SuCoHS

SUSTAINABLE & COST EFFICIENT
HIGH-PERFORMANCE COMPOSITE STRUCTURES
DEMANDING TEMPERATURE
AND FIRE RESISTANCE

SuCoHS Project

Sustainable Cost Efficient High Performance Composite Structures demanding Temperature or Fire Resistance

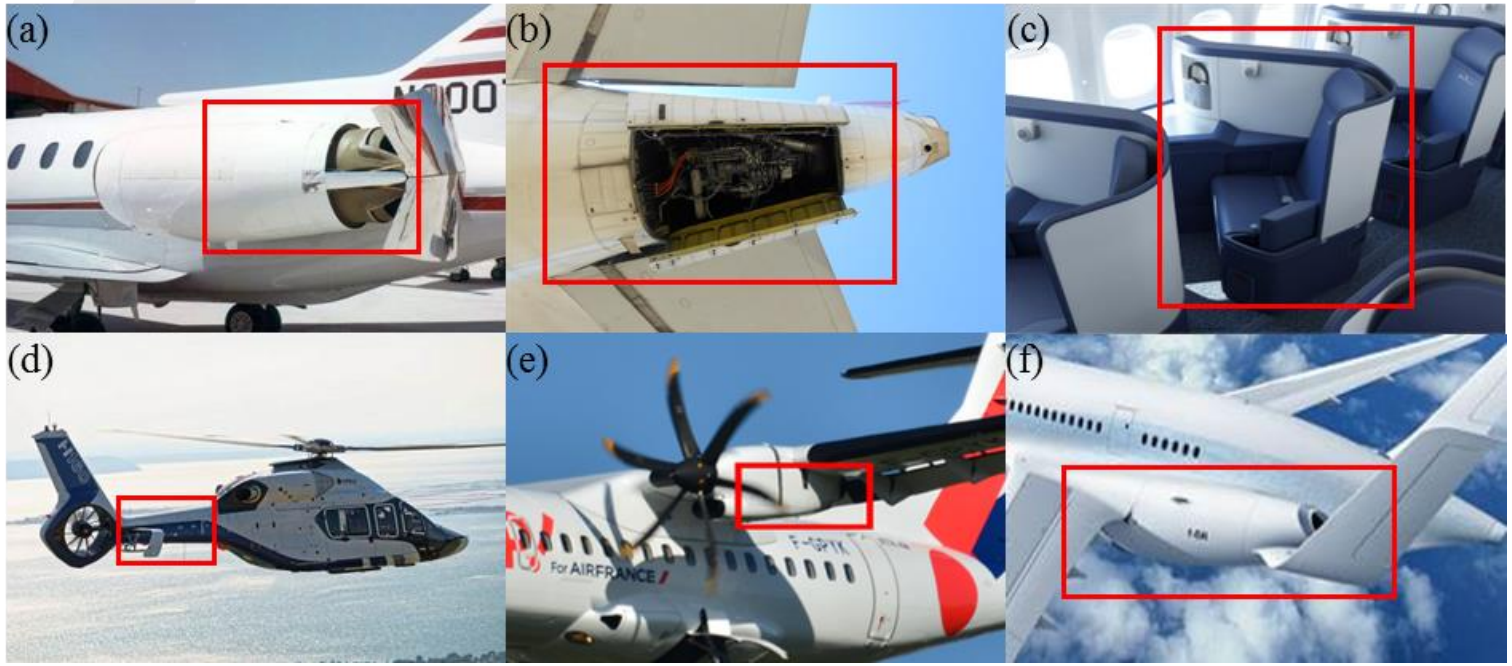
Date: 05 November 2020

Tobias Wille (DLR), Project Coordinator

SuCoHS project, Grant Agreement N° 769118

Background

- Several aeronautical applications demanding high thermal conditions
  - Temperature
  - Fire



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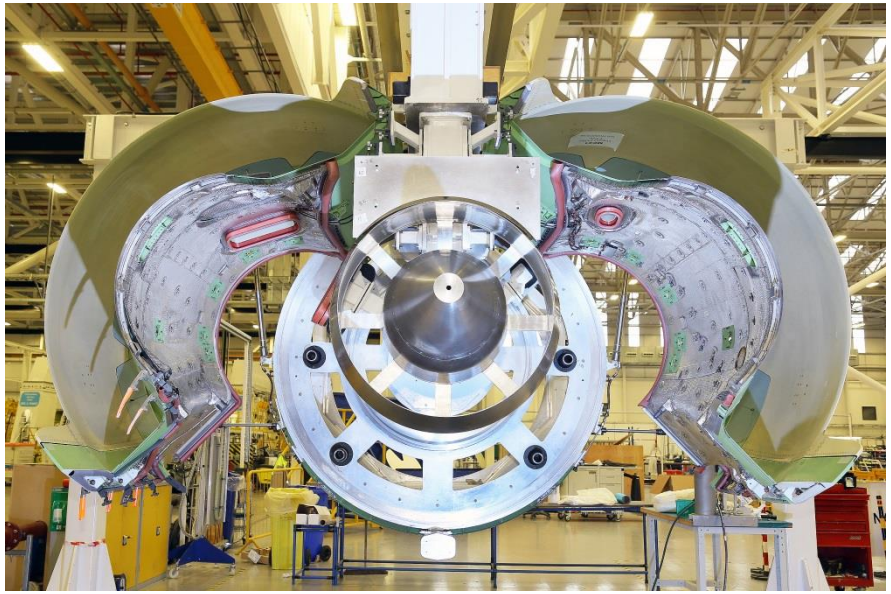
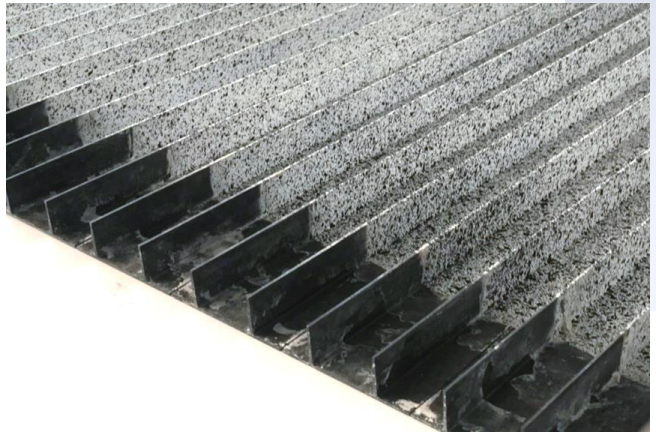
Background

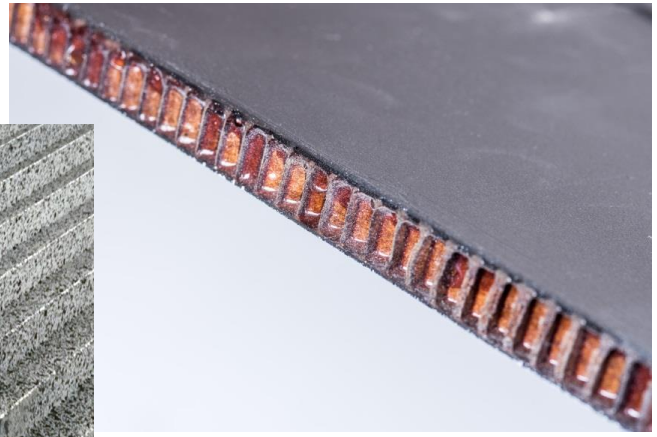
- Current metal designs could be replaced
  - reduce weight
  - improve performance



[Bombardier]

- Improve current composite designs
  - increase efficiency for multidisciplinary requirements
  - reduce manufacturing costs





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Objectives

- Overall objective of EC
  - Maintain European leadership through weight and cost savings in expanding the use of composite materials in areas of demanding high thermal conditions (temperature and fire)
- Technological objectives of SuCoHS project
  1. Multi-material systems/ structures to increase mech. performance, fire and thermal **resistance up to 350°C, reduce weight 12-15% and costs up to 17%**
  2. Systems for multiple sensing during production and operation to **increase safety and aircraft availability and decrease maintenance costs by up to 15%**
  3. Tailored composite manufacturing with in-situ structural assessment to **reduce time and costs for individual production steps by up to 30%**
  4. Multi-disciplinary analysis methods and allowables to **reduce weight and cost of selected parts by additional 3-8%**
  5. **Building block** for designing multifunctional structures validated by representative prototypes with integrated systems
  6. **Pilot demonstration** of future composite part development with horizontal & vertical integration of disciplines, methods and requirements

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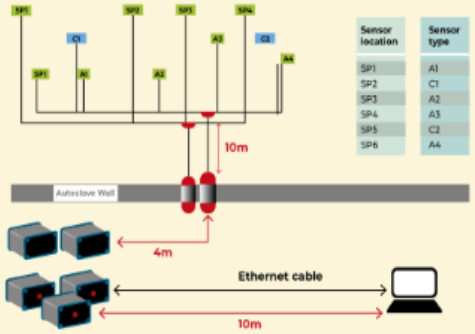
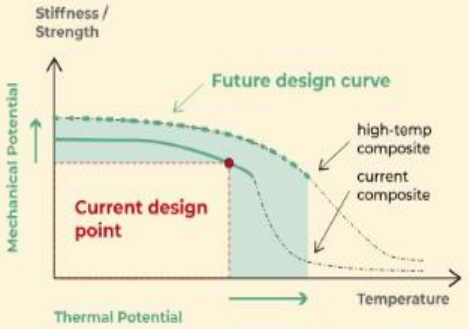
Concept and Methodology

- Concept providing key technologies for
  - Design
  - Manufacturing
  - Operation



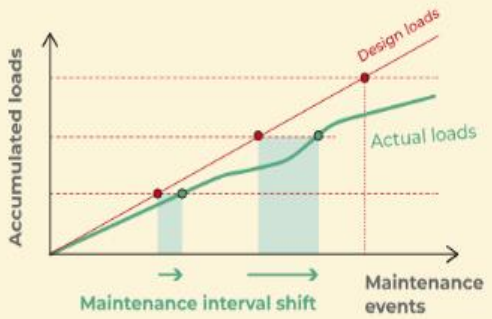
Manufacturing

- Tailored multifunctional preforms
- Advanced hybrid manufacturing technologies
- Zero-defect manufacturing



Design

- New composites materials
- Reliable multidisciplinary analysis tools and allowable
- Robust multifunctional structural concepts



Operation

- Reliable multifunctional sensors
- Efficient tools for structural usage evaluation
- Enhanced maintenance scheduling

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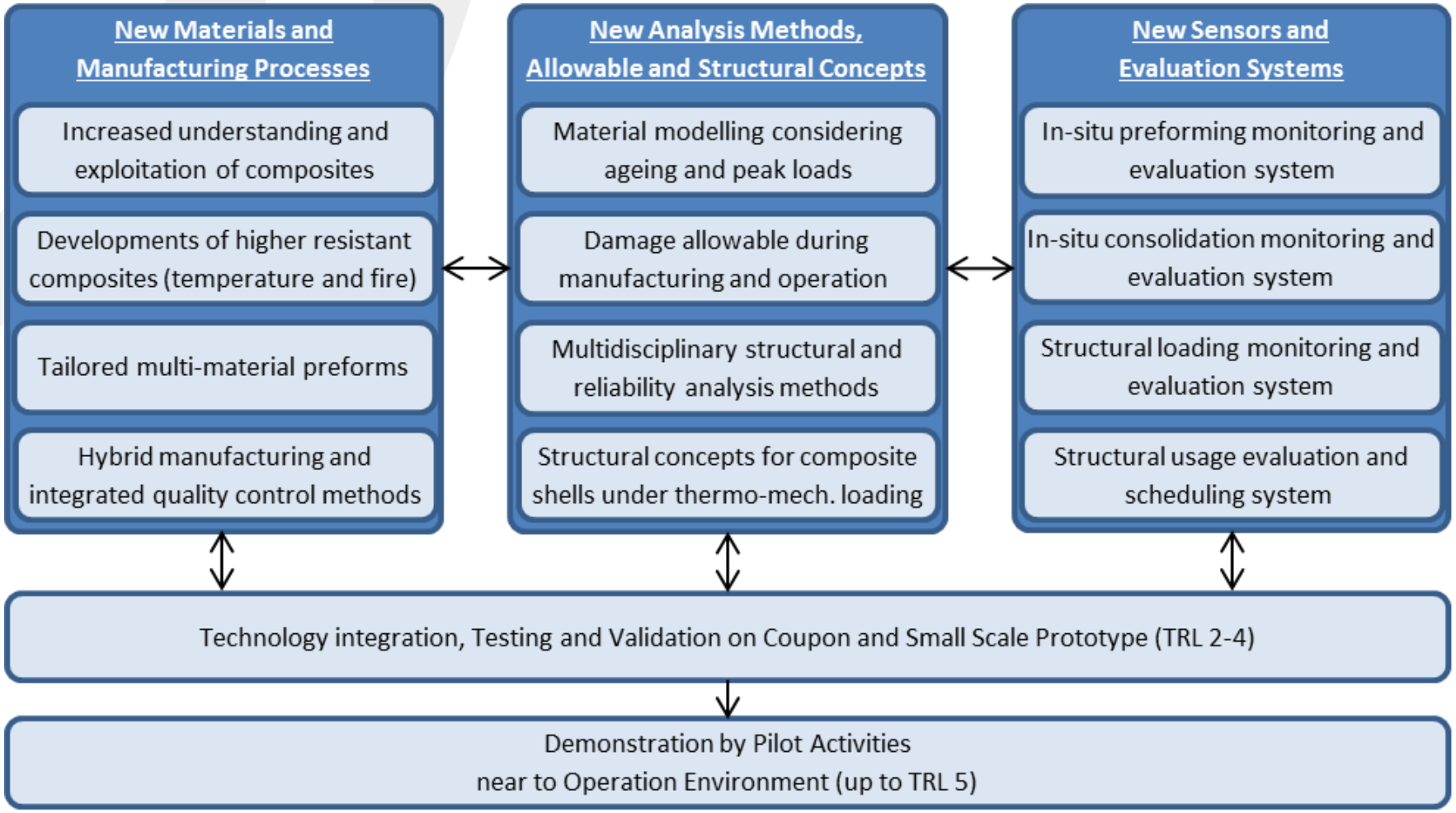
Concept and Methodology

- Methodology



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Consortium

In a nutshell

40 Researchers and engineers

14 Partners

36 Months

7 European Countries

571.5 person-months

EU contribution 6 638 939 €

Project name:
Sustainable and Cost Efficient High Performance Composite Structures demanding Temperature and Fire Resistance

Project acronym: SuCoHS

Funding scheme: Research and Innovation Action (RIA)

Project Coordinator: Dr. Tobias Wille (DLR)

Contact: tobias.wille@dlr.de

Project start date: 01/09/2018

Project end date: 31/08/2021

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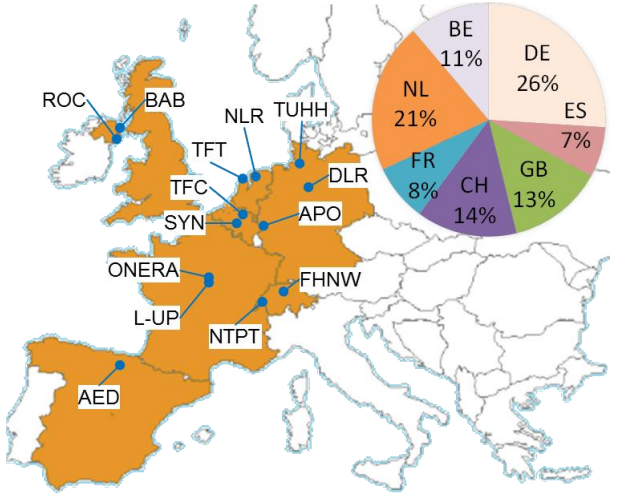
Consortium

- Universities
  - Material toughening
  - Process simulation
  - Probabilistic analysis
- Research centers
  - Material testing and modeling
  - Manufacturing technologies
  - Structural analysis and testing methods
- SME and industrial facilitators
  - Material development
  - Sensor system development
  - Data base
- Industrial end users
  - Structural concepts and simulation methods
  - Production verification
  - Pilot demonstration and evaluation



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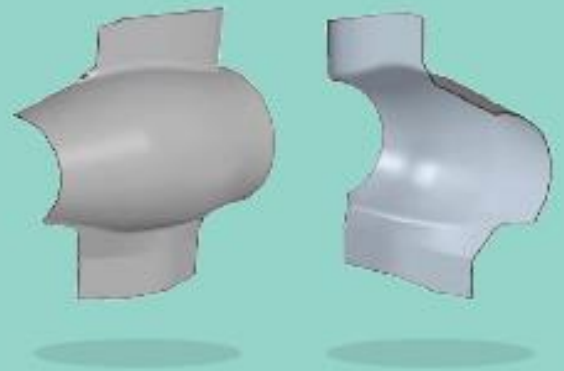
Pilot Demonstrators

High temperature nacelle component
(Bombardier)



- Reduce part complexity
- Multidisciplinary loading
- Reduce number of subparts
- Use of composites at T>335°C

Tail cone panel substructure
(Aernnova Engineering)

- Avoid titanium APU housing
- Use of composites at T>300°C
- Ensure fire resistance
- Ensure damage tolerance

Composite aircraft interior shell
(Collins Aerospace)

- New structural concepts and materials for improved performance at reduced costs
- Flammability and FST requirements

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Recent developments of SuCoHS

- Materials for temperature and fire resistance
- Sensor systems for online process monitoring
- Manufacturing technologies for sensor integrated structures made from new materials
- Probabilisitc analysis methods for considering nonlinearities
- Material and structural testing under higher thermal conditions (temperature and fire)

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Selected topics for subsequent presentations

- Material for temperature and fire resistance
  - Polyfurfuryl alcohol-based resins for fire resistant and high temperature applications (Dr. Hans Hoydonckx, TFC)
  - Material development for high temperature resistant composite based on a modified cyanate ester resin (Prof. Dr. Christian Brauner, FHNW)
  - Thin plies and their advantages (Thomas Ricard, NTPT)
- Sensor systems for online process monitoring
  - Online Cure Monitoring for advanced composites manufacturing (Dr. Nikos Pantelelis, Synthesites)
  - In-situ process monitoring and online defect detection in AFP (Alexander Leutner, Apodius)
- Realisation of smart structures
  - Smart stiffened structures with embedded FBG sensors positioned by AFP technology (Wilco Gerrits, NLR)
  - Embedded FBG sensors for SHM of composite structures (Dr. Pratik Shrestha, Technobis)

Get together

- Homepage
  www.sucohs-project.eu
- Bi-annual newsletters
- Linked In account created for SuCoHS (“company page”)
  https://www.linkedin.com/company/sucohs-project/
- Conferences in 2020 and 2021
  - Aerodays, online, 24-26 Nov 2020
  - ECCOMAS congress 11-15 Jan 2021
  - ISCM 21-22 Apr 2021
  - LighCon 23-24 Jun 2021
  - NAFEMS World Congress 14-18 Jun 2021
  - SAMPE Europe 28-30 Sep 2021

Contact

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DLR

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apodius

BOMBARDIER

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ONERA
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