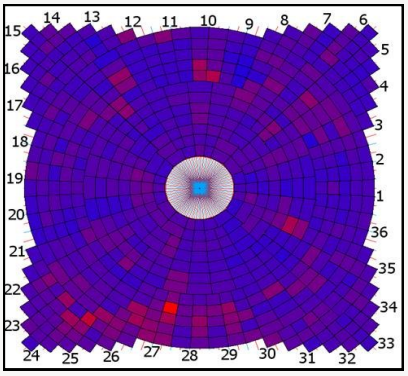
INTELLIGENT OPTICAL SYSTEMS, INC.

# Rapid Ultrasound Detection Panel



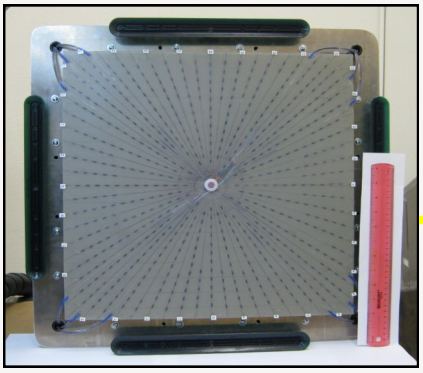

**Color-coded image of detected Guided Wave Ultrasound; red areas show locations of disbonds between composite skin and aluminum honeycomb in F-15 vertical stabilizer.**

**IOS offers a** novel diagnostic/prognostic ultrasound imaging technique for locating subsurface structural damage or defects in large composite components. A self-contained, field usable, roll-away portable diagnostic instrument is available for capability demonstration.

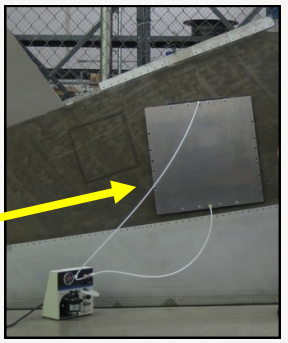
A flexible panel with embedded fiberoptic ultrasonic receivers and single ultrasonic source temporarily attaches, without glue or epoxy, to a target area of the composite structure for NDE/NDT. An optoelectronic instrument under computer-control, performs an ultrasonic scan over the area of the flexible panel- that can cover several square feet. Upon analysis of ultrasound response data, it identifies and locates structural defects/ irregularities in the component.

IOS has pioneered the use of optical fiber Bragg gratings (FBGs), microscopic structures within an optical fiber, to pick up nanometer amplitude ultrasonic vibrations. A single fiber contains many of these Bragg grating ultrasound transducers (BrUTs), allowing ultrasound detection at each location, such as guided wave ultrasound, without the unwieldy bulk of individually cabled conventional piezoelectric transducers. More than 600 BrUT imaging locations in a 2.25 sq. ft. flexible sheet (18 in. side). This sheet readily conforms and attaches to a target component surface (e.g. an F-15 vertical stabilizer as in picture) using simple vacuum suction. The receiver panel section requires no couplant, allowing quick repositioning for subsequent measurements without leaving residue on the surface. After a measurement is performed on one area, the sheet is simply moved to a different location.

IOS' FBG based system enables automated inspection of larger, curved surface areas. Key aspects are: highly sensitive repeatable acousto-ultrasonic measurements with a flexible, temporarily attaching sensor sheet, that conforms to different curvature surfaces,; and a fully automated, continuously self-calibrating acousto-ultrasonic readout system compensating against quasi-static temperature-strain drifts. Structural irregularities are identified by amplitude comparison against a baseline reference data, or based on modal velocity measurements referenced to a model. This is an in situ technique: it does not require aircraft disassembly as is needed for water-jet coupled ultrasonic scans. Its compactness permits field based rapid automated NDE. Tremendous savings in depot maintenance time and cost can be realized by rapid NDE of aging aircraft with portable instrumentation enabling safer operational lifetimes.



**NDT Imaging Panel for Composite Structures by Ultrasound Field Mapping.**



**NDT Imaging Panel Attached to F-15 Vertical Stabilizer. Removal of part is not required for NDR.**

## Hardware / Software Features

- Tunable Laser Light Source, Single photodetecor.
- Contact-only transducer sheet
- Soft polymer transducer sheet
- Dynamic Temperature / Strain Compensation

## Operational Advantages

- Very high Channel Count (at least 620)
- High Sensitivity/Reliability
- Static Field Compensation for temperature or strain changes
- Reliable for field use
- Easier maintenance, single PD can be replaced
- All Digital, LabView based control
- Re-usable, lower cost per use
- Replaces ultrasonic gel; Convenience, No Mess



Address: 2520 W. 237th Street Torrance, CA 90505-5217 Phone: (424) 263-6300 Fax: (310) 530-7417 www.intopsys.com