PROJECT

WASIS

Composite fuselage section Wafer Design Approach for Safety Increasing in Worst Case Situations and Joints Minimizing

Funding: European (7th RTD Framework Programme)

Duration: Jan 2011 - Dec 2014

Status: Complete with results

Total project cost: €4,339,301

EU contribution: €3,239,763

Call for proposal: FP7-AAT-2010-RTD-1

CORDIS RCN : 97208

Background & policy context:

Aeronautics is a key asset for the future of Europe. However, nowadays the industry has to face the challenge of "More Affordable, Safer, Cleaner and Quieter" while at the same time accounting for a demand that will triple over the next 20 years.

Objectives:

The WASIS project aims to rise to this challenge with the development of a composite fuselage structure based on the lattice stiffening concept, optimizing geometrical and mass properties of transition zones of fuselage structural joints. Project overall concept is focused on simultaneous meeting environmental demands and rising safety, coupled with design and manufacturing cost-efficiency improvement.

Methodology:

The lattice approach allows composites to obtain more efficient mechanical behaviour, reducing weight and optimizing structure performance, which will be proved by comparative simulations against other approaches. This will be combined with specially designed semi-loop and micro-pin joining elements to provide the ability of innovative non-regular lattice structure manufacturing, save aircraft weight, avoid fuselage section weakening due to cutting reinforcement fibres.

Furthermore, the structure will also be developed to better withstand worst situation loadings, assessing safety through the large adoption of simulation and virtual testing from the very first design stages to analyse explosions and material damping. Developed innovative fuselage section design will be merged with high-productive filament winding technology to reduce manufacturing costs and time, and samples will be manufactured in order to prove how the different concepts fit together. Complete testing of the samples will be applied to prove the wafer approach. This integrated approach will result in sufficient fuselage weight savings, manufacturing cost/time efficiency and safety increase.

Parent Programmes:

FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

Institute type: Public institution

Institute name: The European Commission

Funding type: Public (EU)

Lead Organisation:

Fundacion Cidaut

Address:
PLAZA VICENTE ALEIXANDRE CAMPOS 2 PQ TECNOLOGICO DE BOECILLO 209
47151 VALLADOLID
Spain

Organisation Website:
http://www.cidaut.es

EU Contribution: €463,607

Partner Organisations:

Institut Fuer Verbundwerkstoffe Gmbh

Address:
ERWIN SCHRODINGER STRASSE GEB 58
67663 KAISERSLAUTERN
Germany

Organisation Website:
http://www.ivw.uni-kl.de

EU Contribution: €401,700

National Aerospace University "kharkiv Aviation Institute"

Address:
17 Chkalova St.
KHARKIV
61070
Ukraine

Organisation Website:
http://www.khai.edu

EU Contribution: €339,500

Comat Composite Materials Gmbh

Address:
Marie Curie Strasse 1
67661 Kaiserslautern
Germany

EU Contribution: €0

Circomp Gmbh

Address:
Marie Curie Strasse 11
67661 Kaiserslautern
Germany

EU Contribution: €424,200

Materials Engineering Research Laboratory Limited

Address:
Wilbury Way
Hitchin - Herts

SG4 0TW
United Kingdom

EU Contribution: €166,337

Comite Europeen De Normalisation

Address:
Avenue Marnix 17
1000 Bruxelles
Belgium

EU Contribution: €13,600

Piaggio Aero Industries S.p.a

Address:
Viale Castro Pretorio 116
185 ROMA
Italy

Organisation Website:
http://www.piaggioaero.com

EU Contribution: €178,839

Netcomposites Limited

Address:
Bridge Way 4A Broom Business Park
Chesterfield
S41 9QG
United Kingdom

EU Contribution: €236,510

Atg Europe Bv

Address:
Huygensstraat 34
2201 DK Noordwijk
Netherlands

EU Contribution: €136,108

Element Materials Technology Hitchin Limited

Address:
Wilbury Way
Hitchin Herts
SG4 0TW
United Kingdom

EU Contribution: €186,159

Inegi - Instituto De Ciencia E Inovacao Em Engenharia Mecanica E Engenharia Industrial

Address:
Rua Dr Roberto Frias 400
4200 465 Porto
Portugal

Organisation Website:

http://www.inescporto.pt

EU Contribution: €412,524

Panepistimio Patron

Address:
University Campus- Rio
26500 Patras
Greece

Organisation Website:
http://www.upatras.gr

EU Contribution: €280,680

Corvus-Aircraft Sportrepulogep Gyarto Es Szolgaltato Korlatolt Tarsasag

Address:
Ii Korzet 35
Balloszog
6035
Hungary

EU Contribution: €0

Technologies:

Composite materials
Composite fuselage sections

Development phase: Research/Invention

Key Results:

Stiffer fuselages, lighter planes

A new design for stiffening aircraft bodies will make them lighter and consequently, more fuel efficient. The European concept depends on a composite lattice design.

Fuel prices have greatly affected airline profitability and there is an urgent need for future aircraft to be cheaper and more fuel efficient. New designs will incorporate many cost-saving features, one of which will be aircraft-body (fuselage) stiffening.

This is the goal of the http://www.wasis.eu (WASIS) project, a partnership among 11 European organisations from 10 countries. Their broad goal is to develop a stiffer fuselage based on an all-composite lattice design. The project focuses on making medium-sized aircraft greener, safer and more efficient.

Specifically, WASIS will focus on reducing fuselage weight via several means. These include optimising shape and weight properties of the transition zone of fuselage joints and replacing the joints with innovative micro-fasteners. The stiffer fuselage will be safer compared to conventional designs. The WASIS innovations will also reduce construction costs through automated manufacturing of wafer structures.

The project's first year saw the beginning of fuselage design that included all joints and openings so that manufacture would require fewer cuts. A wafer structure was designed using operational load scenarios, and then tested against conventional structures. All designs were simulated and refined during the project's second year.

Other work focused on the selection of materials suitable for the lattice design, from a list of candidates already used in aerospace. Chosen materials were tested during the second year.

Feasibility was assessed by manufacturing scaled demonstrators using different materials and techniques. These helped establish the feasibility of filament winding and tape placement as viable processes for the lattice structure. Other tests of manufacturing techniques are underway, including options for automation, combined with stress-testing of the resulting materials. Future work will merge fuselage design with filament-winding technology to reduce manufacturing costs.

WASIS offers a unique opportunity to combine modern composite materials with automated manufacturing, together leading to stronger and lighter aircraft frames. This will reduce fuel consumption and manufacturing wastage. Meanwhile, new designs will make repairs easier. These innovations will foster European industry.

Documents:
Presentation (Project presentation)

STRIA Roadmaps: Vehicle design and manufacturing

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Safety/Security

Geo-spatial type: Other