



TSCOUT™: Thick Section Composite Oblique Ultrasonic Testing

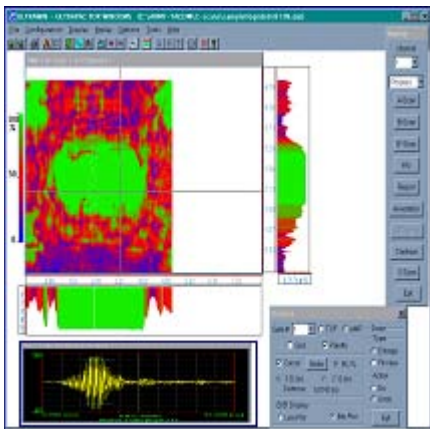
Problem:

Multi-layer composite structural elements have many advantages over comparable metal designs. Among these are a very high stiffness to weight ratio, strength vs. weight and resistance to corrosion. However, in order to realize these benefits, the layers that make up the composite structure must be fully bonded to each other during the original manufacturing or any subsequent repair process.

To determine the quality (integrity) of bonded structures, inspection techniques have been developed including various forms of ultrasonic technology. However, due to the nature of the material - including the bonding process itself - these techniques require sophisticated or highly specialized test set-ups that are typically available only in large laboratories or production facilities - thus are usually not available in portable, field-oriented environments, particularly after the original manufacturing process or during subsequent repair or maintenance operations.

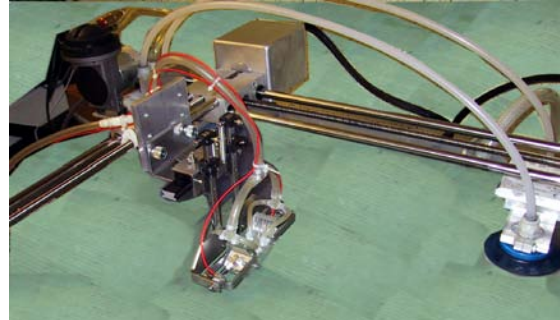
Solution:

An oblique incidence angle, low frequency Guided Wave Acousto-Ultrasonic technique (Thick Section Composite Oblique UT - TSCOUT - as a function of its application) is capable of penetrating through different layers of thick section multi-layered composites and has been used to detect the presence of primary defects. These defects have included delaminations in the composite supporting layer, debonds between embedded elastomer layers and ceramic tiles and debonds between elastomer layers and supporting composite layers.



Representative TSCOUT inspection (C-Scan image) showing delamination (green) in thick section composite

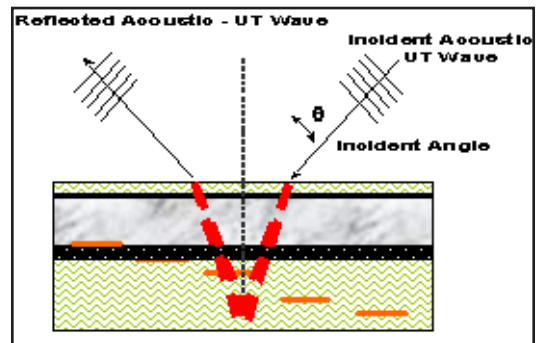
The TSCOUT imaging technique has been configured as a low cost, portable inspection system designed primarily for the field inspection of complex, thick-section composite structures.



View of portable scanning system with dual-sensor head inspecting composite panel

As implemented, the system's key features include: a multi-sensor probe (can be reduced to a single probe, for portability), a proprietary "Arbitrary Waveform Generator" (AWG) board, a multi-channel Digital Signal Processing (DiSP) board, a computer controlled portable scanning bridge (other scanners, including manual versions are available) and a Windows-based Ultrasonic data collection, analysis and reporting control program (UltraWin™). Applications for this field-oriented, portable inspection technology include many critical applications for composite materials and structures - where structural failure is NOT an option.

TSCOUT technology is most usable where other inspection technologies cannot effectively be employed from a single side of a structure; such as: thick section composites used for many aircraft structural components, composite helicopter rotor blades, multi-layer composite-based armor, thick-section composite ship hull structures, FRP (high-pressure) containers, FRP covered concrete and multi-layered (de-icing) blankets.



TSCOUT uses oblique angle, pulse-echo, ultrasonic techniques to scan thick-section composites with access from one side only