

AIDAA 2019 CONGRESS

Rome

Mini-Symposium: *Damage Tolerance of Composite Structures: Beyond the State of the Art*

Abstract

The current design and certification paradigm for damage tolerant composite structures is based on a “no growth” philosophy for “barely visible” flaws that may occur in service, such as delamination due to impact. This design philosophy entails limiting in-service strains to values that are essentially dictated by the compression-after-impact performance of fibre-reinforced composites. However, such strain values are significantly below the ultimate load carrying capability of fibre-reinforced plastics and this limits the structural weight savings that can be achieved by adopting composites in primary airframe and aero-engine components.

This Mini-Symposium aims to provide a comprehensive overview of novel tools and techniques that can enable moving beyond to current “no growth” design approach and towards a truly damage-tolerant philosophy for the design of composites structures, whereby flaws will be allowed propagating in a sub-critical fashion between inspections. This requires a multi-disciplinary approach that involves material science, manufacturing technology, numerical and experimental techniques, as well as in-service structural diagnostics and prognostics.

Contributions to the Mini-Symposium are therefore sought in, but not necessarily limited to, the following areas: manufacturing advances for damage tolerant composite structures, spanning from tailored hierarchical micro-structures to intra/inter-laminar toughening methods, including through-thickness reinforcement; novel modelling techniques for in-service fracture and fatigue assessments of primary composite structural elements, with particular emphasis on large scale simulations, global-local approaches and parallelization; experimental methods for large-scale structural testing of composite assemblies, including the characterisation of environmental effects due to temperature and moisture uptake in fibre-reinforced plastics; structural health monitoring and non-destructive evaluation/inspection of composites structures.

Chairmen

Dr Giuliano Allegri

Prof Mario Marchetti

SYMPOSIUM N.4

DAMAGE TOLERANCE OF COMPOSITE STRUCTURES: BEYOND THE STATE OF THE ART

Chaired by : Dr. Giuliano Allegri
Department of Aerospace Engineering
University of Bristol, UK

KEYNOTE SPEAKER

Prof. Ferri M H Aliabadi
Department of Aeronautics, Imperial College London (UK)

ADVANCES IN STRUCTURAL HEALTH MONITORING FOR LIFE ASSESSMENT OF COMPOSITE AIRFRAMES

Paper N. 1 A. Russo, A. Sellitto, E. Vecchio, T. Stellato, A. Riccio, and M. Damiano -
FIBREGLASS WIND TURBINE ONE SHOT BLADE®: DAMAGE TOLERANT DESIGN.

Paper N. 2 S. Carrino, A. Castriota, R. Nobile, G. Scarselli - LAMB WAVES FOR
FATIGUE DAMAGE DETECTION

Paper N. 3 P. Gaudenzi, L. Lampani, C. Scarponi, M. Pasquali, F. Sarasini, J. Tirillo, T.
Valente - ON LOW AND HIGH VELOCITY IMPACT ON COMPOSITE STRUCTURES
AND RELATED HEALTH MONITORING

Paper N. 4 G. Allegri, A. Melro, L.F Kawashita, S.R. Hallett - THROUGH-THICKNESS
REINFORCEMENT FOR ENHANCED DAMAGE TOLERANCE OF COMPOSITE
STRUCTURES

Paper N. 5 M. H. Nagaraj, J. Reine, R. Vaziri, E. Carrera, M. Petrolo - HIGH-FIDELITY
DAMAGE ANALYSIS OF COMPOSITES USING A PLY-BASED CONTINUUM MODEL

Paper N.6 M. H. Nagaraj, I. Kaleel, E. Carrera, M. Petrolo - CONTACT MODELLING OF COMPOSITE STRUCTURES USING ADVANCED STRUCTURAL THEORIES

Paper N. 7 E. Monaco, N. D. Boffa, F. Ricci - COMPOSITE REINFORCED PLATES BUILT BY CO-INFUSION OR SECONDARY BONDING TECHNIQUES: ANALYSES OF THE EFFECTS OF MANUFACTURING APPROACH ON COMPRESSION BEHAVIOR BY MECHANICAL TESTS, NDI AND GUIDED WAVES BASED SHM

Paper N.8 N. D. Boffa, E. Monaco, F. Ricci, M. Barile, L. Lecce - HYBRID STRUCTURAL HEALTH MONITORING ON COMPOSITE PLATES WITH EMBEDDED AND SECONDARY BONDED FIBER BRAGG GRATINGS ARRAYS AND PIEZOELECTRIC PATCHES

Paper N.9 Ghiasvand, A. Airoidi, A. Spini, M. Boiocchi, C. Mirani, P. Bettini - EXPERIMENTAL AND NUMERICAL INVESTIGATION OF DAMAGE EVOLUTION IN CURVED COMPOSITE LAMINATES