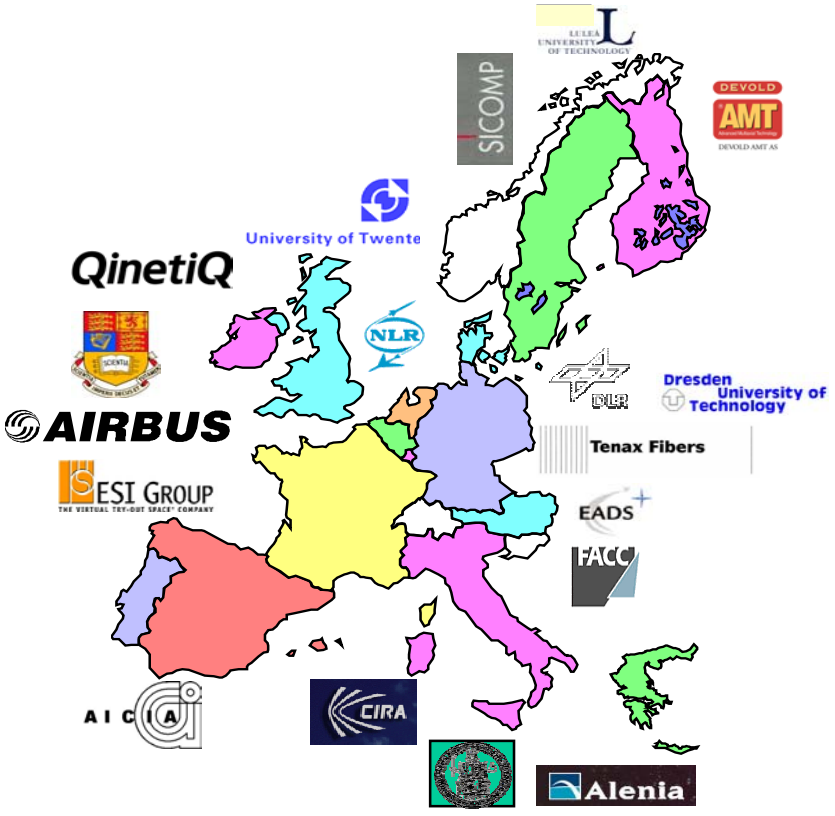

The 11th European Conference on Composites Materials

31st May 2004 Special Session

Designing with Non-Crimp Fabrics

A special session presenting work from the FP5 project FALCOM

FALCOM

Failure, Performance and Processing Prediction for Enhanced Design with Non-Crimp Fabric Composites

The commercial aircraft industry is investigating new technologies to help meet the demands of greater passenger numbers whilst reducing environmental impact at no discernible cost increase to the airlines. Non-Crimp Fabrics (NCF) provide many advantages over traditional pre-impregnated composite materials, for example reduced materials and manufacturing costs. The aim of the FALCOM project is to improve our understanding of the effects of NCF manufacturing on the performance of composite materials, thus permitting optimal structural design and therefore fully exploiting the technology.

The main deliverable and focus of the FALCOM project is an integrated design toolset consisting of a database containing the experimental output of the project, a set of algorithms based on the unit-cell approach and semi-empirical laws, cost analysis tools and a suggested certification methodology for NCF primary structures.

Processability has been experimentally investigated in FALCOM in terms of permeability, drapeability, compressibility and void content. The focus will be on obtaining relationships between processing and performance through fractographic analysis of the material, leading to physically based failure criteria for NCFs. These results will be used to validate the predictive models. The modelling will be carried out at two levels. A local (meso-mechanical) description of the fabric will allow studies of the effect of different processing variables and geometric configurations on processability and performance. The local models will provide homogenised properties that can be fed into the global (macro-mechanical) models to analyse the behaviour of benchmark components, such as stiffened panels.

Upon completion, FALCOM will provide a scientific foundation in the understanding of NCFs, forging strong and well defined links between performance and processing. This will allow engineers to make informed decisions during all stages of the design, manufacture, analysis and certification of NCF components. This will significantly reduce costs (cheaper material and more efficient design) and improve safety (improved certification methodologies). This understanding will allow the designer to utilise existing infrastructure, increasing the scope for increased growth and competitiveness, given the relative simplicity and low initial investment required for setting up the production of resin infused NCF components.

FALCOM Partners

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ECCM-11, Rhodes 31st May 2004

Designing with Non-Crimp Fabrics

PROGRAMME

10:50-11:10	NCFs - current and future industrial applications. J Wenström, Devold AMT, Norway.
11:10-11:30	Use of physically-based unit cell finite element model for the simulation of drapability of NCF materials. M Jevons, Airbus UK.
11:30-11:50	Permeability prediction of NCFs based on a geometric model. R Loendersloot, University of Twente, The Netherlands.
11:50-12:10	Application of permeability network model to non-crimp fabrics. S Lundstrom, Lulea University, Sweden.
12:10-12:30	A 3D FEM study of compressive behaviour of non-crimp fabrics. F París, University of Seville, Spain.
12:30 -12:50	The effect of NCF architecture on impact performance and failure mechanisms. A Foreman, QinetiQ, UK.
13:00 - 14:30	Lunch
14:30 - 14:50	Stiffness degradation in NCF composite in tension due to damage. J Varna, Lulea University, Sweden.
14:50 - 15:10	Compression after impact strength prediction for NCF composite structures. F Edgren, SICOMP, Sweden.
15:10 - 15:30	Designing with NCFs; toolset generation: L. Dufort, ESI Software, France.

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