

33rd SAMPE Europe International Technical Conference & Forum 2012

(SEICO 12)

Strong Features to Support the Lift-off

**Paris, France
26-27 March 2012**

Editors:

Mark A. Erath

ISBN: 978-1-61839-918-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2012) by SAMPE Europe
All rights reserved.

Printed by Curran Associates, Inc. (2012)

For permission requests, please contact SAMPE Europe
at the address below.

SAMPE Europe
PO Box 128
CH-4125 Riehen 2/
Basel, Switzerland

Phone: 41-61-601 87 71
Fax: 41-61-601 81 28

sebo@sampe-europe.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com



TABLE OF CONTENTS

KEYNOTE 1

Paper KN1

COMPOSITES: 30 Years of continued R&D as the Driving Force behind Aerostructures Progress

Speaker & Author: José Manuel Luna Diaz, EADS Senior Expert Domain D-2 Metallic Material and Processes, Head of Composites Production & Development Engineering, and R&T in AIRBUS Military, Centro Bahia de Cádiz, Espana2

SESSION 1 AEROSPACE A-400M - PLENARY PRESENTATION

Paper 44

Requirements, Design Concepts and Certification Criteria of the A400M Composite Structural Elements

Speaker & Co-Author: A.E. Jimenez Gahete, AIRBUS Military Structures and Design, Engineering & Technology Directorate, E-28906 Getafe (Madrid)
Co-Authors: M.A. Calero Gallardo, C. Delgado Hernandez, J. M. Fraga de la Iglesia, AIRBUS Military, Structures and Design, Engineering & Technology Directorate, E-28906 Getafe (Madrid)43

Paper 45

Industrialization and pre FAL for A400M

Speaker & Co-Author: L. Rubio Gracia, AIRBUS Military, El Puerto de Santa María, Cadiz, Espana
Co-Authors: I.M. Bejarano Sanchez, AIRBUS Military, El Puerto de Santa María, Cadiz,
Co-Author: R. Carvajal, AIRBUS Military, Tablada, Sevilla, Espana.....53

Paper 46

The A400M Final Assembly Line Industrialization using the Latest State of the Art Technologies

Speaker & Co-Author: R. Castiñeira Rico, AIRBUS Military, San Pablo, Sevilla
Co-Authors: P. Lopez Fernandez, R. Carvajal Vazques, AIRBUS Military, San Pablo, Sevilla60

Paper 47

Use of New Test Control Equipment Techniques for Full Scale Tests: A400M

Speaker & Co-Author: A.M. Gago Tripero, AIRBUS Military Test Engineering & Technology
Co-Author: P.A. Garcia Serrano, AIRBUS Military Test Engineering & Technology, E-28906 Getafe.....67



SESSION 2 PARALLEL PRESENTATIONS

Session 2A NANO COMPOSITES

Paper 06

Exploiting MWCNT for Upgrading Structural Adhesion Properties

Speaker & Co-Author: R. Intrater, Israel Aerospace Industries Ltd., Engineering Development Group

Co-Authors: V. Weisberg, A.K. Green, H. Leibovich, Israel Aerospace Industries LTD., Engineering, Development Group, Ben Gurion International Airport, IL-70100 LOD76

Paper 18

Low-Cost Multi-Layer Nanoparticle-based Non-Woven Fabrics for Composite Material Surface Enhancement

Speaker & Co-Author: D. Guerra, Technology Development, Nanoinnovations,NANOFABRIX, OH 43065, USA

Co-Author: J. Guerra, Technology Development, Nanoinnovations,NANOFABRIX, OH 43065, USA.....83

Paper 48

Effect of Nanoclay in Reducing Environmental Degradation of Carbon/Epoxy Nanocomposites

Speaker & Co-Author: M. Hosur, Tuskegee University, Material Science & Engineering Department

Co-Authors: A.T. Narteh, S. Jeelani, Tuskegee University, Material Science &Engineering Department

Co-Authors: M. Hossain, K. Imraan, Tuskegee University, Mechanical Engineering Dept. Tuskegee, AL 36088, USA.....91

Paper 58

Mechanical Properties of POSS-Epoxy Nanocomposites under Cryogenic Conditions

Speaker & Co-Author: K. Mishra, Oklahoma State University, Helmerich Research Center

Co-Author: R.P. Singh, Oklahoma State University, Helmerich Research Center, Tulsa, OK 74106, USA97

Session 2B TEXTILES

Paper 07

Economic Mass Production of Preforms using Braiding Technology

Speaker & Author: B. Fabich, RWTH Aachen University, Institut für Textiltechnik, D-52074 Aachen

Co-Authors: M. Linke, T. Gries, RWTH Aachen University, Institut für Textiltechnik, Aachen.....110

Paper 24

Analysis of Delamination and Strength Properties of Multilayer 3D Fabric Composites

Speaker & Co-Author: B.Wendland, RWTH Aachen University, Institut für Textiltechnik, Aachen

Co-Authors: P. Abel, M. Raina, T. Gries, RWTH Aachen University, Institut für Textiltechnik, Aachen

Co-Authors: F. Ghekiere, G. de Clercq, G. Haezebrouck, University College Ghent, Ghent, Belgium115



Paper 59

Effects of pressurized Cores on the Properties of braided CFRP Structures

Speaker & Co-Author: M. Bulat, University of Stuttgart, Institute of Aircraft Design, D-70569 Stuttgart

Co-Authors: R. Kehrlé, K. Drechsler, University of Stuttgart, Institute of Aircraft Design, D-70569 Stuttgart

Co-Author: W. Bommés, Burgmann Packings GmbH, 74638 Waldenburg 122

Session 3 PARALLEL PRESENTATIONS

Session 3A MANUFACTURING

Paper 08

Engineering and Process Development of an UAV's Tail Boom by Filament Winding

Speaker & Co-Author: F. Fracasso, SEPMA Srl., Z.I. Galatina: / Soleto, I-73010 Soleto

Co-Authors: S. Fracasso, A. Sponziello, SEPMA S.r.l.

Co-Author: R. Gollino, SELEX Galileo S.p.A. 129

Paper 16

Fracture Behaviour of CFRP Structure with Flaw – Comparison with Conventional Coupon Test Results

Speaker & Co-Author: M. Kashiwagi, MITSUBISHI HEAVY INDUSTRY LTD., Nagasaki Research & Development Center, JP-851-0392 Nagasaki

Co-Author: Y. Nonaka, MHI, Nagasaki Research & Development Center, JP-851-0392 Nagasaki

Co-Authors: T. Abe, M. Yamashita, MITSUBISHI HEAVY INDUSTRIES LTD., Nagoya Aerospace Systems, JP-455-8515 Nagoja, Japan 135

Paper 29

Improving Thermal Uniformity of integrally heated Composite Tooling through Conductive Coatings

Speaker & Co-Author: S.B. Gosselin, University of Ottawa, Dept. of Mechanical Engineering, Colonel By Hall

Co-Authors: F. Robitaille, B. Jodoin, M. Yandouzi, University of Ottawa, Dept. Of Mechanical Engineering, Colonel By Hall, Ontario, Canada 141

Paper 54

Thermal effects on Cutting Edge Characteristics by Laser Machining of endless Carbon Fibre Reinforced Thermoplastics

Speaker & Co-Author: P. Jaeschke, Laser Zentrum Hannover e.V., D- 30419 Hannover:

Co-Authors: U. Stute, D. Kracht, Laser Zentrum Hannover e.V., D-30419 Hannover..... 147

Session 3B MANUFACTURING

Paper 09

Benefits of Modelling Accurate Moisture Diffusion in Aerospace Laminates

Speaker & Co-Author: J.M. Ryan, AIRBUS Operations LTD., GB-BS99 7AR Filton

Co-Authors: R. Older, R. Adams, S.G.R. Brown, AIRBUS Operations LTD, GB-BS99 7AR Filton

Co-Author: Prof. S.G.R. Brown, College of Engineering, Swansea University, GB-SA2 8PP

Swansea,UK 155



Paper 31

Design Optimization of Interlaminar stressed Composite Aerospace Components

Speaker & Co-Author: G.A. Barandun, Hochschule für Technik, IWK-Institut, CH-8640 Rapperswil

Co-Authors: M. Henne, T. Keusch, E. Thompson, K. Bottome, P. Mason, J. Lee, K. Horejsi, M. Fleischmann, C. Obertscheider, E. Eleven, Hochschule für Technik, IWK-Institut, CH-8640 Rapperswil

Co-Authors: B. Koller, J. Noistering, FACC, A-4910 Ried 161

Paper 76

Modelling the Low Velocity Impact Response of Foam-Based Sandwich Structures

Speaker & Co-Author: J. Zhou, School of Engineering, University of Liverpool, Liverpool L69 3GH, U.K.

Co-Authors: M.Z. Hassan, Z.W. Guan, W.J. Cantwell, School of Engineering, University of Liverpool, Liverpool L69 3GH, U.K. 167

Session 4 PARALLEL PRESENTATIONS

Session 4A REPAIR

Paper 10

Analysis of Composite Scarf Joints

Speaker & Co-Author: T.G. Davies, Swansea University, College of Engineering, GB-SA2 8PP Swansea, UK

Co-Author: J. Sienz, Swansea University

Co-Author: R.W. Jones, AIRBUS Operations LTD., GB-BS99 7AR Filton 174

Paper 62

Investigations of Composite Repair Method by Liquid Resin Infiltration

Speaker & Co-Author: R. Agogu , ONERA / DMSC, F – 92322 Ch tillon

Co-Authors: M. Hautier, D. L v que, C. Huchette, ONERA / DMSC, F-92322 Ch tillon

Co-Authors: O. Hesebeck, Fraunhofer IFAM Institut, D-28359 Bremen..... 180

Paper 63

Rapid Repair

Speaker & Co-Author: G. Wachinger, EADS Innovation Work, D-81663 Ottobrunn

Co-Author: A. Maier, Cassidian, M nchen-Manching, Germany

Co-Author: O. Martinez-Gandullo, EUROCOPTER Donauw rth. Germany

Co-Author: J. Popp, LUFTHANSA Technik, Hamburg-Flughafen..... 186

Paper 64

Abrasive Water Jet machining for Composite Repair

Speaker & Co-Author: C. Cenac, JEDO Technologies, BP 78203, F-31682 Lab ge

Co-Authors: F. Collombet, L. Crouzeix, Y.H. Grunewald, Universit  de Toulouse, Institut Cl ment Ader, F 31077 Toulouse

Co-Author: M. D l ris, JEDO Technologies, BP 78204, F-31682 Lab ge 191



Session 4B iREMO

Paper 69

iREMO: Intelligent Reactive Polymer Composites Moulding

Speaker & Co-Author: M.P. Toitgans, CEMCAT ITA., Parc Universitair & Technologique, F-53810 Changé

Co-Author: A. Beigbeder, CEMCAT ITA., Parc Universitair & Technologique, F-53810 Changé.....214

Paper 70

iREMO Systems helps improve Productivity in the Resin Infusion

Speaker & Author: A. Bansal, ACCIONA INFRAESTRUCTURAS, E-28108 Alcobendas

Co-Author: I. Muñoz Burgos, ACCIONA INFRAESTRUCTURAS, E-28108 Alcobendas220

Paper 71

Modeling of Reactive Polymer Composite Molding Processes using neural Networks

Speaker- & Co-Author: J. Zhang, Newcastle University, School of Chemical Engineering & Advanced Materials, GB-NE1 7RU Newcastle upon Tyne

Co-Author: N.G. Pantelelis, National Technical University of Athens, Mechanical Engineering Department, Athens, Greece248

Paper 72

Use of iREMO System to produce Automotive Parts by RTM

Speaker & Author: Y. Amosse, SOTIRA, Group SORA Composites, Parc Tritaire Technopôle, F-53810 Changé.....N/A

SESSION 5 PARALLEL SESSIONS

SESSION 5A DESIGN

Paper 01

The Effect of Production on the efficiency of CFRP Chopper Disks for Time of Flight (TOF) Spectroscopy

Speaker & Co-Author: V. Antonelli, Technische Universität München, ILS-Institut, D-85748 Gerching

Co-Authors: M. Wedekind, B. Horst, L. Krämer, Technische Universität München, ILS-Institut, D-85748 Garching256

Paper 05

Embedded Instrumentation: From Coupon to a Representative Composite Part

Speaker & Co-Author: M. Torres, Université de Toulouse, Institut Clément Ader, F-31077 Toulouse

Co-Authors: F. Collombet, B. Douchin, L. Crouzeix, Y. Davila, R. Zitoune, Université de Toulouse, Institut Clément Ader

Co-Author: Y.H. Grunevald, SARL Composites – Expertise et Solutions, F-31320 Castant Tolosan, France

Co-Author: R. Bazer-Bachi, IRAP Institute, France

Co-Authors: N. Lammers, G. Luyckx, Gent University, Gent, Belgium

Co-Author: C. Sonnenfeld, Free University of Brussels

Co-Author: H. Hernandez-Moreno, IPN University, Mexico262



Paper 51

Towards an Ontology for Aircraft Design

Speaker & Co-Author: B. Nagel, DLR German Aerospace Center, Air Transportation Systems, D-21079 Hamburg

Co-Authors: D. Böhnke, F. Dorbath, DLR Germany Aerospace Center, Air Transportation Systems, Hamburg292

Paper 52

FOXHOUND: The UK's latest Composite Armoured Vehicle

Speaker & Author: M. French, QinetiQ Farnborough, GB-GU14 0LX Farnborough, Hampshire, UK.....298

Paper 57

Preliminary Design and Optimization of a Component of a Drift Chamber for Mu2e Experiment

Speaker & Co-Author: F. Grancagnolo, Università del Salento, Lecce, Dipartimento di Fisica, I-73100 Lecce

Co-Authors: G. Zavarise, L. De Lorenzis, A. Miccoli, A. L'Erario, S. Rella, F. Rossetti, A. Maffezzoli, Università del Salento, Lecce, Dipartimento di Fisica, I-73100 Lecce299

SESSION 5B MATERIAL

Paper 13

Fracture Toughness of Fiber Reinforced Composites under Transverse Loading

Speaker & Co-Author: C. Marotzke, BAM Federal Institute for Materials Research & Testing, B-12205 Berlin

Co-Author: R. Basan, BAM Federal Institute for Materials Research & Testing, B-12205 Berlin.....309

Paper 25

Tensile Strength of Recycled Carbon Fiber extracted from Waste CFRP by Incineration in Air and Mechanical Properties of its Composites

Speaker & Co-Author: R. Monobe, Doshisha University, Kyotanabe, JP-610-0394 Kyoto, Japan

Co-Authors: K. Okubo, T. Fujii, Mechanical Engineering Department of Doshisha University, JP-610-0394 Kyoto, Japan315

Paper 49

Improving the Damage Tolerance of Composite Sandwich Structures by use of AP-PLY

Speaker & Co-Author: V. Arzoni, NLR National Aerospace Laboratory, NL-8316PR Marknesse

Co-Author: H.M. Nagelsmit, Delft University of Technology, NL-2629 HS Delft

Co-Author: P.J. Van Langen, Amsterdam University of Applied Science, Amsterdam, The Netherlands.321

Paper 67

Phenoxy for Carbon Nanotube Dispersion into Epoxy Matrices of RTM-processed Composites

Speaker & Co-Author: D. Dumont, Université Catholique de Louvain-La-Neuve

Co-Authors: R. Berben, F. Cordenier, E. Henry, M. Sclavons, P. Van Velthem, D. Daoust, Institut of Condensed Matter and Nanosciences, Université Catholique de Louvain-La-Neuve, B-1348 Louvain-La-Neuve327



Paper 61

Aero Engine Lightweight Composite Thrust Reverser Rotating Cascade made of 3D Hollow Elements with Inner Cavities Reinforced with a Corrugated Filler

Speaker & Co-Author: Y. Murashkin, Zaporozhye Machine-Building Design Bureau, A.G. Ivchenko Progress State Enterprise, UA-69068 Zaporozhye, Ukraina
Co-Authors: S. Biryukov, G. Peichev, Y. Yalovenko, Zaporozhye Machine-Building Design Bureau, A.G. Ivchenko Progress State-Enterprise, UA-69068 Zaporozhye, Ukraina333

SESSION 6 PARALLEL PRESENTATIONS

Session 6A IMAC-PRO i

Paper 65

Features and Highlights of IMAC-PRO

Speaker & Author: C. Breu, A. Gessler, EADS Innovation Works, D-85521 Ottobrunn (Munich)340

Paper 27

Optimization of Stringer Manufacturing by Means of an extensive Cost-Analysis Study

Speaker & Co-Author: C. Katsiropoulos, University of Patras, Dept. Mechanical Engineering & Aeronautics, GR-26500 Patras, Greece
Co-Author: S. Pantelakis, University of Patras, Dept. MEA., GR-26500 Patras
Co-Authors: C. Breu, A. Gessler, EADS Innovation Works, Textile Technology & Testing, D-81663 Ottobrunn
Co-Author: K.-H. Semlitsch, SECAT Technologie GmbH., Hönigsberg, Austria.....346

Paper 28

Development of an UD-braided Longeron with Variable Cross-Sections

Speaker & Co-Author: T. Von Reden, Stuttgart University, Institute of Aircraft Design, D-70569 Stuttgart
Co-Author: K. Birkefeld, Stuttgart University, Institut of Aircraft Design, D-70569 Stuttgart
Co-Authors: A. Vigourex, Y. Blanchard, DASSAULT Aviation, F-St. Cloud (Paris)
Co-Authors: F. Henkel, G. Baumgart, SGL Kämpfers, Rheine, Germany.....352

Paper 34

FX-CORE: Functional Braiding Mandrel for the Compression Resin Transfer Moulding of Profiles

Speaker- & Co-Author; C. Dransfeld, Fachhochschule Nordwest-Schweiz, CH-5210 Windisch
Co-Author: M. Siegfried, Fachhochschule Nordwest-Schweiz, CH-5210 Windisch
Co-Authors: T. Von Reden, K. Birkefeld, Universität Stuttgart, Institut für Flugzeugbau, D-70569 Stuttgart358

Session 6B THERMOPLASTICS

Paper 37

Effect of Molding Condition on Mechanical Property of Glass Fiber Reinforced Thermoplastics Using in situ-Polymerizable Polyamide 6 as Matrix

Speaker & Author: K. Nakamura, NITTO BOSEKI Co. LTD., JP-960-8581 Fukushima-shi, Japan
Co-Author: N. Hirayama, NITTO BOSEKI Co. LTD., JP-960-8581 Fukushima-shi, Japan
Co-Author: G. Ben, Nihon University, Japan
Co-Author: H. Nishida, Nagase ChemteX Corporation, Japan.....366



Paper 40

New Polymer Alloys based on in situ-polymerizable Polyamide 6 suitable for infusion process

Speaker & Author: H. Nishida, NAGASE ChemteX Corporation, Nagase, Japan.....370

Paper 41

High Toughness Composites based on in situ-polymerizable Thermoplastic Epoxy-Resin

Speaker & Author: Y. Tsujimura, NAGASE ChemteX Corporation, Nagase, Japan376

Paper 50

Morphological Examinations of Self-reinforced Polypropylene Composites

Speaker & Co-Author: B. Rohde, University of Kassel, Institute of Materials Technology, D-34109 Kassel

Co-Authors: A. Ries, H.-P. Heim, University of Kassel, D-34109 Kassel382

SESSION 7 PARALLEL PRESENTATIONS

Session 7A L C M

Paper 22

Real-time Process Control applied in Liquid Composites Moulding

Speaker & Co-Author: N.G. Pantelelis, National Technical University of Athens, School of Mechanical Engineering, GR-157 80 Athens

Co-Author: E. Bistekos, Synthesites Innovative Technologies Ltd., GR-161 22 Athens, Greece.....389

Paper 38

Improvement of the Toughness of Epoxy Resin Systems using Thermoplastic Binders

Speaker & Co-Author: M. Arnold, Hochschule für Technik Rapperswil, IWK-Institut, CH-8640 Rapperswil

Co-Authors: D. Stapf, M. Henne, Hochschule für Technik, CH-8640 Rapperswil

Co-Author: K. Bender, EMS-CHEMIE AG, Business Unit EMS-GRILTECH, 7013 Domat/Ems, Switzerland

Co-Author: S. Frei, RUAG Aviation, 6032 Emmen, Switzerland

Co-Author: K. Drechsler, Technische Universität München, D-85748 München.....395

Paper 60

Characterization of Reactive Resin Flow during High Temperature LCM Injection

Speaker & Co-Author: B.M. Louis, ETH Federal Technical University Zürich, Centre of Structure Technology, CH-8092 Zürich

Co-Authors: J.I. Maldonado, F. Klunker, T. Lämmlein, P. Ermanni, ETH Federal Technical University, Centre of Structure Technology, CH – 8092 Zürich.....401

Paper 77

Manufacture of a High Durability Carbon Fibre Composite Vertical Axis Experimental Wind Turbine Using Vacuum Infusion Processing

Speaker & Author: A. Mills, Cranfield University, Composites Centre, Bedford, UK407



Paper 12

Study of Al₂O₃ Ceramic Coating deposited onto Carbon Fiber Reinforced Polymer Substrate

Speaker & Co-Author: S. Guanhong, Harbin Institute of Technology, Centre for Composite Materials & Structures, Harbin 150080, P.R.China

Co-Authors: H. Xiaodong, J. Jiuxing, S. Yue, Z. Yesheng, Harbin Institute of Technology, Centre for Composite Materials & Structures, Harbin 150080, P.R. China415

Session 7B NOVEL ASPECTS

Paper 66

Molecular Modelling and Nanotechnology: Theory and Applications

Speaker & Author: M. Meunier, Fellow, Accelrys LTD., 334 Science Park, GB-CB4 0WN

Cambridge422

Paper 68

Wear Application of Co-TiC Cemented Carbides for Gas Turbines

Speaker & Co-Author: T. Cherepova, G.V. Kurdiumov Institute of Metal Physics, National Academy of Science, UA-03142 KIEV

Co-Authors: M. Kindrachuk, O. Tisov, National Aviation University, UA-03680 KIEV423

Paper 74

Novel Lightweight Composites Cores for Aerospace Applications

Speaker & Co-Author: M.R.M. Rejab, Liverpool University, Liverpool, UK

Co-Authors: M.M. Issa, W.J. Cantwell, Liverpool University, Liverpool, UK428

Paper 75

Biodegradeable Sandwich Structures for lightweight environmentally-friendly Design

Speaker & Co-Author: M.Y.M. Zuhri, Liverpool University, Liverpool, UK

Co-Author: W.J. Cantwell, Liverpool University, Liverpool, UK436

Paper 32

Fiber Converter for Cutting Fiber Rovings

Speaker & Co-Author: G. Wiszniewski, RWTH Aachen University, Institut für Textiltechnik, D-52074 Aachen

Co-Authors: G. Seide, T. Gries, RWTH Aachen University, Institut für Textiltechnik, D-52074

Aachen441