Comparison of Selected NDE Methods

Method	Advantages	Limitations	Type of Defects
Microfocal X-ray radiography	High contrast images Good depth of focus Fast scanning Examines entire volume Easy data storage and retrieval	Expensive system Hazardous Plane defects difficult to detect with only one radiograph	With computed tomography, voids, inclusions and cracks with linear dimensions of less than 5 microns
Neutron radiography	Can 'look through' metals without disassembling machinery	Extremely expensive Cumbersome Radiation hazard	Voids, cracks, water entrapment, corrosion deposits
Ultrasonic inspection	Inexpensive method Can probe deeply without loss of signal quality High quality images	Detection of broken fibers difficult with certain methods Requires immersion tanks for large parts Parts tested in situ must be free of contaminants Scan times can be slow Measurements usually dependent on thickness	Location of minor delaminations and other flaws, residual stresses, grain size (depending on method)
Optical fourier laser scattering analysis	Provides information about the orientation and shape of defect	Sensitive to optics alignment	Surface defects of 0.010 mm, 1.5 mm diameter void at 0.1 mm depth, subsurface porosity, grain orientation
Coherent amplified Raman polarization	Any discontinuity is revealed by peak in amplitude	Resolution is limited Requires several scans Maximum detection depth limited by light transmission properties of the material	Defects 0.2 mm wide at depth up to 0.14 mm
Low coherence fiber interferometry	Uses near-infrared light which penetrates ceramics better than visible light Good for materials with poor optical transmission properties Requires only a single scan	Equipment can be complex and expensive Maximum defect size and resolution is limited	Defects 0.20 mm wide at depth of 0.42 mm Depth resolution 0.015 mm

Source: D. Allen, AFRL/PRTP Propulsion Branch, Wright Patterson Air Force Base, Ohio