Nonlinear Crack Growth Monitoring

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Oak Ridge National Laboratory has developed a new concept which will address the Aging Aircraft problem of Nondestructive Inspection (NDI) to find cracks due to either hidden corrosion or stress-corrosion cracking, cracking in multi-layer structures, or cracks in fastener holes in multilayer structures. The Griffith energy technique requires measurement of global loadings and local deflections/strains at critical structural locations to indicate the rapidly increasing growth of hidden cracks with sufficient warning time prior to structural failure to take preventative action to correct the problem or retire the structure before failure. The techniques, as described in the referenced report and patent application (US government rights reserved)[1], have been proven on a laboratory scale to successfully detect the onset of structural failure due to fatigue cracking (including simulated widespread fatigue cracking and cracking in the presence of corrosion), stress corrosion cracking, and low temperature creep crack growth, with a reasonable degree of forewarning before failure. It is also believed that these techniques will be successful for corrosion fatigue and high temperature creep crack growth.

[1]Welch, D. E., Hively, L. M., and Ruggles, M. B., *Nonlinear Crack Growth Monitoring*, ORNL-TM-1999/117, Oak Ridge National Laboratory, Oak Ridge, TN, October, 1999.