

Abstract

Towards a European Research and Innovation Roadmap for Innovative Air Mobility: An EREA Future Sky Perspective

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Abstract

Innovative Air Mobility (IAM) is entering a critical phase of development. While significant progress has been achieved in aircraft technologies, automation, electrification, connectivity, and U-space implementation, the long-term deployment of IAM in Europe remains challenged by questions related to economic viability, societal value, infrastructure readiness, operational scalability, and regulatory proportionality. At the same time, a growing body of evidence suggests that the most promising applications of IAM may extend well beyond the originally envisioned urban air taxi concept, encompassing public-interest services, regional accessibility, infrastructure monitoring, emergency response, environmental observation, and integration with emerging smart-city ecosystems.

To address these challenges and opportunities, the Association of European Research Establishments in Aeronautics (EREA) is currently updating the Innovative Air Mobility (IAM) Theme of the Future Sky Joint Research Initiative. As part of this activity, a new European IAM research and innovation roadmap is being developed to define long-term research priorities and implementation pathways towards 2050. The roadmap aims to provide strategic guidance for research organisations, industry, regulators, public authorities, European partnerships and future framework programmes.

The proposed roadmap adopts a system-oriented perspective and deliberately focuses on IAM operations, services, ecosystems and governance rather than on individual vehicle technologies. This approach reflects the increasing maturity of dedicated technology-focused initiatives in areas such as propulsion, energy systems, autonomy, cybersecurity and aviation safety, while addressing research gaps associated with the

deployment of IAM as a real-world socio-technical system. The roadmap builds upon previous EREA Future Sky work, European Commission initiatives, Drone Strategy 2.0, SESAR developments, the IAM Hub activities, and recent research addressing the integration of unmanned and highly automated aerial systems into urban and regional environments.

Three strategic thematic priorities are proposed.

The first priority focuses on sustainable and value-driven IAM operations. It addresses the identification of economically viable and societally beneficial applications, development of scalable business models, and creation of value through multifunctional operations. Particular attention is given to the potential of aerial systems to generate and exploit operational data supporting monitoring, infrastructure management, environmental assessment and public services, including first responder, medical and disaster response.

The second priority addresses the development of an optimised operational ecosystem. This includes airspace integration, vertiport and ground infrastructure, fleet and mission management, digital integration with urban systems, interaction with Connected, Cooperative and Automated Mobility (CCAM), multimodal transport solutions – Intelligent Transport Systems (ITS), crisis-management systems and other elements of the emerging smart-city environment.

The third priority focuses on proportional and enabling safety and regulatory frameworks. Research areas include operational safety assurance, validation methodologies including Living labs, experimental test sites, advanced simulation capabilities (e.g. provided by EREA members) as enablers of intelligent, safe and secure, governance mechanisms, adaptive regulatory approaches and the development of evidence-based frameworks capable of supporting innovation while maintaining the high safety standards required by European aviation.

A set of milestones extending to 2050 is proposed for each research area. Together they describe a transition from isolated pilot projects towards scalable, multi-purpose and integrated IAM ecosystems capable of generating measurable economic, societal and environmental benefits. The roadmap assumes that successful IAM deployment will depend not only on technological progress but also on the ability to create sustainable operational concepts, establish viable market models, achieve social acceptance and integrate aerial services with broader urban and regional systems.

The paper presents the rationale, development methodology and current structure of the roadmap. It also discusses the lessons learned from stakeholder consultations and highlights emerging trends that may influence future IAM development, including digital twins, data-driven services, smart-city integration, aging societies, territorial cohesion, and public-value-oriented applications. The authors argue that a holistic, ecosystem-based approach is essential to maximise the contribution of IAM to Europe's future mobility landscape.

The roadmap is intended to serve as a living strategic instrument supporting future research agendas and facilitating collaboration among research organisations, industry, regulators and public authorities within the European IAM ecosystem.

References

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Biography

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