

TRACK 1: STRUCTURES AND ADDITIVE MANUFACTURING
“DAMAGE RESISTANCE STUDIES OF COMPOSITE MATERIALS CONFIGURATIONS FOR PRIMARY AIRFRAME STRUCTURE”

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ABSTRACT

Despite realising the benefits offered by composite materials in terms of high strength-to-weight ratio, one specific factor that often ends into over-dimensioning is their vulnerability to damage caused by out-of-plane loads like Quasi-static Indentation (QSI) and low velocity impact. One peculiar concern to out of plane damage in composites is its difficulty to identify by visual inspection unless any complete perforation. Damage resistance and its extent depend on multiple factors, such as the materials used, laminae stacking sequence, and thickness of laminate.

QSI is the simplest test method used to assess damage resistance of laminated composite materials under out-of-plane load. The present study attempts to investigate the damage resistance of various composite materials configurations selected to design primary airframe structures using QSI test. Damage resistance of composite prototypes made of conventional carbon (C) fibre, interply hybrids constitute carbon (C)/ kevlar (K)/ glass (G) FRP laminates and, super hybrid fiber metal laminates (FMLs) are presented for various indenter displacements and load rates. The extent of damage in each configuration and the amount of energy utilized to induce the damage are investigated. Such knowledge shall further allow users to forecast damage tolerance and safe life of these tested configurations.

BIOGRAPHY OF SPEAKER


Prof Joshi has been faculty with the School of Mechanical & Aerospace Engineering since Nov 2000. He was awarded Ph. D. degree for his work in Composites Processing by Monash University, Australia in 1999. Prior to that, from 1988 to 1994, he worked as Scientist at the National Aerospace Laboratories upon completion of his M. Tech. in Aeronautical Engineering from Indian Institute of Bombay (Mumbai). At NTU, Prof Joshi was an integral part of the Singapore’s first microsatellite R&D project, XSAT, which was successfully launched in 2011. He has been PI or co-PI of several R&D projects funded by A*STAR, RSAF, DSTA as well as industries such as ARKEMA, France.

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