



The Development of a Finite Element Program to Model High Cycle Fatigue in Isotropic Plates

By William C. Shipman

Biblioscholar Okt 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x7 mm. This item is printed on demand - Print on Demand Neuware - As part of a joint AFRL-DAGSI turbine blade research effort, a computer program has been developed that uses a von Karman large-deflection two-dimensional finite element approximation to determine stress levels and patterns in isotropic thin plates. The dynamic loading of various plates has been carried out in order to model a high cycle fatigue situation. The research considered the various effects of mode shapes, resident frequency, non-linear cyclic effect, endurance limits, and stress variations within a high cycle fatigue environment. Two main initiatives were taken. First, a transient analysis tool was developed that calculates stress and displacement patterns over a period of time. This analysis also included the effects of damping. The second initiative developed a tool to calculate the eigenvalues (natural frequencies) and eigenvectors of a plate with a given geometry. The results indicated that it is possible to model fatigue at high frequencies using FE analysis and compare these findings with experimentation incorporating a shaker table. In this research, different geometries of plates were investigated to represent turbine blade configurations. One square plate and three trapezoidal...



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