NEWSLETTER

ISSUE 6
MAY 2026

Dear Reader,

We are pleased to present Issue 6 of the HERWINGT Newsletter.

The Hybrid Electric Regional Wing Integration Novel Green Technologies (HERWINGT) project stands at the forefront of aviation decarbonization. Its mission is to design an innovative wing tailored for future hybrid-electric regional aircraft and to develop advanced architectures, structures, and technologies that enable greater integration of electrical systems. These breakthrough solutions target a 50% reduction in fuel consumption at the aircraft level, compared to a 2020 State-of-the-Art (SoA) aircraft, through three key approaches:

- Innovative wing designs and advanced aerodynamics cut drag, reducing fuel burn by 15%.
- Lightweight structures and smart integration deliver a 20% weight reduction.
- Hybrid-electric readiness with H_2/battery systems and SAF-compatible fuel technologies.

This issue highlights the project's advancements over the past four months.

Enjoy the read!

On behalf of the HERWINGT Project Coordinator

AIRBUS

Highlights

CLEAN AVIATION

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HERWINGT Annual Review: Two days of innovation in action

The HERWINGT consortium convened at Airbus Defence and Space in Manching for the Annual Review Meeting.

The first day, **March 12**, included comprehensive presentations and discussions focused on:

- Project objectives and their strategic alignment with the Clean Aviation goals
- Demonstrator strategy across full-scale outer wing boxes, multifunctional leading edges, and innovative strut concepts
- Live visits to the Structural Health Monitoring (SHM) and fuel vent demonstrator facilities

The second day, **March 13**, continued with strong momentum, featuring:

- Advanced morphing technologies for trailing edges, ailerons, and droop noses
- Insights from wind tunnel functional testing of the full-scale outer wing
- Innovations related to Sustainable Aviation Fuel (SAF) system integration, breakthroughs in ice protection technologies, and high fidelity virtual testing
- Presentations on impact monitoring, certification pathways, and lifecycle assessment
- Dissemination, communication, and exploitation strategies supporting the project's overall results

Next, we focus on the technological advancements presented during the annual review, highlighting the Ultra-Efficient Regional Aircraft (UERA) and Use Case B (UCB).

Use Case UERA – Overview and Progress

HERWINGT is aligned with the HERA project in Phase I and used ATR72-600 at the SoA reference

Within the framework of the Clean Aviation programme, the **UERA use case** represents a key reference scenario for **Entry-Into-Service around 2035.** For HERWINGT, UERA provides the main technical baseline for the development of an advanced wing concept aligned with the project's sustainability and performance ambitions.

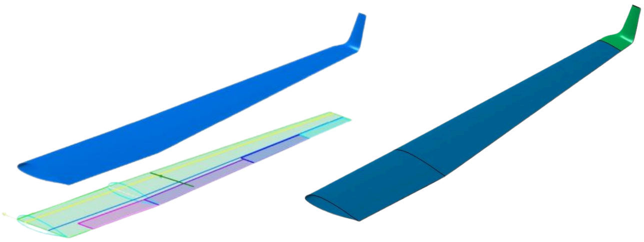
At configuration level, the UERA aircraft is conceived as a **twin hybrid turboprop regional platform**, accommodating up to **72 passengers**, with **a maximum payload of 7,400 kg** and a **design range of 500 nautical miles**. Building on an ATR72-like layout, the UERA wing introduces targeted innovations, including an **increased aspect ratio, new structural concepts and architectures**, and **enhanced wing systems**, such as fuel systems compatible with Sustainable Aviation Fuels (SAF), advanced ice protection solutions, and integrated Structural Health Monitoring (SHM).

From a technical standpoint, **key geometry, system, and structural requirements have been received from HERA**, enabling HERWINGT to initiate the **preliminary structural concept** development for the UERA wing. This work forms the foundation for the subsequent Digital Mock-Up (DMU), Finite Element Model (FEM), and ground-based validation activities.

Important milestones have already been achieved, **notably the completion and delivery of the UERA wing concept configuration.** Ongoing and upcoming activities focus on finalising the **overall structural scheme**, the Structural Assembly Model (SAM) DMU, and the **Global Finite Element Model (GFEM)**, all scheduled for completion in the coming project phases.

Through this work, HERWINGT plays a central role in enabling the UERA vision, ensuring that advanced wing technologies mature consistently with Clean Aviation objectives and contribute effectively to the next generation of low-emission regional aircraft.

UERA Wing Geometry and Requirements – Technical Progress



Wing planform

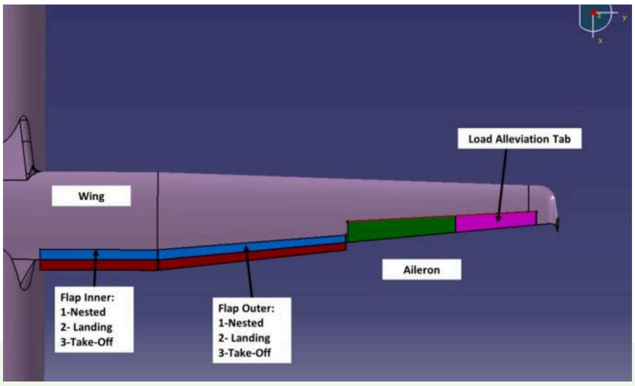
At the aerodynamic level, the UERA wing has been specified to achieve **high lift-to-drag efficiency**, with cruise efficiency targets of **CL/CD ≥ 41** and climb efficiency **≥ 39** for the isolated wing. In addition, **maximum lift coefficients** have been set—**CLmax ≥ 2.3 at take-off** and **CLmax ≥ 2.8 at landing**—to ensure compatibility with regional airport operations and certification constraints.

From a structural and integration perspective, the wing layout includes a **forward spar positioned at 16% of the chord** and a **rear spar at 60%**, providing the structural backbone required for a highly efficient, lightweight wing box. The configuration also accommodates hybrid-electric propulsion integration, with nacelle and powerplant constraints clearly defined to support future propulsion architectures.

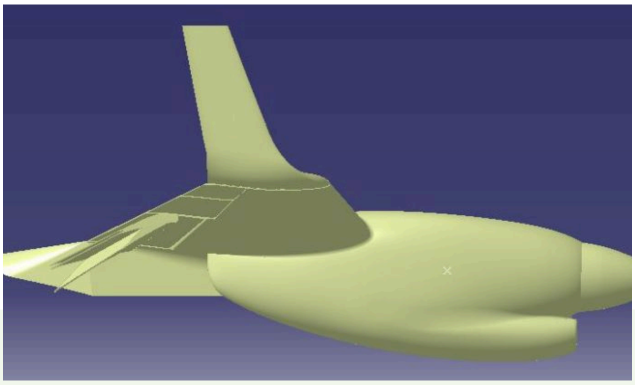
These geometric and performance parameters form the foundation upon which HERWINGT is developing its **structural concepts, digital models, and system integration solutions.** The alignment achieved at this stage ensures that subsequent design, simulation, and validation activities will contribute effectively to a **robust, high-performance wing architecture**, fully consistent with UERA and Clean Aviation objectives.

The development of the **UERA wing geometry** is being carried out through **a close and structured collaboration between the HERA and HERWING**T projects, ensuring full alignment with the aircraft-level requirements defined for the UERA use case.

HERA has released the **baseline wing geometry and performance requirements**, which now serve as the common technical reference for UERA. The wing features a **high-aspect-ratio configuration**, designed to significantly improve aerodynamic efficiency while supporting the ambitious Clean Aviation targets for fuel burn and emissions reduction.

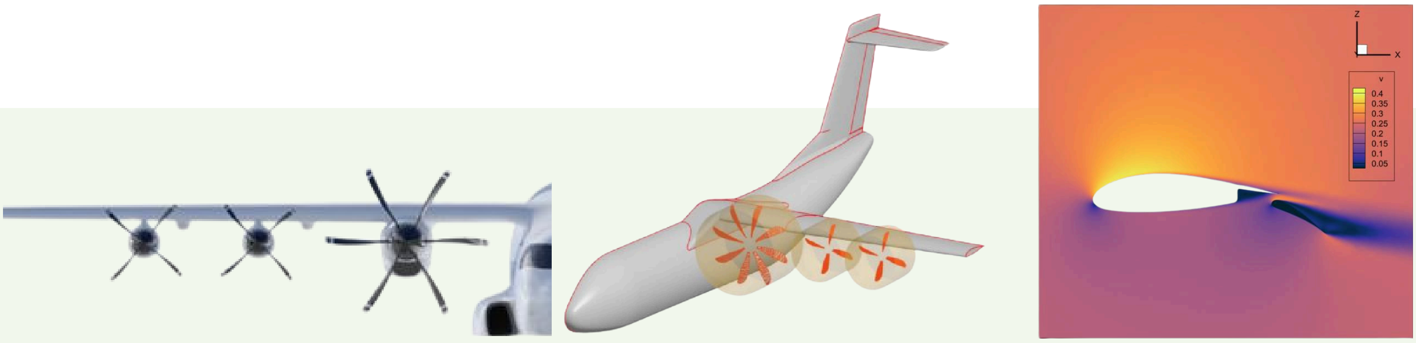


Wing movable surfaces



Nacelle

Use Case B - Overview



Use Case B – Towards Ultra-Clean Regional Aircraft Concepts

In parallel with the UERA activities, **UCB** addresses a longer-term vision for regional aviation, targeting **Entry-Into-Service beyond 2040**. This use case explores more disruptive aircraft configurations and technologies, with a particular focus on **distributed propulsion architectures** and their implications for wing design, performance, and emissions reduction.

The primary objective of Use Case B is to **develop an innovative wing concept for the HERA aircraft**, capable of supporting future propulsion integration while delivering substantial gains in environmental performance. In this context, the wing is expected to contribute to a **15% reduction in overall aircraft fuel burn**, within the broader Clean Aviation ambition of achieving up to **50% CO_2 reduction** at aircraft level. In addition, an ambitious **20% structural weight reduction** is targeted when compared to conventional state-of-the-art solutions.

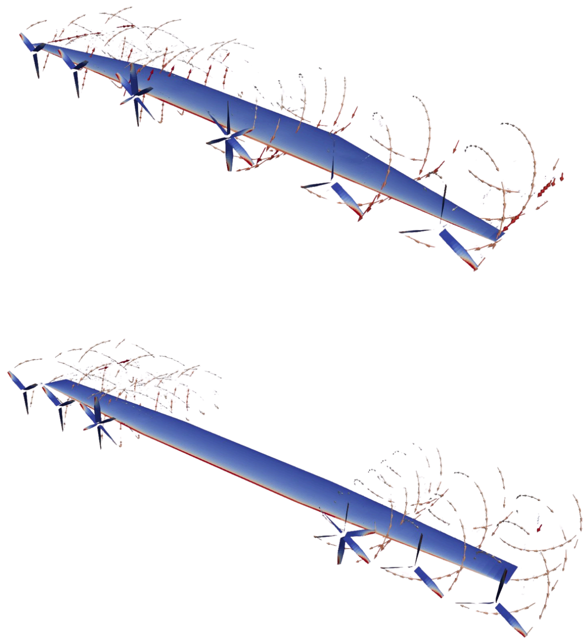
The technical activities under Use Case B focus on the **definition and optimisation of a suitable wing baseline geometry**, followed by a series of **aerodynamic, aeropropulsive, and structural trade-off studies**. These include the assessment of distributed propulsion integration, wing planform optimisation, and advanced structural concepts aimed at delivering the required performance without compromising feasibility or certification readiness.

Within HERWINGT, Use Case B serves as a **technology exploration and risk-reduction platform**, enabling the consortium to investigate advanced concepts that may shape next-generation regional aircraft beyond the UERA timeframe. By addressing high-aspect-ratio aerodynamics, innovative load-bearing architectures, and propulsion–airframe integration challenges, UCB provides valuable insights that complement the near-term UERA developments.

Overall, Use Case B reinforces HERWINGT's contribution to Clean Aviation by extending the project's scope towards **ultra-clean, highly efficient regional aircraft concepts**, paving the way for transformative solutions in the post-2035 horizon.

Use Case B – Wing Trade-Off Studies & Structural Optimisation

Under **UCB,** HERWINGT investigates advanced wing concepts in support of **future distributed-propulsion regional aircraft**, targeting performance levels aligned with **post-2035 Clean Aviation ambitions**. The investigation tasks focus on the progressive refinement of the wing baseline through **coordinated aerodynamic and structural trade-off studies.**

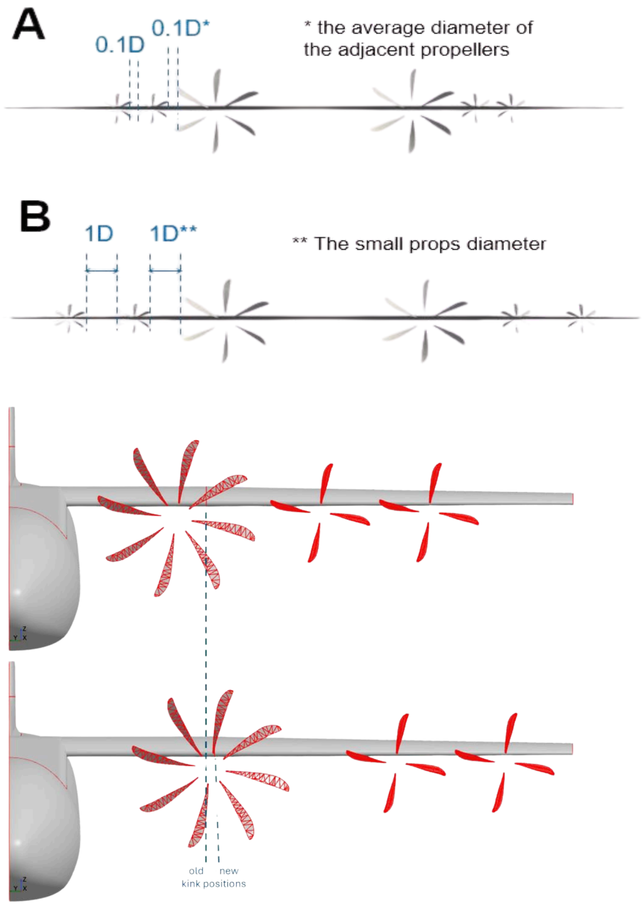


Wing planform optimization

Wing Baseline and Aerodynamic Trade-Offs

The initial UCB wing baseline was defined with an **aspect ratio of 10**, serving as a realistic starting point for distributed propulsion integration. Early assessments confirmed that, while structurally feasible, this configuration does not fully meet the aerodynamic efficiency targets set by HERA for long-term emissions reduction. As a result, a systematic **aspect-ratio trade-off** was launched.

Several configurations were evaluated, maintaining propeller positions while analysing the impact of increasing aspect ratio on **lift-to-drag performance, maximum take-off weight, and emissions**. The studies demonstrated that increasing the aspect ratio progressively improves aerodynamic efficiency, with values around **AR ≈ 16** enabling the required lift-to-drag ratios and delivering meaningful CO_2 reductions. To further enhance performance, **winglet solutions** were introduced and compared, with blended winglets emerging as promising candidates for balancing efficiency gains and structural penalties.



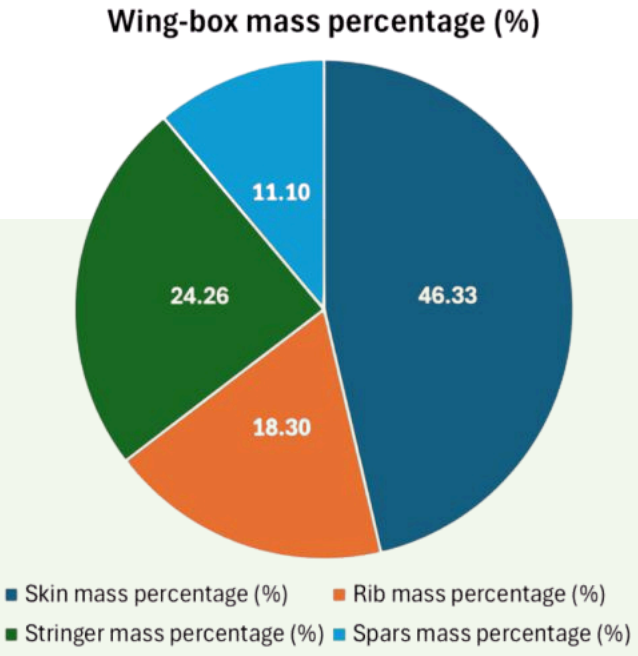
Propeller position trade off

Structural Implications and Weight Sensitivity

The aerodynamic benefits of higher aspect ratios are accompanied by significant structural weight challenges. As wing slenderness increases, bending loads grow rapidly, driving the need for reinforced wing-box architectures. Trade-off results clearly highlighted the sensitivity of structural mass to aspect ratio, underlining the importance of advanced structural concepts to unlock aerodynamic gains without negating them through weight growth.

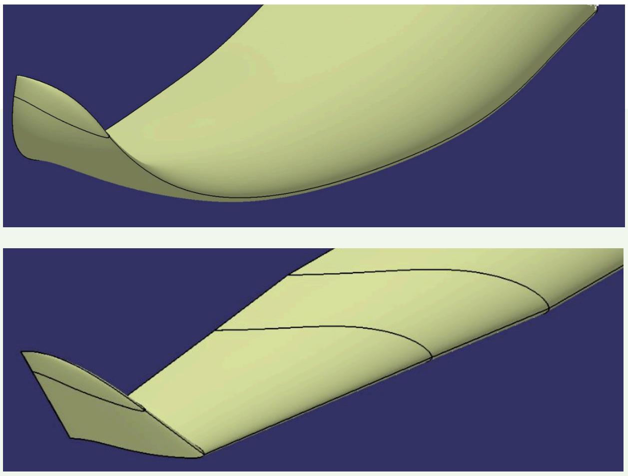
Wing-Box Structural Trade-Offs

To address these challenges, HERWINGT conducted an extensive structural optimisation study of the UCB wing box, investigating multi-spar architectures with different material solutions. Two-, three-, and four-spar configurations were examined, using both metallic alloys and composite materials



Wing-box mass percentage (%)

A parametric design methodology was applied, combining analytical formulations with digital simulations to explore the influence of spar number, rib pitch, stringer layout, and material stiffness on overall wing mass. The results indicate that a two-spar composite wing-box architecture offers the most favourable balance between weight, stiffness, and structural efficiency for the UCB configuration.



Winglet: Straight vs. blended

Key Outcomes and Outlook

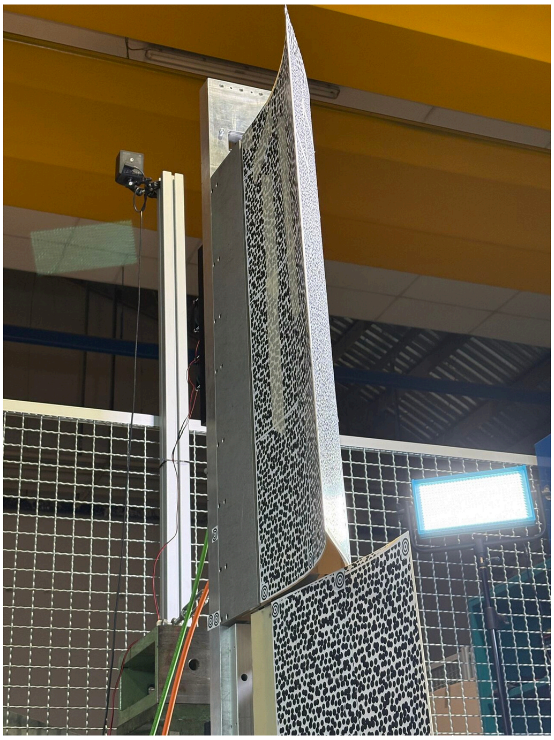
Detailed sizing of the selected two-spar composite solution confirmed its structural viability, yielding a wing-box weight distribution that meets strength, stability, and integrity requirements while minimising mass. The final configuration achieves a total wing-box weight of approximately 1.8 tonnes, providing a robust foundation for further integration studies.

Through Use Case B, HERWINGT is building critical knowledge on high-aspect-ratio wings, distributed propulsion integration, and lightweight structural concepts, directly supporting Clean Aviation's long-term vision for ultra-efficient, low-emission regional aircraft beyond the UERA timeframe.

POLIMI - Latest lab tests on morhping ailerons

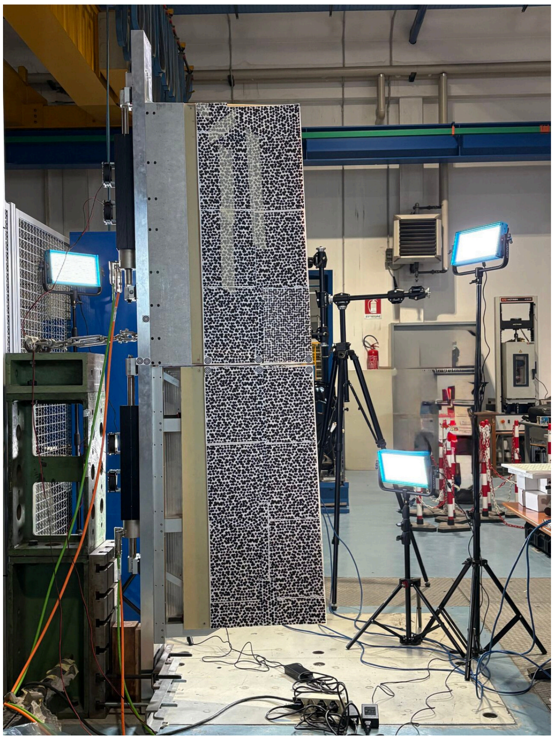
POLIMI team with leader **Alessandro De Gaspari Team Leader,** Associate Professor at Politecnico di Milano**,** completed the very first laboratory tests on their newly assembled morphing trailing edge on December 2025. These initial tests mark a significant milestone in validating the concept and functionality of morphing technologies. The tests included:

- A quasi-static test at 70% of the maximum deflection.
- A preliminary low-frequency dynamic test at 1.5 Hz with limited deflection.



In February and March 2026, **the POLIMI team** tested their wing equipped with high-bandwidth morphing ailerons, leveraging Siemens's camera-based instrumentation and Digital Image Correlation (DIC) system to:

- Reconstruct the morphing shapes,
- Identify the dynamic behaviour of the morphing structure



During the tests, POLIMI was supported by **Emilio Di Lorenzo** and **Davide Mastrodicasa** from **Siemens** Industry Software (part of HERWINGT), who provided their instrumentation and assistance.

The outcomes were very positive and are highly encouraging ahead of the upcoming wind tunnel tests, where Siemens will continue supporting POLIMI with both their instrumentation and know-how.

Stay tuned for the upcoming **Episode 3** on POLIMI's latest lab tests!

To become more familiar with this work, you can watch **Episode 1 (Season 2: The Demo Series)** of the HERWINGT video series.

▶ *HERWINGT Video Series*

POLITECNICO MILANO 1863

SIEMENS - Milestone on testing

SIEMENS Digital Industry Software, is a leading technology company, providing mechatronic simulation and test solutions in the automotive, aerospace and other mechanical industries.

Within HERWINGT D1.9 (see HERWINGT Newsletter, Issue 4), SIEMENS is in close collaboration with the **POLIMI** team and **AIRBUS**, conducting a full-scale Ground Vibration Test (GVT) on the aeroelastic wing demonstrator. The test campaign focuses on identifying and validating global wing modes, local control-surface modes, and critical flutter-related dynamics. In addition to conventional accelerometer-based modal analysis, smartphone video recordings combined with video motion magnification techniques were employed to provide intuitive, qualitative visualisations of the measured mode shapes. The resulting experimental data offer key validation for the aeroelastic models and support their interpretation through photorealistic visual representations of the wing's dynamic behaviour.

HERWINGT GVT: Experimental Setup

Stay tuned for the upcoming **Episode 2** of the HERWINGT SoundBytes Series dedicated to the SIEMENS milestone! Until then, to become more familiar with the work carried out by SIEMENS, you can go through their results, available in the HERWINGT Zenodo profile.

HERWINGT GVT

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A pioneering wing design for a future hybrid-electric aircraft

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