THE PROJECT

HARVEST is an ambitious 36 month project, aiming at providing the aerospace sector with a safer, more economic and environmentally friendly structural material. HARVEST will develop multifunctional composite materials capable of energy harvesting, structural health monitoring (SHM) and self-repairing.

HARVEST will cover the whole value chain of fiber reinforced plastics (FRPs) so as to provide novel FRPs capable of harvesting and storing thermoelectric energy. In addition, HARVEST will develop a purposefully made electronic circuit module so as to power SHM inherent functionalities and provide information on the structural health of the components.

HARVEST demonstrators with TEG capability, autonomous SHM, self-repairing and self-powering capabilities, will result in:

- **a substantial decrease of the environmental impact of aircrafts.**
- **an enhancement of the safety in the Transport sector.**
- **an increase of competitiveness, sustainability and growth for the European Aerospace & Nanomaterials sectors**

CONSORTIUM

Project coordinator

UNIVERSITY OF IOANNINA
Professor A. S. Paipetis
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Partners

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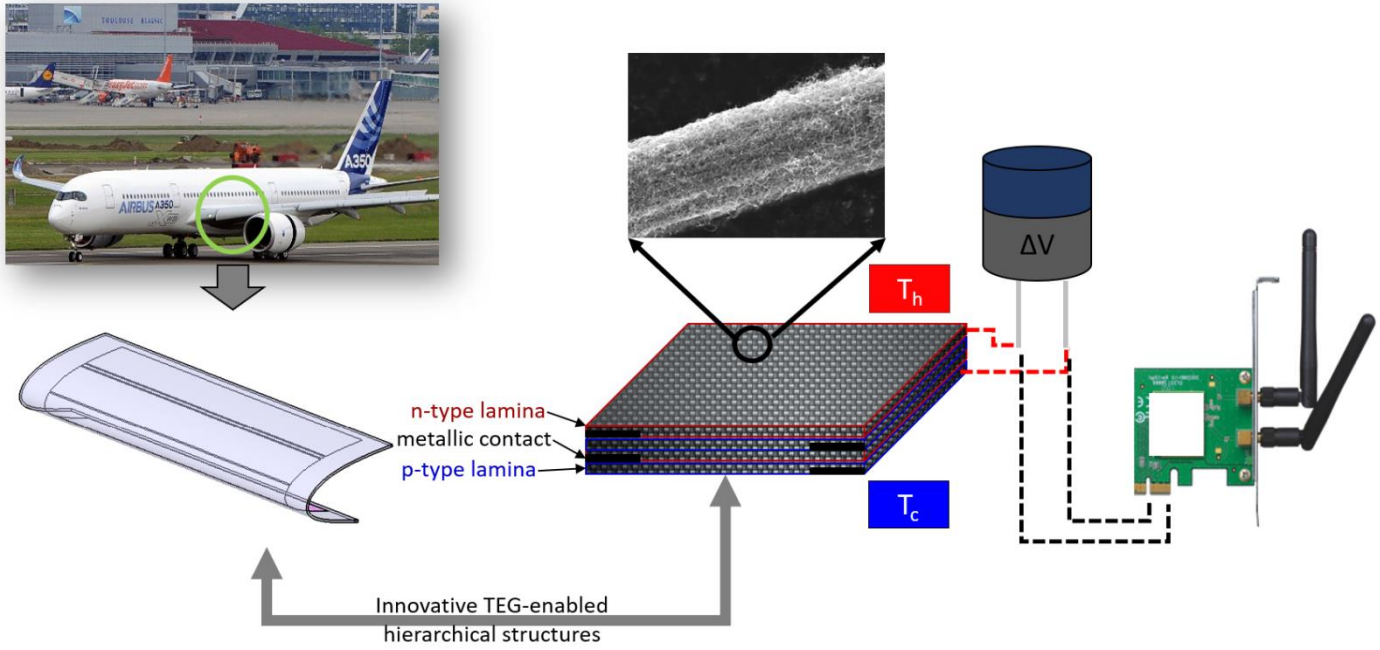
Hierarchical multifunctional composites with thermoelectrically powered autonomous structural health monitoring for the aviation industry

www.harvest-project.eu

September 2018 - August 2021

CONCEPT

HARVEST project will employ breakthrough technologies combining bio-inspired hierarchical ThermoElectric Energy Generating (TEG) carbon fiber (CF) reinforcements with novel self-repairable thermoset matrix systems (3R technology).
The "hierarchical" reinforcement will be made of micron-scale CF coated with nano-scaled particles.



OBJECTIVES

- Biomimetic hierarchical TEG-enabled CF reinforcements by R2R deposition of nanoparticle (NP) based inks
- Smart 3R (Repairable, Reprocessable, Recyclable) nano-modified polymeric matrices with self-sensing and self-repairing capabilities
- Simulation of materials TEG performance using advanced analytical and numerical tools, at different length scales
- TEG-enabled laminated multifunctional composite structures with optimized number of p-n serially interconnected laminae
- Electronic system (software & hardware) responsible for managing the energy harvesting, structural health monitoring (SHM) data accumulation and transmission
- Two Aeronautics Demonstrators and validation of their multifunctional capabilities under operational environments

KEY TECHNOLOGIES

TEG-enabled composites

Unique composite materials capable of thermoelectric generation (TEG) toward a decrease of wasted energy during flight

Self-repair materials

Novel thermoset matrix systems with 3R functionality (Repair; Recycle; Reprocess) toward increased safety and prolonged operational time

Self-powered SHM

Autonomous Structural Health Monitoring (SHM) system toward reduced inspection and maintenance costs

EXPECTED IMPACT

- Increase safety and prolonged operational time, through self-repairing functionality
- Cut end-of-life (EOL) waste material of the aerospace sector, through recyclability capability
- Decrease wasted energy during flight, through TEG functionality
- Realize a self-powered SHM system, through energy harvesting functionality
- Diminish inspection/maintenance/repair costs, through SHM functionality
- Strengthen competiveness of European industries, SMEs and Academia, by boosting their know-how and expertise for large-scale and cost-efficient manufacturing of TEG-enabled smart composites.