domminio

Digital method for improved manufacturing of next-generation multifunctional airframe parts

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Digital method for imprOved Manufacturing of next-generation MultIfuNctIOnal airframe parts: A step closer to cost-effective, efficient, and sustainable manufacturing

DOMMINIO in a Nutshell

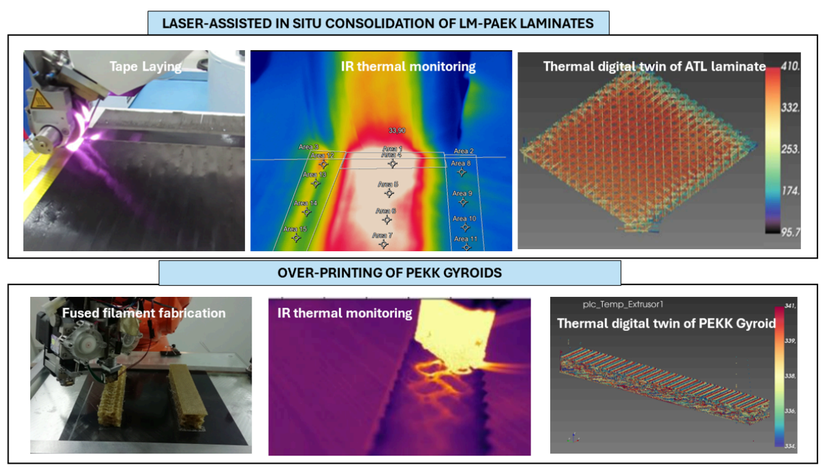
The DOMMINIO project has made significant strides in advancing the design, manufacturing, and monitoring of next-generation thermoplastic composites. Our committed researchers:

- **Developed** advanced models and quality assurance techniques for composite panels using machine vision and thermal models.
- **Focused** on high-performance nanocomposites, enabling induction heating, on-demand repair, and disassembly technologies.
- **Developed** a CNT sensor and characterized its piezoresistive properties when embedded in a composite part for SHM and de-icing applications.
- **Optimized** the combination of ATL + FFF additive manufacturing processes with monitoring systems and refined nozzle designs for defect-free thermoplastic printing.
- I**ntroduced** a Hybrid Twin Platform (HTP) for Multidisciplinary Design Optimization (MDO) and data traceability.
- **Combined** MDO with Life Cycle Assessment (LCA) and Structural Health Monitoring (SHM) to enhance repair strategies and sustainability in aircraft design.

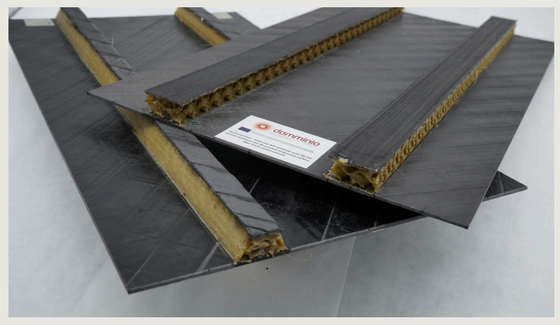
Next-Gen Aircraft Innovation: DOMMINIO's Smart, Sustainable Composite Design for the Future

The DOMMINIO team has developed a data-driven approach to enhance next-generation composite aircraft parts' design fully based on thermoplastic composites with multifunctional capabilities such as SHM, de-icing and disassembly, manufacturing, and lifecycle management. By integrating advanced simulation tools and real-time data collection, DOMMINIO enables the prediction and validation of part properties throughout manufacturing.

The project also incorporates embedded sensors for continuous monitoring during the part's service life, allowing for proactive maintenance and improved product performance. This innovative methodology optimizes design flexibility while ensuring manufacturability, supporting more efficient and sustainable aerospace production.

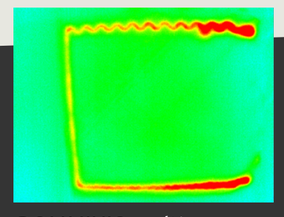


The integration of thermoplastic composites and additive manufacturing is set to redefine the standards for airframe structures. This advancement not only supports the development of lighter and more efficient aircraft but also aligns with the broader industry goals of sustainability and innovation.

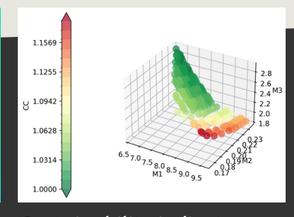


DOMMINIO demo part using AFP ISC to produce CF/LM PAEK laminate followed by FFF deposition of a gyroid core using unreinforced PEKK filament

Disassembled gyroid stiffener from CF/LM PAEK laminate using localized induction heating



DOMMINIO multi-functional AFP panel - thermal image showing the effect of embedded cCNT filament for de-icing



Sustainability indicator integrating MDO optimization

OUR TEAM

CONNECT WITH domminio

101007022

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45 Months

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