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Predictive Numerical Simulation of Lamb Wave Scattering from a Wing Skin Defect for Structural Health Monitoring System Design

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This paper reports on an investigation into the accuracy of numerical finite element simulations of elastic wave scattering from a structural defect in a metallic wing skin component. The work forms part of a broader research program that seeks to develop a validated predictive modelling capability for optimal design of acousto-ultrasonic systems for health monitoring of structural hot spots. The present investigation examines the efficacy of simplified representations of the acoustic transduction process whereby piezoelectric coupling is replaced by a set of traction forces with appropriate time modulation. The motivation for the work is the prospect of a significant gain in computational efficiency. Several different approximation schemes are considered and assessed on the basis of how closely the resulting simulations match experimental observations of the scattered field. Some of the approximation schemes are shown to produce simulation results with an accuracy comparable to that of a piezoelectrically coupled solution, suggesting that improved computational efficiency can be achieved without compromising simulation accuracy.

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Ключевые слова:

Содержание

Abstract

1. Introduction

1.1. Practical Context – Hot Spot Monitoring in a Wing Skin

2. Experimental

3. Numerical simulation

3.1. Piezoelectric Transducer Force Approximation

4. Results and discussion

5. Conclusions