

skyway

THE EUROCONTROL MAGAZINE

TOWARDS A MORE SUSTAINABLE AND DIGITAL WORLD

MAGDA KOPCZYNSKA
DIRECTOR GENERAL FOR
MOBILITY AND TRANSPORT,
EUROPEAN COMMISSION

MAINTAINING EUROPE'S AERONAUTICAL AND ATM COMPETITIVE EDGE

JAN PIE, SECRETARY
GENERAL, ASD

PREPARING FOR SUMMER 2024

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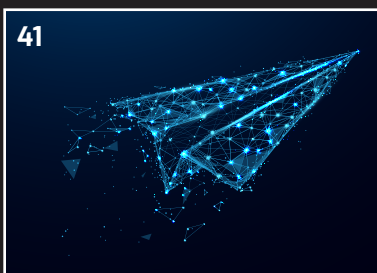
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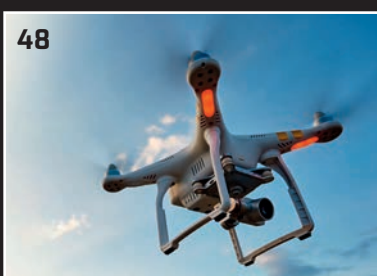
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INNOVATION IS CENTRAL TO PROGRESS

EDITORIAL BY RAÚL MEDINA,
DIRECTOR GENERAL OF EUROCONTROL

Aviation has always innovated, making huge leaps to become the global industry it is now, with over 10 million flights a year just in Europe.

However, the rate of change is set to accelerate as a response to the major challenges we are now facing, several of which are described in this edition. Sustainability dominates much of the discussion, with the ambitious target of achieving NetZero by 2050 dictating action across the sector: from making ATM much better at enabling fuel-efficient trajectories, to a revolution in the production and supply of sustainable aviation fuel (SAF).

We will also see new propulsion types such as aircraft powered by electricity or hydrogen. These aircraft will have to share the skies not only with existing aircraft types, but also with drones and aircraft transitioning to or from higher altitude operations or even space.

There will also be new types of military aircraft and we should be prepared for the current surge in military operations to continue into the future.

In addition to all of this, we still see demand for flying. As discussed in this issue of Skyway, there may well be a move away from short-haul, domestic flights and more use of alternatives, but we are still forecasting around 50% more flights in the network by 2050. Radical change is clearly vital.

Fortunately, the potential for change is massive. Digitisation is moving more rapidly than ever before and, at Network Manager level, we have a number of major changes in the pipeline as part of our iNM programme. More generally, the impact of AI using big data sets is only just starting to be felt – but is already providing new insights into how we can improve performance.

Recognising the need for change is the first step. A detailed and coordinated plan is also vital. Within ATM, SESAR (Single European Sky ATM Research) provides a roadmap for many of the advances we need. Within SESAR the

entire industry comes together to work on the future, with EUROCONTROL's Innovation Hub playing a major role. EUROCONTROL has long had a strong commitment to innovation and over the coming years we will be investing to strengthen our capabilities and provide even more support to our stakeholders.

We are also involved in the vital next step of making sure that innovations actually make a difference – through the SESAR Deployment Manager, based at our headquarters in Brussels.

One new development is the recent appointment (by the European Commission) of EUROCONTROL to act as the CNS (Communications, Navigation and Surveillance) Programme Manager. This recognises the importance of CNS and also the fact that a much more coordinated approach is required across Europe to ensure sufficient coverage, to reduce the extent of duplication and to continue the process of transitioning to a much more digital, data-rich future.

It is an exciting time to be working in aviation – but also it demands of us the commitment to make sure that we can make the transition to a much more sustainable, more efficient industry that responds to society's imperatives. ■





FROM RHETORIC TO ACTION: **ACCELERATING THE TWIN TRANSITION IN AVIATION**

MAGDA KOPCZYNSKA

Director General at the European Commission's
Directorate-General Mobility and Transport (DG MOVE)





"Talk of the 'twin transition' – the move to a more sustainable and more digital way of life – began before the introduction of the current European Commission's mandate."



Talk of the 'twin transition' – the move to a more sustainable and more digital way of life – began before the introduction of the current European Commission's mandate. But the EC's mandate saw us move decisively from words to action, presenting proposal after proposal to set the European Union (EU) on the road to its European Green Deal and Digital Age objectives. Aviation is no exception.

This year the EU will undergo its own transition, as new European Parliament Members (MEPs) are elected, new people take their seats in the Commission and on the European Council. Whoever the next Commission President is, I am sure that she or he will quickly present a vision for the coming five years. While I have no inside information on how this will look, I can say with a great deal of certainty that the focus on cutting emissions and on making more of digitalisation will remain high on the agenda.

I see my role, as Director General of DG MOVE, to lead the policy work needed to meet EU objectives, which will also ensure that our transport system is

fit for the future. Each transport mode has its own challenges when preparing for a future that must be simultaneously more connected, cleaner, greener, smarter and more resilient.

But few sectors are doing so against a recent history that is quite as turbulent as that of aviation. Just as 9/11, SARS, the financial crisis and volcanic ash did in previous decades, COVID and Russia's war of aggression against Ukraine have caused major fluctuations in demand and uncertainty.

I would like to thank EUROCONTROL for taking the initiative to create a solidarity fund for Ukraine and Moldova. It provides support and funding to ensure the longer-term viability of their air traffic control. The extension of the fund in 2024 was very much welcome and the Commission will continue to support Ukraine for as long as it takes.

Flexibility is important – the flexibility to scale up and down as needed would significantly reduce the impact of changing demand and uncertainty in the aviation



sector, for example. As would having the flexibility to deliver capacity where it is geographically needed.

While the benefits are clear, creating this flexibility has been challenging for air navigation service providers (ANSPs). On the Commission side, it remains a priority – not least because this is one route to greater resilience.

THE CAPACITY CRUNCH

While aviation has been hit hard by global events in recent years, the overall growth in demand has not taken the same hit. Passenger volumes are expected to increase from 13 million in 2019, which was the busiest and most congested year ever, to 16 million in 2050.

At the same time, military aviation activities have increased sharply, shrinking the airspace available for civil aviation by around 20%. The increased presence of drones and other innovative air mobility solutions in our skies will add to crowding.

This projected imbalance between the demand and supply of airspace capacity is a major source of uncertainty for the aviation sector, not least for the EUROCONTROL Network Manager.

While I do not have the power, unfortunately, to increase the size of our skies, I can push for a collective and innovative approach, so that we make the very best of what we have.

A SINGLE EUROPEAN SKY

We need to incentivise monopoly service providers to change how they operate – in other sectors, the market takes care of this.

Back in 2019, a wise person's group representing the aviation sector drafted a blueprint to incentivise service providers. The Commission took this up in its proposal to reform the Single European Sky (SES) rules.

One of the main objectives of the reform was to create greater scalability of service provision by proposing a framework that would enable ANSPs to become more flexible by acquiring certain services on the market, improving network management and regulating ANSPs more efficiently.

Negotiations continue, with Member States' main concern being control over investment decisions and spending by their service providers. They also wish to avoid SES rules impacting on military activities, which would be seen as endangering national sovereignty.

"Creating this flexibility has been challenging for air navigation service providers. On the Commission side, it remains a priority – not least because this is one route to greater resilience."

Regrettably this file has not yet been concluded in the Council, although I have not given up hope that it will be. Whatever the outcome, operational stakeholders must become more flexible with regard to service provision.

We are also looking to innovation in air traffic management (ATM) to help us achieve a more sustainable increase in air traffic, to integrate innovative new mobility services into our skies, and to address security requirements.

I am thinking of advanced automation and artificial intelligence in ATM to optimise routing, reduce human error and improve overall efficiency. SESAR JU (Single European Sky ATM Research Joint Undertaking) is supporting some fascinating work here that I am keeping a close eye on, work on using satellites to increase network capacity, for example.

Also notable are artificial intelligence (AI) algorithms that can analyse data in real time to predict air traffic patterns, enabling more effective traffic management. Collaborative decision making can improve situational awareness and lead to better network planning and coordination. Configuring airspace and virtual centres more dynamically also supports increased capacity. Better rostering and increased air traffic controller productivity are also key to increasing performance.

When we update the European ATM Master Plan this year, the objective is to steer and secure commitment from all ATM stakeholders on priority innovation initiatives. The Commission continues to stand firmly behind the concept of a Digital European Sky, which was defined in the Master Plan. What we need now is for the ATM sector to pick up the pace in its deployment of digital solutions.

When it comes to sharing our skies with new, innovative devices and vehicles, I expect the EU U-space to inspire new and optimised ways of managing our airspace. Traditional air traffic management is built on the principle of detect and avoid, whereas the U-space is a first and strategic step towards a digitally integrated airspace. It represents a model of multi-stakeholder collaboration, showcasing the potential for combined efforts in developing sophisticated, integrated airspace solutions that work together to ensure safe and fair access for all airspace users.

This will become increasingly important as we look to drones to decrease emissions and congestion on our roads.

"When it comes to sharing our skies with new, innovative devices and vehicles, I expect the EU U-space to inspire new and optimised ways of managing our airspace."

EMISSIONS – THE CHALLENGE OF OUR ERA

Aviation accounts for around 2.5% of global CO₂ emissions. With the European Green Deal and the Sustainable and Smart Mobility Strategy, the Commission has a clear roadmap to achieving climate neutrality in the EU by 2050. They show the way to cutting transport emissions by 90% by 2050 compared to 1990 levels.

For aviation, our major proposals came as part of the Fit for 55 Package – ReFuelEU Aviation on the use of sustainable aviation fuels (SAF), and the Alternative Fuels Infrastructure regulation. Both have been agreed by the European Parliament and the Council. The resulting framework will support structural changes across the entire value chain, from fuel suppliers and airports to operators.

ReFuelEU Aviation sets a mandate for the minimum share of SAF within aviation fuel. The legal requirement starts with 2% by 2025, then rises to 6% by 2030, 20% by 2035, and up to 70% by 2050.

This responds to the current supply and demand conundrum by ramping up both the production and use of SAF in the EU. It will mean increased capacity and an open door for new market entrants. The Renewable and Low-Carbon Fuels Value Chain Alliance is there to support the process, allowing effective exchange and coordination to ensure that opportunities and barriers to market action are identified.

Beyond supply difficulties, the quality of fuel composition is key. The ReFuelEU Aviation review will cover this, and DG MOVE is working closely with EASA on a project exploring a potential fuel standard. The objective is to limit certain components that are judged to contribute to the non-CO₂ climate impact of aviation. The scientific uncertainty on this is unhelpful; to increase our understanding, we are developing a Monitoring, Reporting and Verification procedure. SESAR projects are also assessing operational trade-offs to ensure that mitigation strategies do not come at the expense of additional CO₂ emissions.

We have also launched the Alliance for Zero-Emission Aviation, calling on members of the aviation community to join forces to prepare for the advent of zero-emission aircraft. I would recommend that we all keep an eye on hydrogen-powered aircraft, not only for their contribution to decarbonisation, but also to noise reduction.

PEOPLE

I have spoken of the innovation needed to reduce emissions, to make ATM more efficient and to introduce more flexibility to aviation. But even in today's increasingly automated world, innovation does not happen by itself. Alongside the latest technologies, the right regulatory framework and sufficient investment, we need the very best minds.

European aviation is a success story, and that is thanks to the people that get planes off the ground, and who are today focused on doing so more sustainably, in ever-smarter ways. As we all try to picture how flights will look in 2035 or beyond, let's make sure we have the right people on board – those who can turn ambition into reality, and who can make sure that today's success story continues. ■

NAV CANADA TRACKING TOWARDS TRAJECTORY-BASED OPERATIONS

indra

NAV
CANADA

Canada's air navigation service provider is accelerating trajectory-based operations by collaborating with Indra, writes **Blake Cushnie**, Programme Director, NAV CANADA and **Oscar López Otero**, ATM Director, Indra

NAV CANADA is taking a substantial step towards a full Trajectory Based Operations environment. In partnership with Indra, one of the leading technology and consulting companies in the air traffic management industry, NAV CANADA will support the deployment of a state-of-the-art flight data processing system (FDP) and an airspace capacity management system (iACM) system for complex airspaces in Canada's network centre.

Trajectory-based operations (TBO) represent a fundamental shift from a system based on regular air traffic services (ATS) intervention to one that takes into account the full picture of a flight from takeoff to landing. The concept of TBO allows an aircraft to fly to its destination based on a pre-determined four-dimensional flight path viewed in its entirety, yielding significant benefits for airlines and air travelers alike.

In addition to providing aircraft with greater flexibility and preferred flight routes, TBO allows aircraft to file their optimised trajectory, reduce their flight time, minimise enroute delays, use less fuel, and paves the way for the integration of new entrants, such as remotely piloted aircraft systems or drones.

Moreover, this partnership is part of a wider agreement that will welcome NAV CANADA in the iTEC Alliance as a new member, made up of Europe's leading air navigation service providers, along with Indra as the sole technology partner. With the arrival of NAV CANADA, long transoceanic journeys could potentially be operated using iTEC SkyNex technology from start to finish, proving the alliance's significant contribution to the evolution of civil aviation.

The agreement reached between both companies and the incorporation of NAV CANADA into the iTEC Alliance is a major boost to NAV CANADA's future roadmap and its commitment to maintaining a safe, efficient and innovative air navigation system. For Indra, this agreement is key to continuing its path towards becoming a global leader in air traffic services and its capacity to face the challenges of the industry outside Europe.

"This partnership with Indra positions NAV CANADA as a forward-thinking contributor to the evolution of air traffic management and trajectory-based operations. We are proud that we have reached an agreement with Indra to deploy the next generation of air traffic management systems

in Canada," said Raymond G. Bohn, President and CEO of NAV CANADA. "Once completed, it will represent a generational leap forward in our air traffic management platforms and will contribute to a more sustainable and efficient air transportation sector in Canada. Security, innovation, expertise and collaboration are the fundamental pillars of NAV CANADA's business strategy."

The new system will integrate information processing from Canada's seven area control centres, automatically notifying the system of any changes in flight plans between each of their respective airspaces. This will enable better flexibility resulting in the improvement of traffic flow within Canadian airspace and across the rest of the network. The result will be more efficient routings for aircraft operators,





1.

President of Global Airports and Operations Control at Air Canada. “We are excited to see how international collaboration brings new technologies for air traffic navigation that will support our operations, increase predictability, and in turn, better passenger experience.”



2.

Scott Wilson, Vice President of Operations at WestJet, also emphasised that the Indra technology that NAV CANADA will utilise will bring various advantages for the aviation industry: “The deployment of this new technology will support our greater operation by reducing costs and fuel burn, ultimately making flights more efficient and affordable for Canadians.”

reduced fuel consumption and associated greenhouse gas emissions while providing greater operational resiliency to disruptions and meeting the capacity requirements of a growing sector.

Indra's President Marc Murtra stated during the signing of the agreement with NAV CANADA that “Indra's technology will not only increase efficiency in air traffic management in Canada but will also enhance predictability and contribute to the reduction of environmental impact. What we have signed

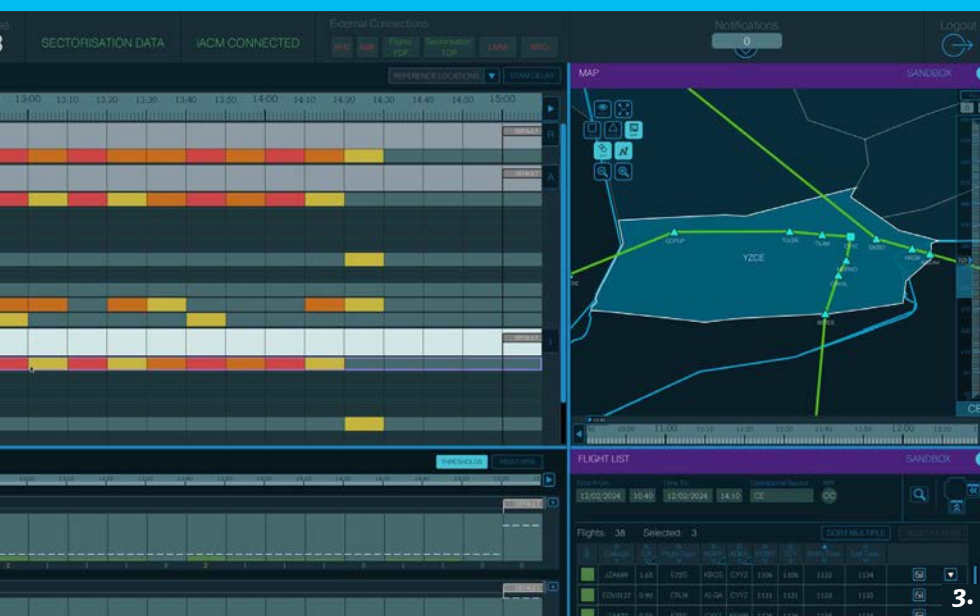
transcends a simple agreement between companies; it represents a renewed commitment between nations. This collaboration is a step forward in sharing knowledge and technology, fostering new streams of relationships, and advancing towards more efficient and sustainable aviation.”

“These advancements will assist us to serve our guests better and work more efficiently, while keeping safety as a priority,” said Kevin O'Connor, Senior Vice

Through its collaboration with Indra, NAV CANADA will bring significant benefits to the Canadian aviation industry, reflect the vision for the future of air traffic management defined by the International Civil Aviation Organization (ICAO)'s Aviation System Block Upgrades (ASBU), which promote technologies that enable greater collaboration and operational predictability in global aviation. ■

Photos:

1. Mark Cooper, Vice President Chief Technology and Information Officer NAV CANADA; Jan-Gunnar Pedersen, CEO AVINOR; Raymond G. Bohn, President and CEO NAV CANADA; Javier Ruano, Managing Director, Indra; Marc Murtra, President Indra; José Vicente de los Mozos, CEO Indra; Victor Martínez, ATM Director Indra; Martin Rolfe, CEO NATS
2. from left to right Martin Rolfe, CEO NATS; Raymond G. Bohn, President and CEO NAV CANADA; José Vicente de los Mozos, CEO Indra; Jan-Gunnar Pedersen, CEO AVINOR
3. Management of the entire national Network in Canada will be supported by Indra's Airspace Capacity Management system (iACM)



3.



WHAT IT TAKES TO MAINTAIN **EUROPE'S** **COMPETITIVE EDGE** IN AERONAUTICS AND ATM

JAN PIE

Secretary General of ASD – the voice of Europe's aerospace, security and defence industries – examines some of the competitive challenges facing Europe's aviation technology sector.

Amid rising geopolitical tensions and increasing geoeconomic competition, the aviation sector is undergoing a period of tremendous innovation and transformation, marked especially by the digitalisation and decarbonisation of air transport.

The European aeronautics industry plays a key role in this innovation and transformation, driving interconnected applications by providing state-of-the-art digital solutions. This applies to the latest generation of aircraft as well as to ground- and aviation-related services, in particular air traffic management (ATM), which make flying safer and more efficient.

Manufacturers, together with our partners from the airports, airspace users and the ATM industry, are committed to reaching net zero CO₂ emissions by 2050 from all flights within and departing from the EU. Via modernised aircraft and ground systems, efficient engines, optimised operations through modern ATM, new propulsion systems and the adaption of our products to the growing use of sustainable aviation fuels (SAF), the aeronautics industry is the cornerstone of efforts aiming to reach net zero emission aviation.

A thriving aeronautics industry which creates thousands of safe, highly paid and highly qualified jobs is essential for Europe's sovereignty in times of growing global uncertainties. Aeronautics companies and the defence, security and space industries form a unique ecosystem in which technological advancements in one sector potentially benefit all others. Maintaining this know-how and innovation capacity is absolutely crucial in an era when technology is a decisive component of global power struggles.

In other words, innovation in the European aviation sector has a technological, ecological, economic and even strategic dimension. As mentioned above, optimised operations through a more digital and efficient ATM have a lot of potential in this respect. Advanced technologies, such as artificial intelligence (AI) will enable more automation. Autonomous functionalities in ATM will in turn allow increased safety, even as air traffic increases, and in mixed operations.

Achieving better efficiency in ATM holds the promise of maximising capacity in the air as demand is rising, while reaching the optimum in routes flown by all air



operators, which again would eliminate a considerable amount of emissions and reduce delays for passengers. Facing this complex challenge will require the deployment of digital tools (provided by aeronautics companies) to support the day-to-day operational decision-making of ATM players, unlocking the power of the latest breakthrough technologies fostered by the Single European Sky ATM Research (SESAR). The main objective that we should aim for and where we can generate a positive impact globally in the coming years, is making European airspace the most efficient and environmentally friendly sky to fly in the world, and to do that as rapidly as possible.

Many of these necessary changes will be enabled or enhanced by progress in research. ASD therefore calls on decision-makers at the European level to guarantee sufficient public funding under the next EU Research Framework Programme to allow for the continuation of the Clean Aviation and SESAR public-private partnerships, while also providing additional public funds to address emerging topics outside the scope of these two projects. This will be paramount for the European aeronautical industry to remain competitive at a global level and for the EU to meet its ambitious climate- and aviation-related goals.

"The main objective that we should aim for and where we can generate a positive impact globally in the coming years, is making European airspace the most efficient and environmentally friendly sky to fly in the world."

In more specific terms, there are a number of concrete research streams that need to be addressed in response to aeronautics – in particular ATM – challenges. This refers for instance to: strengthening of research on highly efficient aircraft propulsion systems; continued efforts on noise and non-CO₂ emission reduction; digital technologies, including artificial intelligence, to increase autonomy and connectivity in aviation; safer operations and cyber security technologies on board and on the ground, based on a more resilient on-board and ground infrastructure; a digital ATM system contributing to the delivery of the Digital European Sky; emerging concepts such as unmanned aircraft systems (drones) and innovative (or advanced) air mobility.



The pace, quantity and quality of innovations are strongly determined by the regulatory environment in which companies operate. With this in mind, there is an urgent need for more consistency in EU legislation. To name just one example: some of the current provisions in the REACH (Registration, Evaluation, Authorisation and restriction of Chemicals) legislative proposal prevent the development and use of safer and more efficient products, making it harder for the aeronautics industry to reach its decarbonisation objectives. If Europe does not want to fall further behind America and Asia, it needs to become a more attractive and business-friendly location for innovators and investors with a predictable, supporting and reasonable regulatory environment.

A concrete example is uncrewed aviation solutions. The United States and China invest heavily in vertical take-off and landing (VTOL) projects and drones and provide innovation-friendly regulation, whereas Europe's spending remains at modest levels and limits the unfolding of this high-potential technology with tight regulatory constraints. This must urgently change in order to catch up Europe's leeway and to ensure that our highly innovative companies will be the frontrunners of urban air mobility and drone developments.

Furthermore, in the EU, the competition policy framework is an important achievement, but it can also bring some constraints that tie the local economy and its innovation potential. For example, the criteria for EU Member States with regards to State aid rules are strict in terms of location and size of the companies and entail funding caps. However, in aeronautics, our industry develops high-value products with a long lifetime span, which in turn requires massive long-lead capital investments that the private sector alone cannot provide. This also concerns necessary

investments for innovations that are indispensable on the path towards net zero aviation. Hence, there is a need for more flexibility in the EU competition policy framework to ease access to State aid programmes to a wider range of companies – even more as other global players strongly support their local companies – including large ones. This is about creating a level playing field for European companies, not giving them an unfair advantage in worldwide competition.

In conclusion, among a myriad of challenges in aviation, the European aeronautics industry is a key provider of innovative solutions, in particular with a view to the digitalisation and decarbonisation of air transport and especially when it comes to state-of-the-art equipment for modern air traffic management. Yet our companies need support from the public side in Europe in terms of investment and funding, fostering research, creating an innovation-friendly business environment and levelling market conditions vis-à-vis state-sponsored firms from other parts of the world. Europe has a strong, innovative and world-class aeronautics industry. The time to act in order to maintain its leading place as a global pioneer of innovation is now. ■

"... the European aeronautics industry is a key provider of innovative solutions, in particular with a view to the digitalisation and decarbonisation of air transport ..."



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TRAVEL IN TRANSITION: AVIATION'S ROLE IN SHAPING THE FUTURE OF TOURISM



EDUARDO SANTANDER

Executive Director, European Travel Commission (ETC), reports on how Europe's airline passengers are driving many of the changes in the industry's key priorities.

Europe would not be the same without tourism. As of 2022, the sector accounted for 8.3% of Europe's gross domestic product (GDP) and provided 34.7 million Europeans with jobs.¹ Tourism is a complex ecosystem intersecting with countless other industries, from transport to retail. Even for those who do not work in the industry, the presence of tourists in one's hometown or city supports local businesses, enlivens the cultural scene and promotes cross-cultural understanding. For every euro generated by tourism, an additional 56 cents of added value trickles down to other industries.²

Investing in tourism therefore means investing in the long-term well-being of communities and small businesses across Europe.

Aviation is vital for the prosperity of European tourism; the travel sector simply could not exist without it. Though rail and bus transport are growing in popularity, flying remains by far the most favoured means of transport for international tourism in Europe. According to Eurostat, 46.5% of all intra-European foreign trips were taken by plane in 2022.³ This is especially important for remote or island destinations, many of which rely far more on tourism for their local economies than their urban, inland counterparts.

The tourism industry does not just rely on aviation for connectivity, but also for Europe's image as a destination. Our continent is crisscrossed by an extensive network of airports, allowing travellers to discover the diversity of cultures, landscapes and attractions that makes Europe so exciting to explore. This is an important element for promoting Brand Europe to long-haul travellers, who typically stay longer and spend more money than intra-European and domestic tourists. Our latest research shows that visitors from outside Europe plan to visit multiple countries during their trip, with air travel being the most common method of transport across borders.⁴ This means that aviation is central to preserving Europe's reputation as an accessible and convenient destination for widespread exploration.

Despite aviation's pivotal role, the industry is facing challenges in Europe. Travellers are increasingly conscious of their carbon footprint. According to a study published in 2023 by the Visa Economic Empowerment Institute, 29% of surveyed travellers have already tried to use less carbon-intensive modes of transport in the last two years, and a further 34% plan to do so for their trips in the next 12 months.⁵ Though air transport remains the most popular choice for intra-European travel, an increasing number of tourists are choosing to travel by train. The rail industry is capitalising heavily on this trend, establishing more services, including sleeper trains, each year.

As is so often the case in the tourism industry, it is guests, not governments, who provide the impetus for change. Public scrutiny of the aviation industry's carbon footprint has created growing pressure for greener alternatives to traditional flying. Some inspiring progress has been made in creating more sustainable aviation technology. We warmly applaud recent advancements in this area, including Jet2's investment in fuel-efficient planes, SAS's plans to launch electric air transport for short trips, and Virgin's inaugural trans-Atlantic flight with sustainable fuels.

EUROPEAN TRAVEL COMMISSION

Despite growing industry focus on lower-carbon transportation, there is still a sizable value-action gap. This rift cannot be filled by the private sector alone, but also requires governmental and inter-governmental intervention. The European Travel Commission is pleased to see that progress is being made on this front, as initiatives such as the carbon offsetting and reduction scheme CORSIA and the EU's decarbonisation legislation RefuelEU will go a long way in lowering the industry's carbon footprint.

"Striking a balance between rising demand for travel and reducing environmental concerns poses significant challenges."

Striking a balance between rising demand for travel and reducing environmental concerns poses significant challenges. Aviation's public perception as an unsustainable industry is a growing issue, and a complete transition to green fuels and technologies is still many years away. In the short term, the air transport sector should invest in multimodal travel, coordinating with partners in the rail and bus industries. This would streamline the consumer's ability to pair their flight with a lower-carbon mode of transportation so travellers can sustainably reach their final destination without having to forgo flying altogether. The tourism sector is eagerly anticipating legislation from the European Commission to facilitate multi-modal travel, and is counting on the aviation industry to support this necessary step.

¹ World Travel and Tourism Council: 2023 Annual Research: Key Highlights

² European Commission Communication: Tourism and transport in 2020 and beyond

³ Eurostat: Tourism Statistics – characteristics of tourism trips

⁴ European Travel Commission: Long-Haul Travel Barometer 3/2023

⁵ Visa Economic Empowerment Institute: Accelerating sustainable tourism: areas for public-private collaboration



Notwithstanding sustainability concerns, the experience of air travel has become more cumbersome for tourists in recent years. In an era dominated by technological convenience, there is an increasing expectation for a smoother travel experience. However, delays, bottlenecks and cancellations persist, creating a negative experience for travellers. Public and private aviation actors must invest in embracing digital solutions and streamlining processes to enhance the overall experience for tourists and business travellers alike.

Some notable developments are expected in 2024. The introduction of the Entry-Exit System in European airports should speed up processing times for non-EU arrivals once the new systems are bedded in. The same can be said for the European Travel Information and Authorisation System (ETIAS) which is expected to come into play in Spring 2025. As the entry points to Europe, airports underline extra-European travellers' first impressions of our continent. It is therefore crucial for Brand Europe that the new arrival systems enter operation as quickly and with as little disruption as possible. The tourism sector is counting on EU aviation and border security authorities, as well as the broader air transport industry, to ensure a smooth transition.

But even with new digital strategies to make arrivals more efficient, human-derived concerns such as strikes and personnel shortages cannot be solved as easily. In 2022 and 2023, many airlines were forced to run reduced schedules due to a lack of workforce, resulting in widespread delays and cancellations. Moreover, the summer of 2023 was marked by industrial action all over Europe, leading to disruptions at peak tourism season. Though there was a slight improvement in flight punctuality in 2023 compared to 2022, the average delay per flight on arrival in July 2023 was still 22.5 minutes.⁶

Most holidays to and within Europe begin with a flight. This means that cancellations and delays are not just a concern for the aviation industry, but trickle down to affect the entire tourism supply chain. Though it might not be immediately obvious, a lack of baggage handlers in Berlin could impact a small business in Greece, just as an air traffic control strike in France could leave a family-run hotel in Ireland empty for the night.

Increased integration of European airspace could help to solve some of these problems. The Single European Sky is a pivotal step aimed at optimising air traffic management. By creating a unified airspace, the EU can reduce congestion, enhance safety and minimise the environmental damage of flying.

This would also lessen the impacts of strikes and labour shortages as it would allow airlines to more easily change their routes to avoid affected areas. The European Travel Commission strongly supports this goal and hopes that a single European airspace will soon become a reality.

"The Single European Sky is a pivotal step aimed at optimising air traffic management. By creating a unified airspace, the EU can reduce congestion, enhance safety and minimise the environmental damage of flying."

Through its indispensable role in European tourism, aviation is crucial for the economic, cultural and social development of the EU. Today, the air transport and tourism sectors stand side-by-side at a crossroads: we must undergo the challenges of the climate and digital transitions to build a travel ecosystem that works for people and the planet.

There are countless actors in the tourism industry working tirelessly to green our industry. At the European Travel Commission, we recently launched our own Climate Action Plan to guide us to net zero by 2050. We are also using our position as an umbrella organisation of national tourism boards to catalyse close collaboration to drive our industry's environmental transition. However, no company, government or organisation can do this alone. Tourism is an intricate ecosystem in which every player, including aviation, must work together.

Preserving tourism for future generations will require the aviation sector to lead the way in decarbonisation efforts. There is no future for international tourism without flying, and insular, remote, and coastal destinations that rely most heavily on air transport are often those with the most to lose if tourist flows are disrupted. The path forward requires collaboration, innovation, and a shared commitment to creating a resilient and sustainable future for both the aviation and tourism industries. We need to address these challenges head on to continue offering unparalleled experiences to visitors and solidify Europe's position as the world's favourite tourist destination. ■

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NEW MILITARY TECHNOLOGIES WILL REQUIRE ATM MODERNISATION TO MANAGE AIRSPACE **MORE DYNAMICALLY, SAFELY AND EFFICIENTLY**



The evolution from prescriptive equipment towards a performance-based approach facilitates civil-military interoperability, writes **Christophe Vivier**, Head of the Single European Sky Unit at the European Defence Agency.

Military aviation is a fast-paced sector, with cutting-edge technology and capabilities, sitting at the forefront of innovation in the air domain. As civil and military aircraft share the airspace, advancements in military aviation have the potential to impact the entire aviation sector, including the management of airspace and air traffic. Taking into account the European Union's 2023 Capabilities Development Priorities approved by the 27 EU Ministers of Defence, here are some of the areas where innovation in military aviation, and broadly speaking the defence domain, is expected to have an impact on air traffic management (ATM).

New technologies such as hypersonic missiles, directed energy weapons and advanced targeting systems will dramatically enhance the capabilities of military aircraft. These advancements will require updates to air traffic management systems to ensure efficient civil-military coordination to manage the airspace more dynamically, safely and efficiently. Flight planning systems must be able to handle the increased complexity of airspace and the need for more precise routing. Interoperability for civil-military data and information exchange will have to be further improved to guarantee a reliable air situation picture, allowing us to detect, identify and classify any cooperative and non-cooperative civil or military air system and to intervene when needed. Underlying information and computer technology (ICT) and operational technology (OT) infrastructures for communication and data exchange protocols will need to be upgraded and updated to manage the increased data flow and use of modern technologies. Additionally, military command and control (C2) systems need to be adapted to this new operational environment. Interoperability and synergies will also contribute, limiting additional equipment requirements for military assets, enabling operating in a modernised ATM system. In this regard, the evolution from prescriptive equipment towards a performance-based approach facilitates civil-military interoperability.

The use of uncrewed air systems (UAS) will become increasingly prevalent in Europe, in military and civilian applications. UAS offer significant advantages in terms of manoeuvrability, endurance and reconnaissance capabilities. However, they also pose new challenges for air traffic management, as they cannot be easily detected, tracked or controlled

in the same way as crewed aircraft. In addition, UAS open the door to new threats in the form of malicious usages in, for example, asymmetric and hybrid warfare, or in the case of threats to mass events or critical infrastructure. The difficult detectability of these novel UAS platforms poses a considerable security risk. Therefore, counter-UAS (C-UAS) for timely and accurate civil-military information exchange will become increasingly important. Integration of local C-UAS systems in the overarching air defence system is challenging, but paramount for the effective protection of the airspace. Although military and State aircraft operations are excluded from the scope of the regulatory framework for the U-space, the implementation of U-space services and their integration into the ATM systems should take into account security and defence considerations. This could improve information sharing between civilian drone navigation service providers and military control and reporting centres and would subsequently contribute to the elaboration of a more complete Recognised Air Picture (RAP) in order to protect the airspace. The proliferation of new types of vehicles operating in the higher airspace and the foreseen increase of space launches in the next decade also entail numerous challenges for the protection and safe usage of the EU airspace as well as for the ATM system.

Artificial intelligence (AI) and machine learning (ML) will play an increasingly important role in Europe's military aviation sector. These technologies can be used to automate tasks such as mission planning, threat assessment and damage assessment. They can also be used to develop more intelligent and autonomous air systems. For instance, the European Defence Agency (EDA) developed a Safe Autonomous Flight Termination (SAFETERM) system exploring the use of state-of-the-art artificial intelligence/machine learning technologies to increase the level of safety of remotely piloted aircraft systems and UAS in specific emergency situations leading to a flight termination or an emergency recovery. However, the military systems will have to be interoperable with civil air traffic control (ATC) systems which could also become more automated, with AI-powered systems making decisions about flight paths, trajectories and separation.





The use of new technologies, including emerging and disruptive technologies (EDTs) and the evolution towards satellite-based services bring a real added value in terms of performance, military mission effectiveness and achievement of environmental objectives. It allows the optimisation and rationalisation of communication, navigation and surveillance (CNS) systems to ensure efficiency and avoid unnecessary redundancies. However, it raises significant challenges for the protection of availability, integrity and confidentiality of mission critical information. Therefore, a resilient and robust data sharing network is essential, considering the relevant cyber security and cyber resilience requirements. Because of this and given that CNS systems play a vital role in security and defence, an EU-CNS evolution plan needs to take the key aspects of resilience and defence into consideration, including minimum operational networks (MON) to ensure the required level of performance, resilience and service continuity for State missions and international commitments. The new Action Plan on Military Mobility 2.0 calls for the expansion of military requirements to include the dual use of air traffic management communication, navigation and surveillance systems and infrastructures while simultaneously allowing for effective access to airspace and use of air navigation services.

The military, and therefore the European Defence Agency, are involved in environmental projects to reduce the military carbon footprint and further contribute to greener defence. Particularly in aviation, the military explores alternative energies, sustainable aviation fuels, advanced simulation in training and sustainable ground facilities, such as the net-zero carbon emissions facility in some airbases. In the environmental domain, we at EDA see that effective civil-military cooperation can foster the development of dual-use solutions to help meet environmental objectives. For instance, new propulsion systems, such as electric or hybrid-electric engines, will offer significant benefits in terms of range, efficiency, and reduced emissions. These advancements will help to make military aircraft more sustainable and less reliant on fossil fuels, but these advancements will also benefit civil aviation and will impact the way air traffic is managed.

Innovation is not only about technology. Innovation is about the successful exploitation of innovative ideas, whether they are of a cultural, organisational or technological nature, or are incremental improvements to keep us one step ahead. The European Defence Agency is very well suited to develop innovative solutions through military-military and civil-military cooperation aiming to

create win-win conditions for ensuring civil flight efficiency and military mission effectiveness. The current context must encourage all civil and military stakeholders to think outside the box and to successfully implement and exploit all innovative ideas and technologies that will bring about a more efficient and sustainable aviation system while contributing to the capabilities needed by the air forces of our participating Member States.

During the EDA annual conference held in November 2023, European Council President Charles Michel highlighted that “we already have strategies for space and for maritime domains, but we can go further in the air domain”. Indeed, in contrast to the approach followed in other domains, the EU currently does not have an EU airspace strategy for security and defence in which both civilian and military strategic objectives are set and commonly agreed and that lays down the actions and mechanisms to ensure free, safe and secure European access to airspace.

Based on the challenges in relation to the development and the implementation of new technologies and considering the current geopolitical and security context, it could therefore be pertinent for the EU to consider developing its dedicated airspace strategy. In a shared continuous airspace, this would allow the EU to exploit civil-military synergies and coherence and to better connect existing activities and ambitions in maritime security, security and defence in space, military mobility, cyber, hybrid and resilience linked to the challenges in the air domain.

Focusing on the added value to Europe's air traffic management system, such a strategy would facilitate the implementation of an integrated way of working between civilians and the military at EU level. It would facilitate the optimisation of the use of airspace, enhance coordination between civil and military authorities, including at EU level, foster the development of dual-use technologies and systems facilitated by appropriate EU structural funds, and ensure EU non-dependency regarding key aviation and ATM technologies.

The crucial importance of the air domain has been further reaffirmed by the Russian war of aggression against Ukraine. Addressing innovation in the aviation sector collaboratively would ensure a safe, efficient and secure European airspace for civilian and military operations, thus enhancing our ability to better anticipate threats, protect passengers and our citizens.

In the framework of its missions, the European Defence Agency stands ready and is perfectly suited to contribute to the development of this common approach. ■



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THE FUTURE OF EUROPE'S AVIATION SECTOR: EMBRACING INNOVATION

The aviation industry, a cornerstone of global connectivity and economic progress, is undergoing a paradigm shift. Europe, at the forefront of this revolution, is witnessing a confluence of innovation in autonomy, digital services, sustainability and inclusivity reshaping the future of air travel. Here we delve into how these advancements are transforming Europe's air traffic management (ATM) services and the broader aviation sector, particularly pilot training, and how using the drone industry is accelerating us towards a fully integrated ATM/UTM (uncrewed aircraft

system traffic management). These innovations will have a profound impact on traditional aviation and, in particular, on ATM services.

The drone industry is the foundation for the future of passenger-carrying, fully autonomous aircraft. We can use the current regulatory environment and technology to test out the reliability, certification standards and ecosystem requirements (such as off-airport vertiports), and then scale for the future where we have larger aircraft with precious cargo (people). Autonomous aircraft are not just a leap in technology but a stride towards enhanced safety, efficiency and environmental sustainability. These uncrewed systems need a reimagined approach to ATM/UTM, where traditional human-centric models evolve to seamlessly integrate autonomous operations.



The seamless integration of new technologies into existing systems is a critical challenge, writes **Julie Garland**, CEO of aviation training organisation Avtrain.



There has been a positive uptake by the public of delivery drone services and the desire for immediate, on-demand services will continue to support growth in this area. However, we have a lot more work to do to see eVTOL (electric Vertical Take-off and Landing) aircraft being widely accepted or demanded by the public, as can be seen in recent comments from French local councils when discussing the upcoming Paris flights by Volocopter at the Olympics. Some use cases are immediately acceptable – such as medical emergencies/evacuation/disaster zones, while others (such as widespread air taxis) will require more engagement with the community, highlighting the positivity of this green mode of transport, so long as the electricity for charging is generated sustainably.

The role of pilots is undergoing a dramatic transformation. In the early stages of the Advanced Air Mobility (AAM) industry, the public and regulators will want pilots onboard aircraft that carry people. But will pilots be pilots as we know them? Will they even be called pilots? What skills will they require? Given the levels of autonomy on these new generation aircraft should they be redefined as systems operators? Certainly, while the industry is new, we will have commercially qualified, possibly even instrument-rated pilots with eVTOL-type ratings flying these aircraft. But can the industry support this long term? There is a significant pilot shortage globally and the cost of the training and salary of an airline pilot will not be sustainable in the AAM industry. So, we need to redefine the role, the requirements, the training syllabus, the delivery of training, the licensing of these systems operators and the role of the human in the loop interaction. And when do we remove them from the aircraft and allow remotely piloted aircraft to carry passengers as a stepping stone towards fully autonomous passenger carrying flights?

The cargo industry, on the other hand, will be an early adopter of eVTOL as this sector is traditionally the least environmentally friendly in the industry with older, fuel-inefficient aircraft. The sector is likely to use fully autonomous flight before we carry passengers autonomously.

Collaborations between aviation authorities, OEMs, ATM/UTM providers, educational institutions and industry stakeholders are crucial in developing comprehensive training programmes. These initiatives should focus on virtual/augmented reality (VR/AR) and mixed reality, AI, machine learning – and a combination of these not yet seen in the aviation industry.

While we embrace technology as an industry, we do not generally move forward quickly; however, the AAM industry will require regulators to keep pace with technological advances.

Aviation businesses must adopt agile and forward-thinking strategies to stay relevant. This involves investing in research and development, fostering a

culture of innovation and adapting business models to incorporate new technologies and practices. A positive example of this is the work Avtrain carried out with ASL Airlines to achieve their EASA Light Unmanned Aircraft Systems Certification (LUC) in 2023. ASL Future Flight, as one of the largest movers of freight in Europe, will use the certification to “train and gain experience on drone operations before moving onto heavier and longer-range operations”, according to the company. LUC is the equivalent of an Air Operator Certificate (AOC) for drones.

The seamless integration of new technologies into existing systems is a critical challenge. Collaborations between technology providers, aviation companies and regulatory bodies are essential to ensure that this integration is efficient, safe and compliant with existing regulations. Many ATM systems are based on archaic technology that might not support a fully automated environment.

SESAR 3 Joint Undertaking (SESAR-JU) is a European partnership between private and public sector partners that was set up to accelerate, through research and innovation, the delivery of the Digital European Sky. SESAR 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.

EALU-AER¹ is a technology infrastructure integration and demonstration project. EALU-AER aims to establish Ireland's first Digital Sky Demonstrator (DSD), located at Future Mobility Campus, Ireland's (FMCI) recently established vertiport site, in Shannon, Ireland. The aims of the project are to:

- prove the feasibility, reliability and operational efficiency of transport services provided by various eVTOL aircraft for a variety of use cases and applications;
- foster and accelerate the development of autonomous software solutions for the control, monitoring, data gathering/orchestration and overall interaction and safety of eVTOL aircraft;
- develop, deploy, and continually test/optimize the use of UAM, rural/remote air transport/freight delivery, and UTM systems in support of eVTOL services;
- develop, deploy and refine operational systems in general eVTOL-based services across multiple use cases and political jurisdictions;
- define possible Separation Standards for Aircraft and UAVs in controlled airspace through partnership with Air Nav Ireland.

¹ EALU-AER has received funding from the SESAR Joint Undertaking under the European Union's Connecting Europe Facility programme under the grant agreement N° 101079674.



This project will see the integration of a UTM technology platform as part of the FMCI operations site, which will leverage a UTM technology solution that encompasses a UAS platform (WebUAS), a backhaul network (AGN), command and control (C2) and surveillance equipment, and advanced three-dimensional phased array radar (Skyler). This technology solution will be integrated as part of FMCI's vertiport and associated facilities to demonstrate the proposed U-space architecture operations and enable U1/U2 services and integration with ATM/ATC. To demonstrate a range of UAM operations, across the range of U-space services projected through the SESAR U-space CONOPS, the project will execute a number of use cases across the three-year period of the programme that capture the operational requirements, vehicle dynamics and technology demonstrations associated with the projected near-term UAM services market, such as local inspection, light-freight, long distance logistics, air-taxi operations, etc.

The use cases are intended to operate in a compounding fashion to build upon prior phases and prior activities carried out in previous SESAR and external programmes. Outputs of these operations are intended to inform and validate the concept of operations, demonstrate and validate the U-space architecture and pave a way for enhanced automation and U3, U4 services – such as detect and avoid and dynamic capacity management.

"By embracing a culture of continuous learning, the aviation sector can soar to new heights of safety, efficiency and sustainability."

EALU-AER is intended to be an infrastructure platform that can be leveraged to support further developments through future SESAR programmes and work streams (see panel on page 25). The UTM technology solution being implemented in this project is intended to be modular and scalable and aligned with the proposed U-space architecture. EALU-AER will feature an integration effort that will see advanced UTM, C2 and surveillance technologies from Collins Aerospace (a leading aerospace systems integrator) being brought together as part of a consortium that will leverage Ireland's first vertiport (developed as part of a wider transport automation research and demonstration

campus) at FMCI, with Avtrain as the regulatory expert for drones, risk management, operator certification, AAM and UTM; AirNav Ireland as the air navigation service provider (ANSP); Shannon Airport Group as the operator of an international airport; Deep Blue as a leading research consultant for safety, security and human performance; and Manna Drone representing the OEM and operator. While the project is for a three-year period, it is planned to build the ecosystem and infrastructure that will continue well into the future.

The future of Europe's aviation sector, shaped by autonomy, digitisation and sustainability, presents challenges and opportunities. To harness the full potential of these innovations, a concerted effort is needed to bridge the skills gap for pilots, regulators and ANSPs through projects such as EALU-AER DSD. By embracing a culture of continuous learning, fostering collaborations and adapting to new business and institutional models, the aviation sector can soar to new heights of safety, efficiency and sustainability. The journey ahead is complex but promising, paving the way for a brighter, more connected future in European skies. ■

Julie Garland

is the Founder and CEO of Avtrain – one of Europe's leading drone training and consultancy organisations. She is a former Airline Training Captain, Aircraft Maintenance Engineer, Barrister at Law and Fellow of the Chartered Institute of Arbitrators. Prior to undertaking her position as CEO of Avtrain she was the Director Compliance for Norwegian Air International. She is the founding and current Vice-Chair of the Unmanned Aircraft Association of Ireland and is President of the Joint European Drone Associations (JEDA) as the Irish representative and is the JEDA representative on JARUS (the Joint Authorities for Rulemaking on Unmanned Systems) where she is Vice-Chair of the JARUS Industry Stakeholder Body's Steering Committee.

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LEGAL RESEARCHER ON UTM,
AIR TRAFFIC DEPARTMENT,
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RICHTER**

PROJECT LEAD BLU-SPACE
AT HAMBURG AVIATION



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Since Hamburg joined the UAM Initiative Cities Community (UIC2) of the European Union's (EU) Smart Cities Marketplace as one of the first European cities back in 2018, it has achieved important breakthroughs but also faced challenges that clearly indicate the stony path towards a functional and accepted integration of UAV into the existing traffic system and urban airspace, write Daniela Richter and Karlotta Victor. Nevertheless, in 2024 Hamburg remains ambitious in its desire to address these challenges as UAV operations promise high effectiveness and added value in the public interest. This article outlines the hurdles and enablers that Hamburg experienced and highlights the U-space challenge that cities have to face in the next few years and how they can work on solutions to fully unlock the economic and application potential of UAVs.

“Being a leading city for digital mobility and aviation, we will embrace the challenge to take unmanned aerial vehicles to their next level”.

Dr Melanie Leonhard,
Minister of Economics and Innovation
of the Free and Hanseatic City of Hamburg

The City of Hamburg has been developing Urban Air Mobility (UAM) as a strategic policy since 2017. Its strategy has been a step-by-step implementation of UAM, with an initial focus on Unmanned Aerial Vehicles (UAVs) that are already certified and permitted to fly uncrewed. A special emphasis lies on UAV uses by public authorities or the Port of Hamburg, reflecting its potential as a strategic asset to Hamburg. After all, the city is one of the world's leading aerospace industry centres and a digital mobility frontrunner. Established in 2017, the UAM network Windrove has become a driving force behind UAV economic development in Hamburg. Windrove supports the regional UAV community with events, networking opportunities and by generating visibility to the wider public. Particularly important is its role in linking policymakers, science and industry. This has led to strong cooperation across different organisations and stakeholders; as a result, public institutions are often project partners alongside commercial operators.

This collaboration has been fundamental to the development of the UAV sector in Hamburg, driving economic growth and providing a foundation for the many small steps Hamburg has taken – and is still

taking – on its way towards UAV operations in this urban space that are safe, integrated and trusted by the public.

Mobility is more than traffic. It includes infrastructure, maintenance and intelligent management of vehicles as an integral part of the smart city approach. Cities that are currently making use of UAVs are already benefiting, although the potential has not been fully realised yet.

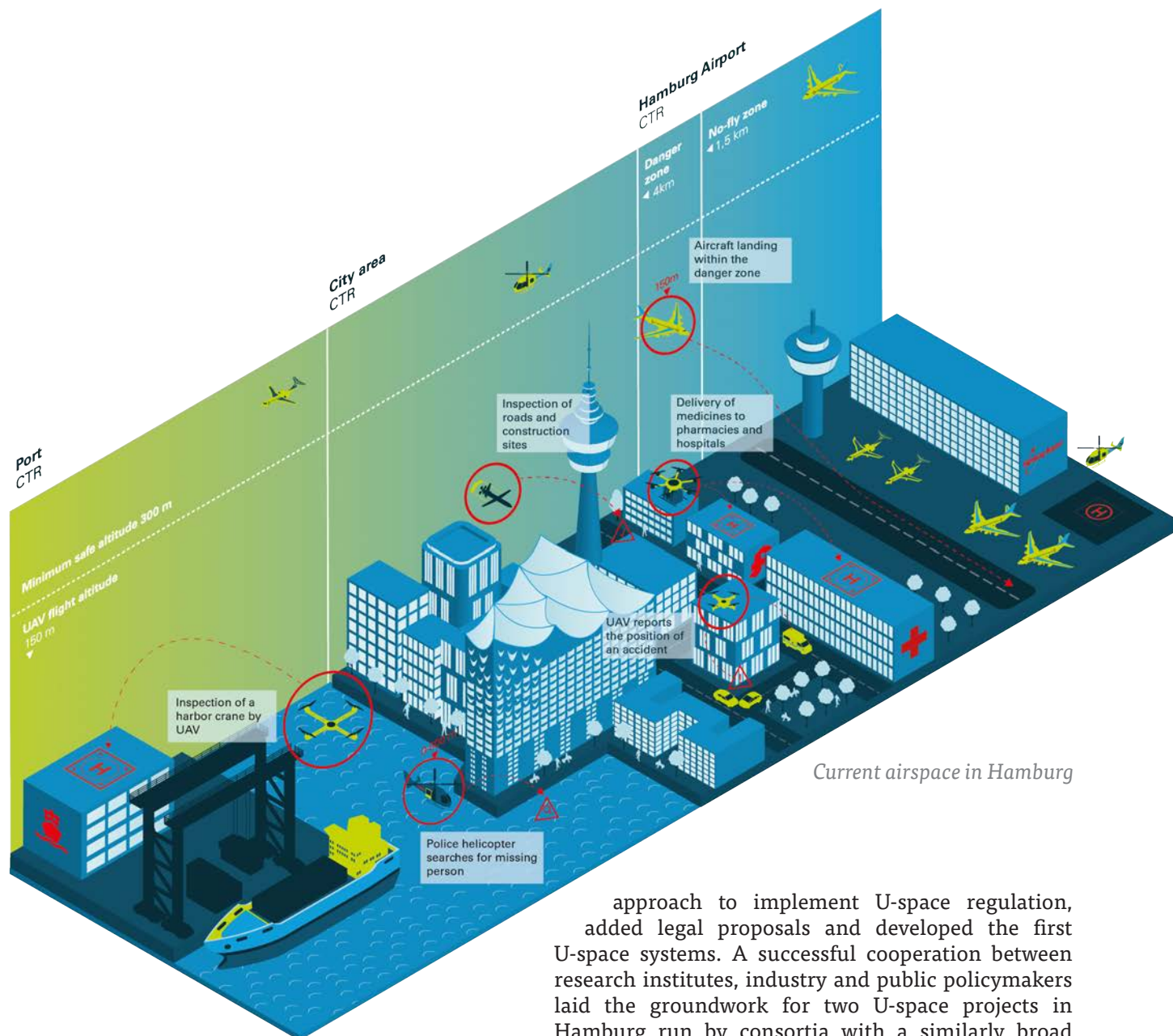
2019 saw the launch of Medifly. This innovative project delivers a proof-of-concept for an urban delivery service by UAV of urgent medical material. A core component of Medifly is to show the potential social benefits of UAV use, be it by reducing the workload of staff, saving emissions or providing patients with faster care. Even members of the public who are sceptical of UAV use in their urban spaces react positively to medical UAV use. As such, the project team behind Medifly sees it as a first step towards a wider acceptance of civilian UAV missions. The project also involved the healthcare sector as an important supporter of urban UAV operations.

Other public services such as fire departments and traffic management are also eager to increase the use of UAVs.

Those sectors are important for the development of new markets and support an evolving European vertical value chain. The strategic goal is to become less dependent on other regions for critical technologies.

An area where Hamburg sees the biggest advantages in enabling UAVs is its port. Hamburg boasts Europe's third-largest port, which has proven to be a facilitator for UAVs on several different levels. Both the operator of Hamburg's port and its port authority have a keen interest in operating UAVs for inspection, transport or surveillance purposes.





Current airspace in Hamburg

Despite numerous research efforts in using UAVs, one of the biggest challenges in Hamburg is not yet fully resolved, namely the integration of UAVs into dense and complex airspace. With two airports within the city's boundaries, almost the entire airspace is part of a control zone (CTR). As a result, UAV flights are restricted in some cases. They have to align with the air traffic at the airport, even though they are not technically equipped for this. On the one hand, rules need to be adjusted to accommodate UAVs; on the other, UAVs need to be coordinated with general or crewed air traffic when they fly in a CTR to ensure safety.

This dilemma drove Hamburg to take on a major challenge: the design of airspace for UAVs. Enter UDVeO ("Urban Drone Traffic efficiently organised"), a pioneer project launched in 2020 before the European regulatory framework for a European coordination system for uncrewed traffic (U-space) went into effect in April 2021. The project developed an interdisciplinary

approach to implement U-space regulation, added legal proposals and developed the first U-space systems. A successful cooperation between research institutes, industry and public policymakers laid the groundwork for two U-space projects in Hamburg run by consortia with a similarly broad make-up, both funded by the federal government. The first project ran for one year and examined the legal and technical challenges of U-spaces, while also tackling the issue of promoting public acceptance and enabling competition in a U-space. The second project ran for six months and tested some UAV use cases in the Port of Hamburg over a period of three months, in the first ever European U-space sandbox.

All projects led to the same conclusion: U-space is a very promising path for the future of UAV traffic, especially if UAVs are flying – as is the case in Hamburg – in a control zone. However, due to the growing use of UAVs, traffic coordination will become increasingly important. That may not apply in all cases but will almost certainly apply in areas where several UAVs fly in the densest of spaces (urban areas) or if their operation is automated.

Nevertheless, a U-space has not yet been applied in any European Member State, although they have been legally allowed to do so since the beginning of 2023.

"The new U-space systems generate and distribute information, requiring testing beforehand to prove their reliability and practicability. This becomes especially important when different and new stakeholders, both private and public, are connected."

The main reason for this seems to be that the European Commission's legislation on the framework of a U-space is an important step but is only halfway to enabling the coordination of commercial UAV traffic. To complete it, the technical set-up of the new U-space system has to make the transition from a model into a real-world system. But the infrastructure set-up of a U-space is a complex undertaking. In a U-space, all required information for the UAV remote pilot has to be collected by the appropriate stakeholder. In particular, official agencies such as police, fire departments, or the air traffic control centre must format data in such a way that it can be immediately sent to the remote pilot via a digital interface. They must also have the necessary technology in place, if necessary by customised existing equipment or developing new equipment along the way. In addition, airspace management companies (U-space Service Providers) must develop a new system that can receive this information in real time and present it to the UAV remote pilot through an operator-friendly application. In order to guarantee the reservation of flight spaces in advance, these companies need to programme a coordination platform.

All in all, the new U-space systems generate and distribute information, requiring testing beforehand to prove their reliability and practicability. This becomes especially important when different and new stakeholders, both private and public, are connected. The entire management system can only work if all systems function in a stable way. If even a part of the required information is missing, the security of the system may suffer.

Hamburg has a response to this big challenge. In December 2023, the fourth interdisciplinary U-space project started in Hamburg, running for two-and-a-half years. It is funded by the federal government and aims to link the necessary U-space systems for the first time under real conditions, developing cross-interface blueprints and involving a broad section of the UAV economy.

Hamburg's planners understand that airspace integration is not only a question of organisational structures and technology development. Just as important from a city perspective is public acceptance. The case of e-scooters banned from Paris shows that new types of mobility entering a crowded traffic system succeeds only with wide acceptance in the population. Air mobility is far more complex than ground-based mobility. The wider public are not the only people who will take some convincing; many more stakeholders need to be persuaded to share the crowded airspace and open the system to new actors. Among others, this could include helicopter emergency services, environmental organisations and city administrations, including city developers.

Hamburg is meeting this challenge by setting up a U-space living lab over the next two years that includes all private and public stakeholders that are required or affected. The living lab enables the necessary iterative development and legislative learning in order to close the gaps left open by the EU law. This approach is not only an enabler for the UAV value chain, it is also an opportunity to take society along on the journey and introduce the public to the upcoming digital transformation. The living lab will bring together legal practitioners and lawmakers, technology developers and the wider society to introduce the next level of mobility automation.

Another key aspect of Hamburg's approach is to pursue a participatory approach to get all relevant stakeholders on board. Concurrently with the living lab project, Hamburg is launching a community-driven UAM strategy process in the first half of 2024.

"The city is one of the world's leading aerospace industry centres and a digital mobility frontrunner."

City and business leaders are proud of Hamburg's status as a leading UAV pioneer. However, the biggest challenges – U-space operational implementation and societal integration – are yet to come. Successful U-space management will deliver both flight safety and planning reliability for UAV operators, two decisive factors in making UAV traffic scalable. A prerequisite for this is that cities are included in the process and become active themselves, because as a new form of mobility UAV traffic will affect cityscapes across Europe. That makes it crucial that the EU and its Member States involve cities along the way to achieve harmonised European-wide UAV traffic. ■



AVIATION'S WIND OF CHANGE: THE YEAR THAT CHANGED US

MARIYA TARABANOVSKA

Founder of Flight Crowd, an educational, not-for-profit organisation informing communities worldwide about the possibilities of electric aviation technology while empowering and upskilling the future flight workforce.

Starting my business during the pandemic was the right time to do it. When the world of aviation was suddenly coming to a halt, with millions of aerospace professionals, airport and airline staff being laid off globally, something had to provide hope. To me, it was the knowledge of what was going on in the world of electric aviation and the urge to share that story with communities worldwide, in an attempt to save the industry I so deeply believe in. What would a 23-year-old aerospace engineer know about starting a company? Not much. But passion, determination and hard work are always a good start.

Flight Crowd is an educational, not-for-profit organisation informing communities worldwide about the possibilities of electric aviation technology while empowering and upskilling the future flight workforce. While the outreach part of the organisation was relatively easy as we were able to make the most of virtual conferences, events and meetups, our key concept was more difficult to sell. "Is this really happening? I never heard of air mobility" was one of the phrases I heard most in the early days of Flight Crowd.

At a time when the importance of sustainability was gaining momentum with the public and governments, one after another, were announcing investments into various green projects, the electric aviation industry was innovating largely behind closed doors, with some of the key programmes and organisations of today (such as the US Airforce's Agility Prime) just starting to emerge.





*Flight Crowd's work experience student.
Visual by Caza Tsang*

As the world began to return to the “new norm”, the shift in the public’s mindset, interests and priorities was quite apparent. Success stories such as the UK’s National Health Service’s use of UAVs for transporting life-saving chemotherapy drugs to remote locations were shared and celebrated by many. But even more widespread was the lack of awareness of the successes and opportunities within the electric aviation sector.

In Spring 2022, Flight Crowd’s Future of Flight Zone Commission, as part of the Fully Charged electric vehicle show, was the first time the UK public (over 26,000 attendees) was presented with an immersive and interactive experience of air mobility at scale. Including an air racing full-scale eVTOL model of the Airspeeder Mk4 to automated robotic parcel loading of the UAV by Motion Robotics, VR eVTOL flights by TEKToWr, Pipistrel Aircraft’s Velis Electro, and more, this was our first time introducing future workforce and consumers to the Future of Flight.

The Farnborough airshow that year gathered eVTOL representatives from across the world, giving a static display teaser of what the future might look like before the end of the decade. Meanwhile, the Opener BlackFly eVTOL was doing flight demonstrations at EAA AirVenture Oshkosh with thousands witnessing the skies of tomorrow.



In Summer 2022, during the in-person attendance of the Royal International Air Tattoo (RIAT) airshow, Flight Crowd’s team conducted a survey to understand public awareness of the Future Flight sector. Out of over 1,400 participants, 93% of aviation professionals and aerospace enthusiasts had never heard of air mobility before learning about it from our team.

The lack of large-scale flight demos with media support, community engagement and ongoing public dialogue resulted in a much larger divide in overall awareness and support of the industry. Showing pictures and video simulations of the art of the possible, or what is done in other countries, is simply not enough if we are serious about global air mobility operations in the next few years.

The recently published UK Civil Aviation Authority (CAA) consumer report highlights a decrease in satisfaction with the overall travel experience, with older consumers and people with disabilities being more reluctant to fly than young and able-bodied people. Delays, a difficult airport and airline experience, the challenges associated with the digital infrastructure required for flight booking and tracking, unsatisfactory complaints handling and other factors were some of the most prominent reasons for travellers opting out of travelling by air.

Flight Crowd engaging with the public at Fully Charged





"While innovative approaches to vertiport operations have the potential to speed up and smooth the airport experience, designing the whole air mobility ecosystem with a wide range of end users in mind is an absolute must."

While innovative approaches to vertiport operations have the potential to speed up and smooth the airport experience, designing the whole air mobility ecosystem with a wide range of end users in mind is an absolute must. The aviation industry has long excluded the needs of any but their healthy and wealthy customers.

With a once-in-a-lifetime opportunity to redefine how we travel by air, air mobility companies must reflect on the worst aspects of commercial and business aviation and present a solution accessible in both design and price-point.

The third most popular question that communities globally ask our team at Flight Crowd, once they learn about when and where the aircraft operations begin, is "How much will it cost me?" Questioning the value for money of operations, especially in the context of the rising cost of living, means the industry needs to make sure electric aviation is delivering a public good – and not just serving an air taxi use case for the wealthy for decades to come.

The wider economic situation, and hence the appropriate pricing structure, must be considered before the public rules out air mobility flights as completely inaccessible to the average individual.

From bitcoin to autonomy and now AI and ChatGPT, the flying cars sector might seem to the wider public as the next big thing that will come and go. Will air mobility provide the future workforce with an exciting, diverse, and inclusive platform to contribute ideas and shape the industry?

The latest UK statistics show that only 31% of core STEM students in higher education in the UK are women or non-binary people. This number decreases to 26% once they reach the world of work. The aviation field is even less popular, with only 13% of the sector identifying as female.



It is estimated that people will have, on average, 12 jobs in their life and allowing employees to work on "cool Future Flight tech" will not ensure 100% retention. Post-pandemic, under-35s connect virtually, prioritise the environment, want to explore the world, and have exciting, high-paying jobs they are unafraid to change. Having their voices heard, having flexibility in terms of work hours and location, development opportunities and a chance to make a positive, lasting impact are all driving factors when it comes to career choices.

Why do we do school and university outreach – hard work that doesn't pay enough? Because the future is in the hands of those just starting their career journey today. It is their future that they should be allowed and empowered to shape. Informing, engaging and inspiring the bright minds of tomorrow is vital to ensure that batteries are designed, eVTOLs are manufactured, vertiports serviced, and that the sector has a bright future ahead.

A study from Label Insights shows that 94% of respondents will stay loyal to a transparent brand. Being authentic, honest and approachable is necessary to secure public support and attract talent into the industry. In 2024, it is not about extensive marketing campaigns but putting skin in the game and having the faces of those leading the new transportation



2.



4.

Photos:

1. Flight Crowd London 2023 'Propel into Future Flight' Boot Camp - Mariya presenting
2. Flight Crowd's 'Future of Flight Zone' at the Fully Charged show
3. Flight Crowd Nottingham 2024 'Propel into Future Flight' Boot Camp
4. Flight Crowd London 2023 'Propel into Future Flight' Boot Camp group
5. 'Propel into Future Flight' Boot Camp Drone demo at Notts County stadium



5.

revolution familiar and recognised by the public, starting at the company's senior leadership level.

Since our founding in 2020, Flight Crowd has undertaken 45 engagements with the aviation sector, organising or participating in 50 community outreach events. We are supported by our corporate partners across the world and the UK Government in our educational programmes. When talking to the public, we serve as a friendly face to the industry, often engaging in difficult conversations and shaping the perception of how the future of flight will change the world of tomorrow. When attending industry conferences, we lobby for communities and build bridges between air mobility organisations and the public, making our aerospace colleagues aware of consumer and workforce needs.

A typical week might see me doing an industry panel on Tuesday, leading a secondary school workshop on Wednesday, and mentoring university students on Thursday. It is the people who innovate the latest technology, it is the value of a personal brand that influences the success of our ventures, and it is the need to connect with future customers and workforce that should be prioritised just as much as investment into aircraft and infrastructure.


Because the skies of tomorrow belong to those who haven't yet been excited about the prospects of future flight. ■

Mariya Tarabanovska

is a multi-award-winning aerospace engineer, entrepreneur, and future flight advisor dedicated to shaping the future of sustainable aviation. As the founder of Flight Crowd (www.flight-crowd.com), a non-profit educational organisation focused on electric aviation, she leads initiatives to educate and empower the future flight workforce.

Her experience spans aerospace & defence, electric aviation operations, and career coaching. Her commitment to community engagement, outreach, and industry advocacy has earned her recognition from the Royal Aeronautical Society, the Vertical Flight Society, eVTOL Insights, the Masood Entrepreneurship Centre of the University of Manchester, and others.

Ukrainian-born, UK Department for Transport's Aviation Ambassador and female aerospace role model, Mariya Tarabanovska is passionate about creating diversity, inclusion and equitable opportunities within the sector. She is dedicated to redefining industry perceptions and inspiring young individuals to explore the limitless possibilities in the world of aviation.



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TOWARDS A UNIFIED SKY VISION: INTEGRATING ATM & AAM FOR FUTURE AIR TRANSPORT

**CANSO**

EDUARDO GARCÍA GONZÁLEZ

Senior Manager Future Skies at the Civil Air Navigation Services Organisation (CANSO).

He reports on the need to work urgently towards the integration of ATM and AAM.

The aviation industry is on the brink of a monumental transformation, driven by the convergence of traditional air traffic management (ATM) and emerging advanced air mobility (AAM) technologies. As demand on airspace across the globe increases and new entrants revolutionise the way we approach transportation, there is an urgent need to work towards the integration of ATM and AAM, ultimately striving towards the creation of a unified sky vision for all stakeholders.

In response to these imperatives, the International Civil Aviation Organization (ICAO) is spearheading efforts to update the Global Air Navigation Plan (GANP), revise the Global Air Traffic Management Operational Concept (GATMOC) and establish a comprehensive framework for the integration of AAM into the existing aviation infrastructure.

ICAO's Advanced Air Mobility Study Group (AAM SG), established in 2023, is tasked with developing a global and holistic vision of the AAM ecosystem. This initiative underscores the importance of harmonising global efforts to accommodate the rapid evolution of aviation technologies and operational paradigms.

To support the ongoing efforts led by ICAO, the Complete Air Traffic System (CATS) Global Council, established by CANSO in 2021, is playing a crucial role in shaping this unified vision. This innovation forum – which includes more than 80 organisations from across the entire aviation ecosystem – is currently focused on characterising the fundamental transformations that the ATM industry needs to undergo in the coming years and decades and developing a pathway to AAM. These transformations are essential for ensuring the safety, efficiency and sustainability of air transportation in the face of increasing demand and technological advancements.



"In-time information sharing – the exchange of real-time, digital information between stakeholders – is essential for informed decision-making and effective airspace management."

By bringing together key stakeholders, including air navigation service providers (ANSPs), regulators, industry associations, technology providers and airlines, the CATS Global Council fosters collaboration and innovation to address complex challenges and drive positive change in ATM.

Some critical transformations are necessary for the future of air transport.

Adopting Trajectory-Based Operations (TBOs) – which represents a fundamental shift in the way airspace is managed and utilised – along with sharing trajectory information and implementing well-established policies for managing flight and flow information, will enable more optimal decisions and enhance operational efficiency.

In-time information sharing – the exchange of real-time, digital information between stakeholders – is essential for informed decision-making and effective airspace management. Technologies such as System Wide Information Management (SWIM) and flight information management (FF-ICE) facilitate in-time information sharing, enabling stakeholders to respond dynamically to changing conditions. Whether this involves large aircraft operations or new entrants, better information sharing allows more efficient upstream speed adjustments rather than holding in the terminal area, runway reassignment upstream rather than large vectors in the terminal area, or in-time availability for electric vertical take-off and landing aircraft (eVTOLs) landing at a vertiport or pad versus holding.

Dynamic/flexible configuration and management of airspace – traditional airspace designs and management processes are being replaced by dynamic, flexible configurations that are adaptable to current operational needs. This transformation allows for the more efficient use of airspace and supports the integration of new entrants into the airspace system.

Advanced safety capabilities are essential to accommodating the increasing complexity and automation of aviation operations while maintaining or improving safety standards. In-time aviation safety management will continuously monitor, assess and

identify mitigations across a broad set of systems, including those providing services to and within the aircraft systems.

Total system performance management will mean that as airspace operations become more complex and diverse, there will be a need to optimise total system performance across multiple dimensions, including safety, efficiency, flow management, noise and emissions. Automation algorithms and advanced technologies play a crucial role in managing total system performance under nominal conditions.

Modernising the regulatory framework and processes will be necessary. The pace of technological innovation necessitates a reform of the current regulatory framework and processes. Streamlined regulatory processes and flexible standards development are essential to support the rapid evolution of aviation technologies and operational procedures.

Integrated/adaptive communication, navigation and surveillance (CNS) will also be required. Integrated CNS capabilities are critical for enabling the safe and efficient operation of airspace systems. Adaptive communication, navigation and surveillance technologies support increased traffic volume and accommodate new entrants into the airspace.

Other transformations include: moving from Magnetic to a True North reference system; evolving/adaptive flight rules and airspace structures; an increased

"The pace of technological innovation necessitates a reform of the current regulatory framework and processes."



level of autonomy in air systems; a performance-based regulatory framework – towards full global harmonisation; enhanced separation management/detect and avoid systems, and the development of a common altitude reference (barometric and geometric altimetry).

Each of these transformations will play a pivotal role in reshaping air transport, emphasising the need for comprehensive efforts. Collaboration, innovation and adaptability are paramount as we advance towards a unified sky vision. Additionally, it raises the question of what these ATM transformations will entail for AAM and how the vision for AAM aligns with these transformative changes.

COLLABORATING ON OUR FUTURE SKIES 2024: TRANSFORMING ATM AND ADVANCING AIR MOBILITY (AAM)

On January 17 and 18 2024, NASA, the Federal Aviation Administration and CANSO held the Collaborating on our Future Skies 2024: Transforming ATM and Advancing Air Mobility (AAM) event in Silicon Valley, bringing together Silicon Valley innovators and traditional airspace users and service providers to address some of the key questions and challenges we will face in our future. Discussions included the compatibility of visions for ATM and AAM, the development of a research roadmap and timeline that is aligned with industry needs, the evolution of airspace classification, high-level recommendations for future airspace functional architecture, and critical areas requiring further collaboration.

The event was supported by the SESAR 3 Joint Undertaking (SJU), the International Forum for

Aviation Research (IFAR) and EUROCONTROL, elevating its status to a higher and more international scale.

The important discourse on ATM and AAM integration that started at this event will continue at the upcoming Airspace World event, to be held from March 19 to 21 March 2024 in Geneva.

"Our journey towards a unified sky vision relies profoundly on collective commitment, driven by advancements in technology and a spirit of innovation."

Our journey towards a unified sky vision relies profoundly on collective commitment, driven by advancements in technology and a spirit of innovation. This collective commitment to shaping the future of aviation involves collaboration among industry leaders, regulatory authorities and stakeholders. The CATS Global Council plays a pivotal role in this endeavour, working closely with organisations such as ICAO and all stakeholders to forge a path towards a safer, more efficient and inclusive airspace system.

Through collaborative efforts and synergy across diverse sectors, we can harness the full potential of integrating ATM and AAM. By aligning our goals and strategies, we pave the way for a transformative era in aviation, one that promises to revolutionise the way we navigate the skies and unlock new opportunities for growth and development. ■



iGA ACADEMY: where knowledge meets practice!



iGA Istanbul Airport's iGA Academy serves as a **Global Training Hub**, bringing together aviation professionals from around the world at the intersection of knowledge and practice. Positioned at the centre of the world, iGA Istanbul Airport continues to shape the aviation industry and contribute to its sustainability through the comprehensive, innovative, and visionary training programmes offered by iGA Academy.

As the sole training institution in its region with prestigious accreditations such as ICAO Trainair Plus Programme Membership, ACI Training Centre Accreditation, IATA's Regional Training Partnership, and recognition from key organisations like the Transportation Security Administration (TSA) of the United States, EUROCAE, and EUROCONTROL, iGA Academy establishes itself as the industry's benchmark, serving as the Global Training Hub at the heart of the world.



iGA Academy actively promotes knowledge sharing through collaborative agreements with other airports, adhering to its vision of **"Cooperation, Not Competition!"**. As the airport globally assigning the second most Seconddees, iGA Academy plays a crucial role in advancing the aviation ecosystem in collaboration with aviation partners. Currently ranking second among institutions providing the most international training in aviation in Europe, iGA Academy facilitated the training of over 400 international aviation professionals from more than 120 different organizations in 2023, fostering a unique environment for the convergence of knowledge and practice at iGA Istanbul Airport. Looking ahead to 2024, iGA Academy aims to strengthen its vision, solidifying its position as a **Global Training Hub** and continuing to shape the aviation industry through increased contributions.

Operating under the visionary principle of **'No Countries Left Behind'**, iGA Academy fulfills its social responsibility by supporting access to quality

education for less developed countries and fostering balanced growth in the industry. The academy's commitment to social responsibility has garnered worldwide recognition, with over twenty national and international awards received globally.

Recognizing the pivotal role of content and satisfied staff members in ensuring guest satisfaction, iGA Academy places significant emphasis on the professional development, talent management, and career guidance provided to iGA Istanbul Airport employees. With over 30 internationally accredited employees serving as instructors, iGA Academy's goal extends beyond providing aviation training and sharing experiences within Türkiye on a global scale.

iGA Academy, through its commitment to excellence, knowledge sharing, and social responsibility, is not only shaping the future of aviation in Türkiye but also making a significant impact on the global aviation landscape. ■

"Elevate your aviation career to new heights with iGA Academy!"



THE EUROPEAN ATM MASTER PLAN AND EUROCONTROL'S ROLE IN WIDER ATM TRANSFORMATION



MAROUAN
CHIDA

HEAD OF THE EUROCONTROL'S
ATM TRANSFORMATION UNIT

The new European Air Traffic Management (ATM) Master Plan will be a key resource in the transformation of European ATM into a high performing, digital and sustainable ecosystem. EUROCONTROL's mission is to support European aviation stakeholders in navigating this transformation and to support strategic, data-driven investment decisions

By the end of 2024 a new edition of the European Air Traffic Management (ATM) Master Plan is due to be endorsed by the SESAR 3 Joint Undertaking (SJU) Governing Board, following a wide stakeholder consultation up to the Single Sky Committee and EUROCONTROL Provisional Council. For Europe's ATM community this is a pivotal document – the agreed roadmap for ATM modernisation to achieve the performance objectives of the Single European Sky (SES).

The current edition of the ATM Master Plan (published in December 2019) defined the vision of a Digital European Sky by 2040 to be reached in 4 successive phases A to D. It outlines the essential operational and technological changes that will be needed to deliver Single European Sky performance objectives. But Europe's aviation industry has undergone some seismic changes since 2019, so a campaign to update the Master Plan by 2024 was officially launched in October 2023 at the SESAR 3 Joint Undertaking's second annual conference (see "Planning for European ATM transformation by defining success criteria").

EUROCONTROL has a key role in supporting the development of this important strategy for Europe. The Agency leverages its data and knowledge to inform on future investment priorities (in research and deployment), to help build consensus on some fundamental issues (civil-military cooperation, new entrants, sustainability, network capacity, cyber...) and most importantly maintain the big picture through modern Enterprise Architecture.

"It is important that stakeholders themselves head the working groups developing the transformation planning process of their own business," said Marouan Chida. "We are the humble servant of the community; we provide all the heavy lifting and the technical knowledge and we are very happy for our partners to be the flag carriers."

On the international front, EUROCONTROL is an active member of #TeamEurope, working closely with all European institutions (European Commission, European Aviation Safety Agency [EASA], SJU, SDM, EUROCAE, State representatives) to ensure global harmonisation. The Agency discusses with international partners such as the US Federal Aviation Administration (FAA), Singapore and the Civil Air Navigation Services Organisation (CANSO) important topics such as trajectory-based operations, new entrants and automation. EUROCONTROL also actively contributes to ICAO activities leading to the development of the eighth edition of the ICAO Global

Air Navigation Plan (GANP) (2025) which sets the global agenda.

Delivering this Master Plan is important, but it is not the end game. This is just the beginning of a new era of ATM modernisation. *“The hard part will remain implementation, where EUROCONTROL must continue supporting its stakeholders – regulators, investors, operators – in climbing this rock. The Agency also needs to support an effective performance monitoring of the system,”* said Marouan Chida.

“We are creating a new brand of ATM transformation. The Agency has a broad remit. We look at the big picture and leverage available resources around architecture, economics, network data and wider aviation market intelligence to provide curated information which help stakeholders translate the Master Plan concepts into concrete changes in their business.”

In collaboration with Solutions projects, EUROCONTROL has developed a digital twin of SESAR’s major developments, called the Digital European Sky Architecture. This gives all stakeholders a unique understanding of how change will impact their technology, processes and business.

“Say you are a Chief Technology Officer (CTO) of an air navigation service provider (ANSP) and are interested in the Virtual Centre Solution for ATS delegation. You want to know how it works and whether you should consider it in your portfolio of investments,” said Marouan Chida. *“The Digital Twin can give you a specialised report, for example on the systems and operational impact of a given design choice. We can then calculate what performance impact will specifically be brought to your organisation and provide a high-level estimate of the cost. Through simulations we can also assess the long-term benefits at local and network level. We start from the pain points of our stakeholders. If it is a question of capacity issues, runway occupancy times for example, we can see what new technologies and processes are available based on an investment now or in 10 years’ time.”*

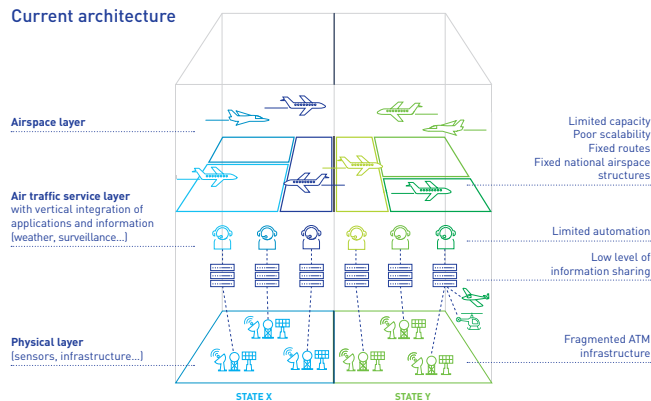
It is not just the smaller ANSPs who are benefitting from this service. Larger ANSPs can use this view of Europe’s future ATM capabilities to understand how to cooperate with neighbours in sharing services, optimise operations in conjunction with other capabilities developed by the Network Manager or even support new business-opportunity offerings to the global ATM market.

At the heart of the transformation process is the idea of breaking the silo-based approaches to technology acquisition that have evolved over decades and move instead towards platforms that buy services instead of equipment. Marouan Chida believes there is a growing realisation among both ANSPs and industry that this is the way forward, especially among the new generation of ANSP chief technology officers. But he also sees there is a growing acceptance of the direction of travel the industry needs to take by CEOs, for whom digitisation of ATM services is vital in being able to adapt service delivery more flexibly to market demand and manage resources in a more optimised way. The iNM flagship programme at EUROCONTROL is a great example of that.

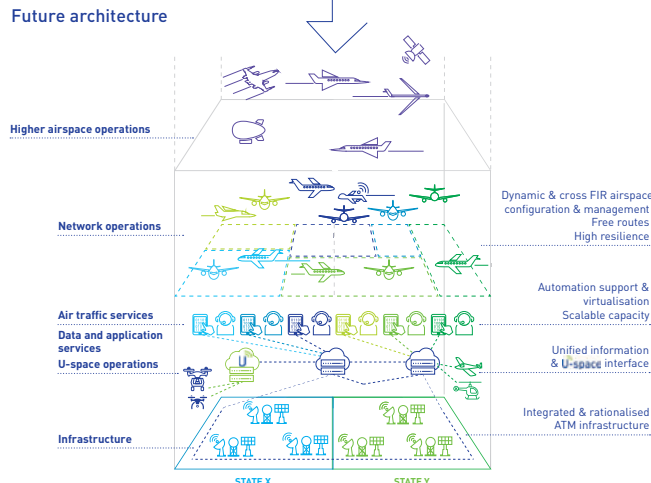
“It’s not about a big bang but more of bending the arc of the future,” said Marouan Chida. *“With the Master Plan and ATM transformation we want to capitalise on European ambitions for the industry, whether you’re a big or small player. ANSPs and airports are increasingly aware they can talk to us about common requirements for their future systems independently or not from their supplier. We can work on the architecture together, benchmark various options and see how change in this area fits in with the overall picture.”*

And one of the things I realise is that not everyone is starting from the same place. We have to understand that everybody may want a Tesla for example, but if you have just bought a car, you’re not going to throw that away. This is why we need to bring ATM transformation to a more local, and tailored level.” ■

Current architecture



Future architecture





PLANNING FOR EUROPEAN ATM TRANSFORMATION BY DEFINING SUCCESS CRITERIA

The EUROCONTROL-led AMPLE3 project supports the SESAR 3 JU in executing the European ATM Master Plan update campaign and ensuring alignment with stakeholder needs. The update campaign involves a wide range of stakeholders from across the ATM community, including regulators, ANSPs, airlines, airports, the military, manufacturers, research organisations and users, with the aim of establishing Europe as the most efficient and environmentally friendly sky to fly in the world.

At the October 2023 launch event, a joint SESAR 3 JU / EUROCONTROL / EASA discussion paper was presented and a Joint Industry Declaration issued, committing to rapid and united action to make European airspace the most efficient and environmentally friendly sky to fly in the world.

The following European ATM Master Plan campaign Success Criteria (SC) have been confirmed by the campaign Steering Group:

- SC1:** Define the critical path for establishing Europe as the most efficient and environmentally (CO₂ and non-CO₂) friendly sky to fly in the world with safety as a paramount feature, and putting that transformation into perspective with the planned introduction of sustainable aviation fuel (SAF) and the next generation aircraft for zero-emission aviation.
- SC2:** Provide the supporting Digital European Sky service-oriented target architecture and a data-driven/cloud technology-based delivery model for a fully scalable and resilient ATM in Europe.
- SC3:** Set out the future roadmap for the evolution towards an integrated European CNS service delivery infrastructure ensuring a higher level of connectivity and automation of systems on the ground and in the air as well as the convergence of the ATM and U-space environments.
- SC4:** Ensure the integration of new entrants and enable in particular Innovative Air Mobility services by elaborating advanced U-space services.
- SC5:** Define the civil-military interoperability and coordination roadmap taking into account the security dimension of ATM.
- SC6:** Include strategic deployment objectives that (a) cater for voluntary or mandated deployment of SESAR solutions and (b) encourage investments by early movers and accelerate market uptake supported by EASA's European Plan for Aviation Safety.
- SC7:** Perform a network performance impact assessment to demonstrate how and when the SESAR vision will contribute to achieve the SES performance objectives and improve passenger experience.
- SC8:** Shape the European position to drive the global agenda for ATM modernisation at ICAO level. ■



TRUSTED COMMUNICATIONS

Introducing the new AirTalk® ZETA

Since 1992, Imtradex has been dedicated to sustainable development of its Air Traffic Management communication device portfolio. The development and production facilities are situated in Dreieich, Germany, near Frankfurt/Main, in close proximity to the headquarters of DFS – the German ANSP. For over 25 years, the AirTalk® family has been a globally recognised portfolio, utilised in airspace management worldwide, from small airspaces to major airports. The AirTalk® plays a pivotal role in Air Traffic Management, serving applications ranging from the latest virtual control centres and remote tower control to en-route centres (ACC) and approach facilities.

Imtradex headsets and PTT buttons are engineered and maintained to uphold the highest safety standards and ensure long-term availability. For instance, the AirTalk® XS headset has been on the market for approximately two decades, along with various PTT buttons available for nearly the same duration. This prolonged availability translates to significant return-on-investment benefits, as voice communication systems can remain reliable for extended periods with the respective headsets. Despite this, Imtradex continues to introduce new and innovative products to the market, such as the remote tower control AirTalk® PTT-19 Dual, designed to

support remote tower controllers with their complex tasks from the palm of their hand. Not so far back, Imtradex introduced a newly designed headset specifically for ATC purposes – the AirTalk® 5000.

Now, during the Airspace World event, Imtradex has unveiled the latest development to the ATM community: the AirTalk® ZETA, the next iteration of headset design for enthusiasts of on-the-ear variants. This new design draws inspiration from the latest AirTalk® 5000 design. Key features of the AirTalk® ZETA include full integration into the existing family, providing access to all functions from the PTT buttons. It offers dual-channel communication capabilities and the option for the CalmNoiseLine feature.

The AirTalk® ZETA prioritises comfort with a modern headband cushion, ensuring a lightweight and comfortable fit. Despite its lightweight design, this new variant is as robust as its predecessor, the AirTalk® 5000.

Like all headsets from Imtradex, the AirTalk® ZETA utilises innovative CooMax cushions, inspired by the latest technologies from the sports industry, to provide exceptional comfort. This new product is slated for release during the second half of 2024. ■

You can find Imtradex at Airspace World at booth B40, or you can contact Imtradex at any time via info@imtradex.de or have a look at the latest information at www.imtradex.de





ADVANCING U-SPACE IMPLEMENTATION THROUGH A COLLABORATIVE APPROACH TO SIMULATION



**MIGUEL
VILAPLANA**

HEAD OF UTM AT AIRBUS



**PATRICK
AMAR**

HEAD OF DRONES
PROGRAMME
AT EUROCONTROL

A joint Airbus/EUROCONTROL U-space simulation service prototype is giving States, regulators, standards bodies and industry a unique view of the risks and effectiveness of different procedures required for implementing U-space airspaces in Europe.

It has been over a year since the European Union's U-space regulation EASA 2021/664 was published, allowing Member States to identify airspace areas where drones can fly increasingly complex, multiple operations – beyond visual line of sight, over people, autonomously and at night – supported by UAS traffic management (UTM) systems run by certified U-space service providers (USSPs). But by the start of 2024, no such U-space areas had been designated.

One of the main challenges has been for States to ensure that an entirely new type of digital air traffic management system will meet the required safety standards. As part of the regulation, States must conduct airspace assessments to prove that the U-space system will be able to manage increasingly complex drone operations within an acceptable level of air and ground risk.



For the past few years, EUROCONTROL has been supporting States in this work¹. More recently, the Agency has been working with Airbus to optimise this task by running realistic airspace simulations.

“Our work together started with a joint realisation that simulation is a key enabler of the development and deployment of U-space,” said Miguel Vilaplana, Head of UTM at Airbus. “We didn’t start with a blank sheet of paper; Airbus has been working with the Federal Aviation Administration and other partners on UTM in the USA for many years and we have been contributing to key U-space projects in SESAR.”

“We ran a pilot project in Riga and then continued to develop the programme with Spain and Switzerland,” said Patrick Amar, Head of Drones Programme at EUROCONTROL. “The programme is part of the Innovation Hub and one of our roles is to advise Member States on how to implement the regulation.”

The airspace simulator is an important tool in this process and provides a realistic representation of the U-space ecosystem. It allows the user to simulate drones and traditional aircraft traffic in overlapping airspace, based on assumptions of demand. It also allows users to simulate other U-space services such as strategic deconfliction and flight authorisation, and to validate standards and the interfaces between stakeholders.

The simulator has proved particularly useful in assessing the air risk – potential drone-to-drone and crewed aircraft-to-drone collisions – which is difficult to assess in any other way. It generates data to validate and verify concepts of operation and interoperability between different elements of the proposed system by simulating drone and traditional crewed aircraft traffic interactions, tracking the separation between vehicles.

“We run thousands of flight hours of data, with stochasticity injected in when and where the operations take place, as well as in the position of the actual vehicles during flight, impacting the conformance of each vehicle to its authorised operational intent,” said Miguel Vilaplana. “This data is then processed to identify the risk of collision and identify where constraints need to be implemented and the subsequent impact of those constraints.”

One of EUROCONTROL’s key roles in the partnership is to capture the needs of Member States in granular detail. *“We gather this information and then interpret it in a way so it can be translated into formats useable by the simulator,” said Patrick Amar. “We have to stay close*

to the users to make sure we are providing them with the exact simulations they need, reflecting their operational constraints.”

The initial use cases of the simulation capability focused on quantifying the impact of strategic deconfliction on safety, but other functions have also been tested, including validating demand-capacity balancing and conformance monitoring services and exploring the impact of dynamic airspace reconfiguration to accommodate traditional crewed traffic in the vicinity of airports.

“This year we will also report back to the European Aviation Safety Agency (EASA) with a review of its implementation plans and some advice on how the regulations might be improved,” said Patrick Amar. “We are in a process of continual development – making sure the simulator has the most up-to-date and realistic data on the vehicles flying.”

While these simulations are specifically targeted at supporting regulators and Member States for airspace risk assessments, other stakeholders are also benefiting from the availability of the service. It has been used to validate requirements of existing standards, such as the ASTM standard for UTM Service Supplier Interoperability – where a 95% conformance to operational intent needs to be shown. Municipalities can start to understand the implications of airspace constraints on drone traffic density in their cities and how to position future infrastructure such as vertiports. Drone operators and U-space service providers can use this type of simulation to support validation and stress-testing of their systems and services, to confirm that they operate as expected under high-density scenarios.

EUROCONTROL identified that it is a challenge for U-space stakeholders who are not aviation experts to fully understand the impact of drone traffic: the simulator provides a way to quantify and visualise this impact that is easy to understand and to adapt (modify no-fly areas, etc.) facilitating collaboration between CAAs, ANSPs, municipalities and security forces.

And as lower airspace operations multiply with the addition of eVTOL (electric vertical take-off and landing) traffic, the simulator can be progressively enhanced to add new vehicle types and more complex operations. While eVTOL operations are likely to differ from drone operations – with more defined route networks and more interactions with traditional crewed traffic – the core airspace management technologies being validated with the simulator will remain relevant. The simulator has already been used in work with NASA on the Advanced Air Mobility National Campaign to validate concepts of operation around eVTOL operations.

¹ Publication of Airspace Risk Assessment guidelines, training and technical workshops

The simulator will also be available to support SESAR and other research projects in areas such as separation management in U-space and its performance, design of flight rules, the implementation of demand capacity balancing, assessment of the performance and behaviour of federated U-space implementations and the value of safety nets, such as aircraft collision avoidance systems.

In the future, the simulator could be run with actual traffic data to verify the consistency of the U-space airspace design and deployed procedures, or to update them as required.

“We will support Member States by ensuring simulations remain as realistic as possible to meet their specific requirements,” said Patrick Amar.

“With these simulations, Airbus and EUROCONTROL can together help open the airspace to new entrants while protecting the growth and sustainability of traditional commercial air transport,” said Miguel Vilaplana. “We have a shared vision.” ■

SOME CONCLUSIONS OF THE RIGA U-SPACE SIMULATION EXERCISE

There is a strong indication that strategic deconfliction, as applied in the U-space simulator work for Riga, could have significant benefits in terms of safety.

This is one of the conclusions of a study which specifically looked at different scenarios for airspace constraints in Riga, and their impact on future drone operations. While the nature of the different constraints is quite specific to the city, several conclusions can be drawn that extend beyond that one use case.

Three scenarios were simulated across a range of demand levels in the Riga work:

- a baseline in which no airspace restrictions are in place;
- a scenario in which a small number of airspace restrictions are in place associated with air risk, and
- a scenario in which a larger number of airspace restrictions are in place associated with both air risk and ground risk.

“The results presented suggest that the probability of a mid-air collision (MAC) increases with increasingly complex airspace restrictions, but that the effectiveness of strategic deconfliction to reduce the probability of MAC remains approximately constant,” according to the research findings Simulating Safety and Efficiency Impacts of Airspace Constraints in U-Space Airspace².

“Hotspot maps show high traffic and loss of separation density around UAS demand origins and delivery locations for all unmitigated scenarios simulated. However, when airspace restrictions are added, traffic and loss of separation density increases significantly on the edges of some restrictions.”

The results show an approximately constant reduction in MAC per flight hour when applying strategic deconfliction – of 99.2%. This suggests that strategic deconfliction based on volumetric intent, as described by the ASTM UTM Standard, could be effective at reducing risk of collision in constrained airspace.

² <https://www.eurocontrol.int/publication/simulating-safety-and-efficiency-impacts-airspace-constraints-u-space-airspace#:~:text=The%20simulation%20results%20suggest%20that,of%20MAC%20remains%20approximately%20constant.>

U-SPACE DESIGN AND IMPLEMENTATION:

EUROCONTROL'S KEY ROLE IN SUPPORTING MEMBER STATES



LAURENT RENOU

HEAD OF AIR TRANSPORT INNOVATION
AT THE EUROCONTROL INNOVATION HUB

which is supporting the implementation of U-space and drone integration programmes among Member States. He explains how EUROCONTROL helps Member States address the challenges they face, such as urban air mobility.

WHAT KIND OF SUPPORT CAN YOU GIVE MEMBER STATES IN THEIR U-SPACE IMPLEMENTATION PROGRAMMES?

Member States come to us with challenges, and we help them identify the risks and implement solutions. For this we have developed a strategy which addresses both very short-term and longer-term challenges.

Among the long-term issues is urban air mobility – which is an exciting challenge but complex in terms of infrastructure (such as vertiports) and air traffic management procedures. We will have to integrate these and decide what kind of equipment needs to be deployed and the interactions with existing airports and air traffic management services.

We are leading the SESAR EUREKA¹ vertiport integration research project, which has 35 partners including civil aviation authorities, industry and air navigation service providers (ANSPs) and is active in six countries. This project will develop a procedure for managing arrivals, departures and turnarounds at vertiports, taking into account key parameters such as interaction with the ATC tower, the impact on airport capacity and emergency management operations.

WHAT WILL EUREKA DELIVER IN TERMS OF OPERATIONAL PROCEDURES TAILORED TO INDIVIDUAL REQUIREMENTS?

The project started in mid-2023 and will end in summer 2026. There will be four different solutions going up to technology readiness level 7, so very close to implementation and deployment. We will have a solution for arrivals and departures including routes and trajectories, another solution around vertiport collaborative traffic management, the third will be emergency management and the fourth, integration into the network – flow management. Countries involved include Italy, Spain and France.

The idea is to develop some principles and guidelines for vertiport deployment across Europe, based on the six different views of the participating countries. At the end of the project, we will also provide recommendations for regulations and standards. And we will have identified the maturity of the technology that will be needed.

¹ SESAR EUREKA Project – Co-funded by the EU (grant ID: 101114799)

WILL EUREKA WORK COVER VERTIPTS INSIDE AND OUTSIDE THE AIRPORT PERIMETER?

Both – but for stand-alone vertiports, integration with air traffic management should be a lesser problem. One of the main issues we need to tackle is integration with ATM traffic.

This project is very complex because of its size and challenges; EUROCONTROL has been identified as the organisation with the capabilities to coordinate this work, with the capacity to develop individual implementation programmes and define recommendations. We are seeking to align the different local implementations, sharing the results – both the successes and the challenges. That is the added value that EUROCONTROL can bring, being a neutral body. From these six different implementations we will be able to export the lessons learned to other countries.

It is part of our Innovation Hub strategy, to foster innovation in a collaborative, inclusive manner.

A more short-term example of the work we are doing is to help support the integration of U-space services as a result of the European Aviation Safety Agency (EASA) U-space regulation, which came into force at the start of 2023. In the last 18 months, our EUROCONTROL Innovation Hub has helped Member States with expert advice from several Agency directorates, including the EUROCONTROL Network Manager (NM), which we can now provide as a package.

"The idea is to develop some principles and guidelines for vertiport deployment across Europe, based on the six different views of the participating countries."



First, the State needs to understand the nature of current drone activity. With our Communications, Navigation and Surveillance (CNS) colleagues, we have developed a drone detection prototype solution that enables the Member State authority to understand existing drone traffic patterns. The system has already been installed in London, Paris and Brussels and will soon be put to work in other European States, for example Cyprus and Austria.

This shows us the traffic idea of numbers and types of drones, whether they are flying in visual line of sight and at what height they are flying.

The second service we can deliver is a process – guidelines for U-space risk assessment, based on the SORA (Specific Operating Risk Assessment) tool. We published the first guidelines in 2023 and we are now regularly updating the documentation and presenting this to Member States. So far, we have supported nine countries with this service in 2023 and we will provide it to eight other countries in 2024.

DOES THIS WORK HELP MEMBER STATES IDENTIFY WHERE U-SPACE AREAS WILL BE LOCATED?

For this we have a new U-space simulation tool, the result of a close collaboration with Airbus, to help us and Member States design the U-space that will manage future drone traffic. We have already used it to support Estonia in its U-space development programme and other States will also be using it soon (see related article in this issue: Advancing U-space implementation through a collaborative approach to simulation).



U-SPACE AREAS MIGHT BE DEVELOPED BY MEMBER STATES AND BY INDIVIDUAL CITIES AND PORTS WHO WILL WANT THEIR OWN DRONE AND ADVANCED AIR MOBILITY ECOSYSTEMS. WHERE DO YOU THINK THE MAJOR AREAS OF GROWTH WILL COME FROM?

I think growth will come from both Member States and cities and ports. The original demand always starts with cities and ports. Take Rome, for example. Advanced Air Mobility planning there began with the urban ecosystem but then the State had to facilitate that ecosystem in different locations and harmonise procedures with other countries.

"As we support different implementations, we are developing a collaborative insight into the benefits of each solution and how this can be scaled and exported to different locations."

THERE SEEM TO BE DIFFERENT NATIONAL APPROACHES TO ARCHITECTURE – ESPECIALLY THE INFORMATION FLOWS BETWEEN THE COMMON INFORMATION SERVICE AND THE U-SPACE SERVICE PROVIDER. THIS DOES NOT APPEAR TO BE HARMONISED THROUGHOUT EUROPE. HOW BIG A PROBLEM IS THIS AND HOW DO WE GET AROUND IT? DOES EUROCONTROL HAVE A ROLE HERE?

We need to be very open and assess the different architecture options. That is why it is good that we have many different cities involved so we can draw on different experiences – identify which model works well for a given environment, which one might need improvement, and which one should be avoided altogether. Maybe there is not a single solution that fits all.

As we support different implementations, we are developing a collaborative insight into the benefits of each solution and how this can be scaled and exported to different locations.

ARE THERE MAJOR DIFFERENCES BETWEEN STATES ON U-SPACE IMPLEMENTATION AND HOW DO YOU REACH A U-SPACE ARCHITECTURE SOLUTION WHICH BEST SUITS THE CUSTOMER'S NEEDS?

We listen. We then facilitate a discussion. We don't come with a solution – we offer different examples and then focus on a solution which best meets their needs. We connect them with other customers to understand in more depth the lessons learned.

HOW DO YOU PLAN FOR U-SPACE MANAGEMENT SYSTEMS TO HAVE SCALABILITY BUILT INTO THEIR OPERATIONS FROM DAY ONE?

It's important that we are involved in different initiatives because we have access to all the data and we can share some of this data with Member States. We have an agreement on what data can be shared for the benefits of all States, based on the digital resources of the EUROCONTROL Network Manager (NM).

As EUROCONTROL builds the new digital platform for NM we will be able to – where approved – share increasing amounts of data to the benefit of everyone.

DO MEMBER STATES REGARD DRONES AND ELECTRIC VERTICAL TAKE OFF AND LANDING (EVTOL) AIRCRAFT AS A SINGLE INDUSTRY?

I think there are two different approaches required.

Urban air mobility faces many social acceptance challenges. For sure there are technical challenges, but this is what engineers like. Public acceptance, however, is an entirely different challenge.

With drones we can already see some clear benefits and in many places the industry has been established.

One aspect which crosses both, and where we can help, is in noise assessments. The EUROCONTROL Innovation Hub already does this for commercial aviation clients and we are also working now to assess the noise impact from these new kinds of vehicle – because noise is a key factor in their social acceptance. We have already developed some new tools to complement our existing range of noise assessment capabilities. ■

NEW ENTRANTS DRIVE INNOVATIONS IN CIVIL AND MILITARY AIRSPACE MANAGEMENT OPERATIONS



EUROCONTROL's Civil-Military Cooperation Division is at the forefront of implementing new technological and operational measures to cater for a wide range of new airspace users, both civil and military, reports **Remus Lacatus**, Innovation, Architecture and ATM Operations expert.

As European air traffic management (ATM) undergoes modernisation, the number of new entrants performing civil and military operations is increasing dramatically.

On the military side, the impetus for change is triggered by security and defence requirements, leading to next-generation fighter aircraft and weapon systems. At the same time, there is an overlap between civil and military realms because of the steady rise in manned and unmanned aerial vehicles operating beyond the boundaries of conventional airspace.

The rapidly evolving extension of airspace usage to higher altitudes and the development of U-space operations demand advanced cooperation and interoperability between civil and military aviation stakeholders.

It is crucial that progress is made on the implementation of technological and operational measures that enhance the flexibility and dynamism of airspace and traffic management through civil-military collaboration. Consistent civil-military solutions are key to reducing the impact of the increasingly complex aviation environment for both aircraft operators and the European ATM network.

"Enhancing the versatility of civil-military cooperation stands as pivotal in addressing the complexity inherent in the future European ATM ecosystem"

As new entrants emerge, adapted air traffic services are needed to support higher airspace operations (typically above flight level 600) and U-space operations (typically occurring in airspace below 500ft). Furthermore, cutting-edge technologies and air vehicle concepts call for increasing levels of digitalisation and automation in terms of both vehicle operation and service provision, for which the early development of system support and operational procedures is essential.

Considering that a significant number of vehicles engaged in these operations will not adhere to conventional ATM procedures, the overarching challenge for the European ATM system is to ensure that future operations of these new entrants are seamlessly integrated into ATM network operations, with no adverse effects on safety and a minimum impact on civil and military activities.

The deployment of next-generation aircraft will drastically transform military training and live operations. New training scenarios requiring larger volumes of airspace will exert pressure on airspace organisation (new airspace design principles) and management (enhanced airspace management – ASM – procedures), affecting airspace from the ground up to higher airspace.

It is imperative for civil and military ATM experts and decision-makers to intensify their collaboration to modernise current ASM mechanisms and to pinpoint optimal solutions that can effectively accommodate these changes. In particular, increased dynamism, flexibility and civil-military collaborative use of airspace are key requirements.

Higher airspace will no longer be the exclusive domain of space and military operations; it will need to accommodate a diverse range of vehicles, from slow-moving high-altitude platform stations (HAPS) or long-endurance balloons, to very high-speed vehicles, such as supersonic and hypersonic aircraft.

The behaviour and flight performance of these entrants might introduce additional uncertainties in ATM, specifically when transiting conventional airspace on their ascent and descent. Emphasis should be given to interfaces with conventional airspace to guarantee the secure and seamless integration of diverse vehicle types.

Moreover, although the sovereignty of States over their airspace is indisputable, from a purely operational standpoint the ASM approach to operations in higher airspace should ideally be less fragmented, focusing on user requirements rather than geographical boundaries. The challenge is to maintain uniformity in applying advanced ASM principles across both conventional and higher airspace, including at their interface.

With safety, cost and efficiency as the main drivers for their deployment, unmanned aerial vehicles and remotely piloted systems, generally called drones, operate from very low levels or from uncontrolled airspace up to the higher limits of controlled airspace. There is also growing demand for drones to be able to use segregated and non-segregated airspace.

These vehicles, poised to provide advanced data-driven services and to operate anywhere between

"It is very likely that the integration of new entrants will necessitate enhanced levels of digitalisation and automation, in terms of the operation of vehicles and the provision of services."

500ft and 60,000ft, will have to comply with air traffic management rules. This entails a profound shift in the management of airspace and trajectories, as well as in collaboration between civil and military entities, with the aim of reconfiguring airspace in a dynamic and flexible manner. This evolution is essential to ensuring that air traffic control services can safely oversee manned and unmanned operations.

It is very likely that the integration of new entrants will necessitate enhanced levels of digitalisation and automation, in terms of the operation of vehicles and the provision of services. A key issue that needs consideration is interoperability from system and user perspectives.

Developments in ASM support systems and services should keep pace with the integration of state-of-the-art technologies into newly established platforms, meet the demands of existing legacy equipment and ensure a balance between the needs of civil and military operations.

Like traditional aircraft operators, new entrants must be capable of informing the authorities responsible for the airspace that they will use about their flight/mission intentions and be able to exchange information appropriately during the execution phase. Seamless access to and exchange of information among all providers and users of ATM information and services must be achieved via fully interoperable systems and/or procedures.

Moreover, the extensive spectrum of users, encompassing private, State and international entities – civilian and military – underscores the need to move away from existing fragmented approaches in ASM and service provision and to evolve towards greater harmonisation.

Advancing the concept of flexible use of airspace (FUA) is a process that has already started with the implementation of rolling airspace use plans, some local real-time airspace data exchanges, enhanced network impact assessment, ASM solutions and ASM performance assessments. But the goal of achieving effective and coordinated FUA among (local and regional) ATM stakeholders while ensuring optimal use of available airspace has yet to be achieved.

The configuration of cross-border modular airspace blocks in areas with lower traffic demand but which are suited to operational needs, supported by enhanced civil-military collaborative decision-making (CDM) at network level, could make larger airspace volumes available for military training and exercises, while minimising the impact on traffic flows, especially in core areas.

Improved operational interactions between the Network Manager and tactical military commands responsible for large-scale events and operation planning have proved to be an effective solution in preventing disruptions to general air traffic. The new permanent liaison officer posted at NATO Air Command is a first response to the need to continuously adapt civil and military airspace and flight planning to the reality of the “new normal”, characterised by dynamic changes and new operational requirements.

Nevertheless, enhancing the system support provided by the EUROCONTROL military liaison officer (MILO) function, within the Network Manager (NM) and NATO, with the capability to assess in real time the status of airspace and the implementation of FUA at network level, will be key to ensuring the efficiency of NM. Integrated ASM system support as well as the use of artificial intelligence (e.g. heat maps, predictive tools) for performance assessments are two options available when it comes to bringing about the required enhancements.

While the sharing of sensitive mission data with the ATM network will certainly continue to be limited by the need-to-know principle, the sharing of harmonised information would not only enhance the predictability and effectiveness of traffic flow management but would also support military cross-border operations, with no impact on sovereignty.

An important step is the adoption and sharing with NM of the new harmonised OAT Flight Plan to facilitate military mobility across Europe. It is imperative that NM and the pilot States successfully complete the first phase of the iOAT FPL¹ implementation project in order to provide the basis for its expansion at ECAC level.

The sharing of real-time airspace planning and activation/deactivation information between all local and regional actors will be another critical step to achieving optimised business and mission trajectories.

Civil and military operational stakeholders, together with NM, should strive to implement relevant and mature operating methods delivered by the SESAR programme.

The dynamic mobile area (DMA) design principles allow for state-of-the-art integration of the concepts of mission trajectory and advanced flexible use of airspace in dynamic and flexible solutions for airspace reservation management in the future dynamic airspace configuration environment.

Following the successful validation of geographically dependent dynamic mobile areas, SESAR 3 is now validating the concept of moving and flexible “protection bubbles” for different types of military missions. This is expected to streamline flexibility in the tactical phase of ATM network operations by ensuring integration through safe separation of flights in situations characterised by a high degree of uncertainty. ■

¹ Improved Operational Air Traffic Flight Plan





LORD ADDS SPEED AND FLEXIBILITY TO DECISIONS BY MAASTRICHT CONTROLLERS

Maastricht Upper Area Control Centre (MUAC) began validating a new decision support tool in March. The Lateral Obstacle & Resolution Display (LORD) offers conflict resolution support for planning and tactical controllers, reducing cognitive load and adding a safety check for flight clearances.

Air traffic controllers at the EUROCONTROL Maastricht Upper Area Control Centre (MUAC) manage some of Europe's busiest airspace, issuing clearances to up to 5,500 flights a day based on a deep understanding and knowledge of flight profiles. Software tools help to identify potential conflicts and bottlenecks, but they stop short of finding solutions or alternative trajectories, leaving all problem-solving to the controller.

A novel approach by MUAC's systems development team – based on a concept originally devised by the Delft Ecological Design research group at TU Delft – combines controllers' intuitive skills with a three-dimensional probe called the Lateral Obstacle & Resolution Display (LORD). LORD displays all possibilities and limitations of the current environment while allowing the controller to select the most appropriate clearance. The tool provides a concise overview of available and unavailable trajectories towards a probed flight level and presents this information to the controller in an intuitive and comprehensive graphical arc, representing the conflict and solution spaces. The tool can also be used to check or confirm a clearance and is configurable to suit individual controller preferences.

LORD scans each heading and flight level combination to identify limitations in the lateral and vertical dimensions, taking into account projected trajectories of the surrounding traffic. The tool also considers

rate of climb, speed of turn and uncertainties such as pilot reaction time that accompany aircraft clearances. The controller can use the tool to probe different hypothetical manoeuvres or to check the availability of flight levels using the cleared flight level (CFL) menu populated by the ATC Real Ground-breaking Operational System (ARGOS). On opening the tool, conflicting trajectories are highlighted, and for each trajectory the projected conflict geometry and minimum distance between the aircraft pair are displayed. By simply moving the probe line, the controller can try out alternative routes towards any probed level.

"LORD displays constraints in the environment and presents alternatives for the controller to pick. It shows the information in a condensed form, cleverly combined to explain the options in an intuitive way to the controller."

Marco Vismara, System Development Operational Expert and Air Traffic Control Officer, MUAC

ONLINE VALIDATION

Online validation started in the MUAC Operations Room in March, where a dedicated group of controllers began testing the usability and accessibility of the tool, its display options and ease of use. About a dozen experienced controllers are complemented by a team of analysts, including human-machine-interface (HMI) and automation experts. Additional controllers will join the online validation group over the next

few months to continue defining how the tool should operate based on their user experience and human factor principles. The aim is to introduce LORD to the entire Operations Room within a year.

"The solution is deeply embedded into the existing HMI so as not to put at risk functionality and workflow. We are leveraging HMI shortcuts to exploit more features and add to the capabilities of LORD." **Sevastian Zakora, HMI Software Engineer, MUAC**

In the initial version, the look-ahead time for LORD has been set to eight minutes. While there is no limit to the number of aircraft, only the conflicts with a projected minimum distance of not more than eight nautical miles are displayed, colour coded (orange or yellow) based on their severity. Similarly, the standard displayed arc presented to the controller currently extends 40 degrees on each side of the flight track, however it can extend up to 170 degrees each side when the route points for the subject flight justify such an expansion. Importantly, the tool does not prompt the controller to pick a specific solution or trajectory but displays all conflicts within the range and leaves the final decision to the controller.

"In line with the MUAC Automation Strategy and the Ecological Interface Design framework, we believe if a system only provides a single best trajectory in a complex traffic scenario, it will elicit either over- or under-reliance in the controllers (with associated human factors implications) instead of achieving the initial goal: optimised workload. Therefore, the system first needs to provide the context – an intuitive overview of all possibilities and limitations – in which the optimum trajectory can be embedded." **Adam Tisza, Automation, HF & UX Requirements Expert, MUAC**

In comparison with previous probing tools, the controller sees the availability of alternative trajectories at different flight levels. As a result, the controller benefits from reduced cognitive load and shorter input sequences for conflict avoidance or resolution. The controller still applies individual

buffers; however workload is reduced, and the transparent nature of the tool means decision making becomes quicker and safer. The addition of further variables such as wind or environmental factors in the future is expected to bring even more insight to controller decisions.

LORD can be displayed in different ways, for example depending upon whether it is supporting the planner or executive controller. The click-and-hold trigger from any flight level suits tactical decision making where alternative trajectories can be seen at a glance. The planner, meanwhile, will benefit from the probe capability to assess different levels and/or trajectories before proposing a solution.

"The tool is so intuitive, it stays on screen for only a very short time, just for the decision. It displays all the information needed in a transparent and lean way to keep the controller's focus on the real issues." **Marco Vismara, System Development Operational Expert and Air Traffic Control Officer, MUAC**

IN-HOUSE DEVELOPMENT

LORD is the second decision-support tool displaying conflict and solution spaces based on Ecological Interface Design principles, introduced in the ARGOS server by MUAC's systems development team. A menu shading function was added to the controllers' display four years ago to indicate which flight levels are safe and which may lead to a conflict. This menu allows controllers to select and clear conflict-free flight levels via radio communication or datalink, uploaded directly to the aircraft's cockpit. LORD takes this concept a step further by adding the lateral dimension on top of the vertical conflict scanning to generate a transparent conflict and solution space overview.

"These developments are part of our strategy to automate some of the less complex tactical traffic scenarios, and to provide advanced decision support for complex scenarios,



From left to right:
Humberto,
Marco,
Adam and
Sevastian.

in order to accelerate operator actions and thereby increase productivity. Our objective is to continuously improve our operational performance to accommodate future traffic demand.” **John Santurbano, Director MUAC**

The ARGOS server performs computations based on flight data and surveillance data to identify optimal trajectories and solutions that support safe and efficient operations using a deterministic model that emulates strategies used by controllers. While certain components of the deterministic resolution could make use of a machine-learned (ML) model in the data analysis phases, such as the calculation of variable speed and/or climb/descent rate in the trajectories, neither artificial intelligence (AI) or ML models are used in the tactical decision and execution phases of separation assurance. This is due to the lack of explainability of AI in a system that interacts and collaborates with controllers.

“ARGOS processes trajectories with fine-grained accuracy and precision. A wide range of manoeuvres, uncertainty and complex separation rules are carefully considered. State-of-the-art algorithms and immense computing power are required to achieve real-time processing in MUAC’s dense airspace.” **Humberto Carvalho, Software Engineer, MUAC**

The systems development team deployed a web-based prototype to speed up the development process that enabled software engineers and HMI experts to work in parallel. Using past traffic data to feed the algorithms, prototyping and testing took place at the same time over a condensed time period between 2020-2023. Air traffic controllers are greatly involved and provide crucial operational knowledge. It is an iterative process that aims to converge towards next-generation ATM tools that provide high operational value.

FUTURE STEPS

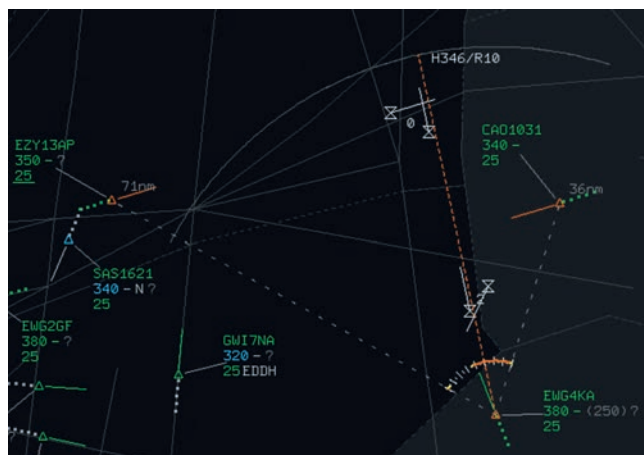
MUAC has an ambitious vision to revolutionise air traffic control and manage its airspace more efficiently under the banner of ARGOS. In addition to providing high-level decision support for controllers handling complex and challenging scenarios, routine traffic and actions should benefit from highly automated support tools. The development team is working on an algorithm to determine if a flight is involved in a complex scenario, or whether it can be handled by automation under the supervision of the planner in a datalink environment. This leaves the executive controller free to focus on core issues while an automated “second executive” handles simple scenarios. The planner retains an overview of the entire sector which is managed by two agents.

Working in partnership with the German Aerospace Centre (DLR), MUAC is developing operational procedures aimed at contrail prevention, for example

avoiding ice-super-saturated regions using modified trajectories. With more than half of the impact of aviation on climate change believed to come from aircraft non-carbon emissions, preventing contrails is rapidly growing in importance. ARGOS is set to help automate and integrate these calculations into the operational environment, combined with development of human factor elements and optimum trajectory calculations using iterative prototyping methodology.

Introducing new concepts relies on an expert team that crosses multiple domains including HMI and software analysts, air traffic controllers and human factors experts. MUAC draws on all these capabilities to ensure the focus remains on delivering safe and expeditious air traffic management.

“We have a very agile team that is able to prototype new concepts very efficiently and quickly. This still requires a huge amount of software development, but the process takes weeks rather than months and requires significantly fewer resources. Such an approach allows the users to evaluate crude prototypes very early on and see their feedback being implemented at a fast pace.” **Adam Tisza, Automation, HF & UX Requirements Expert, MUAC** ■



In order to let EWG4KA descend to its Transfer Flight Level (250), the ATCO might feel inclined to let it turn right and pass behind CAO1031. LORD raises awareness that CAO1031 is flying in conformance with its route, including an imminent turn, which will not allow for such a solution. Furthermore, a right turn would bring EWG4KA into another conflict down the sector with EZY13AP, which is also about to descend to flight level 250. At a glance, LORD indicates that both conflicts can be avoided by a slight left turn, granting all three flights unrestricted, continuous descents.

Image behind the title: LORD tells the ATCO ROT361C may be descended to its Transfer Flight Level (260) if adhering to its present track.

“It’s like a ballet in the sky.

You have dancers, musicians, stage production, staff, lighting - if everyone is working at their optimal levels then the performance is fantastic.

But one twisted ankle and everything is thrown out of sync.”

PREPARING FOR SUMMER 2024 MORE TRAFFIC, DISRUPTIVE WEATHER BUT DEEPER AND MORE EFFECTIVE COLLABORATION

The Network Manager and partner stakeholders made significant improvements in air traffic capacity management last year – the focus is on building on these to manage air traffic in 2024 more effectively and efficiently, report Steven Moore, Head of ATM Network Operations and Yolanda Portillo, Head of the Network Manager Operations Centre at EUROCONTROL.

Preparing the European air traffic management ecosystem for the high summer season is like preparing the theatre for a ballet, though the stakes are, of course, considerably higher.

The number of different actors, their priorities and their challenges, all have to be carefully coordinated and lessons of the last performance integrated into the planning for the next. With summer 2024 fast approaching, planning for the high traffic season has been given a new structure and focus with EUROCONTROL's Joint Approach programme, which in 2023 delivered new levels of collaboration among all stakeholders, and made network performance improvements which exceeded expectations. This year the process needs to be refined further, so even though more traffic is forecast, the European aviation network should be able to manage the increases while minimising delays and environmental emissions.



"Last summer was manageable, mainly as a result of the work of stakeholders whose priorities were aligned, as far as possible, to those of the network," said Steven Moore, Head of ATM Network Operations, EUROCONTROL

"We saw 7% more traffic but delays per flight were reduced by 18%, not counting weather-related issues. It was the first time the Network Manager had adopted a Joint Approach with C-level representatives of airports, air navigation service providers (ANSPs), airlines and other stakeholders all in the same room. We agreed to focus on four main actions: prioritising the first rotation; disciplined flight plan execution; delivering agreed capacities and taking a realistic approach to scheduling, including turnround times."

Each action brought its own reward. Prioritising the first rotation brought a 20.4% reduction of first-wave delays in 2023 over 2022; research has shown that a delay of one minute in the first take-off of the day can result in a four-minute delay in the final rotation of the day. Sticking closely to the flight plan reduced unplanned entries into regulated airspace by 7% over the previous year. Delivering agreed capacities delivered a reduction of 6.7% of departure delays as a result of en-route ATFM delays. Realistic scheduling – replacing "hoped-for" with "most probable" turnround times – meant aircraft operators reduced their turnround time excesses by 17.5% over 2022. If an airline schedules an inbound flight to arrive at 1500 and the outbound flight to leave at 1510 that can create major network challenges.

"The campaign brought another benefit," said Steven Moore. "We saw that with all stakeholders working together more closely there was a change in view of how they saw the network. Of course, they continued to prioritise the needs of their own organisation but they could also see the network impact of their decisions. So asking for a short cut, for example, had two impacts on the network: it meant the aircraft was in the wrong place at wrong time, but with the aircraft no longer flying the planned route it meant the planned-for airspace capacity was not being optimally used. Last summer 8% of flights deviated from their flight plan into a regulated area. That's something we really need to look into. We saw major improvements in 2023 but it was still not good enough."

"Our role is to give more information to the coordinators so they can make more effective decisions based on their commercial priorities and operational possibilities. But this new approach has made a real difference because if an airline has signed up to more disciplined flight plan execution, even if it is running later than planned, keeping the flight plan up to date and not asking for that short cut will have an important effect on the performance of the overall network."

For 2024, the Joint Approach plan is being refined even further. Now stakeholders have agreed to work towards measurable objectives, perhaps by reducing first-wave delays by an agreed percentage over last year's performance for example. And a fifth action has been added to the list: improved planning for weather disruptions (see panel: "Summer 2023: more traffic, fewer delays but far more disruptive weather").

"We have been implementing cross-border weather procedures for five years, increasing stakeholder involvement along the way, but the idea for next summer is that we need to do something else, to take a more network-centric approach," said



Yolanda Portillo, Head of the Network Manager Operations Centre, EUROCONTROL

"Weather is one of the main capacity constraints in our network, as it is difficult to manage because it is less predictable and more dynamic," she added. "But we want to introduce a collaborative decision-making procedure, to decide and agree with all stakeholders how to manage the movement of traffic around disruptive weather areas. This means developing a kind of re-routing playbook which can be applied in bad weather. And we also want to have a single, more precise and continuous network forecast. At the

Summer 2023: more traffic, fewer delays but far more disruptive weather

Between June and August 2023 traffic recovered to 93% of 2019 levels increasing 7% over 2022, in line with EUROCONTROL forecasts. ANSPs and NM planned for the impact of the ongoing war in Ukraine and provided extra capacity, flexibility and improved procedures for military operations.

Air Traffic Flow Management (ATFM) delays were similar to the previous summer with 3.8 minutes per flight (3.7 in 2022). But weather delays increased significantly (up 59%), in contrast to delays due to capacity/staffing and other causes, which decreased. Without the weather element, ATFM delays per flight were 18% lower than in 2022.

ATFM delays attributed to adverse weather occurred with particularly high frequency in 2023. In 22 out of the 92 days considered (almost one in four), weather delays represented more than 50% of total ATFM delays. This compares to only seven days in Summer 2022 (one in 13 days). Weather is responsible for around 30% of all delays in Europe.

moment this data is provided only at specific times in the day, for defined periods, but we need this data all the time. The provision of sustainable meteorological data at European level – what we call a “network forecast” – adapted to the aeronautical environment is vital. Accuracy, continuity and granularity of data supply shall be assured.

“The impetus behind this is not just about reducing delays but about bringing more stability into the network, reducing volatility and the threat of sector overloads and unexpected traffic.”

As a first step, NM together with EUROCONTROL's Innovation Hub in Brétigny and Eumetnet are working together to analyse the reliability of current forecasts. This will bring trust, which should reduce the need for ANSPs to apply last-minute regulations due to bad weather. If the new service can guarantee a higher level of accuracy, ANSPs and NM would be able to better plan in advance and reduce the overall impact of convective weather events into the European network.

“We would also like to improve civil-military coordination around cross-border-weather events via the Network Manager Operations Centre, and have more airports involved as well, perhaps even extending these procedures into weather-related events at airports, in the wintertime, as well as the en-route phase during summer,” said Yolanda Portillo.

“We want to introduce a collaborative decision-making procedure, to decide and agree with all stakeholders how to manage the movement of traffic around disruptive weather areas.”

“The weather problem is really two problems: the accuracy of forecasts and how we are structurally set up,” said Steven Moore.

Many European airports are not set up to operate at full “usual” capacity for prolonged severe winter events. It is therefore important the airport is realistic about how many flights will be impacted. Instead of hoping the weather will not be as bad as predicted, it would be better to be clear about the most probable outcome and plan for that.

Another NM development for summer 2024 will be to extend the All Together Now campaign, which gives flight dispatchers, pilots, air traffic controllers, flow management positions and airports a clear overview of the processes they should follow to ensure efficient, optimal operations.

The All Together Now campaign for 2024 involves a structural look at the five priorities and at identifying how operational staff from all stakeholder groups can contribute to working towards the network priorities.



This will be a critical part of the network performance plan for Summer 2024. NM is expecting another 5% increase in traffic this year over last year. “But that masks the real story,” said Steven Moore. “In some regions that means traffic will increase 15% or more, while in others there may be no growth at all. And capacity will continue to be constrained by the ongoing war in Ukraine and more recent disruptive events in the Red Sea. Which means that every dancer, musician etc in the ballet will have to work to their optimal level for the benefit of the network for it in turn to work at its optimal level, giving the best overall performance possible.” ■

THE NEW CNS PROGRAMME MANAGER'S ROLE AND CHALLENGES



PAUL BOSMAN

HEAD OF ATM INFRASTRUCTURE,
EUROCONTROL



PREDRAG VRANKOVIC

COMMUNICATIONS, NAVIGATION,
SURVEILLANCE (CNS) PROGRAMME
MANAGER, EUROCONTROL

Paul and Predrag explain how the Agency is tackling the challenging new task of contributing to the modernisation of Europe's CNS infrastructure.

EUROCONTROL took on a new role as CNS Programme Manager at the start of 2024, created to accelerate the upgrade of Communications, Navigation and Surveillance (CNS) equipment across Europe. The task is one of 12 recommendations made by the CNS Advisory Group convened by the European Commission in 2020, and responsible for the 2022 CNS Action Plan¹. EUROCONTROL's approach is intentionally centred on providing objective views, in addition to education and support, to meet the plan's ambitious targets. Its leadership role also recognises that modernisation relies on participation from across the industry, involving extensive input from air navigation service providers (ANSPs), regulators, industry, airspace users, civil and military operational stakeholders.

CNS infrastructure is an essential technical enabler for the provision of air traffic services. The European ATM Master Plan² describes how CNS infrastructure should evolve by deploying new systems and rationalising existing systems to take advantage of synergies within the system. In practical terms, however, ground infrastructure modernisation needs compatible on-board equipment and this can mean costly avionics upgrades with airlines only recouping their investment in a harmonised environment. As a result, progress has been slow and uneven, leaving a large number of nationally operated legacy CNS systems which the CNS Advisory Group says are costly to maintain, energy inefficient – adding environmental cost – and reduce spectrum

efficiency. In contrast, transitioning to modern digital technology in an increasingly optimised network offers a route to more efficient CNS services with greater resilience, scalability and increased automation. For example, by implementing datalink services, system wide information management (SWIM), secure Internet Protocol networks, advanced surveillance services and benefit-driven Performance-Based Navigation (PBN), airspace users gain access to more services from less infrastructure. These new capabilities help to reduce the cost of CNS services, estimated at around €1.2 billion/year (en-route) currently³, improve efficiency and reduce associated emissions.

EUROCONTROL launched a series of stakeholder meetings in 2023 in response to the Commission's proposal for the Network Manager to coordinate CNS evolution activities. Bilateral meetings with ANSPs, SESAR Joint Undertaking (SJU), SESAR Deployment Manager (SDM), the Performance Review Body (PRB), European Aviation Safety Agency (EASA), European Defence Agency (EDA), airline representatives, professional staff organisations and EUROCAE identified key objectives for the next five years along with an initial project management plan approved by the Network Manager Board. The CNS Programme Manager function is part of Network Manager's tasks defined in Commission Implementing Regulation (EU) 2019/123.

CNS EVOLUTION PLAN

CNS rationalisation comes with many challenges, not least persuading investing operational stakeholders of the benefits of transitioning to smarter technology. Protecting national security and defence missions also impacts investment decisions, as do local cost structures. The ATM Master Plan defines the evolution towards the targeted CNS infrastructure as being composed of a core network based on an

¹ CNS Action Plan: <https://www.eurocontrol.int/sites/default/files/2022-06/wac2022-cns-strategy-s1-christine-berg.pdf>

² European ATM Master Plan 2020 edition: <https://www.atmmasterplan.eu>

³ CRCO data: Aggregated costs for communications, navigation and surveillance in ECAC area, CNS Advisory Group report.

optimised combination of ground and space-based technologies. This is complemented with Minimal Operational Networks (MONs) of conventional infrastructure that are needed to maintain services in case outages occur in the backbone infrastructure, for example interferences affecting satellite navigation signals. One of the first tasks of the CNS Programme Manager is to translate this vision into a CNS Evolution Plan setting out the main steps to achieving this goal with short-, medium- and long-term objectives. Updated on an annual basis, a first version due at the end of 2024 will drive this process in cooperation with all the relevant stakeholders.

Among early initiatives, decommissioning unnecessary surveillance infrastructure will bring immediate safety benefits by reducing the number of interrogations demanding spectrum bandwidth. Aircraft transponders designed to support 50-60 interrogations per second are known to receive double this volume in some parts of Europe where multiple secondary radars operate in close proximity. The resulting frequency congestion risks degrading technical performance and adds to operational and maintenance costs for individual States.

Europe's legacy ground-based navigation aids also soak up unnecessary costs when newer, more versatile navigation systems are available. Some States have already begun decommissioning VHF Omnidirectional Range (VOR) equipment and Non-Directional Beacons (NDB) while supporting Performance-Based Navigation (PBN) capabilities onboard modern aircraft with GNSS and an optimised network of Distance Measuring Equipment (DME). PBN gives airspace users the flexibility to navigate in line with operational needs, instead of being constrained by the ground locations of navigation beacons, while also supporting more accurate trajectories. Maintaining a minimum number of ground-based nav aids provides resilience in case of interference to satellite signals.

Europe's established infrastructure provides further opportunities to create synergies between systems, especially where facilities operate in close proximity in neighbouring States. Sharing processed data across borders requires robust and secure data sharing agreements and not all States are ready to reduce terrestrial infrastructure, for example countries bordering on conflict areas. The operational needs of military and civilian service providers are central to the CNS evolution plan and will be reflected in a performance-based approach that allows technology diversification while ensuring availability and continuity of service.

A sector not subject to immediate decommissioning but set to benefit from CNS modernisation is Europe's communication infrastructure. Here, new

technology will augment existing communication services, for example enabling datalink exchanges between flight crews and air traffic controllers, freeing up congested VHF channels and automating routine functions. In addition to faster, more accurate messaging, newer technology supports service provision for new entrants and U-space services. However, deployment of high-performing datalink infrastructure has lacked clear direction despite evidence from SESAR research of the benefits in terms of safety and capacity. An enabler for future operational needs and concepts including four-dimensional trajectory management, the technology became mandatory from 2020 under EC Regulation (EU29/2009) but continues to experience compatibility and performance issues.

The CNS Programme Manager strengthens EUROCONTROL's datalink performance monitoring group in several ways. Working with all relevant parties, the CNS Programme Manager cell strengthens the root cause analysis of outages and identifies responsibilities to resolve compatibility issues between air and ground equipment. The activity affects ANSPs, aircraft operators, manufacturers and service providers such as the future Datalink Service Provider and other communication service providers; it will notably build on the newly established ATS Common Datalink Service (ACDLS) governance to reduce the current fragmentation existing in datalink service provision.

EUROCONTROL is also upgrading its datalink laboratory with the latest interrogators, transponders and receivers to allow faster diagnosis when issues arise. The datalink laboratory is designed to support similar validation activities for surveillance and navigation performance. Finally, the CNS PM cell monitors emerging communications technology including SATCOM Class B, L-band digital aeronautical communication system (LDACS) and Internet Protocol (IP) solutions that will make up the future communications infrastructure.

COMMON SOLUTIONS

Successful implementation of the CNS evolution plan relies on close stakeholder cooperation and support. EUROCONTROL's contribution extends to education and engagement, rather than enforcement, placing special emphasis on a collective responsibility to realise the programme's aims. This includes developing robust CNS implementation business cases (network and local level) for any given infrastructure in support of decision making, as well as identifying financing and funding opportunities and exploring possibilities of financial incentives for all stakeholder groups concerned, to synchronise and accelerate the evolution of the CNS infrastructure. Achieving a



successfully accelerated and synchronised rollout of CNS ground equipment and associated avionics/on-board equipment is challenging in itself, and generating the financial resources to fund such an approach, in a time of continued financial stress, is a challenge of similar magnitude.

"To ease the process, EUROCONTROL is re-enforcing its joint CNS stakeholder platform to engage with experts and stakeholders."

The CNS Programme Manager also identifies potential regulatory recommendations, for example to include in the European Aviation Safety Agency (EASA) regulations, the link with performance review scheme, and to be addressed through the ATM Master Plan framework. This ensures that issues that arise through monitoring of CNS evolution and at implementation or local level do not stall the CNS evolution and can be resolved using existing mechanisms. To ease the process, EUROCONTROL is re-enforcing its joint CNS stakeholder platform to engage with experts and stakeholders. This community provides a "working interface" to share knowledge and expertise as well as concerns about the programme. The programme manager is currently working on ways to engage with military representatives to bring this community along the same pathway when it comes to the rationalisation, resilience and national dimension of CNS infrastructure⁴.

For the next decade, the CNS Programme Manager will contribute to modernisation of CNS infrastructure and airborne equipment, building on current rationalisation plans and assessing network needs versus individual States. Finding an appropriate equilibrium between these approaches will result in the delivery of a consistent level of service across Europe, harmonising the approaches to rationalisation through a pan-European lens. Importantly, it will establish a process to support coordinated investment efforts by operational stakeholders and be able to demonstrate benefits including improved safety, operational efficiency, reduced emissions, increased capacity and lower infrastructure costs. ■

⁴ EUROCONTROL <https://www.eurocontrol.int/communications-navigation-and-surveillance>
Side Panel

The CNS Advisory Group: 12 recommendations

1. Translate the Master Plan's CNS roadmap into a CNS evolution plan with short-, medium- and long-term objectives, priorities and decision points.
2. Improve cost-efficiency through rationalisation, including decommissioning of CNS facilities, maintaining robustness while ensuring safety and national and global/international security.
3. Implement CNS infrastructure applying a technical performance 3-based approach in a way that is simple and cost-efficient.
4. Conceive an integrated CNS evolution maximising synergies and addressing physical and cyber security for Communication, Navigation and Surveillance services.
5. Develop a long-term EU strategy and policy to improve aviation spectrum efficiency as a driver of the CNS evolution.
6. Reduce the greenhouse gas emissions of the CNS infrastructure to maximise aviation's contribution to achieving European net zero carbon emissions targets.
7. Demonstrate operational and technical interoperability and scalability of the infrastructure before deployment.
8. Develop robust CNS implementation business cases involving stakeholders at the earliest possible opportunity.
9. Ensure smart use of incentives to support stakeholders in implementing the CNS evolution plan.
10. Apply a smart(er) approach when developing technical CNS regulations to support the implementation of the CNS evolution plan.
11. Establish a holistic CNS programme management to ensure successful implementation of the CNS evolution plan using or adapting existing entities to maximum effect.
12. Consider the importance of the human dimension aspects related to the evolution of the CNS infrastructure.

2024 iGA ACADEMY International Training Calendar

ACI (Classroom)

GSN1: Safety Management Systems (SMS)	March, 2024
Airport Economics	March, 2024
Wildlife Hazard Management	April, 2024
GSN2: Airside Safety and Operations	April, 2024
GSN3: Emergency Planning and Crisis Management	June, 2024
Managing Aerodrome Works	July, 2024
GSN4: Working With Annex 14	July, 2024
GSN5: Advanced Safety Management Systems	August, 2024
Runway Incursion Awareness & Prevention	August, 2024
Airport Executive Leadership Program (AMPAP Elective)	September, 2024
GSN6: Aerodrome Auditing and Compliance	October, 2024
Aeronautical Studies and Risk Analysis	October, 2024
Airport Commercial Marketing	October, 2024
Developing a Customer Culture in Airports (AMPAP Elective)	December, 2024
Airport Communications and Public Relations in Airports (AMPAP Elective)	December, 2024

ACI-ICAO Professional Accreditation Program (Classroom)

AMPAP: Global Air Mobility Systems 13 - 17 May, 2024

ICAO (Classroom)

TIC 1 (Virtual)	March, 2024
Apron Markings Management	May, 2024
Training Instructors Course (TIC) 2	June, 2024
International Air Law (Virtual)	September, 2024
ICAO Annex9 Facilitation	November, 2024
Safety Management for Practitioners	November, 2024

IATA (Classroom)

Transforming Customer Satisfaction Data into Actionable Insight	June, 2024
Aviation and Environment: Managing Green Airports	July, 2024
A-CDM in Airport and Ground Operations	July, 2024
Change Management	July - August, 2024
Developing an Effective Safety Culture	August, 2024
Aviation Policy and Advocacy	September, 2024
Human Factors in Ground Operations	September, 2024
Management of Aviation Facilitation	September - October, 2024
Aviation Law for Managers (Non-Lawyers)	October, 2024
Passenger Processing Design and Implementation	November, 2024
Airport Extreme Weather Operations and Planning	December, 2024

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