show that the centrifugal loadings have a significant effect on the local and integrative deformations of the blades as well as the character of the responses.

Key Words Blades Numerical analysis Bird collision Responses

DAMAGE MECHANICS DESCRIPTION OF DUCTILE CRACK GROWTH

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ABSTRACT Damage models of material failure by microvoid nucleation and growth to coalescence are described. Approximate constitutive relations are used, to model both the nucleation and growth of the microvoids. The Crack growth has been numerically analyzed, based on damage medel of finite element method and compared with the experiments of compact tension specimen successfully.

Key Words Damage Crack propagation Voids

RESEARCH ON VIBRATION CHARACTERISTICS OF A CRACKED BLADE

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ABSTRACT A method for calculating vibration characteristics of a cracked blade has been developed by using a transfer matrix analysis. The effects of the crack on stiffness at the crack location is equivalent to the flexibility of an elastic hinge. A cantilever beam with rectangular cross- section with a transverse crack extending uniformly along its width is taken as an example. The influence of parameters, such as depth, position of crack, on natural frequencies of blade oscillation is discussed. It is found that the natural frequencies of the rotating cracked blade increase as the crack moves from the root to the tip of the blade and decrease as the exent of the crack increases oscillation and the crack in the beam has substantial effects on the natural frequencies as rotational speed increases. The nonlinear vibration characteristics (frequency spectrum) of the cracked blade are analyzed theoretically by using square function to simulate crack open and closure. It is shown that nonlinear vibration characteristics become obvious as the extent of the crack increases. The experimental research on vibration characteristics of cracked blade has been carried out with rectangular cross- section cantilever beam as a specimen. The experimental results verify the analysis of the theoretical method. Finally, a suggestion is offered on an on- line diagnostic system of blade crack.

Key Words Blades Cracks Vibration characteristics

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