

Enhancing innovation in aviation

(Presented by ERA)

Introduction

The European Regions Airline Association (ERA) is a trade body that represents over 55 airlines, and over 170 associate members, including manufacturers, airports, suppliers and aviation service providers across the entire spectrum of the aviation industry.

Our members' commitment to providing essential connectivity, bridging gaps between regions and providing air services to destinations that might otherwise be underserved or inaccessible, ensures that European citizens and goods can travel efficiently, safely and sustainably. They contribute significantly to local economies by facilitating tourism, business travel and trade, stimulating growth and creating jobs and are a key enabler to fostering regional economic development.

Our sector's commitment to sustainability will see it be the first to adopt new propulsion technologies which are expected to provide up to one third of the decarbonisation required to reach net zero as laid out by the industry's Destination 2050 roadmap.

Alongside these new propulsion technologies, we are entering a new technological age, with the deployment of disruptive digital technologies and services, underpinned by the likes of Artificial Intelligence (AI) and Large Language Models (LLM), which will become more prevalent and will soon touch on all areas of the industry whether that be operational, commercial or from a safety perspective.

Against that backdrop, ERA is delighted to be given the opportunity to provide the Hermes Air Transport Organisation with our views on enhancing innovation in aviation. This short paper will address the following areas:

- new propulsion technologies;
- AI and LLM;
- cybersecurity;
- Urban and Regional Air Mobility (UAM/RAM);
- development strategies;
- funding mechanisms; and
- pathways to implementation.

New propulsion technologies

As noted above, the regional sector will be the first to deploy electric, hybrid and hydrogen-powered aircraft, with commercial roadmaps and studies clearly demonstrating that zero-emission technologies will be implemented first in smaller regional aircraft.

Reflecting this, ERA's manufacturer members have grown substantially over the last two years, with ten 'new entrant' OEMs now among our membership. AURA AERO, Heart Aerospace and ZeroAvia were elected to the ERA board, helping to shape the strategic direction of the association.

These new entrants into the OEM arena will complement the legacy of regional manufacturers by delivering new aircraft that will substantially reduce emissions, deliver lower operating costs and quieter operations, and play a vital part in delivering ERA's commitment to net zero as laid out in the Destination 2050 initiative.

Improvements in aircraft and engine technology will reduce CO₂ emissions by 37 per cent in 2050, and as traffic fully recovers from the impact of COVID-19, the share of upcoming aircraft is expected to increase.

The different propulsion technologies can be summarised as follows:

- Hybrid-electric turboprop aircraft combining kerosene or Sustainable Aviation Fuel (SAF) with energy storage in batteries, for example the ATR EVO, are expected to enter service in 2035 and aim to reduce CO₂ emissions by 50 per cent compared to 2020 (without SAF benefits).
- Hybrid-electric aircraft using electric propulsion, such as those designed by Heart Aerospace, AURA AERO and Maeve Aerospace, estimate reducing CO₂ emissions by 99 per cent compared to upcoming aircraft and will enter into service from 2030.
- Hydrogen fuel cell powerplants for regional aircraft, for example as produced by ZeroAvia and Universal Hydrogen, will see CO₂ emissions reduced by 100 per cent with an energy efficiency improvement of 30 per cent compared to the average fleet in the regional class in 2030, with initial entry into service expected from 2026.

Over the next decade, these innovative technologies will enter service, providing regional aviation with a platform to become the first market sector to meet net zero emission targets, however significant investment in infrastructure will be required, particularly at airports where clean energy demands and hydrogen liquefaction facilities are needed.

AI and LLM

AI's influence on regional aviation is evolving quickly. Digital tools and platforms can significantly enhance operational efficiency and customer experience. Implementing AI-driven analytics, cloud computing and Internet of Things (IoT) technologies can optimise flight operations, maintenance schedules and passenger services with digital transformation facilitating data-driven decision making and real-time monitoring.

- AI and LLM algorithms analyse vast amounts of data, including weather patterns, air traffic and historical flight data and can recommend the most efficient routes both for the airspace user, but also for Air Navigation Service Providers (ANSP). This can deliver fuel management and environmental benefits for the airline and capacity improvements for the ANSP.
- AI-driven predictive maintenance systems can monitor aircraft health in real time. By analysing data from sensors embedded in various aircraft components, AI can predict potential failures before they occur. This proactive approach reduces downtime, enhances safety and lowers maintenance costs.
- AI-powered chatbots and virtual assistants improve customer service by providing instant responses to enquiries, managing bookings and offering personalised travel recommendations. AI can also analyse customer feedback and preferences to tailor services and improve satisfaction.

The sheer speed of AI development means that regulation has had to catch up quickly. The EU AI Act, passed in March this year, has adopted a risk-based approach, one that is generally supported by ERA. However, with regional aviation reliant on a global supply chain which will also be impacted by the deployment of AI, there are already concerns that potential different regulatory approaches by states outside the EU will lead to significant complexity in the management of information security risks.

Cybersecurity

With innovation brings new and additional risks that must be managed and mitigated, and the aviation sector is no different. The sector faces a constant barrage of cyberattacks on a regular basis, with all actors increasingly becoming targets for threats like Distributed Denial of Service (DDoS) attacks and ransomware. These attacks not only put pressure on organisations but also pose risks to safety.

As the European regulator for aviation safety, the European Union Aviation Safety Agency (EASA) has developed the Part IS regulation to address information management security threats and vulnerabilities faced by aviation organisations. It requires aviation organisations in Europe to identify and manage information security risks and the data used for civil aviation purposes. It requires affected stakeholders to detect information security events, classify them accordingly, and respond to, and recover from, incidents based on their impact on aviation safety.

Developing effective regulation is of course challenging due to this constantly changing landscape, therefore it essential to create rules that can adapt to different types of organisations and emerging threats and that are flexible and adaptable to meet the diverse needs of aviation, allowing organisations to tailor their approaches.

Whilst the Part IS provides a proactive and flexible approach, allowing organisations to manage information security risks effectively while maintaining aviation safety, ERA along with other aviation associations has highlighted to the European Commission (EC) that harmonisation of different cybersecurity workstreams in the EU is required to avoid duplication and creating additional complexity in an already complex environment.

We therefore support the subsequent work being carried out by an EC-led aviation security expert subgroup tasked with mitigating any duplication, conflict of requirements and ensuring alignment of requirements.

EUROCONTROL, through the work of the European Air Traffic Management Computer Emergency Response Team (EATM-CERT), helps stakeholders protect against cyber threats, and their efforts are also supported by ERA.

ERA considers cybersecurity a priority safety topic, with the subject being a standing agenda item for our Operations and Air Safety Groups. ERA will hold a separate workshop on cybersecurity and AI at our upcoming General Assembly in Seville in October.

Urban and Regional Air Mobility

When we consider innovative technologies, Urban (UAM) and Regional Air Mobility (RAM) have been at the forefront of recent research and development activities.

Electric vertical take-off and landing (eVTOL) aircraft, represent a significant leap in aviation design and propulsion systems. These technologies can reduce local noise pollution and emissions and provide greater flexibility in terms of landing and take-off sites.

Like the deployment of new propulsion technology, implementing UAM and RAM requires new

infrastructure, as well as integration into the current airspace including the development of vertiports and deployment of new and advanced air traffic management systems.

The rise of UAM and RAM has significant implications for regional airlines. With companies exploring on-demand air taxi services, which can potentially offer faster, more efficient travel options in congested urban areas, these new models create opportunities for investment and partnerships, further stimulating economic activity and innovation within the aviation sector.

Regional airlines are likely to face increased competition from UAM services, particularly for ultra short-haul routes. As air taxis and eVTOL aircraft become more prevalent, they could capture a share of the market traditionally served by regional airlines. It is therefore likely that this competition will compel some regional airlines to innovate and enhance their service offerings, raising the possibility of strategic partnerships with UAM and RAM operators.

It is foreseen that UAM and RAM could serve as feeders to regional airline hubs, improving connectivity and reducing travel times for passengers. Therefore, through integrating UAM services, regional airlines could offer seamless, multimodal travel experiences, enhancing overall passenger 'door to door' experience and potentially increasing demand for regional services.

Development strategies

Collaboration is essential if we are to unleash the potential of these new innovative technologies with further government support, closer industry collaboration and additional investment in research, development and deployment.

Governments should create favourable policies and provide funding for research and development in aviation. Grants, tax incentives and public-private partnerships (PPP) can all encourage innovation development.

The SESAR Joint Undertaking is a good example of a PPP that plays a pivotal role in modernising European air traffic management through technological innovation and a collaborative approach. With several projects addressing AI, UAM, trajectory-based operations, non-CO₂ effects and mitigations, to name a few, the innovations driven by SESAR can help regional airlines better navigate the complexities of European airspace, improve their service offerings and contribute to a more efficient and sustainable aviation industry.

In the context of new propulsion technologies, stronger strategic governance at EU level is needed to support key industry roadmaps to achieve net zero. The EU has currently two alliances dealing with aviation sustainability, led by two different EC Director Generals. The first covers Net Zero Emission Aircraft (AZE) and the second, known as the Renewable and Low-Carbon Fuels Value Chain Industrial Alliance (RLCF), covers SAF. Both state the need for a pipeline of projects and matchmaking between actors and investors. However, they are not equal in their achievements, do not benefit from the same level of resources, nor do they share their best practices.

However, the scope of these alliances is important to bring together all sides of sustainability. The current Commissioner for Climate Action has called for an aviation pact, involving services of the EC and industry representatives, to enable the necessary policies to fulfil industry commitments. ERA supports this call and would urge for the next mandate to set up such a governance framework.

Regulatory safety bodies need to adapt quickly to the evolving technological landscape to ensure safety standards are maintained. It is important that both industry and regulators are in close collaboration with each other. Innovation development means that the sharing of knowledge and resources will be vital with industry supporting the regulators to help establish standards and best practices.

Innovation also requires a platform for investing in education and training programs. With a skills shortage existing in the aviation sector today and to prepare the workforce for the aviation world of tomorrow, universities and training institutes will need to offer specialised programmes in these disruptive technologies.

By supporting innovation development through funding, collaboration and education, the aviation industry will be able to harness the full potential of these technologies ensuring a safer, more efficient, sustainable and customer-centric future for regional aviation.

Funding mechanisms

At a holistic level, the European Union offers several funding programmes aimed at fostering innovation in the aviation sector. Programmes like Horizon Europe, the EU's key funding programme for research and innovation, provide substantial grants to projects that advance sustainable and competitive aviation technologies. Additionally, the European Green Deal, which aims to make Europe climate neutral by 2050, offers funding opportunities for green innovations in aviation.

As previously noted, PPP, venture capital and private equity all have a role to play, especially in startups and companies developing disruptive technologies demonstrating the potential for significant returns on investment through innovative business models, technologies or services.

Traditional bank loans and financial instruments, such as bonds, remain viable options for funding innovation. Financial institutions may offer favourable terms to airlines with robust business plans focused on innovation and sustainability. Additionally, the European Investment Bank (EIB) should engage more closely with the aviation sector and provide loans and guarantees for projects that align with EU aviation sustainability policy objectives.

National governments across Europe should provide subsidies and tax incentives to encourage innovation in the aviation sector. This financial support should reduce the risk associated with investing in new technologies and promote sustainable practices.

Looking more closely at new propulsion technology, innovation in electric and hybrid aircraft presents a significant opportunity for regional airlines to reduce operating costs and emissions with various EU funds currently available for new aircraft manufacturers or SAF producers to scale up, like the EIC Accelerator or the Innovation Fund. However, there is concern that they do not always have the right scope and the application process is very complex. More importantly, they do not always combine strategically with national funding opportunities to create the maximum effect for beneficiaries. In the private sector, investing in aviation technology today is unclear and many actors are reluctant to invest in the right place. For example, investments in eVTOLs are approximately seven times higher than in SAFs, yet still not a single eVTOL has been fully certified. More involvement of actors like the EIB is needed and ERA would support setting up an

order-backing system and an investor guide to give more certainty and confidence to private investors.

Pathways to implementation

With regards to new aircraft technologies, we must provide a way of preparing the ecosystem for regional aircraft, including new technologies and best-in-class aircraft. The Public Service Obligation (PSO) scheme is a very strong incentive towards new aircraft and needs to be strengthened as well as being continuously improved by the industry, Member States and the EC working together.

Associated with such a scheme, a revision of the Alternative Fuels Infrastructure Regulation (AFIR), dating from 2017, is needed to cover infrastructure deployment for electric charging stations adapted to high-voltage aircraft, such as hybrids or battery–electric propulsion.

Airport and en-route charges must be adapted to support potentially heavier but cleaner aircraft, where cleaner aircraft will always be more economically viable than current aircraft.

At the same time, SAFs need to fit within regional airlines' transition plans together with fleet renewal, therefore adequate supporting systems such as a Book and Claim are required.

More generally, we believe that collaboration with technology providers, research institutions and other airlines is crucial for successful innovation. Partnerships can provide access to technologies, shared expertise and funding opportunities. Participating in consortiums like the SESAR Joint Undertaking can help regional airlines stay at the forefront of air traffic management innovations.

Implementing pilot programmes allows stakeholders to test new technologies and processes on a smaller scale before full deployment. Prototyping helps identify potential issues and refine innovations to better meet operational needs. Successful pilots can provide proof of concept and justify further investments.

Once pilot programmes demonstrate viability, upscaling and integrating these innovations into operations is the final step to implementation. Once again, access to funding is vital through grants, venture capital, PPP and government subsidies.

Adopting sustainable practices not only addresses regulatory and environmental pressures but also attracts environmentally conscious passengers. Investments in SAFs, electric and hybrid aircraft and carbon offset programmes are key levers for enhancing sustainability. This can also open potential new funding opportunities from green investment funds.

Conclusion

Enhancing innovation in European regional aviation requires a holistic approach. By embracing short and long-term innovations, fostering collaboration, securing funding and implementing strategies effectively, Europe can lead the way toward cleaner, more efficient and connected skies.

It requires a strategic and well-co-ordinated approach that involves setting clear goals, fostering

collaborations and testing new ideas through pilot programmes. By leveraging funding instruments, investing in R&D, engaging with regulators and developing talent, the regional sector can take advantage of these emerging technologies.

Utilising digital transformation, customer-centric innovations and advanced air traffic management will further drive efficiency, competitiveness and sustainability, helping regional airlines adapt to the new operating landscape and thrive in the future.

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