PROJECT

SARISTU

Smart Intelligent Aircraft Structures

**Funding:** European (7th RTD Framework Programme)
**Duration:** Sep 2011 - Aug 2015
**Status:** Complete with results
**Total project cost:** €50,712,428
**EU contribution:** €32,434,311

**Call for proposal:** FP7-AAT-2011-RTD-1

CORDIS RCN: 100047

**Background & policy context:**

The SARISTU project 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. The project addresses topics like aircraft weight and operational cost reductions, improvement in the flight profile, aerodynamic performance.

**Objectives:**

The project proposal concerns the challenges posed by the physical integration of smart intelligent structural concepts. It addresses aircraft weight and operational cost reductions as well as an improvement in the flight profile specific aerodynamic performance.

This concerns material concepts enabling a conformal, controlled distortion of aerodynamically important surfaces, material concepts enabling an active or passive status assessment of specific airframe areas with respect to shape and potential damages and material concepts enabling further functionalities which to date have been unrealizable.

Past research has shown the economic feasibility and system maturity of aerodynamic morphing. However, few projects concerned themselves with the challenges arising from the structural integration on commercial aircraft. In particular the skin material and its bonding to the substructure is challenging. It is the aim of this project proposal to demonstrate the structural realizability of individual morphing concepts concerning the leading edge, the trailing edge and the winglet on a full-size external wing by aerodynamic and structural testing.

**Methodology:**

Operational requirements on morphing surfaces necessitate the implementation of an independent, integrated shape sensing system to ensure not only an optimal control of the aerodynamic surface but also failure tolerance and robustness. Developments made for structural health monitoring will be adapted to this task. Similar systems optimized for rapid in-service damage assessment 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. The additional benefit of a utilization of these adapted systems for part manufacture process and quality control shall be assessed in SARISTU.

Addressing the Nanotechnology aspect of the call, benefits regarding significant damage tolerance and electrical conductivity improvements shall be realized at sub-assembly level.

**Parent Programmes:**

[FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)]
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<td><strong>Institute name:</strong></td>
<td>The European Commission</td>
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<td><strong>Funding type:</strong></td>
<td>Public (EU)</td>
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**Lead Organisation:**

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<th>Address</th>
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<tr>
<td>Airbus Deutschland GmbH</td>
<td>Kreetslag 10, 950109 HAMBURG, Germany</td>
<td>€1,607,664</td>
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**Partner Organisations:**

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<td>Gkn Aerospace Services Limited</td>
<td>Ferry Road, East Cowes, PO32 6RA, United Kingdom</td>
<td>€255,529</td>
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<td>Universitaet Siegen</td>
<td>Adolf Reichwein Strasse 2A, 57076 Siegen, Germany</td>
<td>€190,000</td>
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<td>Catalyse Sarl</td>
<td>Boulevard De La Pomme 116, 13011 Marseille, France</td>
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<tr>
<td>Short Brothers Plc</td>
<td>Airport Road, Queens Island, BT3 9DZ, United Kingdom</td>
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**Organisation Website:**

- [http://www.airbus.com](http://www.airbus.com)
- [http://www.aerospace.bombardier.com](http://www.aerospace.bombardier.com)
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<td>Fundacion Para La Investigacion, Desarrollo Y Aplicacion De Materiales Compuestos</td>
<td>Avda Rita Levi Montalcini (Tecnogetafe) 29 28906 Getafe Spain</td>
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<td>Cpb Software (Austria) Gmbh</td>
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<td>Societe Anonyme Belge De Constructions Aeronautiques</td>
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<td>Stichting Centrum Voor De Ontwikkeling Van Transport En Logistiek In Europa</td>
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Via S. Pescatori 68
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<td>29, avenue de la Division Leclerc BP72 CHÂTILLON CEDEX France</td>
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<td>Rue De L'essor 4</td>
<td>5060 Sambreville Belgium</td>
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<td><strong>Centre National De La Recherche Scientifique</strong></td>
<td>3 rue Michel-Ange 75794 PARIS France</td>
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<td><strong>Katholieke Universiteit Leuven</strong></td>
<td>Oude Markt 3000 Leuven Belgium</td>
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<td><strong>Universidad Politécnica De Madrid</strong></td>
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Altran Aviation Engineering Gmbh

Address:
HEIN SASS WEG 38
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Organisation Website:
http://www.altran.com

EU Contribution: €0

Technologies:

- Aircraft design and manufacturing
- Morphing wing

Development phase: Validation

Nanomaterials
Nanomaterials for structural health monitoring

Key Results:

Lowering air travel costs thanks to smart materials

An EU initiative is developing intelligent design techniques that can seamlessly change the shape of an aircraft's wings. Combined with technologies enabling self-sensing structures and Nanocomposites, this has the potential to reduce development time and costs in manufacturing and operations.

Smart intelligent structures can offer significant savings in an aircraft's total weight, manufacturing and operational costs, but they pose practical challenges. Overcoming these difficulties is the aim of the EU-funded http://www.saristu.eu/ (SARISTU) (Smart intelligent aircraft structures) project. Researchers seek to demonstrate through testing that individual shaping or morphing concepts are structures that can be achieved on a full-size external wing. Furthermore, engineers are integrating complex sensor networks and employing Nanocomposites on major test pieces.

As the project enters its final year, design activities for the major wing and fuselage demonstrations were completed. Wing and fuselage related integration and testing continue. The main demonstrator parts manufacturing has been launched in SARISTU’s third year following completion of major smaller scale test series.

Morphing technologies employed at the wing leading edge, trailing edge and winglet have been verified at sub-assembly level and are moving up for verification at assembly level.

Damage detection testing for the self-sensing fuselage demonstrator has begun. The door surround structure parts were manufactured and are awaiting final assembly.

Through validation, project partners were able to limit the cost of integrating structural health monitoring systems into the manufacturing chain. This reduces in-service inspection costs by up to 1%.

In its fourth and final year, SARISTU will continue to evaluate the interface between diverse technological solutions and their collective impact on aircraft, particularly through wing and fuselage demonstrations. In doing so, it will reduce aircraft weight, operational costs and noise, and enhance aerodynamic performance.

Documents:
- Periodic Report Summary 2 - SARISTU (Smart Intelligent Aircraft Structures)

STRIA Roadmaps: Vehicle design and manufacturing

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Deployment planning/Financing/Market roll-out

Geo-spatial type: Other