-CONTRAIL project came to a close in November, delivering critical insights into aviation-induced cloudiness and non-CO_2 climate effects. Using AI and satellite imagery, the project has established a robust evidence base for the Euro-Atlantic region, offering a series of recommendations:

- **Prioritise nighttime mitigation:** Contrails formed at night trap longwave radiation without the offsetting cooling effect of daytime shortwave reflection. Mitigation efforts should focus on nighttime operations to avoid these net-warming effects.
- **Focus on winter operations:** Radiative forcing is most severe during autumn and winter. Conversely, mitigation is less critical in summer, while spring requires further research due to high uncertainty.
- **Target oceanic regions:** The southern North Atlantic is a high-risk zone due to high altitude, humidity, and dense transatlantic traffic. These conditions create more persistent and frequent contrails than the drier atmosphere over central Europe.
- **Invest in fundamental research:** To build a trustworthy Monitoring, Verification, and Reporting (MVR) scheme, continued investment is needed in novel contrail models, satellite detection algorithms, and robust avoidance schemes for flight planning.

Project deliverables and resources

The community can now access the publications and the open-source libraries linked to them, a visualisation dashboard, and the policy brief— summarising the project's key findings.

More about the E-CONTRAIL project

EXPLORATORY RESEARCH

AI on the ground: ASTAIR simulations set course for smarter airport operations

The SESAR JU ASTAIR project reached a key milestone with the successful completion of its final AI validation activities, paving the way for a new concept definition that will shape future airport operations.

From 12 to 16 May 2025, project partners gathered at ENAC in Toulouse to carry out a week of intensive real-time simulations. The aim: to evaluate the operational relevance and maturity of AI-powered human-machine Interfaces in complex airport environments. These activities culminated in a Final Workshop held on 27 May, bringing together stakeholders to reflect on the results and the way forward.

During the validation week, air traffic controllers and airport operations professionals tested AI-supported tools in both nominal and non-nominal scenarios, using real-time and fast-time simulation techniques.

At Charles de Gaulle Airport, AI systems assisted with pushback coordination, taxi management and conflict detection. The Situation Awareness Global Assessment Technique was used to measure situational awareness during simulation pauses.

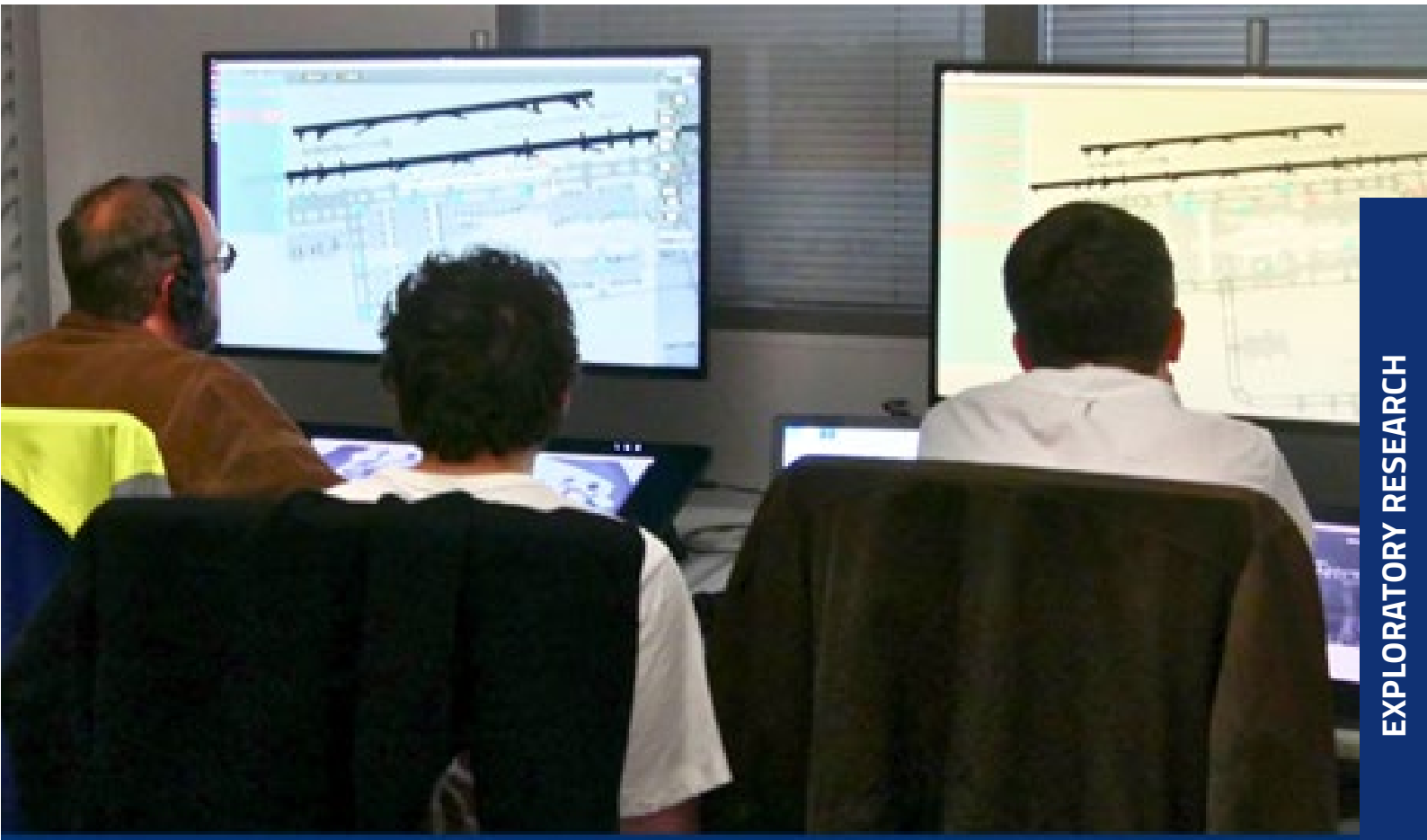
In more complex scenarios, such as emergency returns or blocked parking stands, the AI worked alongside ATCOs to support decision-making in fast-changing situations. Simulations explored two levels of automation: Level 2, which promotes active interaction with AI, and Level 3, which allows ATCOs to supervise AI-led decisions. These distinctions sparked important reflections on trust, delegation and the future role of humans in airport operations.

Post-simulation feedback was gathered through structured debriefings and questionnaires, focusing on usability, cognitive workload, situational awareness and overall trust in AI tools. A dedicated session with ground operations professionals added further insights, especially on evolving roles such as tug fleet management, supported by AI planning for towing and taxiing.

Held on 27 May, the ASTAIR Final Workshop brought together aviation stakeholders to review the validation results and begin shaping the future concept. The session allowed participants to assess how AI integration could be scaled into real-world airport operations and provided a strategic platform to align on use cases and priorities.

This final stage of validation marks ASTAIR's readiness to enter the Maturity Gate assessment (TRL1), with results feeding directly into the upcoming validation report and concept definition deliverables. The project stands as an important step towards digitalising airside operations and integrating trustworthy, human-centred AI into the heart of air traffic management.

More about the ASTAIR project



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.

More about MultiModX

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

Challenge accepted: Fresh eyes on the future of air traffic management

ATM is a sector like no other—where human factors, operational efficiency, and safety imperatives converge in a high-stakes environment. As digitalisation and innovation reshape aviation, the winners of the SESAR Young Scientist Award 2025 are leading the charge, demonstrating how human intelligence and machine learning can work in tandem to address the sector's most pressing challenges.

"*During my studies, which initially covered all major transport modes, aviation stood out as the domain in which engineering, human factors, and operational processes are most tightly coupled*," explained **Hannes Braßel**, **Technische Universität Dresden**, winner of first prize in the SESAR Young Scientist Award PhD category.

His research looked into enhancing ground safety at airports, with a solution scalable to airports anywhere and to emerging aviation infrastructure.

In aviation, "*the interaction between mature, safety-critical systems and the gradual introduction of fundamentally new*

technologies creates a uniquely demanding engineering environment," Hannes said.

Improved safety analysis

His winning project combined Light Detection and Ranging (LiDAR) technology, computer vision, and prediction algorithms for aircraft and vehicle movements. Hannes explained that "*even small, well-validated improvements in situational awareness or decision support can lead to substantial safety benefits.*"

Aircraft ground accidents and incidents were analysed to identify recurring conflict patterns, which were then recreated in a simulation environment. While such predictive systems may appear sophisticated from the outside, "*their foundation is often rather unspectacular*," he added, modestly.

"*A significant part of the work consisted of carefully reviewing, classifying, and cross-comparing more than a thousand accident and incident reports, including detailed background research.*"

This meant teaming both computer algorithms to assess a mass of data. Hannes cautioned that "*a central design principle*" of his project "*is that automation should support human operators rather than replace them.*"

The rollout of digitalisation and the evolution of the aviation industry means computers and emerging artificial intelligence (AI) are increasingly playing a role in air traffic control and the way we fly. The European ATM Master Plan 2025 from SESAR maps out this "human–machine teaming," in which the role of people will evolve significantly, focusing on tasks and situations too complex for humans to handle and teaming up with automation to address emerging traffic challenges.

As Hannes put it: "*The aim is not to automate decisions, but to make emerging risks visible at an early stage and in a form that aligns with existing operational reasoning. In this sense, AI is treated as a decision-support layer that enhances situational awareness and enables timely, well-informed human intervention.*"

Tools and the 'truth' about airport visibility

The winner in the 2025 Student category agreed that machine learning can best be used to partner rather than replace human expertise.

Vera Tessa Cornelie Buis, **Wageningen University & Research in collaboration with LVNL**, was given first prize in her category, for research applying machine learning algorithms to improve airport visibility forecasting, especially in low-visibility conditions.

"*A machine learning model like this could be a useful additional tool to help forecast visibility conditions*," she explained. "*In my opinion, it should be seen as an additional decision-support tool, rather than a 'truth.*"

Accurate weather forecasts are crucial for minimising delays and optimising flow and capacity management at airports. Specifically, Vera's work aimed "*to understand how machine learning would perform in forecasting a certain weather phenomenon that current weather models struggle with, namely fog.*"

She focused on limited runway capacities caused by low visibility conditions. When visibility is low, the number of take-offs and landings must be limited for safety reasons. "*Sometimes a difference in just one hundred metres can have a big impact on the capacity of a runway*," Vera said.

There is a need to make the aviation industry as efficient as possible, she explained, for reasons ranging from minimising costs and environmental impact, to maximising safety and the passenger experience. The weather plays a significant role in this, directly influencing both on route traffic and airport capacities.

The big advantage of the model used is that "*you can tailor it specifically to your liking, which in this case means to the wishes of air traffic control at Amsterdam Airport Schiphol.*"

For Vera, the prize was the culmination of years of dreams and hard work. "*I've always been into aviation ever since I was young*," she said. "*It's the industry that truly fascinates me the most, combining engineering, hospitality, beauty and hard work in a complex, dynamic and around-the-clock operation.*"

Read about past winners of the prize

Read about the 2025 edition of SESAR Innovation Days

Developing dynamic ground and on-board solutions for a more sustainable aviation future

Transitioning from rigid arrival structures to more dynamic systems has been identified as a promising method to make aviation more environmentally sustainable, while addressing capacity demands in the terminal manoeuvring area (TMA).

Both the GALAAD and DYN-MARS project are tackling this challenge with distinct but complementary approaches.

GALAAD's focus is primarily to improve ground systems and the management of terminal airspace operations, aiming to transition from rigid performance-based navigation (PBN) route structures to a more flexible system. DYN-MARS, on the other hand, is centred on avionics innovations and improving the efficiency of aircraft during descent and approach, including the optimisation of vertical and speed profiles.

Both projects are approaching the same target objectives from different viewpoints, aiming to make Europe the most efficient and environmentally-friendly sky to fly in.

GALAAD: Steering aircraft towards a more flexible – and green –final approach

The project addresses a concept for PBN route structures (trombones, point merge or other) to be activated or deactivated depending, for example on; the time of day, noise control purposes, or on traffic demand. This would avoid the use of complex route structures during periods of low demand, enabling agile responses to variations of operational conditions in the terminal area such as traffic density, airspace availability or environmental constraints.

The end-to-end concept is addressed with the delivery of the appropriate STAR clearance to each aircraft via voice or controller pilot data link communication (CPDLC) thanks to enhanced onboard capabilities to support the Pilot in his/her decision for proposed trajectory acceptance.

The arrival manager (AMAN) system with its enhanced functionalities is expected to support ATCO's for the dynamic assignment of the optimal and most eco-efficient PBN route structures, depending on metrics such as predicted arrival airborne delay.

The dynamic use of PBN route structures will allow trade-offs and optimisation of benefits depending on traffic demand (e.g. improved capacity during peak periods, fuel-efficient operations during off-peaks, reduced noise footprint at night) in the TMA.

DYN-MARS: Optimising energy management for descent and landing

DYN-MARS on the other hand is attempting to minimise the flight environmental footprint during descent and landing through improved collaboration between pilot and ATC in planning and executing flights through novel avionic functions. Dynamic route structures maintain closed loop procedures which are sized according to traffic conditions, enabling the pilot or FMS to accurately predict and plan an optimal descent and approach. This will help improve an aircraft's energy management.

The DYN-MARS solution aims to allow pilots to plan their optimum descent profile more autonomously, while ATC will ensure the appropriate separation needed with other aircraft.

To achieve these goals, the project is developing novel flight management system (FMS) functionalities which will provide optimised display flying cues to the flight crew (i.e. suggestions on high lift device extension, landing gear extension, speed brakes use and optimal speed settings) enabling a significantly enhanced aircraft energy management, which is particularly useful during ATC speed interventions. These new avionic functions were designed with the additional goal to reduce pilots' workload during these demanding flight phases.

As a result, the aircraft's emissions (noise, CO_2, etc.) will be noticeably reduced during the approach thanks to a decrease in the number of level-offs and the use of idle thrust. This facilitates the optimisation of the aircraft's energy management, directly related to its specific capabilities.

More about GALAAD and DYN-MARS

Bringing “harmony” to our busy skies

Air traffic is growing in Europe, but staff shortages and capacity limits risk disrupting operations. “*When demand outweighs capacity, the result can be increased safety risks, more flight delays, and a poorer passenger experience***,” says Jacek Kopeć, HARMONIC’s project manager at the Eurocontrol Innovation Hub.**

HARMONIC, a SESAR consortium project led by EUROCONTROL, aims to deliver tools to maintain efficiency as traffic grows. “Our goal is to provide an intuitive solution that reconciles the competing demands of airspace users,” remarks Kopeć.

A suite of solutions for optimising airspace utilisation

The project is developing a suite of solutions for providing decision makers with the data-driven insights they need to optimise airspace utilisation. “*These include advanced tools that enable stakeholders to exchange information that is essential to achieving more efficient demand and capacity management, as well as better flight planning*,” explains Kopeć.

One of those tools looks to collaboratively manage severely degraded network operations such as disruptive and widespread thunderstorm activity or a serious ATM system malfunction. Another will allow stakeholder business preferences to be fully integrated into the demand and capacity balancing (DCB) process. The project is also working on tools to improve the flexibility and dynamicity of airspace management, extending its application from the pre-tactical to the tactical phase.

> ***By addressing civil military cooperation, the solution offers enhanced information services for dynamic airspace reservations and ensures that the results of this collaborative decision-making process are seamlessly used in air traffic control operations.***
>
> Jacek Kopeć, HARMONIC’s project manager at the Eurocontrol Innovation Hub

Other tools in the HARMONIC toolbox include a configuration plan optimiser, network DCB solver, and advanced ‘what-if’ functionality. The project also developed solutions to enhance the collaborative decision-making processes and implement dynamic capacity assessment methods.

“*Put these tools together and what you get is an innovative solution that can take all the different constraints and priorities happening across the entire network and produce a coordinated, network-wide solution*,” notes Kopeć.

Leveraging the power of artificial intelligence

According to Kopeć, one of the keys to HARMONIC’s ability to harmonise airspace demand and capacity is its use of advance algorithms – many of which leverage the rapidly evolving power of artificial intelligence (AI) and machine learning.

In addition to coordinating the request and priorities of the airlines, airports, and ANSPs, the project is developing processes for improving civil-military coordination – the net result being an even more optimised airspace.

“*By addressing civil military cooperation, the solution offers enhanced information services for dynamic airspace reservations and ensures that the results of this collaborative decision-making process are seamlessly used in air traffic control operations*,” adds Kopeć.

Check out HARMONIC’s papers on its solutions, one on enhanced dynamic airspace configuration algorithm and the other on multi-objective air traffic flow management.

JARVIS: Increasing the trustworthiness of AI in aviation

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 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.

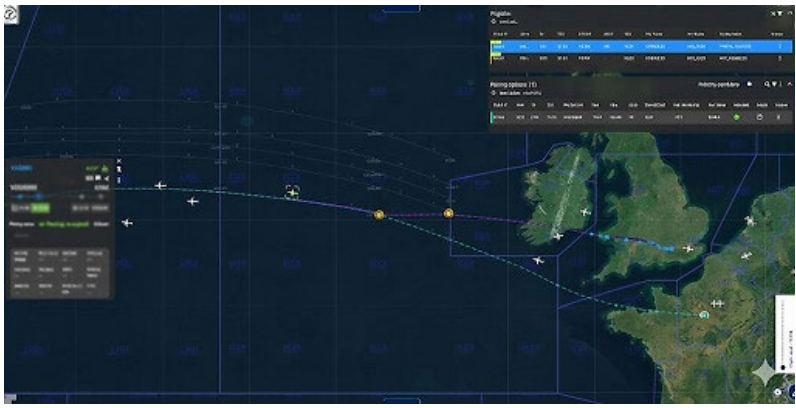
> ***Our digital assistants don't replace humans, but collaborate with them, benefiting passengers and industry.***
>
> Stefano Riverso, discipline leader autonomous systems, Collins Aerospace

"*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. More about JARVIS.

GEESE project makes progress on wake energy retrieval

The GEESE project marked a landmark year in 2025 by successfully demonstrating wake energy retrieval (WER)—a groundbreaking technique inspired by the flight patterns of migrating geese. This innovation allows a following aircraft to benefit from the reduced drag in the wake of a leading aircraft, cutting fuel consumption and emissions while ensuring safe separation.



In March, the project launched its validation phase with a tabletop exercise in Toulouse. Pilots, dispatchers, and flight operations experts from Air France, Delta Air Lines, French Bee, and Virgin Atlantic collaborated with specialists from DSNA, EUROCONTROL's Network Manager, and NATS to test the Airbus pairing assistance tool (PAT). This tool identifies real-time opportunities for aircraft to fly in formation-like pairings, maximising drag reduction and fuel efficiency. Later that month, a technical review by SESAR JU confirmed robust progress, with no shortfalls in technical development or project planning.

As spring progressed, the GEESE consortium conducted real-time simulations across Europe to refine operational procedures and assess human performance. In Madrid, Lithuanian air traffic controllers from Oro Navigacija—supported by Airbus, DSNA, and the Universitat Autònoma de Barcelona—tested ATC-pilot communication using a prototype controller working position developed by INDRA. Meanwhile, at DSNA's Brest control centre, simulations focused on perfecting phraseology and communication, with input from controllers, airline pilots, and EUROCONTROL's Network Manager. Additional exercises at Air France's Charles-de-Gaulle facilities explored collaborative decision-making for WER flight plan adjustments, using EUROCONTROL's Planta platform to streamline coordination between dispatchers and air navigation service providers.

In September and October, the GEESE team executed eight trials over the North Atlantic as part of the fello'fly demonstrator. These trials, involving Airbus, Air France, Delta Air Lines, French bee, Virgin Atlantic, AirNav Ireland, DSNA, EUROCONTROL, and NATS, proved the feasibility of guiding two aircraft to a precise rendezvous point while maintaining full vertical separation and regulatory compliance. Each trial required seamless coordination between airlines' operational centres, air traffic control, and flight crews, with the EUROCONTROL Innovation Hub interface ensuring safety and practicality.

The trials validated a meticulous process: the Airbus PAT calculated new trajectories in real time; dispatchers, crews, and ATC assessed these for operational viability; one aircraft adjusted its route to meet the other; and both crews committed to arriving at the exact predetermined time. With these achievements, the GEESE team is now analysing the data and preparing for the next phase of validations.

More about GEESE

A view towards trajectory-based operations

TBO is widely regarded as the most significant air traffic management concept since radar, and a cornerstone of SESAR's vision for a more predictable system.

"*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 air traffic control clearances*," says **Gérard Mavoian**, **NETWORK-TBO project manager at EUROCONTROL**.

TBO has the potential to improve predictability, increase airspace capacity, reduce aviation's environmental footprint, and make flights more efficient. In Europe, that potential could translate into a 100% increase in average sector capacity. This would mean an increase from the current 45 flights per hour in many sectors to 97 flights per hour. It would also cut the average working time needed to manage 100 flights in half.

The NETWORK-TBO project aims to enable aircraft operators, air traffic control, and the Network Manager to share a unified view of flight trajectories, making trajectory-based operations (TBO) a reality. "We aim to deliver and validate the solutions that will make trajectory-based operations a reality in Europe – and beyond," says Mavoian.

Increasing collaboration and predictability

With a focus on the network management aspects of trajectory-based operations, the project is working to increase collaboration and predictability between all the involved stakeholders. "Airspace users can use this prediction to decide whether to consider a constraint in their planning phase," he explains. "As a result, they will be making a flight plan that is more likely to be flown."

Key innovations include:

- A reference, end-to-end 4D trajectory to enhance predictability in pre- and post-departure phases.
- An AI-based solution that predicts airspace constraints and provides confidence indicators, helping operators create more realistic flight plans.
- Collaborative decision-making processes and automation tools to reduce operator workload.

NETWORK TBO is also developing collaborative decision-making processes, as well as solutions to increase automation and reduce operator workload.

Towards a global approach to trajectory-based operations

In addition to delivering the solutions that will make TBO a reality in Europe, NETWORK-TBO is contributing to the International Civil Aviation Organisation's (ICAO) efforts to implement TBO worldwide and across all phases of flight. The project is also working to align the different trajectory management related concepts developed by SESAR, EUROCONTROL and ICAO.

The project also works closely with the SESAR3 ATC-TBO project, which validates TBO use cases in the tactical execution phase (i.e., within the coordination and separation horizon of the planner and executive air traffic controllers). "In doing so, NETWORK-TBO is paving the way towards a truly global approach to trajectory-based operations," adds Mavoian.

More about Network TBO

Virtualisation in ATM: rethinking air traffic service delegation and controller deployment

The SESAR flagship on virtualisation has made significant progress with two key projects, iSNAP and IFAV3, both focused on enhancing the flexibility and efficiency of Europe's air traffic management.

From 14 to 16 October 2025, the iSNAP consortium, carried out a successful validation exercise demonstrating how digital technologies can enable air traffic control centres in different countries to share and delegate airspace responsibilities more flexibly.

The validation completed work on Solution 0418: "D-Architecture supporting delegation of ATM services provision amongst ATSUs", which aims to create a digital framework allowing air traffic service units (ATSUs) to delegate the control of airspace sectors to one another in real time. This capability is crucial for improving operational flexibility, managing traffic fluctuations, and ensuring business continuity in contingency situations. It also supports the broader virtual centre concept, one of SESAR's flagship efforts to digitalise and modernise Europe's ATM infrastructure.

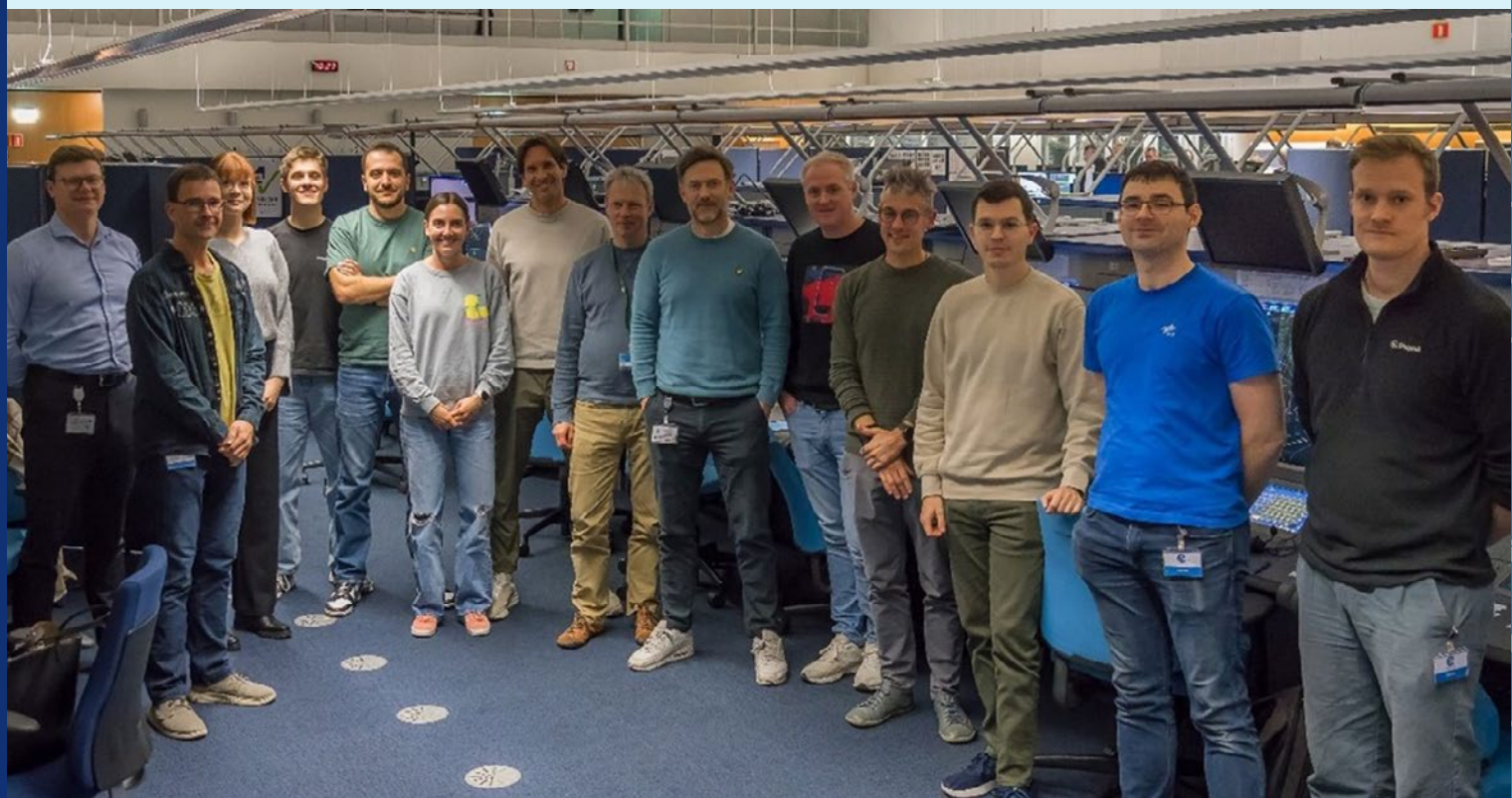
"*The completion of Solution 0418 is a remarkable achievement for iSNAP and a key contribution to building a more flexible and digital European sky*," said **Mayte Cano**, **Project Manager** of the team. "*It demonstrates how interoperability and service-oriented architectures can reshape the future of ATM service provision.*"

Meanwhile, IFAV3 advanced the way air traffic controllers are deployed across sectors. By analysing real-time ATM data, including radar recordings, the project's smart controller experience assessment and required competency estimation tools allow for more adaptable and efficient ATCO assignments. This approach reduces training costs while ensuring safety and maintaining airspace capacity.

During the final validation exercise in Maastricht from 4 to 13 November, 19 ATCOs participated in simulations across both familiar and unfamiliar sectors. The results will help refine a more flexible, evidence-based deployment process, with insights to be shared through publications and industry conferences.

Together, these projects represent a major step forward in optimising air traffic service delegation and the best use of controller resources, aligning with SESAR's vision for a modernised European ATM network.

More about iSNAP and IFAV3



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.

Supported by Europe's Rail and 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**.

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.

More about Travel Wise

A seamless solution for keeping drones safely separated

The SESAR-supported SPATIO project is delivering a separation management service that will help drones safely and simultaneously operate in very low-level airspace.

Keeping aircraft safely separated is one of the core functions of air traffic management (ATM). But as more and more drones take to the skies, doing so becomes easier said than done.

"*Before we can have a high volume of drone traffic transporting goods and people, we first need separation management solutions that will prevent mid-air collisions,*" says **Pablo Sánchez-Escalonilla**, technical manager at CRIDA, a subsidiary of ENAIRE, the Spanish air service navigation provider (ANSP).

Separation management is a core function of **U-space**, Europe's unmanned traffic management (UTM system). It relies on multiple mitigation barriers—such as demand and capacity management, conflict detection and resolution, and detect-and-avoid—to maintain safe distances between drones and other airspace users. "*While many of these technologies already exist, they have yet to be brought together and used as a coordinated separation management solution,*" explains Sánchez-Escalonilla.

SPATIO addresses this gap by integrating these capabilities into a single, seamless separation management service. "*By bringing together industry, ANSPs, institutions, and universities, we aim to replace the research silos that have traditionally separated these innovations with the coordination needed to implement an integrated separation management solution,*" adds Sánchez-Escalonilla, who helps coordinate the project.

Safe, secure and simultaneous drone operations

Building on previous SESAR research, including DACUS, BUBBLES and TindAIR, SPATIO is developing services such as dynamic capacity management and strategic and tactical conflict resolution. "*Together, these solutions will help ensure safe, secure and simultaneous drone operations within high-risk areas like urban environments – an important prerequisite to gaining societal acceptance of drone operations,*" says Sánchez-Escalonilla.

SPATIO in action

Separation management begins before take-off, when flight plans are assessed against airspace capacity to identify and mitigate risks in advance. During flight, SPATIO can monitor drone activity, predict conflicts, and support resolution measures, including collision avoidance manoeuvres. "*When a conflict is predicted, the solution works with the drone pilot to implement common resolution rules and collision avoidance manoeuvres (an evolution of the traditional 'rules of the air') to safely guide the aircraft and recover the original flight plan with minimal interference,*" notes Sánchez-Escalonilla.

Towards a dynamic drone ecosystem for Europe

Looking ahead, SPATIO aims to validate some solutions at Technology Readiness Level 7 through live demonstrations. "*Thanks to the cooperation of our partners, SPATIO will prove instrumental in safely increasing the number of drones that can simultaneously operating in our skies, ultimately enabling a dynamic drone ecosystem across Europe,*" he concludes.

More about SPATIO

FASTNet: Data connectivity to boost airport operations

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 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 restrictions and strategic 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.*"

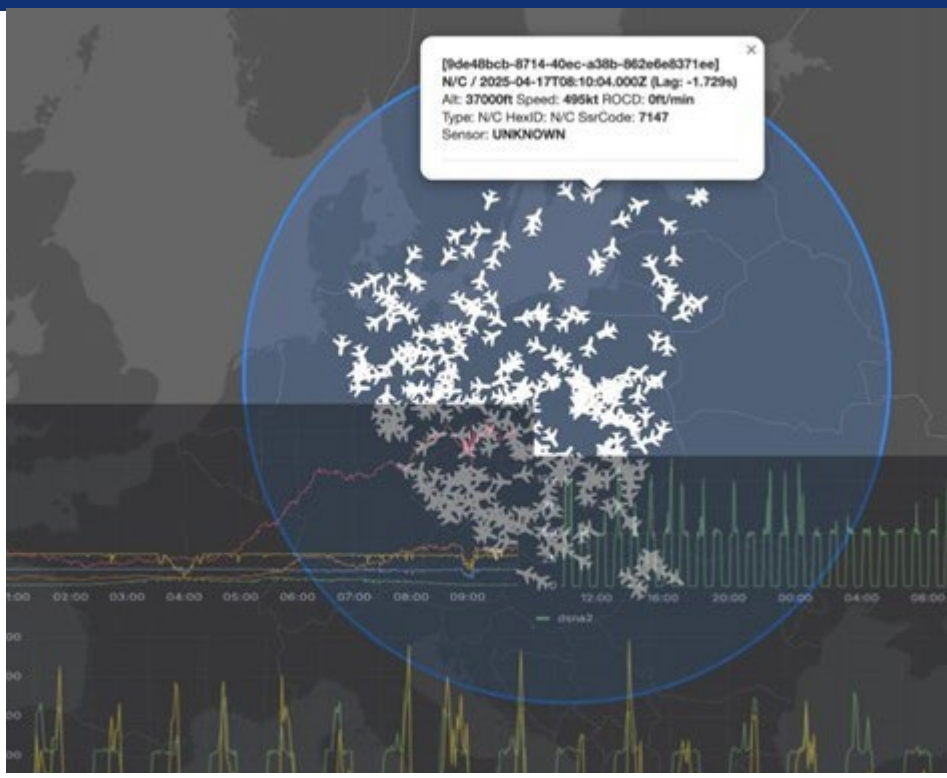
From the passenger perspective, FASTNet solutions will improve the predictability of operations and lead to better airport experiences. This includes better handling of PMRs, less waiting time at check-in and an overall reduction in stress.

"*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.*"

More about FASTNet

Advancing the Digital European Sky through data service innovation

In 2025, the CNS DSP project completed a major validation campaign, marking an important step towards delivering comprehensive communication, navigation and surveillance (CNS) data services for European aviation.



Through a series of validation exercises conducted between April and December, the project demonstrated the technological maturity and operational readiness of three SESAR solutions designed to support the transition to a service-based, digital ATM infrastructure, aligned with the Digital European Sky vision.

Together, these solutions form the basis of a centralised, cloud-based CNS data services platform, enabling aviation stakeholders to access high-quality, real-time and post-operational data through secure interfaces.

Three solutions, one integrated service model

The project validated a multisensor surveillance tracking platform, capable of consolidating surveillance data from multiple sources and providing a fused, cross-border air situation picture. The platform successfully demonstrated both data provision and data consumption, confirming its ability to deliver surveillance services securely and in real time to external ATM systems.

An ATM data service provider solution further showed how surveillance data can support operational services such as trajectory prediction, as well as post-operational applications including environmental performance assessment. The validations confirmed the platform's ability to support real-time ATM functions and higher-resolution analysis of historical data.

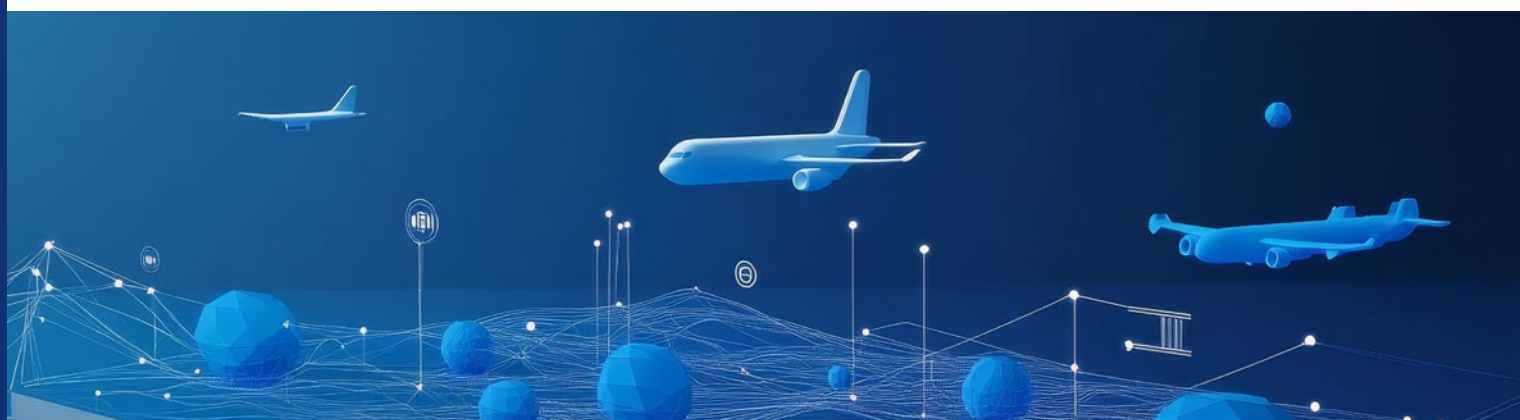
The project also validated real-time GNSS monitoring and interference detection services, demonstrating the ability to assess GNSS performance and integrity across all flight phases. The solution showed how degraded signals and potential interference can be identified and monitored, strengthening navigation resilience in complex operational environments.

Proven maturity and interoperability

Across the campaign, the CNS DSP solutions progressed to TRL6–TRL7, demonstrating readiness for operational deployment. The validations used real operational data from multiple ANSPs and were conducted in representative operational environments across Europe.

A joint validation with the VITACY project demonstrated how CNS DSP services can integrate with other virtualised ATM services, confirming the feasibility of distributed, service-based ATM architectures and reinforcing the role of data services as a cornerstone of future ATM operations.

More about CNS DSP



Transitioning to a modern datalink environment

Traditionally, air traffic controllers have communicated with pilots using radio technology, namely very high frequency VHF (now VDL2). But as the number of flights continues to increase, this approach is quickly becoming obsolete as the bandwidth for this technology is limited.

"*This increase in air traffic demand, combined with our limited resources, has made it necessary for European ATM to decongest the VDL2 bandwidth before the so-called 'VDL2 crunch' arrives,*" says **Diego Herce**, a project manager at the European Satellite Services Provider (ESSP).

The ESMA Digital Sky Demonstrator proposes combining both legacy radio technology (VDL2) and the new Iris Satellite Communication service developed by the European Space Agency's (ESA) Iris programme and led by Viasat.

Specifically, the project is demonstrating two key datalink solutions: dual link ATN/OSI and multilink ATN/IPS. The dual link ATN/OSI solution refers to a datalink communication service that uses open system interconnection (OSI) protocol. It allows both the air traffic controller and pilot to seamlessly use air traffic services (ATS) with both current radio based VDL2 and Iris SatCom technologies. The demonstration is based on extensive data collection in a real operational environment and will involve a large number of aircraft properly connected to both links and operating across Europe.

The multilink ATN/IPS solution is a separate demonstration that will address progress in the ground infrastructure using the new internet protocol suite (IPS). The purpose of the demonstration is to show how an IPS-equipped aircraft can utilise OSI-based ground systems during a transatlantic flight from the US to Europe. It will also allow the project to measure the performance of such flights in a near-operational environment.

Together, the demos will support the development of a European data link environment capable of decongesting traditional radio bandwidth in one of the most demanding airspaces. "*The work being done by the ESMA DSD project will play a key role in helping ATM overcome the capacity constraints foreseen by current technologies and transition towards a future-proofed digital and highly automated solution,*" concludes Herce.

More about ESMA

Demonstrating to next-generation air-to-ground communications technologies in European airspace

In July, the three-year AMEA Digital Sky Demonstrator got underway to trial next-generation air-to-ground communications technologies in European airspace.

AMEA is short for Air-Ground Multi-Link Evolution and Advancement. Building on the achievements of the earlier ESMA Demonstrator, AMEA is testing the integration of multiple communications technologies—such as satellite and terrestrial links—into aircraft and ground systems to improve resilience, efficiency, and environmental performance in air traffic services.

Specifically, the Demonstrator focuses on combining next-generation satellite communications (SATCOM services) with terrestrial systems like VDL Mode 2 (a type of radio datalink) in a so-called ATN-OSI configuration, while also implementing a secure internet-based version of this network, known as ATN-IPS. Together, these upgrades are designed to boost performance, increase resilience and handle much higher data volumes than today's systems.

Through two large-scale, complementary demonstrations, the project will:

- Extend multilink capabilities (i.e. the ability to use multiple communication channels simultaneously) in both aircraft avionics and ATM ground systems.
- Measure and analyse performance and system resilience in high-data scenarios.
- Validate the performance of secure next-generation ATN-IPS networks.
- Conduct a three-year flight campaign using commercial aircraft operated by partner airlines.

The Demonstrator will apply or use air traffic services (ATS) B1 and B2 services during normal flight operations. These services provide enhanced digital communications between pilots and controllers, reducing radio congestion and improving overall efficiency. The results will show real-world evidence to support the deployment of *SESAR solution #109 on Air Traffic Services datalink using SatCom Class B*, which promotes the use of SatCom Class B as part of Europe's future air traffic datalink infrastructure.

More about AMEA

Wrapping up with impact: HERON trials hybrid taxiing

HERON, and Airbus-led three-year European Digital Sky Demonstrator successfully wrapped up in 2025 after extensive trials of hybrid-electric towing vehicles, known as Taxibots. The project aimed to enhance the efficiency and sustainability of aircraft operations, both in the air and on the ground.

At the heart of HERON's ground movement studies is the Taxibot, a pilot-controlled hybrid-electric tug designed to tow aircraft between gates and runways without the need for engine power. By reducing fuel burn, the system significantly cuts CO_2, NO_x and noise emissions. The technology is now certified for retrofit on Airbus single-aisle aircraft, with easyJet planning a live trial at Schiphol airport later this year.

Amsterdam Schiphol, which targets zero emissions by 2030, is one of several major hubs participating in the trials, alongside Paris Charles de Gaulle, Brussels, New York JFK and New Delhi airports. Future developments include a fully electric version and a variant for widebody aircraft.

Led by Airbus, HERON brought together 24 partners from across the aviation ecosystem, including airlines, airports, air navigation service providers and manufacturers. While Taxibot is a key highlight, the project also advanced work on trajectory-based operations, single engine taxiing and greener arrival and runway procedures.

More about HERON

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**. 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.

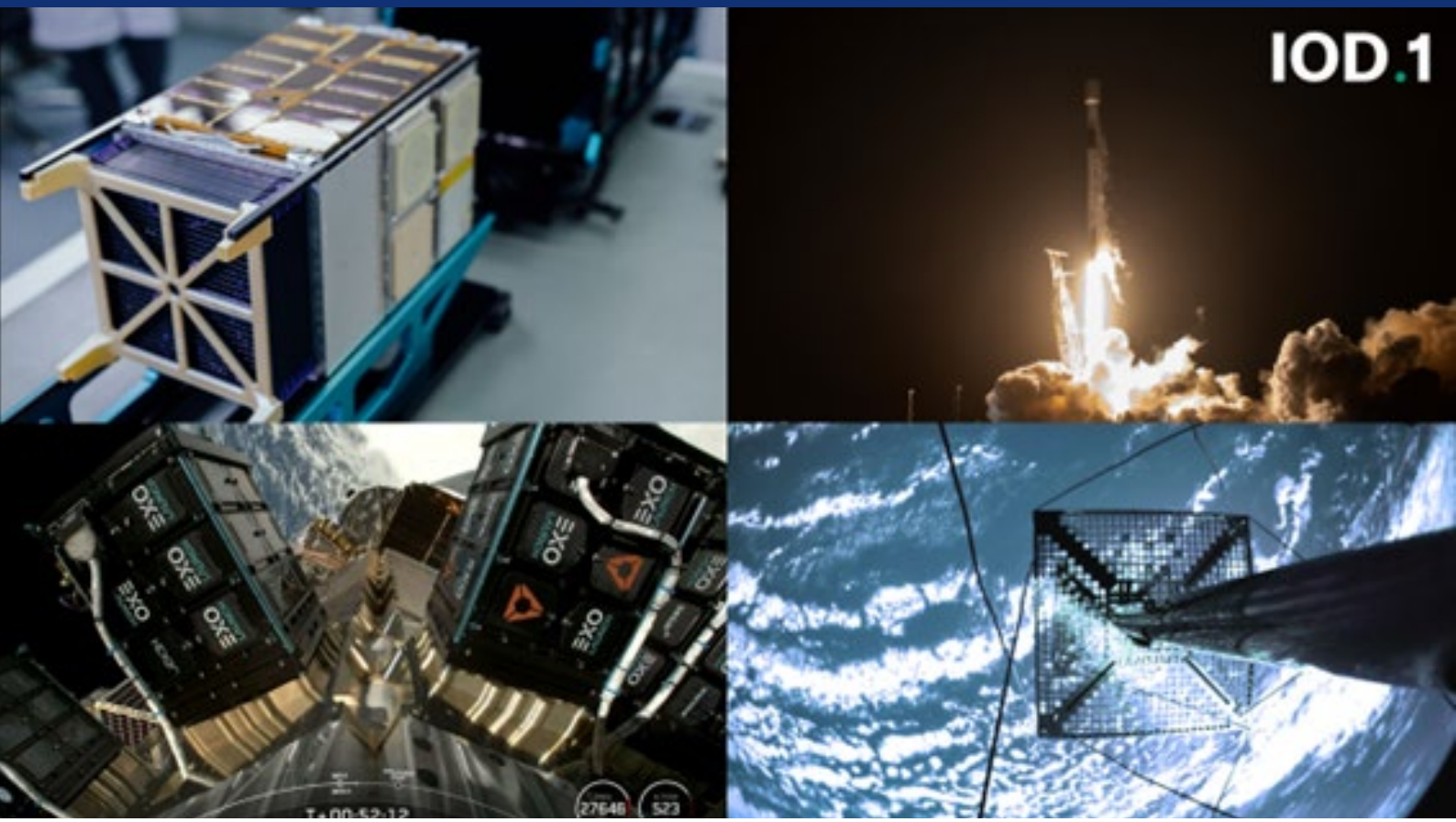
"*Airports that implement this solution will contribute to capacity management at the network level and, in doing so, will improve air traffic flow across European airspace, resulting in fewer delays*," says **Alan Marsden**, **work package leader at EUROCONTROL**.

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**.

More about PEACOCK



ECHOES project marks global milestone in satellite-based VHF communications

In December 2025, the ECHOES Digital Sky Demonstrator concluded after nearly four years, marking a transformative leap for ATM. The initiative proved that VHF voice and data communications could be reliably delivered from space—a first for aviation.

The Demonstrator's success hinged on the launches of two satellites: IOD-1 (March 2025) and IOD-2 (June 2025). IOD-1 achieved a historic milestone by enabling the first real-time VHF voice communication between a pilot and air traffic controller via satellite, tested over the Atlantic Ocean with airlines like Air Europa and Iberia. This demonstration confirmed the viability of space-based VHF for operational use.

IOD-2 expanded testing, validating both voice and VHF data-link communications—critical for functions like controller-pilot data exchange and trajectory management. These trials, involving ANSPs, communication service providers, and airlines, proved that space-based VHF could deliver seamless, resilient communication, especially in remote oceanic regions where traditional coverage is limited.

ECHOES united over 200 professionals from industry, research, and regulatory bodies, ensuring the solution aligned with real-world ATM needs. The project reached Technology Readiness Level 7 (TRL 7), demonstrating operational reliability under realistic conditions. This achievement signals readiness for certification and deployment, addressing a long-standing gap in global aviation communication.

End-users—pilots, controllers, and operations managers—praised the solution's coverage and service continuity. The project's closure in December 2025 underscored its legacy: a validated, collaborative blueprint for safer, greener, and more connected air traffic management.

More about ECHOES

U-space is becoming a reality: SESAR JU showcases demonstrator achievements across Europe

U-space is becoming a reality, thanks to the achievements of SESAR JU's Digital Sky Demonstrator projects. Over a two-day event in Brussels in October attended by over 250 participants, U-ELCOME, BURDI, and ÉALÚ-AER showcased their results. The event provided a forum to discuss the next steps for implementing U-space services as the demonstrators draw to a close.

U-space has been a focus of SESAR JU's research and innovation since 2015, following the EU Aviation Strategy and the Warsaw Declaration on drones. The adoption of the EU Drone Strategy 2.0 in 2022 set out a bold vision for the future of unmanned aviation in Europe, while the first U-space regulations, which entered into force in 2023[1], provided the regulatory and operational framework to safely introduce drones into European airspace.

The three U-space Digital Sky Demonstrators which are now coming to a close, are helping to translate this framework into

real-world services in Belgium, Ireland, Italy and Spain, showing how drones can operate safely and efficiently at scale alongside manned aviation.

In his intervention, **Jan-Christoph Oetjen**, **Member of the European Parliament**, stressed that the "*civil drone revolution is already a reality*" and that Europe must maintain its momentum in a "*global race for technological leadership*". He pointed to SESAR's role in accelerating innovation through collaboration and highlighted the importance of continued EU investment under the next Multi-annual Financial Framework to keep Europe's skies safe, sustainable and competitive.

U-ELCOME successfully implemented initial U-space in France, Italy and Spain, validating its deployment through more than 1,000 drone flights, operating in both controlled and uncontrolled airspace. The project deployed multiple U-space Service Providers (USSPs) in a single location, showcasing how providers can operate together and interoperate seamlessly. The consortium also developed a U-space Implementation Handbook, a practical guide for current and future implementers.

BURDI developed the first cross-border U-space reference design between Belgium and the Netherlands – a pioneering step for European interoperability. Executed demonstration flights, especially BVLOS (Beyond Visual Line of Sight) drone operations in the Port of Antwerp / Antwerp Harbour geozone, integrating drone operations into complex and real-world environments. BVLOS drone flights between hospital sites in the Kempen region, reduced transport times from ~30 minutes by traditional ground vehicles to under 13 minutes with drone transportation.

ÉALÚ-AER established Ireland's first Digital Sky Demonstrator in Shannon, integrating drones with traditional air traffic control. The project tested advanced U-space technologies and BVLOS operations, while also conducting national public consultations to assess societal acceptance of drones in daily life. The demonstrator also supported Ireland's first all-electric aircraft flight, integrating it into the project's focus on future air mobility.

All three demonstrators provided practical insights, recommendations, and lessons learned to guide future U-space deployment and standardisation, inform best practices, support integration with existing air navigation services, and foster safe, efficient, and socially accepted operations across Europe.

Next steps for U-space

The event underscored the value of operational experience, public engagement, and cross-border collaboration in enabling U-space implementation. Lessons from Belgium, France, Ireland, Italy, Spain, and The Netherlands and will inform the next steps for SESAR JU, as the partnership continues to support research, testing, and deployment of safe, efficient, and sustainable U-space operations across Europe.

More about U-ELCOME, BURDI, and ÉALÚ-AER

Publication shines spotlight on SESAR innovations for smarter airports and seamless journeys.

In 2025, CORDIS, the European Commission's primary source for information on projects funded by the EU's research and innovation framework, published an infopack how the SESAR JU is making airports smarter and more connected, offering passengers more reliable and resilient transport.

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. The Info Pack highlights 12 projects supported by the SESAR that are helping to make this transformation a reality – enhancing airside efficiency, improving traffic management in and around airports, and enabling seamless multimodal journeys. Europe's sustainable and smart mobility strategy envisages seamless travel from door to door. Along with the European Green Deal and Fit for 55 plan, it 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. The projects highlighted in the Pack work to improve multimodal mobility by linking airports with ground transport modes such as rail and bus lines. Data sharing allows smooth transfers between modes of transport, reducing travel times, and booking platforms that enable single-ticket journeys across multiple modes of transport. Innovations in digitalisation and AI enhance the efficiency of airport operations, offering improvements in collaboration across airports, 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 new technologies such as unpiloted aircraft. Research and demonstration projects powered by SESAR 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.

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