

PIPISTREL 

*beauty  
by design*





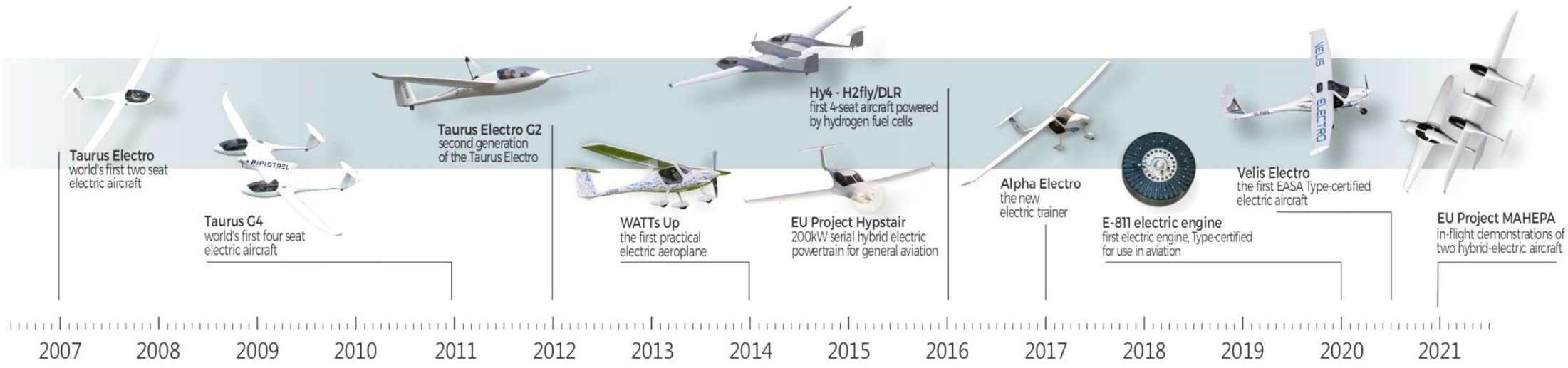
# *Pipistrel R&D activities towards the ambition of an innovative hydrogen-powered 19-seat aircraft concept*

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International Hydrogen Aviation Conference 2023, Edinburgh, Scotland

# R&D activities – Electric and hybrid-electric aircraft – Until 2021



# R&D activities – Hydrogen-powered aircraft – Until 2023



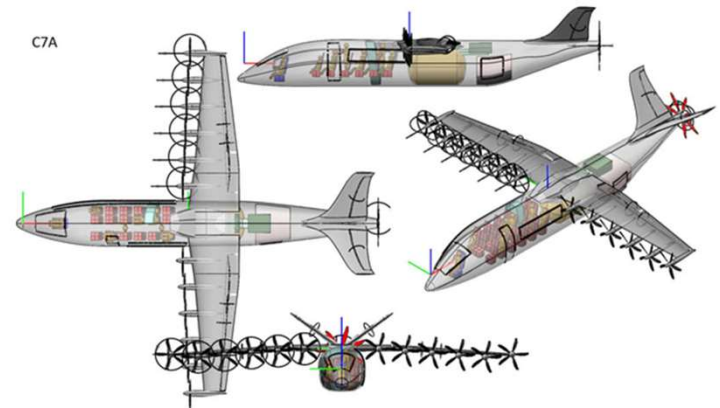
## Hy4



## MAHEPA



## UNIFIER19



## HEAVEN



F. Gaspari et al. Concept of Modular Architecture for Hybrid Electric Propulsion of Aircraft. Tech. rep. D1.1. MAHEPA Consortium, 2017. <https://mahepa.eu/2020/12/11/mahepa-announces-hydrogen-fuel-cell-driven-hy4-has-flown/>  
Erzen, D., Oliviero, F., & Trainelli, L. (2021). UNIFIER19: from TLAR to a Winner of a Concurrent Conceptual Design Competition. In 11th EASN International Conference. <https://www.unifier19.eu/>  
<https://heaven-fch-project.eu/>

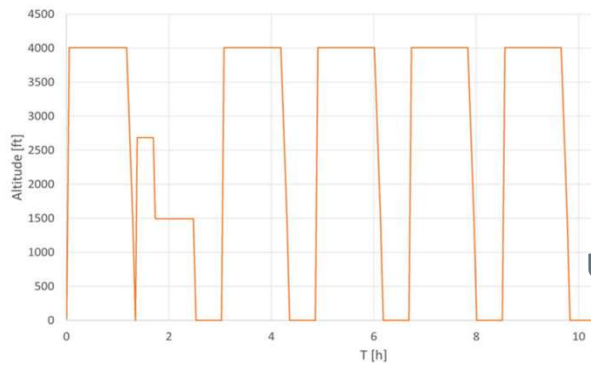
# UNIFIER19 (2019-2022)



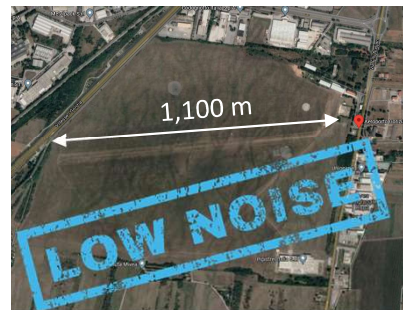
## Pipistrel Miniliner



3-5 hops with no refuelling (realistic operational logistics considering infrastructure limitations in 2030)

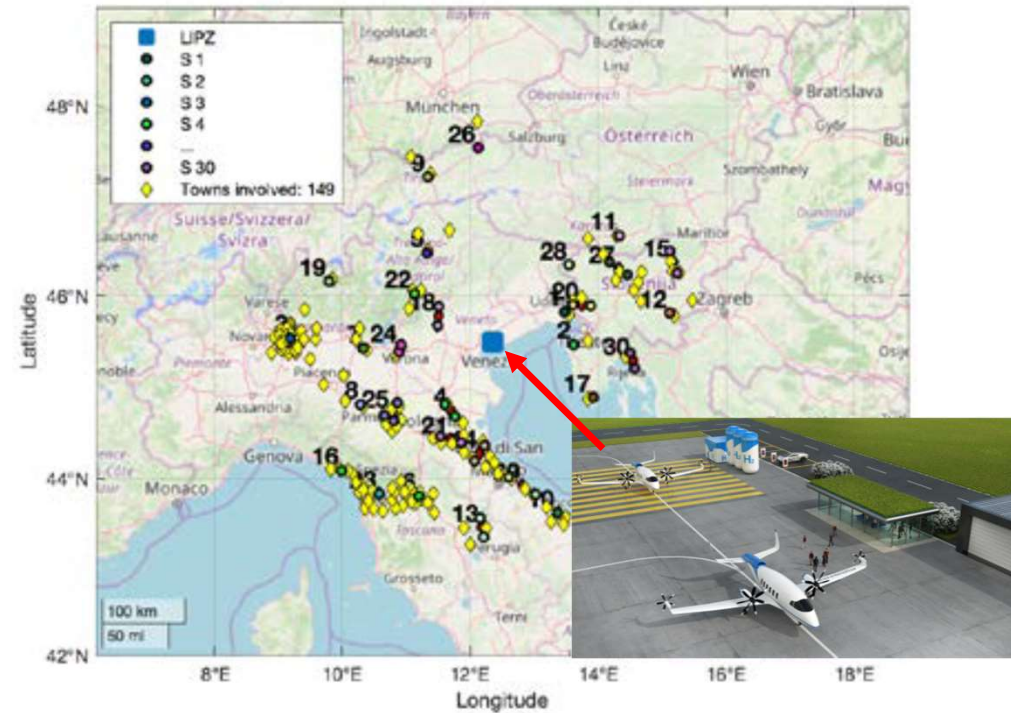


Aeroporto di Gorizia



Use of fuel cells, electric motors, and low-noise propellers

**Market study (UNIFIER19)**  
 Secondary airports that could be served by a microfeeder service to VCE.  
 800 m runway, 250 km range, 370 km/h cruise.



40,000 potential customers for VCE

# R&D activities – Clean Aviation Phase 1 (2023-2026)

## fLHYing tank



Disruptively de-risk the aeronautical application of relevant-scale liquid hydrogen tanks via the design, manufacturing, and flight-testing of a 1,000-liter vacuum-insulated composite liquid hydrogen tank in an unmanned cargo platform.

## H2ELIOS



Development and ground testing of innovative concept for liquid hydrogen storage tank for aircraft applications.

## NEWBORN



Development and ground testing of fuel cell system for aircraft applications.

## HyPoTraDe



Fast-track characterization of state-of-the-art fuel cell powertrain architectures in relevant operating conditions via components acquisition, assembly, and ground-testing of a set of 500-kW modular fuel cell-battery hybrid-electric DEP powertrain architectures, including liquid hydrogen fuel and cryo-enabled thermal management.

## CONCERTO



Certification of novel aircraft technologies.

## *R&D activities – Other EU projects on hydrogen-powered aircraft*



**TULIPS**



TULIPS accelerates the implementation of innovative and sustainable technologies to reduce emissions at airports.

**ALBATROS**



Advanced systems and solutions for better practices against hazards in the aviation system.

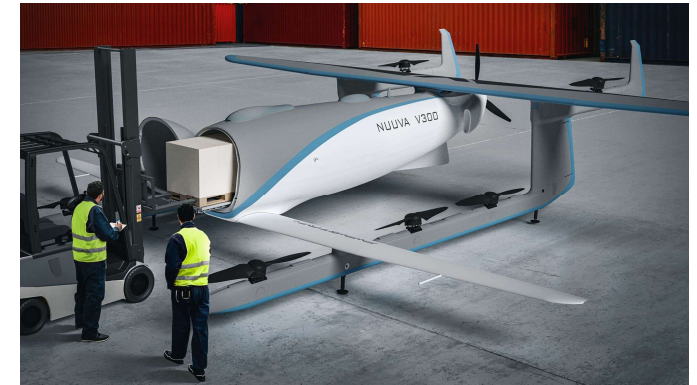
# fLHYing tank

flight demonstration of a Liquid HYdrogen load-bearing tank in an unmanned cargo platform

**Main objective:** Disruptively de-risk the aeronautical application of relevant-scale composite liquid hydrogen tanks via the design, manufacturing and flight-testing of the fLHYing tank in an unmanned cargo platform.

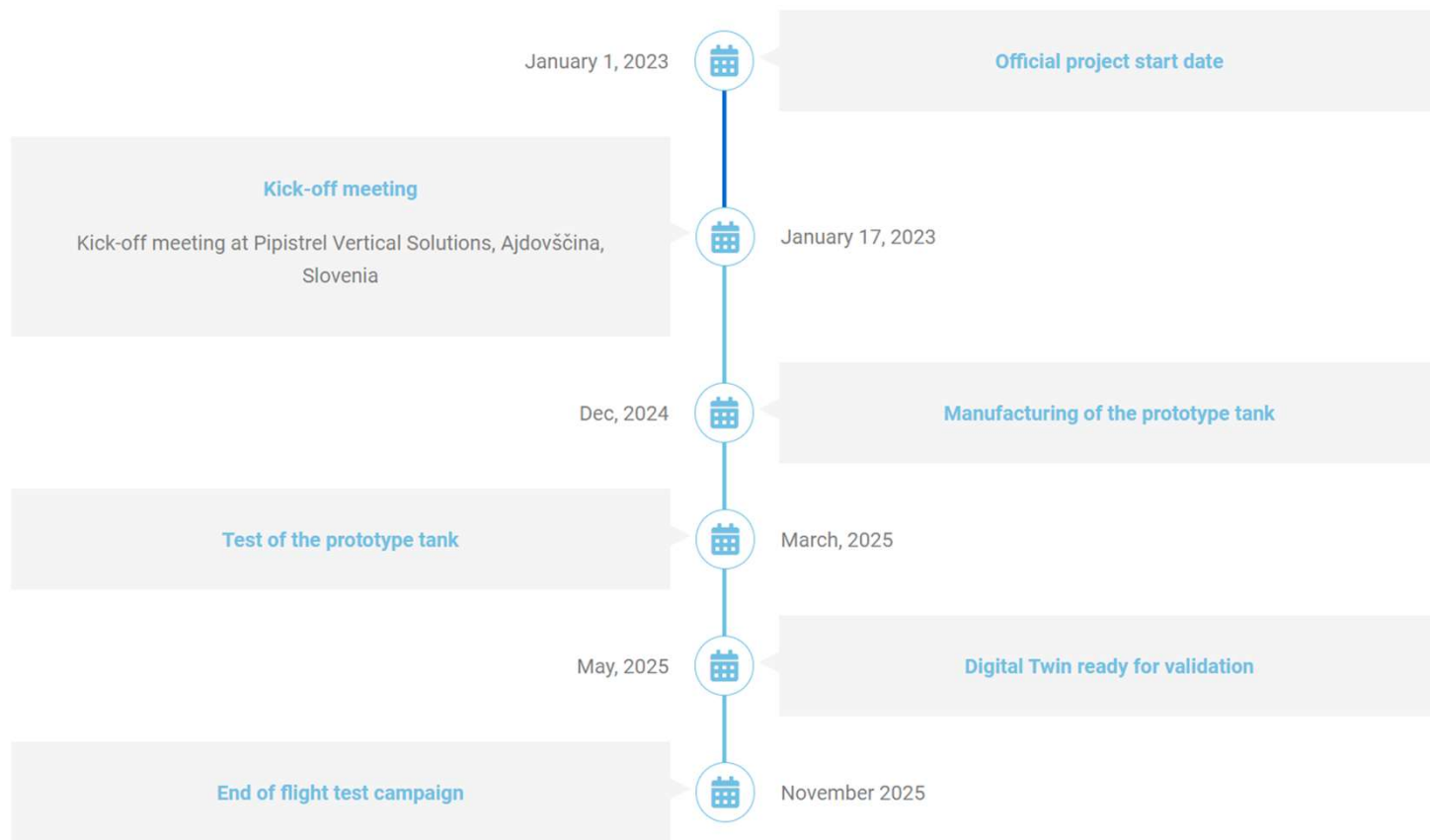
## Progress until August 2023:

- Definition of requirements.
- Preliminary definition of system architecture.
- Technical performance studies.
- Composite material screening campaign.



# fLHYing tank

flight demonstration of a Liquid HYdrogen load-bearing tank in an unmanned cargo platform





## *Concluding remarks*

- The Miniliner 19-seater concept developed in UNIFIER19 has shown market potential, based on preliminary market studies.
- EU R&D funding is crucial towards the de-risking and development of hydrogen powertrain building blocks.
- Pipistrel is coordinating and/or involved as partner in several EU-funded projects that aim to develop such building blocks, including liquid hydrogen storage and distribution systems, fuel cell systems, certification rules, and ground handling equipment and procedures.
- Within the fLHYing tank project, Pipistrel and the consortium aim to develop a groundbreaking digital twin of an aviation liquid hydrogen storage system, calibrated with flight test data. This effort will serve for the identification of design drivers of liquid hydrogen tanks based on the interaction of flight dynamics with LH<sub>2</sub> fluid dynamics.

# THANK YOU!

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 [www.flyingtank.eu](http://www.flyingtank.eu)

The logo for FLHYing tank, featuring stylized green and blue lines and leaves. The text "FLHYing tank" is displayed, with "FLHYing" in black and "tank" in black. A green circle containing "H<sub>2</sub>" is positioned above the "i" in "ing".

FLHYing  $\text{H}_2$  tank

Flight demonstration  
of a **Liquid HYdrogen**  
load-bearing **tank**  
in an unmanned  
cargo platform

# Acknowledgment



The project is supported by the Clean Aviation Joint Undertaking and its members. Clean Aviation is the EU's leading research and innovation program for transforming aviation towards a sustainable and climate neutral future. As a European public-private partnership, Clean Aviation pushes aeronautical science beyond the limits of imagination by creating new technologies that will significantly reduce aviation's impact on the planet, enabling future generations to enjoy the social and economic benefits of air travel far into the future. Visit the website to find out more about Clean Aviation: [www.clean-aviation.eu](http://www.clean-aviation.eu)



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