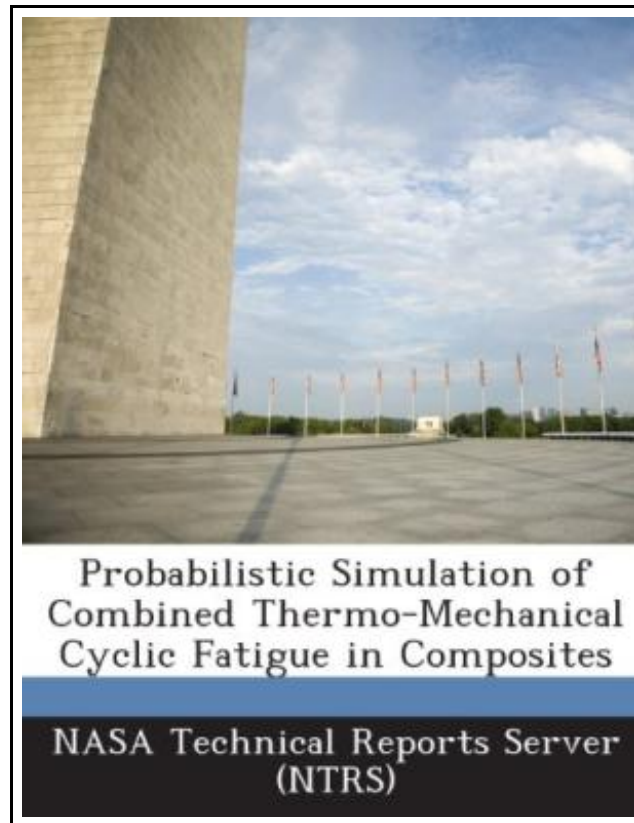


Probabilistic Simulation of Combined Thermo-Mechanical Cyclic Fatigue in Composites



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PROBABILISTIC SIMULATION OF COMBINED THERMO-MECHANICAL CYCLIC FATIGUE IN COMPOSITES



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Bibliogov, United States, 2013. Paperback. Book Condition: New. 239 x 180 mm. Language: English . Brand New Book ***** Print on Demand *****.A methodology to compute probabilistically-combined thermo-mechanical fatigue life of polymer matrix laminated composites has been developed and is demonstrated. Matrix degradation effects caused by long-term environmental exposure and mechanical/thermal cyclic loads are accounted for in the simulation process. A unified time-temperature-stress-dependent multifactor-interaction relationship developed at NASA Glenn Research Center has been used to model the degradation/aging of material properties due to cyclic loads. The fast probability-integration method is used to compute probabilistic distribution of response. Sensitivities of fatigue life reliability to uncertainties in the primitive random variables (e.g., constituent properties, fiber volume ratio, void volume ratio, ply thickness, etc.) computed and their significance in the reliability-based design for maximum life is discussed. The effect of variation in the thermal cyclic loads on the fatigue reliability for a (0/+/-45/90)s graphite/epoxy laminate with a ply thickness of 0.127 mm, with respect to impending failure modes has been studied. The results show that, at low mechanical-cyclic loads and low thermal-cyclic amplitudes, fatigue life for 0.999 reliability is most sensitive to matrix compressive strength, matrix modulus, thermal expansion coefficient, and ply thickness. Whereas at high mechanical-cyclic loads and high thermal-cyclic amplitudes, fatigue life at 0.999 reliability is more sensitive to the shear strength of matrix, longitudinal fiber modulus, matrix modulus, and ply thickness.



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