

Scaling clean aviation: EU-Funded 'TRIATHLON' Project aims high with hydrogen propulsion and innovative storage solutions.

In a bid to boost aviation towards a sustainable future, TRIATHLON, a new Horizon Europe funded project, kick-started its ambitious journey in January 2024. Coordinated by Stichting Materials innovation institute (M2i) and Delft University of Technology (TU Delft), TRIATHLON unites a consortium of 8 partners from 6 countries. The collaboration includes universities, industrial designers, and technology suppliers, all pooling their expertise to pioneer disruptive approaches for robust, low-maintenance, low-emission, highly responsive hydrogen-electric powertrains for megawatt class aircraft.

At its core, TRIATHLON seeks to tackle the synergy between powertrain components to address the challenges of scaling up hydrogen propulsion technology. By adopting a versatile architecture similar to the ZEROe turboprop demonstrator, TRIATHLON aims to develop solutions applicable across various aircraft configurations. TRIATHLON will run for 4 years.

What is TRIATHLON about?

TRIATHLON envisions to develop disruptive approaches to design more robust, low-maintenance, low-emission, highly responsive hydrogen-electric powertrains for megawatt class aircraft.

However, the impact of TRIATHLON extends far beyond its consortium. Through its innovative technologies, TRIATHLON anticipates a host of transformative outcomes for the aviation industry:

Emissions Reduction: Implementing NOx reduction strategies and harnessing excess hydrogen for recompression.

Storage Solutions: Eliminating cryogenic pumps and enhancing fuel distribution with high-pressure storage buffers.

Energy Efficiency: Leveraging excess heat for hydrogen conditioning through state-of-the-art 3D printed heat exchangers.

Gravimetric Index Improvement: Enhancing powertrain efficiency and compactness through effective thermal management.

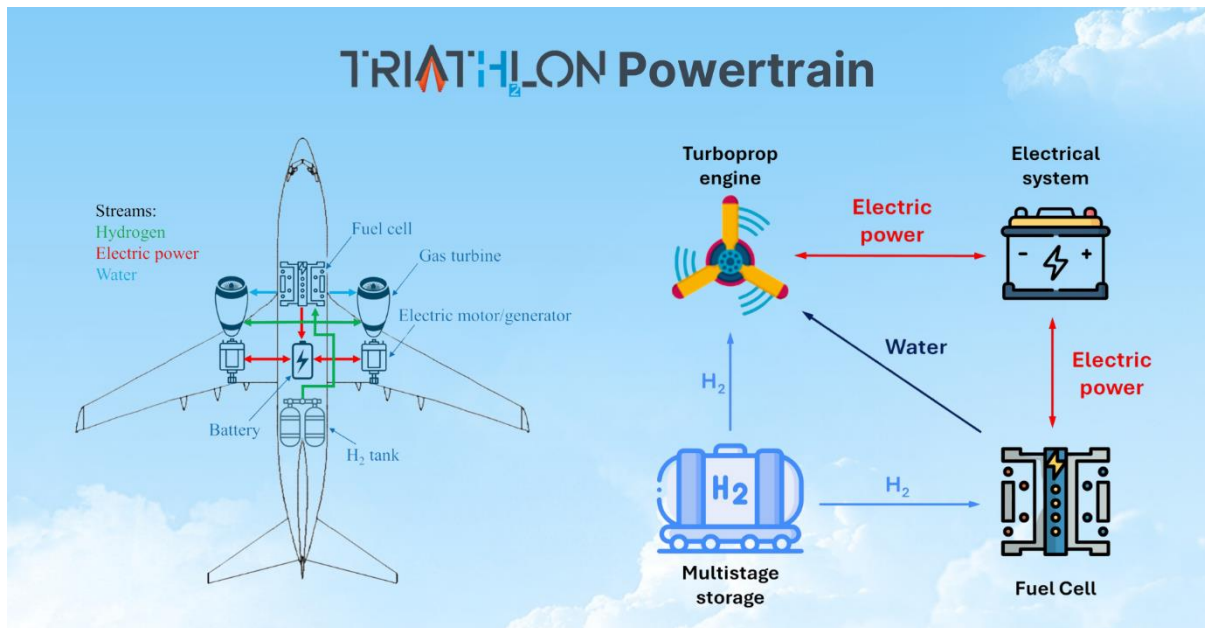
To meet its ambitions, TRIATHLON aims to achieve 4 specific objectives:

- Develop a hybrid power generation system that achieves high efficiency, power density, and ultra-low NOx emissions.
- Develop and investigate the feasibility of target-oriented storage solutions for higher gravimetric density and lower loss to atmosphere, increasing safety and reducing cost.



TRIATHLON

- Characterize interfacial heat and mass transfer of hydrogen phase change flow and define thermal management (TM) solutions based on structured minichannels.
- Assess technologies and pave draw a roadmap to increased Technology Readiness Levels (TRL).



TRIATHLON - who is behind it?

The consortium includes 8 partners from 6 EU countries: The Netherlands, Germany, Turkey, Austria, Italy and Czech Republic, bringing together the necessary disciplinary and interdisciplinary knowledge, expertise and capabilities for the execution of the project. 3 of the partners are knowledge institutes and 5 are SMEs.









- **Delft University of Technology, Sabanci University and Ergon**, consultancy company for heat transfer and combustion, will contribute with their expertise on heat transfer and combustion to advance the understanding of hydrogen powertrain for MW class aircraft.
- **Cryomotive**, hydrogen mobility SME, will perform 1D thermodynamic simulations.
- **Dresden University of Technology**, and in particular The Institute for Lightweight Engineering and Polymer Technology of the TUDD, will focus on lightweight storage solutions for cryo-compressed hydrogen.
- **Lithoz**, SME developing systems for ceramic materials, will prepare the photocurable ceramic suspension needed.
- **M2i**, a non-profit organization, was chosen to act as project coordinator and project manager to avoid conflicts of interest.
- **AMIRES**, a consulting and management company for research, development, and innovation projects, will be responsible for dissemination and communication.

The TRIATHLON team will benefit from the expertise and guidance of an external Advisory Board (AB), consisting of accomplished experts in their respective fields, such as: Safran, Pipistrel, H2Pulse, Avio Aero, GE Turkey.



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The Consortium:

Partner Name	Short name	Country
1. Stichting materials innovation institute	M2i	 Netherlands
2. Delft University of Technology	TUD	 Netherlands
3. Technische Universität Dresden	TUDD	 Germany
4. Ergon Research Srl	ERG	 Italy
5. Sabanci Universitesi	SAB	 Turkey
6. Cryomotive Gmbh	CRY	 Germany
7. Lithoz Gmbh	LIT	 Austria
8. AMIRES SRO	AMI	 Czech Republic

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