

TRACK 1: STRUCTURES AND MECHANICAL SYSTEMS
“SMART RESTORATION OF DEFECTS IN DAMAGED COMPOSITE AERO-STRUCTURES”

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ABSTRACT

This paper is in the area of structural healing technology with a focus on smart and sustainable composite repair techniques on aero-structures. It provides approaches to repair both barely visible damages, which are internal and visible surface defects of the laminate. A repair technique is being developed for in-situ repair of low-velocity impact damage (LVID) in aircraft composite structures made from carbon-fiber reinforced polymer (CFRP). A low-viscous resin injection system with a flexible vacuum chamber (FVC) and a low-viscous resin infusion system have been developed for the repair of damaged specimens made of 16, 24 and 32 ply Prepreg laminates. Non-destructive testing (NDT) has been done on pristine, damaged and repaired specimens using Ultrasound C-scan and Infrared Thermography equipment. Destructive tests for mechanical strength evaluation and the compression-after impact (CAI) tests have been conducted on pristine, damaged and repaired specimens to find the strength recovery and repair efficiency of various repair methods. The low-viscous resin injection method using the flexible vacuum chamber and the blended healant of Epo-Tek 301 and Nanoforce-100 achieved the highest repair efficiency of 79.3%.

BIOGRAPHY OF SPEAKER


Dr Hamid is a Senior Lecturer at Republic Polytechnic’s School of Engineering. He received his PhD and MSc degrees in Aerospace Engineering from University of Manchester. He has 15 years of working experience at 5 universities and polytechnics and 7 years of industry experience in aircraft design and manufacturing. He has over 90 papers in aerospace and mechanical engineering, aviation management and engineering education. Dr Hamid is the project leader for ‘In-situ healing of damaged composite aero-structures’ in collaboration with Newcastle University Singapore, for which he was conferred the Crescendas Medal for Outstanding Applied Physics Research from Institute of Physics, Singapore in 2017. He also received the MOE Outstanding Innovator Award 2017 and the Most Innovative Project Award 2015 from JEC Group France.