This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 723368.
MAHEPA starts first demo flights

Whether you are an engineer, a pilot, or simply an aviation enthusiast, we have some breaking news for you: after three years of research, development, integration, and testing of an array of components for two completely novel hybrid-electric aircraft propulsion systems, the visionary MAHEPA project is starting with its very first demo flights.

The year 2020 will go down in aviation history as the year of the first demonstration flights of two groundbreaking hybrid-electric aircraft, namely the much anticipated MAHEPA Panthera and the Hy4. The first of these aircraft is a hybrid-electric version of the conventional Pipistrel Panthera model, combining an electric drive with an internal combustion engine (i.e. ICE-hybrid). The second, a decisive step forward in the evolution of the award-winning Pipistrel Taurus G4, combines an electric drive with hydrogen fuel cells (i.e. FC-hybrid). The newly developed hybrid-electric powertrains will lead to much lower emission rates in aviation, and the hydrogen fuel-cell-powered Hy4 will even make the dream of zero-emission passenger flights a reality.

The demonstrator aircraft will validate key propulsion technologies, leading to zero-emission passenger aircraft in the near future.
The past year has been a time of great success, but also of extensive research, new designs, and development challenges. All efforts were worthwhile, as the successful testing of the ICE-hybrid and FC-hybrid drive systems marked milestones of incredible technological and performance progress.

With a motor capable of reaching an impressive 300 kW output power, both aircraft demonstrated a high level of technological capability. Proof of the aircraft’s technological prowess was accompanied by initial market analyses. These analyses highlighted several market potentials, where novel aircraft could be used to drastically reduce travel times, traffic congestion, and emissions. The segment of micro-feeder services from cities to major hub airports is just one of such potentially attractive markets. As the aviation industry is seeking ways to shift to more environmentally sustainable technologies, MAHEPA is delivering exceptionally valuable results for the construction and application of hybrid-electric propulsion technologies.

Flying small hybrid-electric aircraft establishes a wealth of fundamental knowledge and technologies to be scaled up in the future.

The coming years will surely see commercial air traffic transition to more environmentally friendly technologies, with expected significant contributions from the MAHEPA project.
HIGHLIGHTS OF THE PAST YEAR

The first flight of the two novel hybrid-electric aircraft takes the technology a giant leap closer to reality. The powertrains have been adapted to the special requirements of the MAHEPA Panthera and Hy4 aircraft. The project successfully completed pre-flight qualification tests and reached an important project milestone.

The results show this very lightweight electric drive unit can provide 300 kilowatts (kW), delivering efficient and low-noise propulsion. This achievement heralds a major advancement of electric powertrains for aviation.

Aircraft powered by this technology, whether with single or modular powertrain architecture, will enable cleaner, quieter and more sustainable air mobility. The existing air transport market will likely be affected with the development of new market segments resulting in shorter commuting times.

Because of its slim design the MAHEPA electric drive unit can be used in a distributed propulsion architecture and is ideally suited for use in future larger commuter-class, zero-emission, hybrid-electric mini-liners and micro-feeders.
A novel, powerful, and safe battery system has passed the final tests and is ready for integration into the Panthera’s wings. All issues with thermal runaway and cooling were resolved and the battery’s liquid cooling system surpassed all requirements and expectations.

An innovative cooling system immensely improved the battery’s cooling performance.

The new and unprecedent design of the battery system was the key to achieving a high level of safety. This may represent a very important milestone in the future of electric aviation.

The fuel-cell hybrid-electric power-generation system was significantly improved to make the Hy4 drive system more efficient and reliable. The fuel-cell system, with the Power Management, Control, and Delivery (PMCD) module, was integrated on board the Hy4 aircraft. The battery system’s physical properties were sized to optimally fit into the fuel-cell system’s framework.

The hydrogen fuel system is now completed and ready for ground testing. The system integrated into the Hy4 aircraft, capable of continuous power output of 52 kW and peak power of 120 kW, will be the most powerful fuel-cell system ever used to power a flying aircraft.
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The MAHEPA consortium has enjoyed a year full of events. The innovative project was presented at a range of conferences, trade fairs, and congresses worldwide. The MAHEPA project was presented at several international conferences and fairs using virtual and augmented reality showcasing the MAHEPA Panthera and its hybrid-electric propulsion system.

MAHEPA was presented and showcased at the 8th European Aeronautics Days in Bucharest, the More Electric Aircraft (MEA) conference in Toulouse, the 13th IEE PowerTech 2019 in Milan, the International Congress of Aeronautics in Rome (AIDAA), the MEA Seattle 2019, the European Transport Conference, the MEA Hamburg, the Cre@ctivity 2019, and the Aerospace Europe Conference 2020 in Bordeaux.
MAHEPA will be remembered as one of the most important starting points for the development of new technologies.

Lorenzo Trainnelli, Politecnico di Milano

We are paving the way towards the electrification of aviation.

Fabrizio Gaspari, Pipistrel Vertical Solutions d.o.o.

Emission free electric flight with hydrogen is feasible, and MAHEPA is a crucial project for the future.

Josef Kallo, H2Fly GmbH
MAHEPA starts first demo flights

UPCOMING PROJECT EVENTS

MAHEPA workshop: Certifiability and airworthiness aspects of hybrid-electric powertrain
EASA, Cologne, Germany | July 2nd - 3rd 2020

MAHEPA out-of-box seminar
ICTS, Portorož, Slovenia | September 17th - 18th 2020

MAHEPA Autumn School: Challenges in greener aviation: the hybrid-electric solution
TU Delft, Netherlands | November 9th - 13th 2020

MAHEPA workshop: Safety and HMI considerations in hybrid-electric aviation
AERO, Friedrichshafen, Germany | April 21st - 24th 2021

MAHEPA final conference: Deployment challenges of hybrid-electric aircraft and future research areas
AERO, Friedrichshafen, Germany | April 21st - 24th 2021
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