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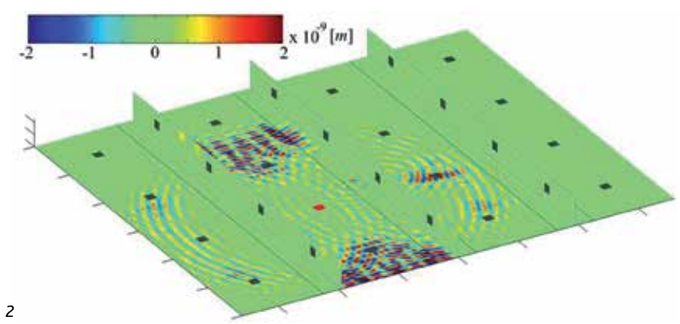
Smart Intelligent Aircraft Structures -SARISTU

SARISTU (Smart Intelligent Aircraft Structures) is a large-scale integrated project which aims at achieving reductions in aircraft weight and operational costs, as well as an improvement in the flight profile specific aerodynamic performance. Coordinated by Airbus, the SARISTU Consortium brings together 64 partners from 16 European countries. The total budget of the project is 51 M€, partially funded by the European Commission under FP7-AAT-2011-RTD-1 (Grant Agreement number 284562). The project started in September 2011 and is expected to be completed by August 2015.

SARISTU focuses on the cost reduction of air travel through a variety of individual applications as well as their combination. For the first time ever in smart material concepts, SARISTU offers the opportunity to virtually and physically assess the interaction of different technological solutions and their combined effects at aircraft level.
Specifically, the joint integration of different conformal morphing concepts in a laminar wing is intended to improve aircraft performance through a drag reduction, with a positive effect on fuel consumption and required take-off fuel load as well as a decrease of the airframe generated noise.
Another important objective is to limit the integration cost of Structural Health Monitoring (SHM) systems still ensuring lifelong applicability by moving the systems integration as far forward in the manufacturing chain as possible. Finally, the incorporation of Carbon Nanotubes into aeronautical resins is expected to enable weight savings of up to 3%.
The University of Siegen is involved in the application scenario "Impact damage assessment using integrated ultrasonic sensors" within the second topic of "Integrated Sensing for SHM". Systems developed for SHM will be optimized for rapid in-service damage assessment. They have progressed to a maturity which allows their inclusion in the next generation of aircraft. However, the time consuming application of these sensor systems has to be further improved by integration at the component manufacturing level.
In order to add self-sensing functionality to the fuselage, piezoelectric transducers will be permanently implemented onto the structure. By actuation and sensing of guided waves in pitch-catch mode, damage will be detected and assessed through wave-damage interaction in the structure. Furthermore, the functionality of self-sensing structures will be assessed. The main focus is on their capabilities regarding: Damage Detection, Sensor Integration, Quality Assurance, Contacting and Data Transfer based on the physical system integrated during manufacturing.
It is the task of the team of the University of Siegen to simulate the wave propagation and the interaction with damage such as delamination to find suitable sensor configurations for the application scenario. Furthermore new methods for the self-diagnosis of ultrasonic sensors will be developed to make sure that the deployed sensor system is working properly.



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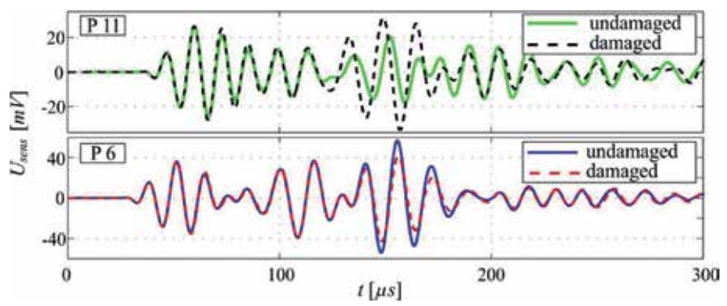

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Text source, Fig 1
Airbus Operations GmbH - ESWNG

Fig. 2 ,3
University Siegen
Simulation of ultrasound Lamb wave propagation in a complex geometry and exemplary sensor signals before and after damage

I Project Management and Execution

EADS Innovation Works,
Structure Health Engineering - IW SP HG
on behalf of Airbus Operations GmbH - ESWNG

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