PROJECT

HARVEST

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

Funding: European (Horizon 2020)

Duration: Sep 2018 - Aug 2021

Status: Complete

Total project cost: €3,999,921

EU contribution: €3,999,921

CORDIS RCN : 216003

Objectives:

HARVEST will unleash the potential of breakthrough technologies by creating integrated multifunctional systems for Aeronautics via the development of:

1. Structural composites, comprised of hierarchical carbon fibre (CF) reinforcements and an innovative thermoset 3R (repair, recycle and reprocess) epoxy matrix with ThermoElectric Generation (TEG) and self-repair capabilities,
2. Autonomously TEG -driven integrated systems for on- and off-line structural health monitoring- (SHM) and
3. Wired and low-power wireless SHM data transmission and mining system. The innovative intelligent materials and parts will be manufactured in purposefully developed pilot lines aiming at reducing production time and costs.

CFs yarns or textiles will be coated with nanomaterials using facile & environmentally friendly deposition and doping methods in a Roll-to-Roll (R2R) pilot line targeting dramatically increased TEG performance compared to existing composites, carbon and organic based materials. Innovative TEG-hierarchical composites will be manufactured with new generation 3R thermoset matrix systems enabling out of autoclave manufacturing and self-repair. These will be interfaced with a purposely designed hardware to:

1. Power inherent functionalities (e.g. strain, damage or UV-exposure sensing),
2. Drive external elements (e.g. piezo electric sensors for SHM) and
3. Transmit sensing signals to a remote panel.

The autonomous SHM systems will increase the safety of civil aviation; reduce emissions and maintenance & life cycle costs. The proposed technologies will be finally integrated in two aircraft demonstrator parts, targeting areas with temperature gradients (e.g. engine vs. environment, inside vs. outside fuselage during flight) or where quick heat dissipation is essential (e.g. landing gear after take-off). The location of suitable heat sinks in real structures will be established using advanced numerical tools to identify thermal gradients in operating environment.

Parent Programmes:

H2020-EU.3.4. - Horizon 2020: Smart, Green and Integrated Transport

Institute type: Public institution

Institute name: European Commission

Funding type: Public (EU)

Other programmes: MG-1-4-2016-2017 Breakthrough innovation

Lead Organisation:

Panepistimio Ioanninon

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Organisation Website:
http://www.uoi.gr / www.rc.uoi.gr

EU Contribution: €794,979

Partner Organisations:

Institut Fuer Verbundwerkstoffe Gmbh

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http://www.ivw.uni-kl.de

EU Contribution: €260,313

Societe Nationale De Construction Aerospatiale Sonaca Sa

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http://www.sonaca.com

EU Contribution: €292,841

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EU Contribution: €246,875

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EU Contribution: €286,238

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EU Contribution: €206,250

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EU Contribution: €317,278

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EU Contribution: €795,399

Steinbeis Advanced Risk Technologies Gmbh

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Organisation Website:
http://www.stw.de

EU Contribution: €205,125

Nanocyl Sa

Address:
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EU Contribution: €217,500

Fundacion Cidetec

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Organisation Website:
http://www.cidetec.es

EU Contribution: €377,125

Technologies:

Aircraft design and manufacturing
Combining recycled carbon fibres and bio-fibres in a hybrid non-woven and bio-based epoxy resins

Development phase: Research/Invention

Condition monitoring

Condition monitoring
Structural health monitoring based on modelling

Development phase: Research/Invention

STRIA Roadmaps: Vehicle design and manufacturing

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Safety/Security

Geo-spatial type: Other