Partner activities

Airbus Operations

As the consortium leader of the HERA project, Airbus Operations is responsible for the overall coordination and the development of the entire fuselage backstructure architecture. This includes the definition of design principles as well as the requirements for high-rate manufacturing processes and sustainability. Airbus also develops essential tooling concepts, ensures compliance with industrial requirements among the partners and supplies the necessary materials for the entire consortium. Finally, Airbus evaluates the developed technologies through structural tests and on validators to demonstrate the achievement of project goals such as weight savings and process efficiency.

Airbus Aerostructures

As a manufacturer of innovative fiber composite structures for aircraft construction Airbus Aerostructures GmbH participates in all sub-areas of the project. The consortium leader, Airbus Operations GmbH, is supported in development activities (design and calculation) to create a production-ready design. Furthermore, a spring-in simulation is to be set up with other partners to improve the geometric accuracy of thermoplastic components. In the field of stamp-forming technology, technology building bricks along the process chain are being investigated. These include innovative heating processes, preform technologies, clamping frame concepts, and high-rate optimised edge machining. Airbus Aerostructures GmbH is also responsible for the production of large component validators. This includes the planning, execution, and evaluation of tests along the test pyramid.

Cevotec

Cevotec develops technologies for placing off-axis plies for flat spar preforms. The key points for Cevotec here are the development of placement technology and its integration into existing robot systems with the aim of providing an optimized, reliable production process with high layup rates. Using the process chain developed here, the preforms are created for the validators, which are then shaped into spars and mechanically tested by the consortium leader Airbus. The project will be completed with the identification of further development

needs for industrial maturity and the creation of concepts for the technical combination of AFP and FPP for future high-rate serial production

DLR is involved in the HERA project with the Institute of Structures and Design (DLR-BT and ZLP) and the Institute of Lightweight Systems (DLR-SY). DLR-BT is improving and validating the distortion simulation for thermoplastic fuselage frames. The aim is to compensate for production-induced thermal distortion as fully as possible using forming and thermal simulations. Based on the further developed simulation methods, design instructions for moulding tools and recommendations for process parameters will be developed. As a result, shim-free assembly should be made possible. DLR-SY validates the structural behaviour of new frame configurations. To this end, a 4-point bending test device is being developed using simulation methods. Subsequently, manufactured frame segments are tested on the test bench and the mechanical behaviour is validated in order to derive conclusions for the design. DLR-BT (ZLP) is developing a high-rate-capable non-destructive testing concept based on the laser-coupled ultrasonic method. The first step is to validate specific geometric challenges. Based on the results, an automated inspection concept for high-rate frame production will be developed and demonstrated at full scale.

Within the joint project »HERA«, the participating institutes Fraunhofer IGCV, Fraunhofer ICT and Fraunhofer IFAM focus on development of resource-efficient and high-rate thermoplastic-based preforming, forming, and consolidation processes as enabler of eco-efficient and sustainable production solutions for CFRP lightweight structures. Fraunhofer ICT and Fraunhofer IGCV are investigating various technology bricks for automated production of small and large fuselage back-up structure components, such as automated fiber placement, automated tape laying, stamp forming, and thermoplastic short fiber injection for functionalization. Research on plasma-polymer release coating on molds for release-agent-free forming and demolding of thermoplastic CFRP components is performed by Fraunhofer IFAM. The developed technologies will be validated by production of selected test samples in collaboration with the project partners.

The focus of the work at IVW in the HERA joint project is on the further development of process chains and process combinations, as well as the integration of process digitalization concepts for the production of rear-end structures for a future single-aisle aircraft. The focus is on the one hand the production of small components, where the economic efficiency and high-rate capability of selected processes are investigated. On the other hand, thermoplastic high-speed tape laying applied in preform production for thermoforming will be optimized for high production rates. At the same time, digital methods will advance the analysis of sensor data. This data is employed for deriving relationships between process parameters and manufacturing quality as well as for creating process simulation models. The manufacturing process for small components can be optimized with flexible toolings for taking advantage of part families and smart part design adaptions. For the automated fiber placement process, the actual lay-up rate can be increased by higher process speed, software-supported optimization of lay-up path planning as well as adaptation of component design and lay-up scheme.

XELIS

In the project HERA, XELIS GmbH is developing tools and processes for manufacturing curved, thermoplastic profiles using the X-CCM® process. In parallel, a thermoset preform for a stringer profile is being produced. Another key focus is on the automation and rate capability of efficient material preparation for thermoplastic prepregs, which serve as precursor materials for the X-CCM® technology. This lays the foundation for stable, resource-efficient, and highly precise production of complex lightweight structures – an important step toward pioneering, high-volume manufacturing technologies of the future.