HIGH PERFORMANCE LIGHTWEIGHT PANELS WITH A NEW OPTIMIZED DESIGN FOR ADVANCED AIRCRAFT STRUCTURES

Goal of the project

Design of aircraft panels, made of metal and composite material, flat and curved, with improved performances.

Short description of the project

Evaluation of the properties of some sandwich panels having an ultra light core, spatially folded. An increase of their performances with respect to the honeycomb core sandwiches is expected.

Project implemented by

- University Politehnica Bucuresti - Coordinator
- Straero S.A - Partner 1
- University Politehnica Timisoara - Partner 2
- INAS S.A. - Partner 3
- MART Mechanics S.R.L. - Partner 4

Main activities

- Characterization of three types of structural adhesives: Araldit AV138 M1 + HV 998, Araldit AW 106 + HV 953U and Bison using tensile tests and vibration excitation technique.
- Characterization of mechanical properties of metallic materials used for faces and cores in sandwich structures
- Static tests on single and double lap joints for the characterization for the characterization of the behavior of structural adhesives at ambient temperature.
- Numerical simulations of the behavior of doubler adhesive joints.
- Numerical simulation of the adhesive joints under four point bending

Implementation period

02.07.2012 - 30.06.2016

Results

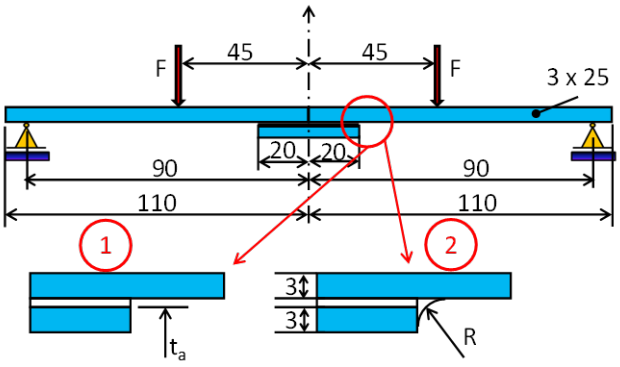
Identification of new mechanical interconnection solutions for the skins, using elements that cross the core of the sandwich, which are simpler, more efficient and cheaper than those currently in use.

Skins interconnection is more convenient in the case of rigid polymeric foam core. Thus, the risk of delamination is reduced and this procedure is expected to increase the rigidity and resistance of the designed panels. Designing a new auxetic core structure.

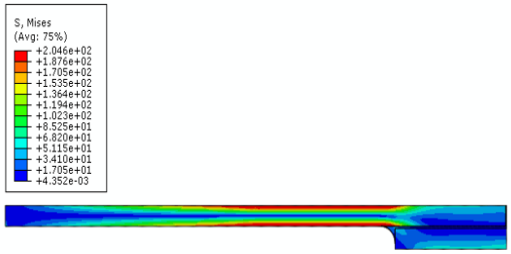
The main results were published in:

- R. Negru, L. Marsavina L.,C. Caplescu, H. Filipescu, Assessment of brittle mixed -mode fracture using the theory of critical distances, Proceedings of International Conference on Innovative Technology, IN-TECH 2013, Budapest 10-13.09.2013, p. 313-316

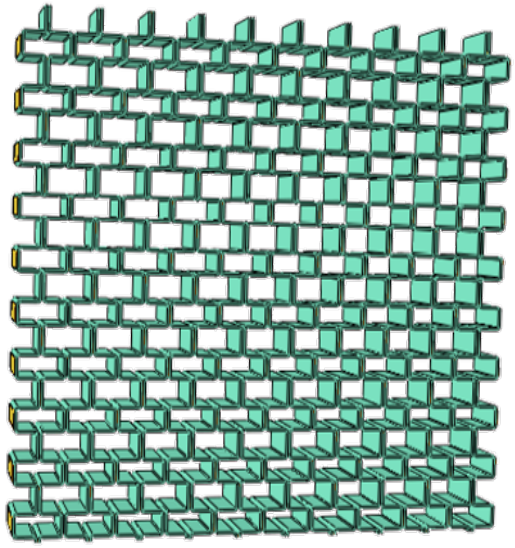
- R. Negru, L. Marsavina, H. Filipescu, C. Căplescu, T. Voiconi, Assessment of brittle fracture for PUR materials using local Strain Energy Density and Theory of Critical Distances, Theoretical and Applied Fracture Mechanics, (OnLine First)



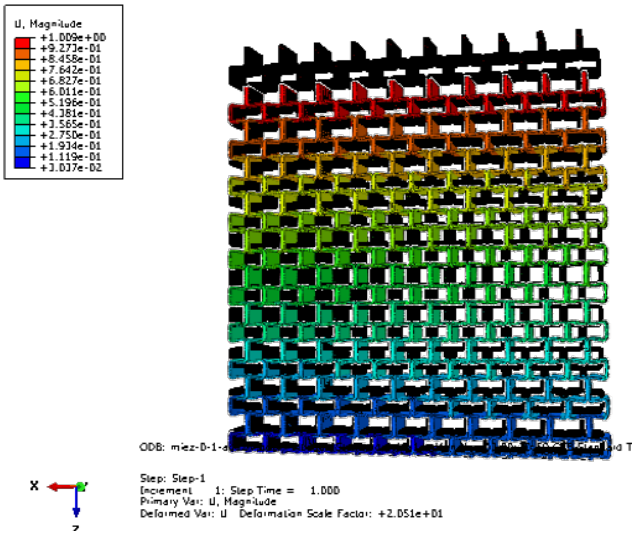
Geometry of the adhesive joint under four point bending



Equivalent stress distribution for the adhesive joint under four point bending



Auxetic core structure



Total displacement of the structure

Applicability and transferability of the results

Results and design solutions will be transferred to sandwich structure manufacturers to improve their technologies.

Also, companies involved on design of aircraft will benefit by our developed sandwich structures and hybrid assembly solutions.

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Research centre

ICER - Research Institute for Renewable Energy

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"There are no secrets to success. It is the result of preparation, hard work, and learning from failure."
Colin Powell

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