

HERWINGT



CLEAN AVIATION

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AIRBUS

Dear Reader,

I am glad to share with you Issue 4 of the HERWINGT Newsletter.

The Hybrid Electric Regional Wing Integration Novel Green Technologies (HERWINGT) project is one of the pioneers in the decarbonization of aviation. It aims to design a novel wing ideal for the future hybrid electric aircraft of the regional segment and to develop architectures, structures, and technologies that enable higher integration of electrical systems. These breakthrough solutions aim to achieve a 50% reduction in fuel consumption, at the aircraft (A/C) level, compared to a 2020 State-of-the-Art (SoA) A/C, in three different ways:

- Pioneering wing configurations and improved aerodynamics leading to drag reduction and enabling a fuel burn reduction of 15% at the wing component level, compared to a 2020 SoA wing.
- Wing structures, more integrated systems, and new material technologies resulted in a weight reduction of 20% at the component level, compared to a 2020 SoA wing.
- The development of technologies enabling the wing for a hybrid-electrical use case (H2/Batteries and fuel systems using Sustainable Aviation Fuels (SAF)).

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The final chapter of Hardware Demonstrators

Following the exploration of the first eight hardware demonstrators in Issue 3, we now turn the spotlight to the remaining eight hardware demos. These demonstrators represent the culmination of advanced engineering, sustainable design, and integrated systems thinking, each contributing to HERWINGT's mission to revolutionize wing architecture for next-generation aircraft.

From adaptive structures to intelligent systems, the technologies featured in this issue push the boundaries of what's possible in aerospace design. As we move closer to full-scale validation and integration, these demonstrators not only showcase technical excellence but also reflect the collaborative spirit driving HERWINGT forward.

We invite you to dive into the details and discover how these innovations are paving the way toward cleaner, smarter, and more efficient regional air travel.

D1-9 Aeroservoelastic testing on high aspect ratio wing scaled half model

Advancing load alleviation technologies through scaled aeroelastic testing:

A scaled aero-servo-elastic half-model of the aircraft is being used to validate advanced Gust and Maneuver Load Alleviation technologies, key enablers for reducing wing structural weight. This 1:8 scale model is tested in a wind tunnel under simulated, tuned gust excitations to assess the effectiveness of these innovations. The objective is to elevate the technology readiness level (TRL) from 3 to 5, marking a significant step toward real-world application in next-generation aircraft design.

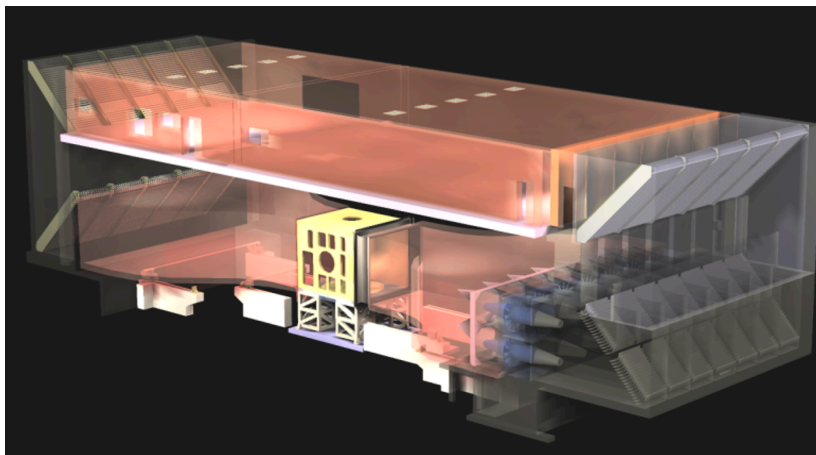
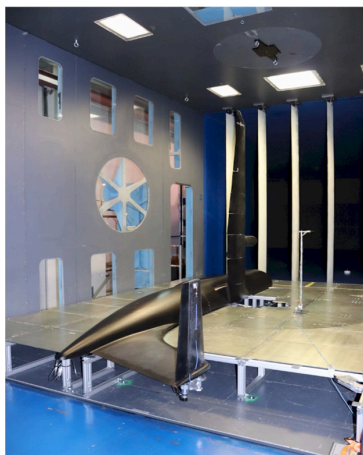


Figure 1. Aeroservoelastic scaled wing model testing

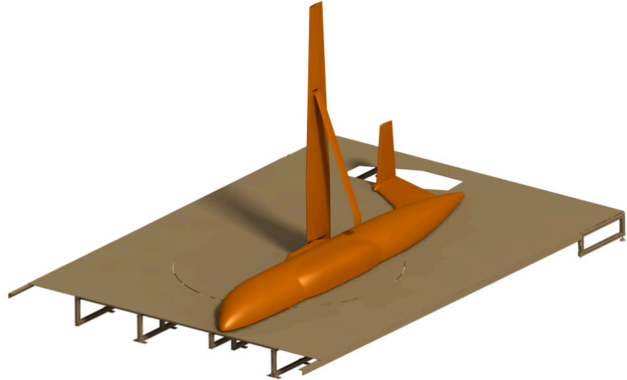
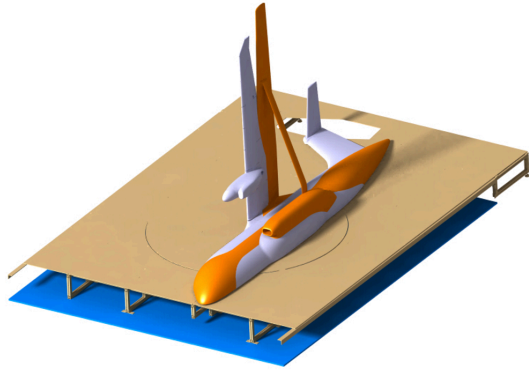


Figure 2. Quantity Indicator System Bench Testing

D1-10 New Fuel System Integration

Advanced Testing of Fuel Quantity Indicator System Begins at ADS Getafe:

ADS Getafe has initiated comprehensive bench testing of its Fuel Quantity Indicator (FQI) system, integrating both sensors and advanced computation algorithms. The test bench features a fuel tank equipped with capacitive probes and actuators designed to simulate various tank attitudes.

The campaign includes both static and dynamic test phases, each conducted across a range of fuel quantities and tank orientations, including pitch and roll variations. A key focus is evaluating probe performance with Sustainable Aviation Fuel (SAF), alongside refuelling and defueling scenarios. Despite the inherent complexity posed by SAF's flammability, the testing schedule remains on track with no anticipated delays.

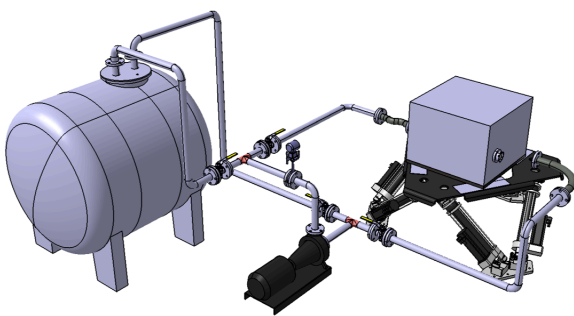


Figure 3. Fuel Quantity Indicator System Integration



D1-11 Induction Heating Ice Protection System

Electromagnetic Ice Protection System to be tested on composite leading edge demonstrator:

A cutting-edge ice protection system utilizing induction heating is set to undergo integration and testing on the multifunctional thermoset composite leading edge demonstrator (D1-4) (see Issue 3). This initiative aims to validate the system's de-icing performance under realistic conditions, while also assessing its seamless integration with the structural elements of a real aircraft leading edge. The full-scale system tests will be conducted at the RTA Ice Wind Tunnel, providing a representative icing environment to rigorously evaluate functionality and structural compatibility.

D1-12 Integrated Fuel Vent System

Innovative composite fuel vent system demonstrator under pressure testing:

A novel multifunctional fuel vent system, structurally integrated into a thermoset composite wing upper skin, is being developed and tested to push the boundaries of aerospace design. The demonstrator features two omega-shaped ducts bonded onto a composite surface, interconnected via specially designed couplings that are 3D printed directly onto the ducts. This setup will undergo rigorous pressure testing to validate its performance. The primary objective is to showcase how hollow structural stiffeners can serve dual purposes, providing both mechanical reinforcement and functional fuel venting. The project aims to deliver viable design concepts, prove their manufacturability, and demonstrate their operational effectiveness in real-world conditions.

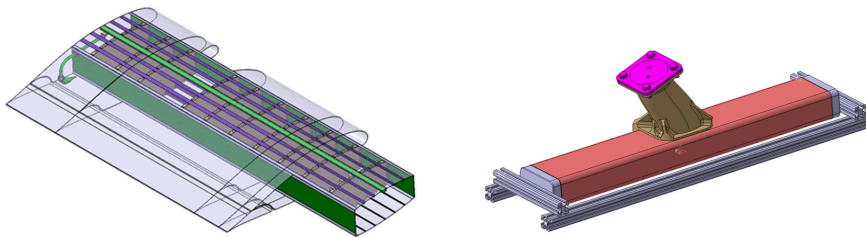


Figure 4. Integrated Fuel Vent System – Structural Layout

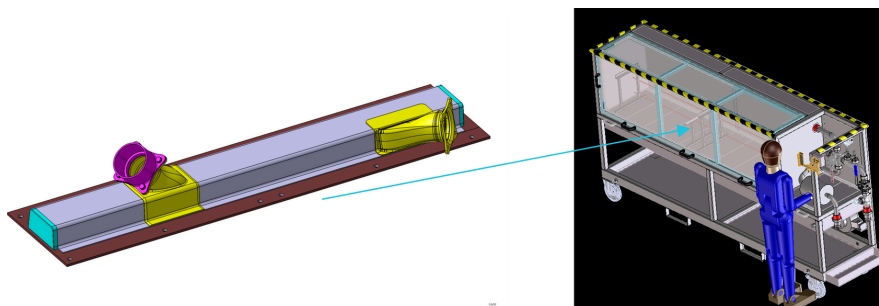


Figure 5. Pressure Testing Setup for Fuel Vent System



D1-13 Morphing Trailing Edge Flap

Camber Morphing Flap Demonstrator advances toward higher TRL:

A camber morphing flap demonstrator is being developed for integration into a single-bay assembly with a span of approximately 0.5 meters, aimed at advancing adaptive wing technologies. The project focuses on the experimental validation of the morphing concept through a series of ground-based evaluations, including static, dynamic, and fatigue tests. All mechanical and functional testing will be conducted at CIRA, which is also overseeing the manufacturing of the demonstrator. This initiative targets a TRL increase from 3 to 5, marking a significant step toward the practical application of morphing aerodynamic surfaces.

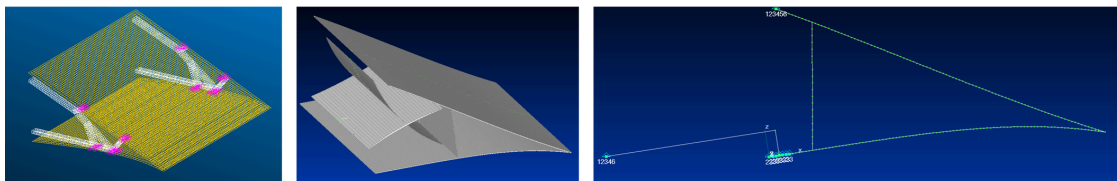


Figure 6. Morphing trailing edge flap demonstrator.

D1-14 Morphing Aileron

Full-Scale Morphing Aileron Demonstrator targets aerodynamic and structural breakthroughs:

A camber morphing flap demonstrator is being developed for integration into a single-bay assembly with a span of approximately 0.5 meters, aimed at advancing adaptive wing technologies. The project focuses on the experimental validation of the morphing concept through a series of ground-based evaluations, including static, dynamic, and fatigue tests. All mechanical and functional testing will be conducted at POLIMI, which is also overseeing the manufacturing of the demonstrator. This initiative targets a TRL increase from 3 to 5, marking a significant step toward the practical application of morphing aerodynamic surfaces.

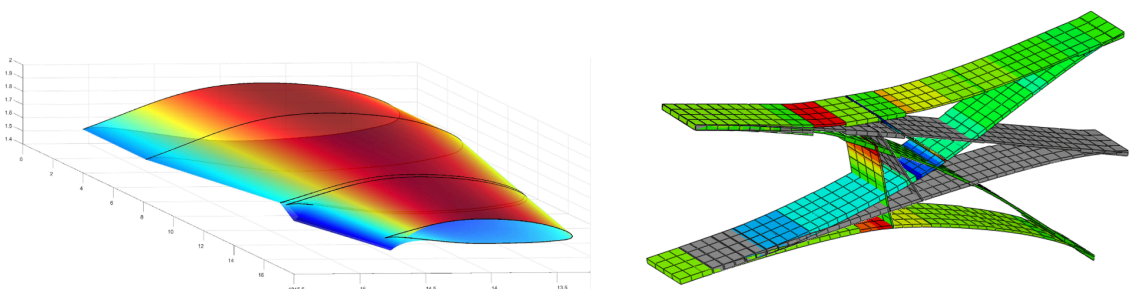


Figure 7. Full-scale morphing aileron demonstrator.

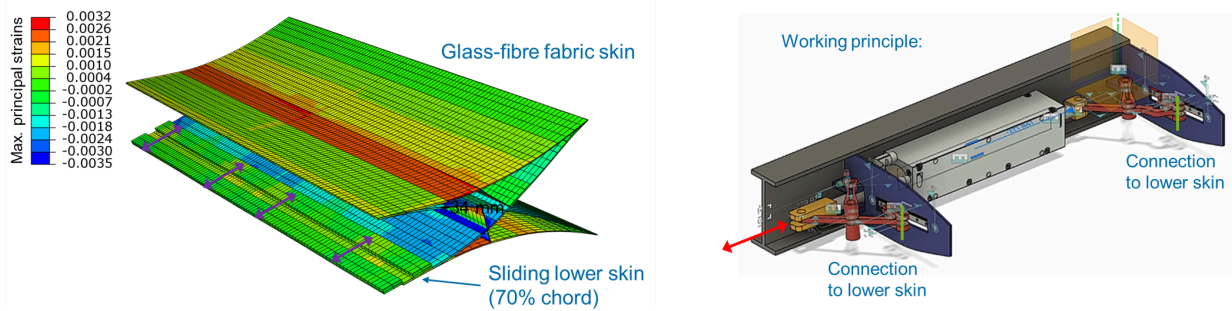


Figure 8. Morphing droop nose demonstrator – structural strain analysis.

D1-15 Morphing Droop Nose

Morphing Droop Nose Demonstrator set for ground testing:

A fully compliant morphing droop nose demonstrator, designed for high-lift flight conditions, is being prepared for integration into a single-bay assembly to undergo ground-based testing. With a span of 0.5 meters, the demonstrator aims to validate the structural design through a series of static and fatigue tests. These evaluations will focus on the system's ability to accurately reproduce the target morphed shape while assessing the durability of structural components under repeated loading. The project aspires to elevate the technology from TRL3 to TRL5, marking a significant advancement in adaptive high-lift device development.

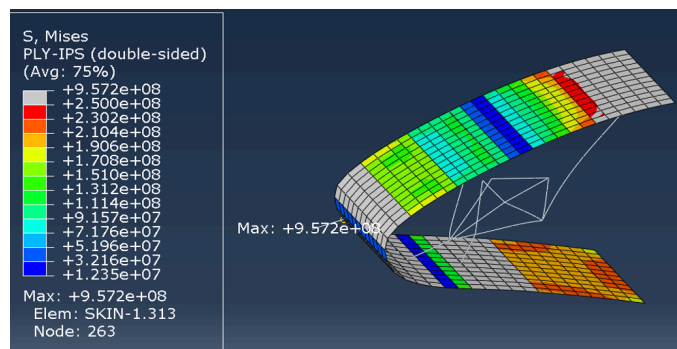
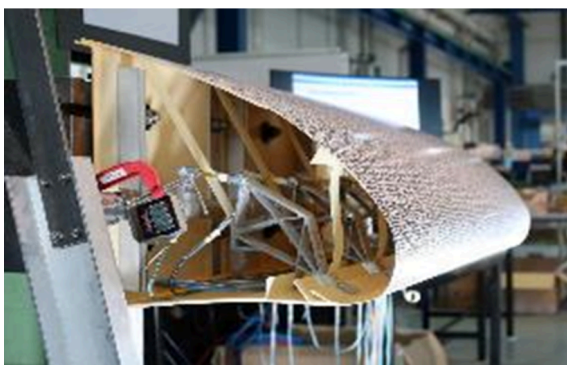


Figure 9. Stress distribution in morphing droop nose.



D1-16 Functional testing in Wind Tunnel of full scale outer wing and morphing aileron

Morphing Aileron Demonstrator prepares for wind tunnel validation:

A 3-meter span dummy wing box, representative of an outer wing section, has been assembled with an active morphing aileron demonstrator to undergo functional testing under low-speed wind tunnel conditions. This setup enables early validation of the morphing aileron's aerodynamic performance without waiting for the final structural wing box, streamlining the development timeline. The test campaign will focus on evaluating key performance metrics, such as rotation angle, actuation bandwidth, and power consumption under aerodynamic loading. The goal is to advance the technology from TRL3 to TRL5, demonstrating its readiness for future integration into high-performance wing architectures.

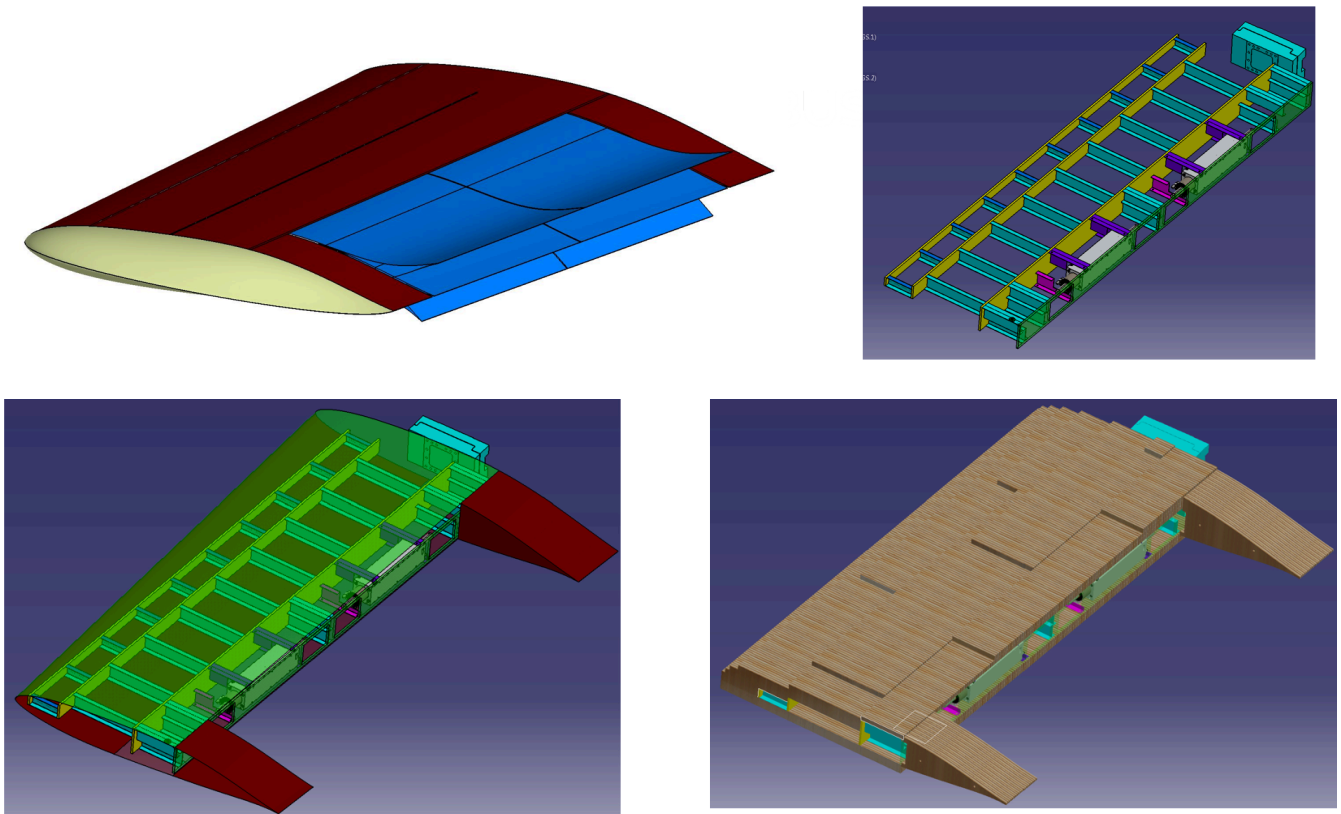


Figure 10. Wind tunnel testing of morphing aileron.

HERWINGT



A pioneering wing design for a hybrid-electric regional aircraft with a maximum capacity of 100 seats and a range of 500 km to 1000 km

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