Strategic cooperation plan on Net-Zero Aviation between Piemonte Region and Clean Aviation JU

- related to the Memorandum of Cooperation signed on 28th November 2023 by Piemonte Region and the Clean Aviation JU

Updated in February 2025[1]

1. Context

The Clean Aviation Joint Undertaking (CAJU) is the European Union's (EU) leading research and innovation programme for transforming aviation towards a sustainable and climate-neutral future, in line with the European Green Deal. It is a European public-private partnership between the European Commission through Horizon Europe (HE), the EU research and innovation programme, and the European aeronautics industry. It has a budget of €4.1 billion divided into €1.7 billion in EU funding and no less than €2.4 billion in private funding. The Clean Aviation's disruptive technologies will help reduce the greenhouse gas emission footprint of Short-Medium Range (SMR) and Regional (REG) aircraft by no less than 30% compared to 2020 state-of-the-art aircraft. The technological and industrial readiness of the Clean Aviation technologies will support the entry into service of new product by 2035, with the aim of replacing 75 % of the global civil aviation fleet by 2050. Clean Aviation programme (2022-2031) builds on the knowledge and expertise of the Clean Sky programmes (2008-2024).

Piemonte Region, which is the base of world leading industrial and academic players in aeronautics, is a strategic European region pioneering research for clean technologies and the design, development and production of a new generation of green aircraft. With an ambitious Operational Programme 2022-2027, Piemonte Region will contribute to accelerate the transition towards an air-transport system with zero emissions by 2050. This is well reflected in the Region's Smart Specialization Strategy (RIS), where aeronautics is identified a strategic area for the regional development, with objectives/priorities that are well aligned to the CAJU objectives. The RIS builds on research and innovation as key elements to succeed in the decarbonisation and reindustrialisation of the aviation sector at regional level. In addition, to meet the challenges of climate change and inclusive economic growth, based on sustainable competitiveness, Piemonte Region supports the European Union's initiative about sustainable aviation. The Piemonte Region is supporting the project "Città dell'Aerospazio", a centre of excellence located in Turin where industry, university, small and medium enterprises and start-up will gather to create an ecosystem focused on innovation and sustainability, and equipped to address the challenges of the aviation sector, with the ambition to become a driving force for international industrial competitiveness. Città dell'Aerospazio will rely on IS4Aerospace (IS4A) Laboratories, National Recovery and Resilience Plan (NRRP) funded, that will provide high level technology development services to the ecosystem. The IS4A Labs will enable several and differentiated innovation activities including Digital Twin, AI, HPC and representative demonstrations by Ground and Flying labs.

[1] This document has been updated to align it to the revision of the Clean Aviation Joint Undertaking's Strategic Research and Innovation Agenda issued in September 2024.

2. Challenge

The goal of transforming air transport towards climate neutrality is a long-term ambition. To meet this challenge, it is essential to pull together the best expertise and resources from beyond the aviation ecosystem and include world-class research and innovation from other strategic sectors, such as hydrogen, batteries and digital. However, achieving a climate-neutral aviation system is well beyond the private sector's ability and capacity to invest on its one. The aviation sector currently estimates that at least €12 bn in research and innovation would be needed over the timeframe of HE. No single country in Europe has the financial, technological and industrial capacity to fully support the required transition.

Efforts should be made at Union, Member State and Regional level by sharing roadmaps and managing synergies utilising a wide array of funding and financing sources from regional, national authorities and the European Union's Multiannual Financial Framework.[2]

3. Purpose and scope

The purpose of the present note is to lay out the strategic areas of cooperation between Piemonte Region and the CAJU in the implementation of the jointly signed Memorandum of Cooperation in order to establish and maximise synergies between the Parties. In particular, this note presents the high-level/strategic objective of the cooperation, areas of technical cooperation, expected impacts of the cooperation, and funding made available from both parties.

4. High level objective of the cooperation

The objective of this cooperation is to accelerate the demonstration of low-emissions aircraft technologies and concepts, so that these innovations are part of new aircraft concepts with entry-into-service [EIS] by 2035.

5. Areas of cooperation

The CAJU's *Strategic Research and Innovation Agenda* (SRIA) sets out the path towards achieving the overall Clean Aviation vision, in terms of timeframe and scale of impact, focusing on three *thrusts:*

i) hybrid-electric regional aircraft,
ii) ultra-efficient SMR aircraft
iii) hydrogen-powered aircraft.

Focus is placed on the regional and SMR segments targeting increased efficiency in commercial aviation by no less than 30%, as they account for more than 50% of global aviation greenhouse gas emissions. The first phase (2022-2026) of the Clean Aviation programme focuses on development of concepts, technologies and architecture options. The second phase (2026-2031) will address the maturation and integration of these technologies and concepts through (flight) demonstration.

The Smart Specialization Strategy of Piemonte Region has strong focus on aeronautic R&I on low-emission technologies for general and commercial aviation, including regional and SMS segments. Thematic areas are

[2] COMMISSION NOTICE Synergies between Horizon Europe and ERDF programmes https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022XC1104(02)&from=EN

addressed, i.e. ultra-efficient powertrain systems with zero/very low emissions, advanced materials, smart mobility and manufacturing, and security.
In addition, the RIS3 of Piemonte Region builds on other strategic pillars that are expected to play a key role in supporting the transformation of aviation towards a sustainable and climate-neutral future. In particular, the pillars "Mobility" and "Advanced Manufacturing", where Piemonte Region for example plans to invest on fuel cells, hydrogen production and storage, biofuels, green airports, eco-friendly materials, recyclable materials, additive manufacturing, digital twin and digital technologies through all Aircraft Life Cycle, from concepting to production, customer service and pilot training.
In line with the high-level common objective, CAJU and Piemonte Region may cooperate and develop synergies on the following technical areas.

5.1. Technical Areas

Intersecting synergies, i.e. areas of intervention by both parties:

- Hybrid-electric regional aircraft with 30% increased efficiency compared to 2020 state-of-the-art aircraft available for order/delivery
    - Aircraft architecture
    - Airframe systems (e.g., wing, fuselage, empennage)
    - Thermal management
    - Electrical distribution
    - Energy generation and management
    - Batteries and fuel cells suitable for aviation application
    - Multi-MW hybrid-electric propulsion system based on fuel cells and/or battery, including system integration, sub-systems, modules and components
    - Ground and flight demonstration and testing

- Ultra-efficient SMR aircraft with 30% increased efficiency compared to 2020 state-of-the-art aircraft available for order/delivery
    - Aircraft architecture
    - Light weight airframe systems (e.g. wing, fuselage, empennage)
    - Ultra-efficient propulsion system able to use 100% SAF or H2 as fuel, including system integration, sub-systems, modules and components
    - Ground and flight demonstration and testing

- Hydrogen-based technologies enabling hydrogen-powered aircraft
    - Technology and demonstrators for multi-MW H2-fuel cell propulsion and aviation systems
    - Propulsion system based on H2 burn gas turbines, including system integration, sub-systems, modules and components (with ultra-low NOx hydrogen combustion)
    - Liquid-H2 storage and distribution onboard
    - On-board liquid-H2 refuelling system (with venting)
    - Ground and flight demonstration and testing

- Transversal areas

- Novel certification methods and means of compliance, including simulation systems
- Advanced materials (e.g. functionalized materials, metamaterials, nanomaterials, adv. coating) and additive manufacturing
- Digital technologies for simulation, integration, modelling, digital twin
- Artificial intelligence for Simulation (e.g. surrogated models) and Multidisciplinary Design Optimisation
- Digitalisation in the field of manufacturing, maintenance and certification
- Single pilot enabling technologies, such as Pilot Digital Assistant, Pilot Performance Monitoring, Flight & Mission Autonomy, also enabled by AI
- Advanced and adaptive Training for green Aircraft of the future
- Flight trajectories optimization and eco-flight assistance
- Life-cycle aspects
- Noise abating technologies compatibly with noise regulations foreseen at EIS 2035
- Health Management, Predictive Maintenance, Spare and Fleet Management
- Sustainable industrialization

The RIS3 of Piemonte Region also focuses on low-emission technologies. R&I on these technologies demonstrating "scale-up" opportunities onto regional and SMR segments could also be an area of cooperation.

Complementary synergies, i.e., areas of intervention by Piemonte Region (as such areas are not covered in the CAJU SRIA):

- infrastructure at airport:
  - ground-based refuelling (including protocols) and supply systems for liquid/gaseous H2 for regional/SMR aircraft
  - large liquid H2 storage
  - infrastructure for charging batteries
- development, production and use of green Hydrogen and Sustainable Aviation Fuels (SAF) in Piemonte Region.

6. Expected impact of the cooperation

The cooperation between Piemonte Region and CAJU is expected to maximize impact on the following areas:

- Increased number of demonstrated low-emissions aircraft technologies and concepts with EIS by 2035.
- Increased number of complementing stakeholders, competences, and capabilities (including newcomers to the field of aeronautics and in particular SMEs, start-ups and/or knowledge centres that can bring disruptive innovation) from the outset of CAJU and Piemonte Region funded projects contributing to the high-level common objective, as stated in section 4.
- Increased exposure of legal entities based in Piemonte Region to the Clean Aviation programme and increased contribution of these entities to the Clean Aviation objectives and EU Green Deal objectives.[3]
- Increased exposition of legal entities based in Piemonte Region to the European level of aviation R&I and leading players worldwide, including CAJU Members and beneficiaries.

[3] Through the financial tool "Contract Innovation", the Piemonte Region supports companies that need to carry out feasibility studies in order to assess the viability of a project before applying to CAJU's Calls for proposals

- Developed capabilities required for the future supply chain of the next generation of aircraft, and growth and increased competitiveness of the legal entities based in Piemonte Region.
- Increased number of jobs and availability of skills and competencies in the Piemonte Region relevant to support transition towards climate neutral aviation by 2050.

7. Funding and timeline

As mentioned in section 1, CAJU is jointly funded by the European Union (€1.7 billion) and private members (€2.4 billion), bringing the total budget to €4.1 billion for the period 2021-2027 (end of funding in 2031). Fundings are assigned to applicants according to the HE regulation through open and competitive calls for proposals. Since the programme started, CAJU has launched 20 projects[4] through its first call for proposal in 2022 and the second call for proposals[5] in 2023. Further calls for proposals will be launched during the course of the programme. In phase 1 of the CA Programme (2022-2026), the focus is placed on developing and down-selecting technologies with highest potential to reach TRL 6 by 2030. In phase 2 (2026-2031), the focus is placed on ensuring further maturation and demonstration of the selected technologies up to TRL 6, including aspects related to industrialisation to maximise potential entry into service by 2035.

The **Piemonte Region is mobilising** € 250 million **from the ERDF envelope** for innovation projects in sectors envisaged by the RIS as priority systems, such as aerospace, mobility, advanced manufacturing and green technology. It is envisaged that up to € 65 million may be demanded by the local aviation ecosystem to support innovation activities contributing to sustainable aviation. Moreover, during the 2021-27 period, the Piemonte Region may allocate additional funding to support the aviation sector coming from program others than ERDF.

As a first action of this plan, on 25 July 2023, the Piemonte Region has launched a call for proposal[6] named SWIch "Supporto alle attività di ricerca, sviluppo, innovazione e alle fasi di industrializzazione dei relativi risultati funzionali alla accelerazione della messa in produzione e/o commercializzazione", with a budget of € 80 million euro. The Piemonte Region is planning to allocate more funding through calls for proposals launched on a yearly basis with a comparable budget.

8. References

- Council Regulation establishing the CAJU, (EU) 2021/2085 of 19 November 2021. Official Journal: OJ L 427, 30.11.2021, p. 17–119. https://data.consilium.europa.eu/doc/document/ST-12156-2021-INIT/en/pdf.
- CAJU Strategic Research and Innovation Agenda (2024) https://clean-aviation.eu/sites/default/files/2024-09/2024-Clean-Aviation-SRIA.pdf
- COMMISSION NOTICE Synergies between Horizon Europe and ERDF programmes https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022XC1104(02)&from=EN
- La Strategia Di Specializzazione Intelligente Del Piemonte https://www.regione.piemonte.it/web/temi/sviluppo/sistema-ricerca-innovazione/strategia-specializzazione-intelligente-s3-2021-2027

[4] https://clean-aviation.eu/media/news/lift-off-for-daring-new-projects

[5] https://clean-aviation.eu/clean-aviation/participation/calls-for-proposals

[6] https://bandi.regione.piemonte.it/contributi-finanziamenti/bando-swich-sostegno-alle-attivita-rsi-alla-valorizzazione-economica-dellinnovazione

9. **Glossary**

CAJU : Clean Aviation Joint Undertaking
EIS : Entry-In-Service
EU : European Union
HE: Horizon EuropeNRRP : National Recovery and Resilience Plan
REG : Regional
RIS *:* Regional Innovation Strategy
SMEs : Small Medium Enterprises
SMR : Short-Medium RangeSRIA : Strategic Research and Innovation Agenda