

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



# Newsletter

Issue #4, October 2023



**Pablo Romero Rodríguez**

**DOMMINIO Project coordinator**

**R&D Program Manager Advanced  
Materials & Manufacturing**



This project has received funding  
from the European Union's  
Horizon 2020 research and  
innovation programme under  
grant agreement No 101007022



**Funded by  
the European Union**

Discover the Future of Aviation with DOMMINIO - Newsletter Edition #4

Welcome aboard as we soar into the 4th edition of the DOMMINIO Newsletter, your gateway to the latest breakthroughs in aviation. Join us on an exhilarating journey into the world of the DOMMINIO project, where we are reshaping aviation systems through a cutting-edge Digital method for improved Manufacturing of next-generation Multifunctional airframe parts.

At DOMMINIO, our devoted researchers are focused on developing an innovative data-driven methodology encompassing the design, manufacturing, maintenance, and pre-certification of multifunctional and intelligent airframe parts. Our vision is clear: to achieve cost-effective, efficient, and sustainable manufacturing of high-quality aircraft components, leveraging the following technologies:

- Robotic Technologies (ATL, FFF) for precision manufacturing
- Advanced Simulation Tools for optimized performance
- Online Process & Quality Monitoring for real-time insights
- Structural Health Monitoring (SHM) with data-driven fault detection capabilities

As we forge this transformative path, our newsletter proudly presents the findings from our latest milestone - "On-line process control for high-quality automated manufacturing - WP4." Delve into the articles, insights, and discoveries shared here, and witness how DOMMINIO is shaping the future of aviation.

Stay connected with us through our website and join our vibrant social media community to remain up-to-date on the latest developments of the DOMMINIO project. Together, let's unravel the boundless possibilities that lie ahead for aviation systems.

Happy reading, and let's embark on this thrilling journey to redefine the future of aviation!!!

*Let's connect*



**WP4****In a nutshell**

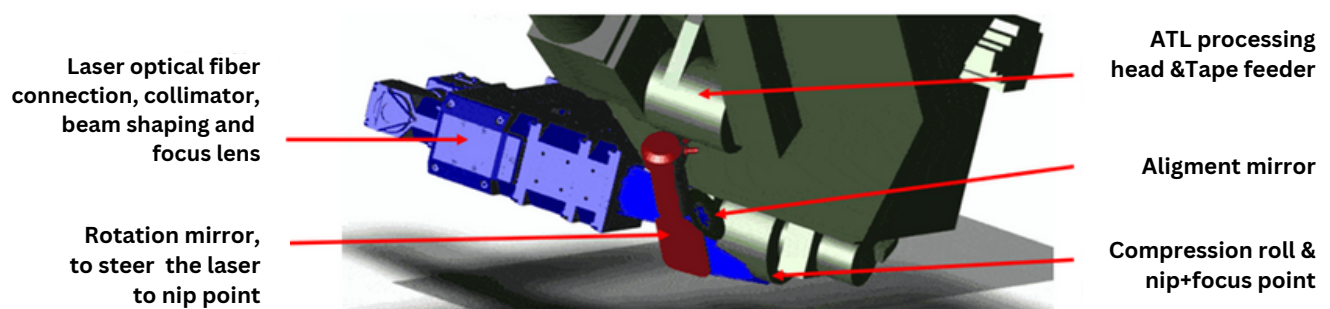
The tasks performed in this work package can be divided into four different activities.

**The first** task was about the ATL process and the thermal management of the deposition: a laser was used to heat up the thermoplastic tape and the substrate to optimize the bonding between the layers.

**The second** task was the development of a novel sensorized FFF extrusion nozzle for printing high-performance polymers and continuous fibers while monitoring temperature and pressure with sensors.

**The third** task was about on/offline monitoring of the temperature in the tape lay-up and FFF processes. Finally, the fourth task was about ultrasound scanning to ensure in-line the quality of lay-up plies.

**Figure 1:** ATL process with laser adapted



WP4

## Innovative Heating and Sensing in DOMMINIO Project

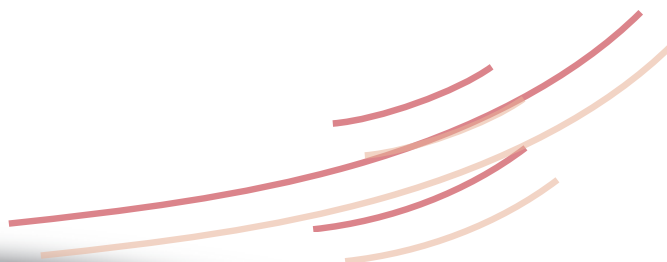
In the domain of technological advancement, the DOMMINIO project has achieved a significant breakthrough. They have successfully engineered a novel heating system for the **Automated Tape Laying (ATL)** process, granting precise control over the local heating of a tape to match desired heat profiles. This feat was accomplished by integrating the system into an existing ATL processing head at our esteemed partner, **AIMEN**.

What makes this achievement truly remarkable is the system's capability for real-time adjustment of the horizontal heat profile. This dynamic control is achieved by monitoring the tape's heating behavior through a thermal camera, allowing immediate, localized modifications.

Simultaneously, a parallel endeavor unfolded at IPC facilities in collaboration with WP4 partners. Here, a cutting-edge, sensorized nozzle for the **Fused Filament Fabrication (FFF)** process was thoroughly designed and manufactured. This nozzle boasts temperature and pressure sensors, while a heated dome was introduced to regulate temperature around the printing area. This ingenious addition pre-heats previous layers, significantly enhancing adhesion between them. Real-time data from these sensors fuels the digital twin, making it a powerful tool in the manufacturing process.

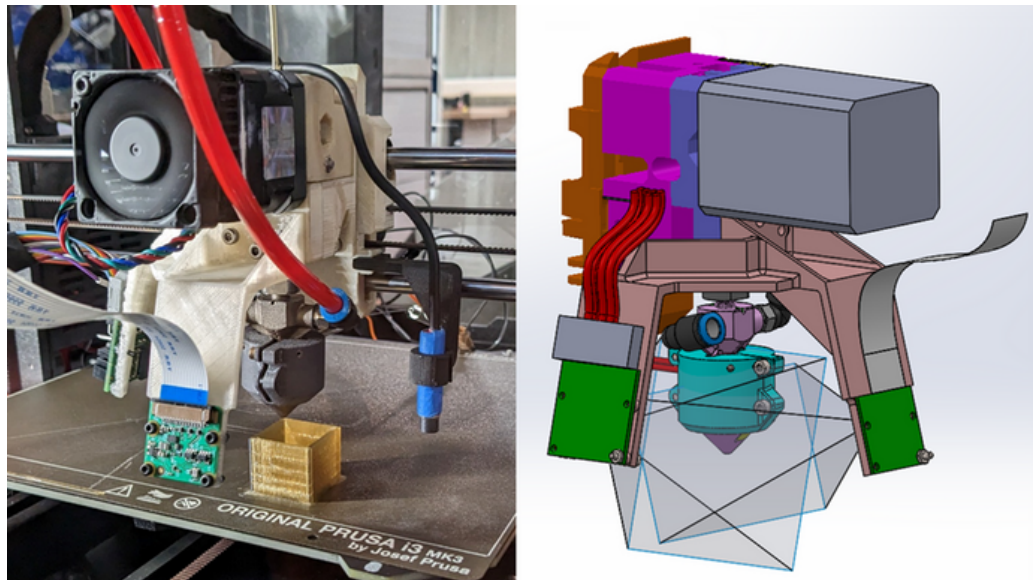
The final chapter of WP4 brought forth a non-contact scanning ultra-sonic system conceived and crafted by the skilled hands at **DASEL** partner. This system and its versatile software were purpose-built to integrate into ATL processes seamlessly.

All the material developments from the earlier WP3 have now been rigorously tested on the nozzle. They are poised to undergo their ultimate trial in WP6, where they will shape the future of our remarkable demonstrator.

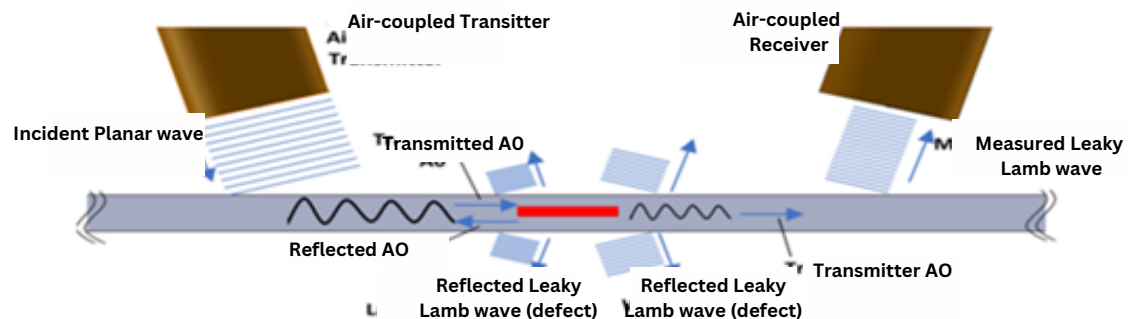




**Figure 2:** FFF sensorized nozzle with thermal and optical cameras. PEEK, a technical, high performance polymer, was printed without the use of an heated chamber. The system includes an optical and a thermal camera to monitor the process, which is a requirement of the aerospace industry



**Figure 3:** Ultra-sonic scan system



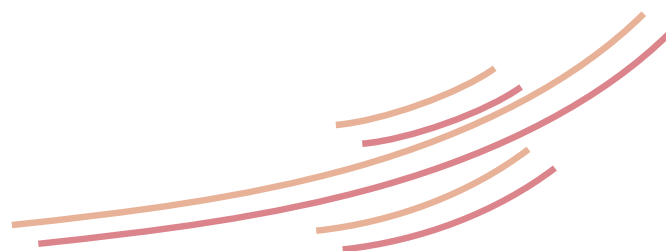
WP3

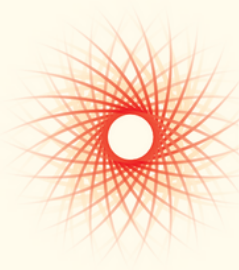
## Contribution of the WP4 to the overall DOMMINIO scope

In brief the so far achievements in DOMMINIO project are:

- We've perfected the pre-heating process using laser and filament, enhancing layer bonding significantly.
- Our cutting-edge sensorized nozzle, equipped with temperature and pressure sensors, redefines precision in manufacturing.
- The ultra-sonic scan ensures high-quality parts and validates their integrity.

Now, our focus turns to WP6 at AIMEN facilities, where these breakthroughs converge into our final demonstrator, shaping the future of advanced manufacturing.





# dominio

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

Issue #4, July 2023

Digital method for improved Manufacturing of next-generation Multifunctional airframe parts



## Our Team



R-NANO



## Connect with us

