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# PRACTICAL MULTISCALING

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## ABSTRACT

The talk presents a practical multiscale-multiphysics design system, which integrates reduced order multiphysics-multiscale analysis capabilities for life prediction and durability of composite structural components within a nonintrusive stochastic multiscale framework for uncertainty quantification and propagation at multiple scales. The stochastic multiscale-multiphysics design system has been successfully deployed in aerospace industry (Lockheed-Martin, Northrop-Grumman, Rolls-Royce, United Technologies, Pratt-Whitney) for durability, fatigue life prediction and environmental degradation of CMC and PMC structural components as well as in automotive industry (General Motors, Automotive Composites Consortium) for crash prediction of composite cars. The talk includes theory, applications and software demonstrations. The case is made for a widespread adoption of multiscale methods in practice. We show that it is feasible to reliable predict the behavior of large-scale heterogeneous structural systems well into post-failure regime by accounting for fine-scale material details at a computational cost comparable to the phenomenological modeling of heterogeneous materials.