



# EXFAN

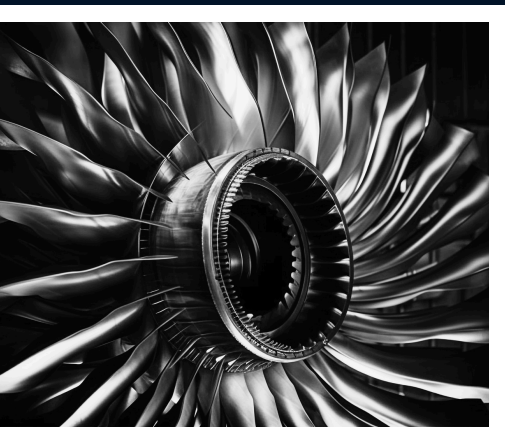
NOVEL RECUPERATION SYSTEM TO MAXIMIZE  
EXERGY FROM ANERGY FOR FUEL CELL POWERED  
GEARED ELECTRIC AIRCRAFT PROPULSION SYSTEM



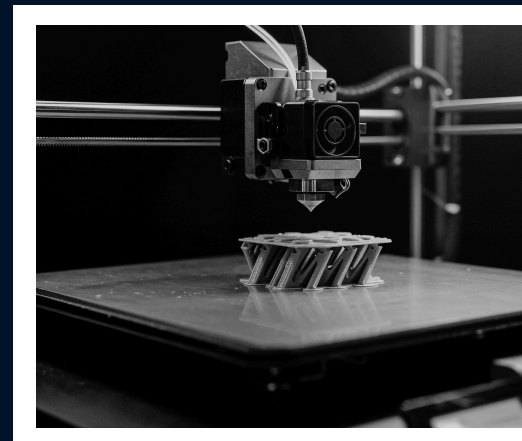
## Newsletter #2

September 2025

*18 Months of Innovation and Collaboration*



**"Harnessing Waste Heat  
for Aerodynamic  
Advantage"**



*Simplicity is  
Extraordinary*

Every watt matters. In aviation, every watt of electricity from a fuel cell means an equal watt of waste heat. The exFan project keeps things simple: it recovers that heat and turns it into thrust.

This is not just clever; it's practical.

A smart thermal-management system keeps heat under control.

Simulation models and lab tests ensure it works long before flight tests begin.

That's what happens when innovation meets clarity.

No gadgets. Just ideas, put to work.



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Principal Researcher

**cidetec** >  
surface engineering

## EDITORIAL NOTE

In the past six months, exFan has moved from concept to results.

WP4 closed with the delivery of the exFan concept, bringing together **simulations**, **thermal management**, and a **compact powertrain design**. WP5 is now underway, focused on airflow, fan design, and aerodynamic analysis. WP6 advanced our materials work: chemical polishing and NiP **coatings** have improved **corrosion resistance** and **durability** without affecting thermal conductivity.

Beyond the lab, we hosted **Vienna Aviation Days 2025**, which gathered industry, research, and policy players to discuss propulsion from “**tank to thrust**.” The event showed how projects like exFan and **ClimAvTech concept** can align efforts and move aviation closer to hydrogen-electric propulsion.

Step by step, the pieces are coming together.



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# EXFAN



## FROM IDEAS TO CONCEPT: DEFINING THE EXFAN ARCHITECTURE

### FEATURED STORY

## Bringing all components together into one concept

WP4 moved from ideas to a defined exFan concept. The concept brings together all major components: Thermal Management System (by ADT), Electric Machine (by EGI), Gearbox (by TUM), Fan (by DLR), Energy System (by PiD), and Heat Propulsor (by TUW, FHG).

### KEY OUTCOMES

#### Mechanical Powertrain

Concept delivered with main performance values such as shaft power, efficiency, mass, volume, and power density.

#### Energy System

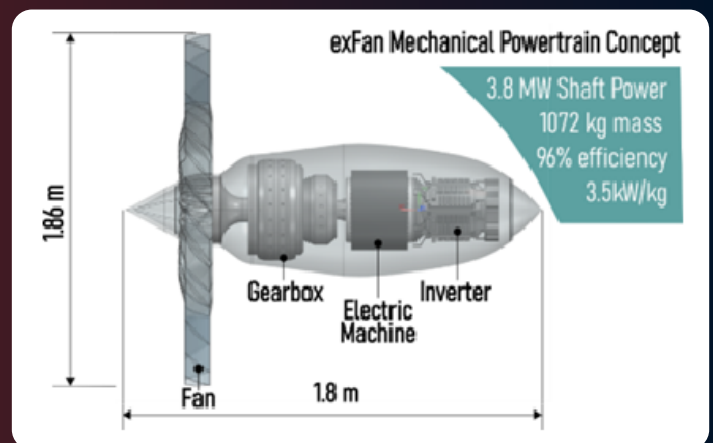
A fuel cell-battery concept that minimizes power losses using power-split, oxygen injection, and internal regeneration.

#### Life-Cycle Assessment

Reference cases defined (kerosene turbofan, H<sub>2</sub> turbofan, H<sub>2</sub> fuel cell electric fan, fuel cell propeller) to compare exFan against conventional and alternative technologies.

#### Heat Propulsor

Concepts for intake, fan stage, diffuser, heat exchanger, and nozzle investigated in 1-D simulations. Fan, diffuser, and heat exchanger identified as critical components for detailed design.



### CONTRIBUTION TO THE PROJECT

WP4 provided the component concepts, narrowing them down to the best-performing option. With WP4 complete, WP5 and WP6 now move into detailed design, while WP7 will integrate the final solution into the full exFan system.



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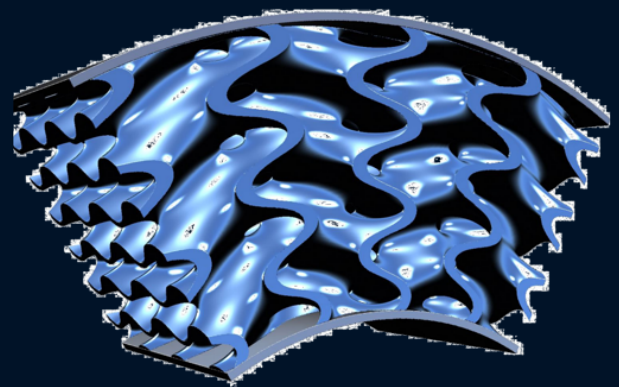


## FROM ROUGH TO REFINED: IMPROVING SURFACES FOR BETTER THERMAL PERFORMANCE

### FEATURED STORY

## Heat Propulsor: Heat Exchanger & Surface Design

WP6 has made big steps in designing and testing advanced heat exchanger surfaces for the exFan project. With more than 150 test samples produced, the team has moved from simple parts to complex geometries, showing how additive manufacturing can create lighter, more efficient components.



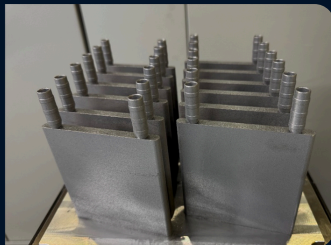
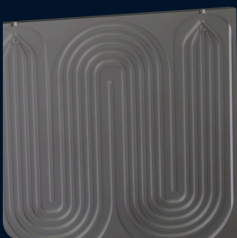
**155 samples built:** Moving from basic to complex heat exchanger geometries.

**Surface polishing:** Roughness reduced by nearly 50% ( $R_a$  11  $\mu m \rightarrow$  6  $\mu m$ ).

**NiP coatings:** Thicknesses 9–30  $\mu m$ , improved adhesion, corrosion, and erosion resistance.

**Long-term tests:** 135-day exposure confirmed strong corrosion protection.

**Innovative designs:** TPMS-inspired geometries with novel tunnel shapes for better airflow.



### WHAT'S NEXT?

The next steps include finalizing surface finishing methods, fabricating 17 test heat exchanger articles, and benchmarking exFan's novel TPMS geometries against conventional designs.



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## VIENNA AVIATION DAYS 2025: CONNECTING RESEARCH, INDUSTRY, AND POLICY

### MAJOR HIGHLIGHT

## Vienna Aviation Days 2025

On 7-8 July 2025, exFan organized Vienna Aviation Days 2025 (VAD2025) at the WKO in Vienna, powered by Advanced Drivetrain Technologies GmbH (ADT). Under the theme “Future propulsion systems from tank to thrust, from research to qualification”, the two-day event brought together stakeholders from across Europe to discuss next-generation propulsion technologies.

### Participation at a glance:

- **150+ participants** from industry, research, and policy.
- **25+ technical presentations** across five sessions.
- **15 EU-funded projects** represented in the ClimAvTech cluster.
- Strong contributions from companies, universities, and ministries.

VAD2025 highlighted the value of collaboration: bringing together technical presentations, cross-project networking, and policy dialogue to accelerate aviation's transition. It confirmed exFan's role not only in advancing technology but also in connecting projects and communities across Europe.



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## ADDITIONAL DISSEMINATION & COMMUNICATION ACTIVITIES

### SCIENTIFIC PUBLICATION

"Fundamentals of Innovative Aircraft Heat Exchanger Integration for Hydrogen-Electric Propulsions", **Aerospace** 2025, 12(4), 320  
doi: 10.3390/aerospace12040320



*aerospace*

### NETWORKING EVENT

ClimAvTech-Future of Climate-Neutral Aviation Climate Impact and Novel Engine Concepts



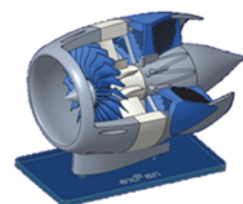
### MEDIA FEATURE

Contribution of TUW at AVIATION WEEK NETWORK



### The Week In Technology, March 3-7, 2025

Graham Warwick March 04, 2025



The hydrogen-electric geared fan has swept heat exchangers in the fan discharge flow to cool the fuel cells.

Credit: Vienna University of Technology

### CONFERENCE PARTICIPATION

A TUW presentation at AIAA SciTech 2025 – ClimAvTechSession



**SCITECH** FORUM  
6-10 JANUARY 2025  
ORLANDO, FL





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### Project Coordinator



### Technical Coordinator



### Research Coordinator



### Project Partners



## CONNECT WITH EXFAN



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