



Multilyer Synthetic Aperture focusing Technique (SAFT) for Ultrasonic Inspection: Non-destructive Analysis of Layered Anisotropic Composite Metals

Structural analysis for flaws within composite materials is a serious concern for many industries where a failure to manufacture product within very narrow specifications can lead to disaster. An example is the construction of wing components within the airplane, aeronautics, and aerospace industries. Long, planar wing structures are manufactured from anisotropic composite materials, i.e. there is a tendency of the building material to exhibit different properties in response to stresses applied along axes of different directions. This makes post-manufacture analysis impossible using current inspection methods; there is simply no way to analyze a wing for



structural integrity before use without damaging it in the process.

Dr. Ronald Kline of San Diego State University proposes a multilayer SAFT for non-destructive ultrasonic inspection of anisotropic composite media to solve this problem. It is an algorithm that uses a non-destructive evaluation technique. The algorithm accounts for change in wave velocities and travel times as they propagate along any anisotropic material. Specifically, a multilayer SAFT algorithm calculates propagating ultrasonic wave time shift and sums A-scan waveforms in layered anisotropic media at any given depth, ply orientation, and number of plies. By taking into account the orientation and thickness of each layer, an exact representation of the media is given.

The technology is valuable because it allows manufacturers the ability to identify fissures, voids, and other structural discrepancies that can compromise wing strength and ultimately the performance of the aircraft overall.

Benefits

- Non-destructive, real-time analysis of composite structures before inclusion within overall product
- Accurate reproduction of structural flaws
- Improves product quality
- Measures fatigue

Applications

- Airplane, aeronautic, and aerospace wing and component manufacture
- Structural integrity evaluation of buildings, dams, and bridges
- Quality assurance for auto/marine/tooling components

rev. 9/26/2005

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