Laser Shearography NDT: Technological advantages and applications in the Aerospace Industry

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Laser Shearography is an optical, Non-Destructive Testing (NDT) technique used to reveal sub-surface defects in structures. Through the application of a load using either thermal, vacuum-partial, vacuum-ambient or vibration-mechanical excitation to a structure, a laser shearography sensor can observe (minimal) surface bending in the form of an out-of-plane strain field and image the measurement as a phase map. Since the sensor is sensitive to changes in the interference in laser light, the capability of the sensor to detect bending is within the sub-micrometer range. The technology can deployed for the detection of an array of defects; including; disbonds, delaminations, kissing bonds, cracked cores, crushed cores, ingresses and foreign-object-damage (FOD) in laminates, honeycombs, foam-cores and bonded components. Shearographic systems are often used for aerospace testing applications, frequently as automated systems, including; fairings, nacelles, cowlings, radomes, helicopter blades, pressure vessels, tanks and control surfaces. The ultimate goal of any NDT system is deliver reliable measurement results as economically as possible. Laser Shearography can detect defects which other NDT methods cannot, including; kissing bonds, node bond splits and ply wrinkling. In many cases the reliability of the technique, as quantified through the small defect size detection at 90% Probability of Detection (PoD) and low False Call Rates, is unmatched. The economic advantages of using Laser Shearography include; high inspection rates (i.e. m2/sec), low sample preparation times, simple automatability and formal NDT technique approval & recognition.