



A Manufacturing Sensitive Design Strategy

For composite materials using physical modeling and stochastic simulation of defects

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A B S T R A C T

This presentation outlines a strategy for designing composite structures accounting for the presence of defects that are inevitable in a practical manufacturing process. The essential ingredients of the strategy are incorporation of defects in physical models for assessment of composite performance and connecting the performance metrics to defect severity measures. A cost/performance trade-off then leads to cost-effective design. To illustrate the strategy, two examples of failure in composites under transverse tension and under axial compression are taken. Stochastic simulations of representative volumes are conducted to develop defect severity measures and to assess failure. Experimental data are taken to validate the predictions of the physical models and parametric studies are performed to illustrate trends in effects of manufacturing defects on design thresholds.



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B I O

Ramesh Talreja is currently a AAAS Science and Technology Policy Fellow placed in the DOE Water Power Technologies Office.

In his permanent position, Dr. Talreja is a Tenneco Professor in the Department of Aerospace Engineering and in the Department of Materials Science and Engineering at Texas A&M University. Prior to that, 1991-2001, he was a professor of aerospace engineering at Georgia Institute of Technology. His research is in composite materials that he began at the Technical University of Denmark where he earned his PhD in Solid Mechanics in 1974 and was endowed with a Doctor of Technical Sciences degree in 1985 on his collected works on fatigue and damage mechanics of composites. His recent work has focused on the effects of manufacturing defects on the performance of advanced composites. He is the recipient of the 2013 ICCM Scala Award, and World Fellow and Life Member of ICCM. The American Society for Composites selected him for the 2017 Outstanding Researcher Award.