8th ASNT Research Symposium, Orlando, Florida, 22-26 March 1999

Composite materials NDE using enhanced leaky Lamb wave dispersion data acquisition method

Yoseph Bar-Cohen[a], Ajit Mal[b], Shyh-Shiuh Lih[a] and Zensheu Chang[a]

[a] Jet Propulsion Laboratory, Caltech, MS 82-105, 4800 Oak Grove Dr., Pasadena, CA 91109-8099, 818-394-2610, fax 818-393-4057, yosi@jpl.nasa.gov

[b] Mechanical and Aerospace Engineering Department, University of California, Los Angeles, CA 90095

ABSTRACT

The leaky Lamb wave (LLW) technique is approaching a maturity level that is making it an attractive quantitative NDE tool for composites and bonded joints. Since it was first observed in 1982, the phenomenon has been studied extensively, particularly in composite materials. The wave is induced by oblique insonification using a pitch-catch arrangement and the plate wave modes are detected by identifying minima in the reflected spectra to obtain the dispersion data. The wave behavior in multi-orientation laminates has been well documented and corroborated experimentally with high accuracy. The sensitivity of the wave to the elastic constants of the material and to the boundary conditions led to the capability to measure the elastic properties of bonded joints. Recently, the authors significantly enhanced the LLW method's capability by increasing the speed of the data acquisition, the number of modes that can be identified and the accuracy of the data inversion. In spite of the theoretical and experimental progress, methods that employ oblique insonification of composites are still not being applied as standard industrial NDE methods. The authors investigated the issues that are hampering the transition of the LLW to industrial applications and identified 4 key issues. The current capability of the method and the nature of these issues are described in this paper.