Center for Nondestructive Evaluation (CNDE)

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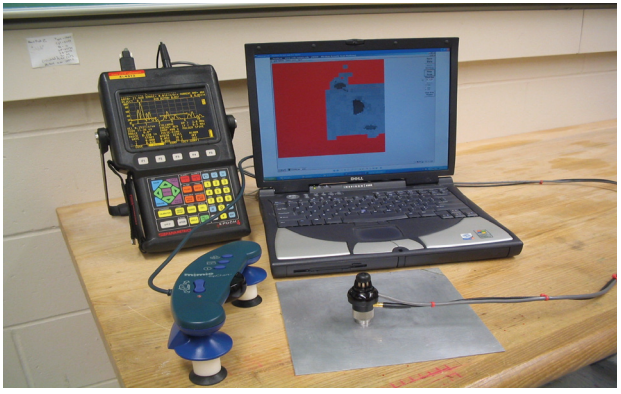
Generic Scanner to Image NDE Data



The Generic Scanner or "GenScan" has demonstrated the ability to take off-the-shelf, relatively inexpensive nondestructive evaluation (NDE) flaw detectors and combine them with non-encumbering position encoding devices and newly developed software. This creates semi-automated NDE scanners that have far greater capability than previously available scanners. This CNDE research was initially funded by the Federal Aviation Administration to develop improved methods for inspecting composite aircraft structures. The main advantage of the generic scanner is that it allows inspectors to create images that can provide a more intuitive and thorough inspection of relatively large areas of commercial aircraft, e.g., composite control surfaces. The system has been designed to mate with a number of portable NDE devices used throughout the aviation industry. Image scans from the scanner can be readily saved and transmitted electronically for further off-site analysis.

GenScan has been successfully coupled with several eddy current and ultrasonic flaw detectors. A number of scanner prototypes have been assembled and beta site tested at several aviation maintenance facilities in the civil and military sectors. These GenScans can increase inspection capabilities of a variety of existing NDE devices, enables maintenance organizations to extend the use of instruments, and mitigates the need to purchase more expensive, specialized NDE instruments with built-in imaging systems.

> **Economic Impact:** The generic scanner will provide more robust inspections, particularly of relatively large featureless areas encountered such as those on composite aircraft. It is being actively reviewed by the US Navy and US Air Force for its ability to increase existing inspection capabilities and can be easily adapted for inspection applications.

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Dripless Bubbler: Portable Scanner for Aircraft Inspection

Researchers at the Center for Nondestructive Evaluation (CNDE) have developed a field able ultrasonic scanning system for aircraft inspection. Developed by the center's Composite Group, the "Dripless Bubbler" is the first portable ultrasonic scanner with a closed-cycle water couplant and uses high frequency focused ultrasonic beam. It is essentially a portable ultrasonic scanner designed and developed for aircraft inspection. It can be attached to the fuselage of an aircraft and inspect it for hidden corrosion. It uses a unique closed-cycle pump/vacuum water handling system that uses focused transducers. The focused ultrasonic beam leads to superior image resolution and more accurate determination of the metal loss due to corrosion. The dripless bubble scanner has the unique capability of scanning over protruding rivets on the aircraft skin. The closed-cycle water-handling feature makes it compatible with the safety requirements of maintenance hangars. Because this device performs ultrasonic inspection with a focused beam, it provides much improved resolution and sensitivity compared to previous methods. The resolution afforded by the focused transducer makes it a useful tool for mapping out the depth profile of corrosion.

> **Economic Impact:** The Dripless Bubbler received an R&D 100 award. It was licensed to and commercialized by Sierra Matrix, Inc. of Fremont, California. The technology was also used in addressing the corrosion problem of KC135 wing skins around fasteners.

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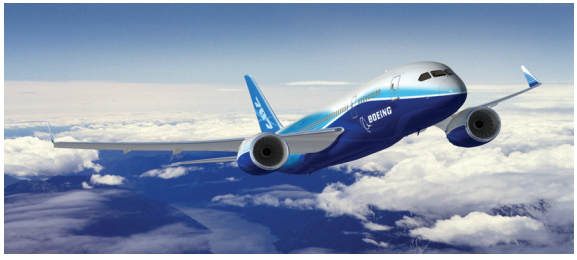
Time-Proven "Coin Tap" Automated



The hearing-based, manual tap test, practiced widely by aircraft inspectors, was computerized and automated to give it quantitative and imaging capabilities and to take the "human factor" variation out of the inspection procedure. The tapping action was automated with the invention of a magnetic cam-action cart. Equally-spaced and uniform taps were made as the cart was pushed over the part's surface. The simple encoding method gave the system a previously unavailable imaging capability. Computer-aided tap tester (CATT) has proven effective for the inspection of both composite structures and metal honeycomb structures on a wide variety of control surfaces on aircraft. It also provided the quantitative inspection results in the form of images that can be archived electronically.

> **Economic Impact:** The technology was patented and licensed to a start-up company, Advanced Structural Imaging, Inc. in 2001. Two of the original inventors of the CATT participated in the company. So far, Boeing and other aircraft manufacturers and R&D organizations in NDE have purchased ten units from the company.

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