

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

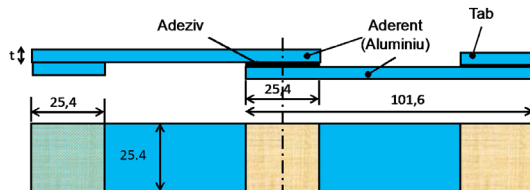
Evaluation of the properties of some sandwich panels having an ultra light core, spatially folded. An increase of their performances with respect to the honeycomb core sandwiches is expected.

Designing and evaluation of simple solutions as to achieve constructive orthotropic panels with increased carrying capacity, having double or triple core. By choosing the materials and the component geometry the mechanical properties will be conveniently changed from one layer to another.

The designing of hybrid assembly solutions (structural adhesives and mechanical fastening) of sandwich plates having the core and skins made of dissimilar materials.

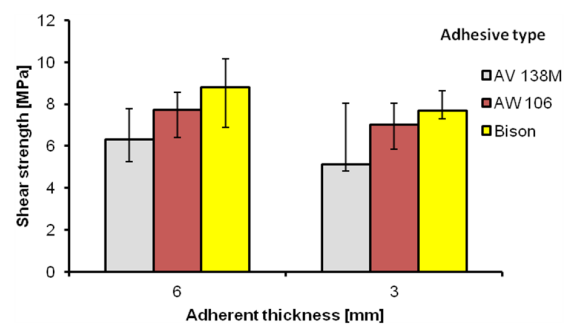
The use of prefabricated and commercially available materials, such that the costs of the designing, manufacturing and homologation of the designed panels will be minimized.

Development of procedures for simulating the mechanical response of the panels, using homogenization method for a more simple and efficient design process.



Project implemented by

- University Politehnica Bucuresti - Coordinator
- Straero S.A - Partner 1
- University Politehnica Timisoara - Partner 2
- INAS S.A. - Partner 3
- SMART 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 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 - 30.06.2015

Research centre

R research Centre for Processing and Characterization of Advanced Materials

Results

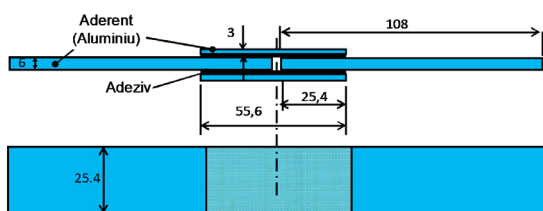
Identification of new mechanical interconnection solutions for the skins, using elements that cross the core of the sandwich, which are simpler, more efficient and cheaper than those currently in use. Skins interconnection is more convenient in the case of rigid polymeric foam core. Thus, the risk of delamination is reduced and this procedure is expected to increase the rigidity and resistance of the designed panels.

Conference Papers:

- Negru R., Marsavina L., Caplescu C., Filipescu H., 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, ISBN 978-953-6326-88-4

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.

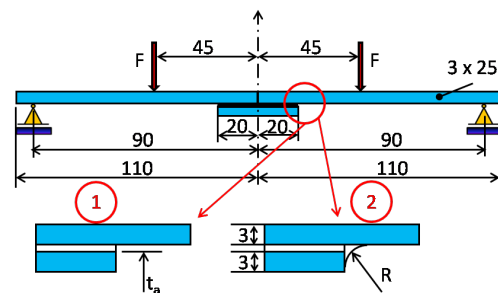


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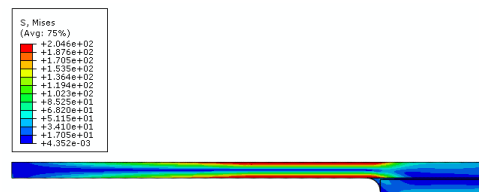
Fields of interest

- Composite and sandwich structures
- Mechanical testing of composite materials
- Finite Element Analysis of sandwich structures
- Fracture and Damage Mechanics of composite structures



Research team

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