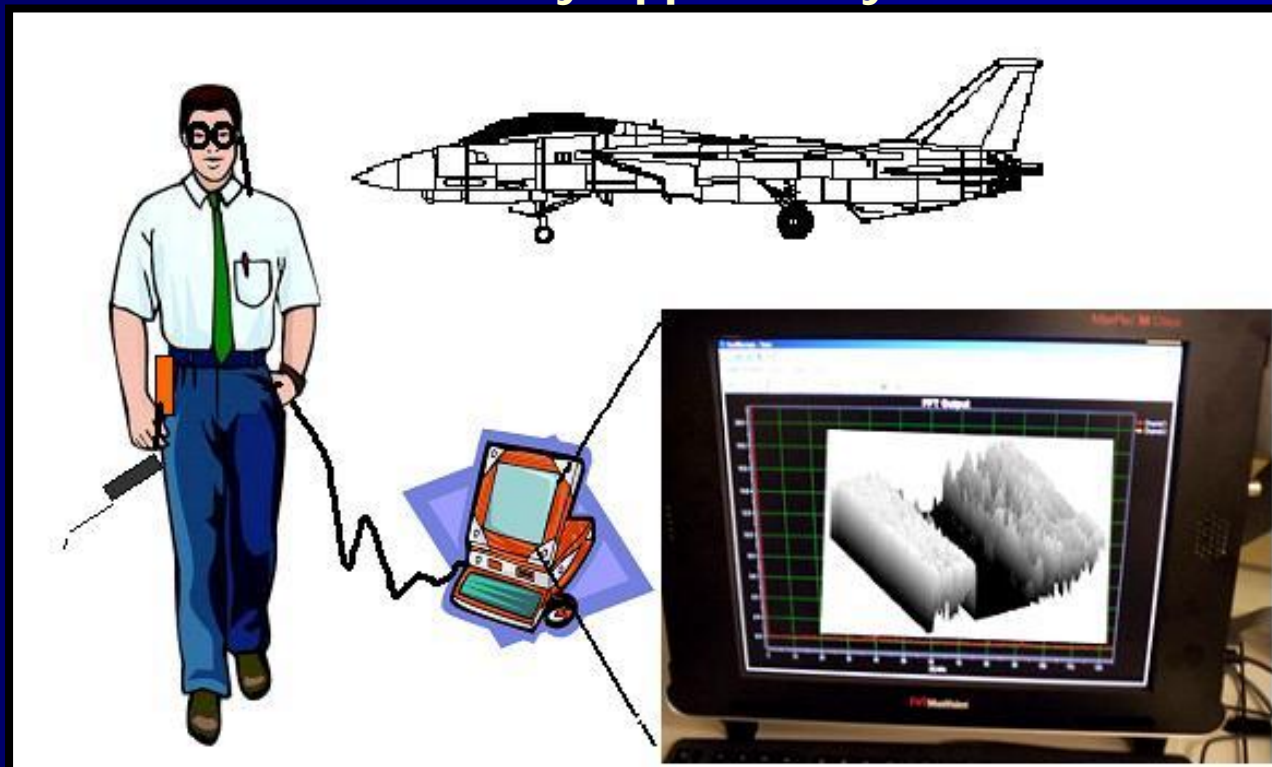


Hand-held NDI system is cost effective for detecting hidden metal defects in aircraft

Presented by:
Timothy C Tiernan

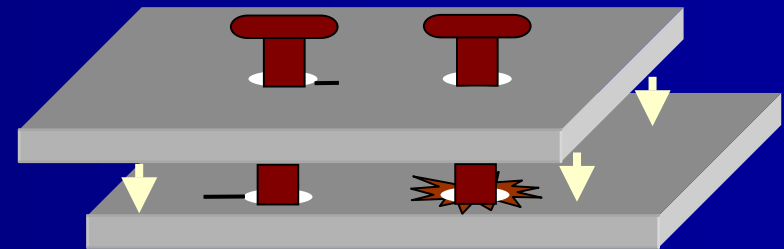
2006 Navy Opportunity Forum



Problem with Existing Non-destructive Inspection (NDI) Technology

- Difficult or impossible to detect small, incipient defects in:

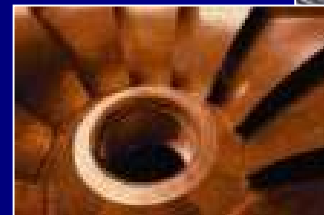
- Hidden second-layer defects
 - Cracks under rivet heads
 - Deeply buried corrosion



- High-performance components
 - Titanium
 - Metals under carbon-filled epoxy



- Curved components
 - Turbine blades
 - Hydraulic tubing



Platforms That Can Benefit

- Legacy aircraft, e.g.
 - F/A-18 Hornet
 - EA-6B Prowler



- Advanced planes
 - V-22 Osprey



- Next generation aircraft: F-35 JSF

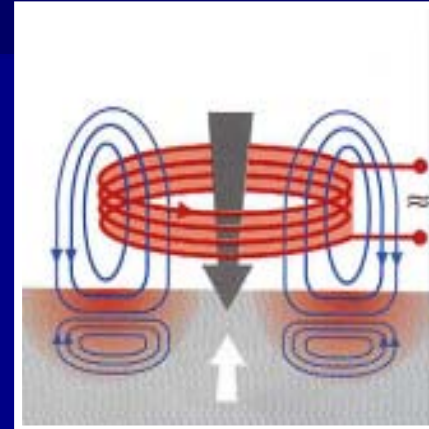


- Tomorrow's Defense platforms



Baseline NDI Technology

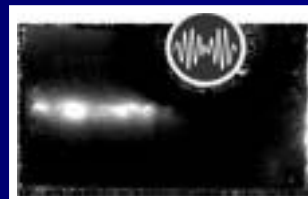
- Eddy current
 - Uses wire coils for sensors



- X-ray



- Ultrasound



- Comparative Vacuum Monitoring (CVM)

Customer Needs

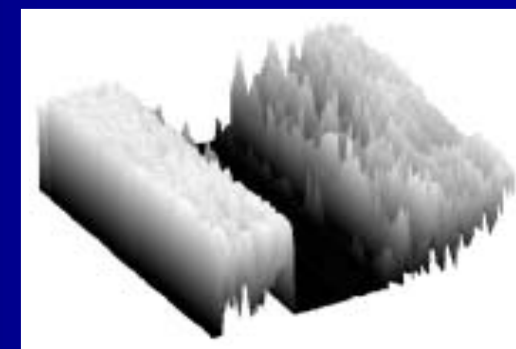
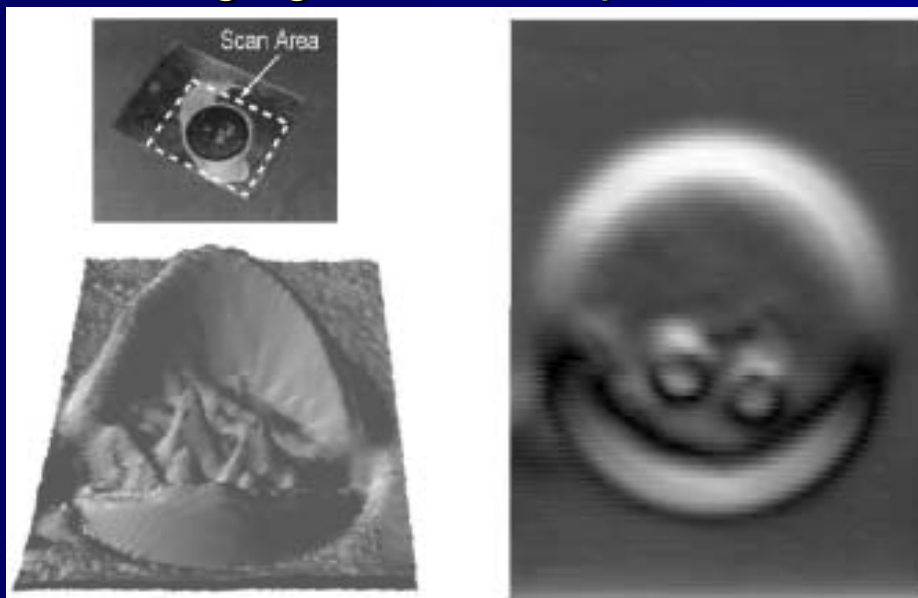
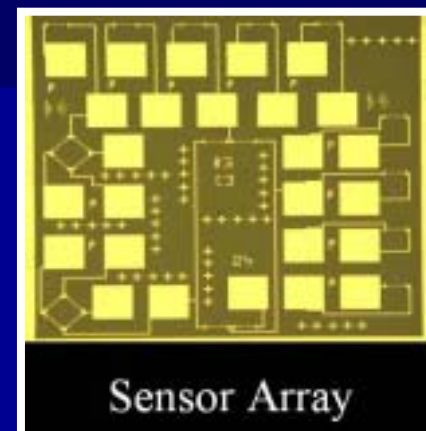
- Detectability of hidden defects
- Detectability of small and incipient defects
- NDI of high performance structures

- Portability
- Minimal operator training
- Rapid, high-throughput inspection
- Low cost



RMD's Solution

- Solid-state sensing elements
 - Robust; microscopically small (< 2 microns)
 - Sensitivity x1000 > wire coils used in ECT
- 3-D imaging of microscopic cracks & corrosion



5 mil wide defect, hook shank

RMD's Solution

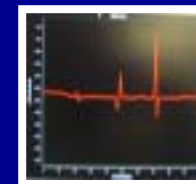
- Hand-held NDI system

- Portable PC-based
- Lightweight
- Head up display



- Proprietary signal processing algorithms

- Provides width, depth of cracks or corrosion




- Versatile


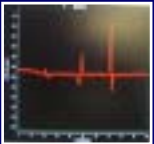
- Applicable to multiple components and structures



Benefits of RMD's NDI Technology

<i>Feature</i>	<i>Advantage</i>	<i>Benefit to Customer</i>
Microscopic, solid state sensors and sensor arrays  Microscopic Sensor	High signal-to-noise ratio	Rapid inspection of 2 nd layer
		NDI of cracks under rivets
		NDI of titanium components
	Low-cost	Cost-effective solution for platform's inspection needs
	High spatial resolution	Locate small, incipient defects
		Accurate defect localization
Robust	High repeatability	

Benefits of RMD's NDI Technology

<i>Feature</i>	<i>Advantage</i>	<i>Benefit to Customer</i>
Imaging capability 	Intuitive display	Less operator training
		Faster inspections
Heads up display	Operator comfort	More inspections
Integrated coil	Stability	Repeat calibrations unnecessary
Advanced signal processing and electronics 	Low noise	Enhances detectability of hidden cracks and corrosion
	Versatility	Leverage system electronics for multiple NDI applications

Comparison of NDI Technologies

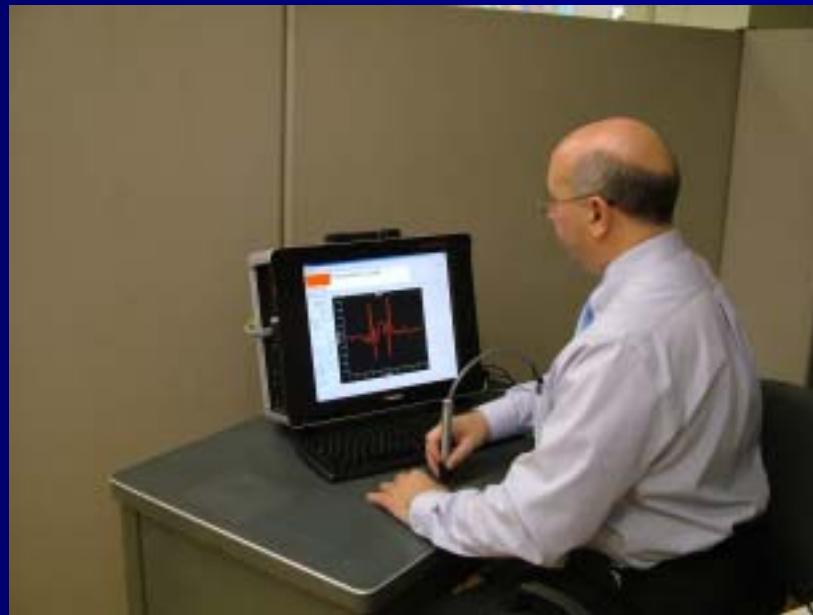
	RMD	ECT	X-ray	US	CVM
Sensitivity	*****	**	***	****	****
Penetration	*****	***	***	***	N/A
Resolution	*****	**	****	***	**
Titanium	*****	*	***	***	***
2 nd layer	*****	*	**	***	N/A
Under rivet heads	*****	*	**	***	N/A
Aging effects	***	*	*	*	*
Portability	*****	****	**	**	**
Cost	\$10-20k	\$10-20k	>\$100k	>\$100k	?

Current State of Development

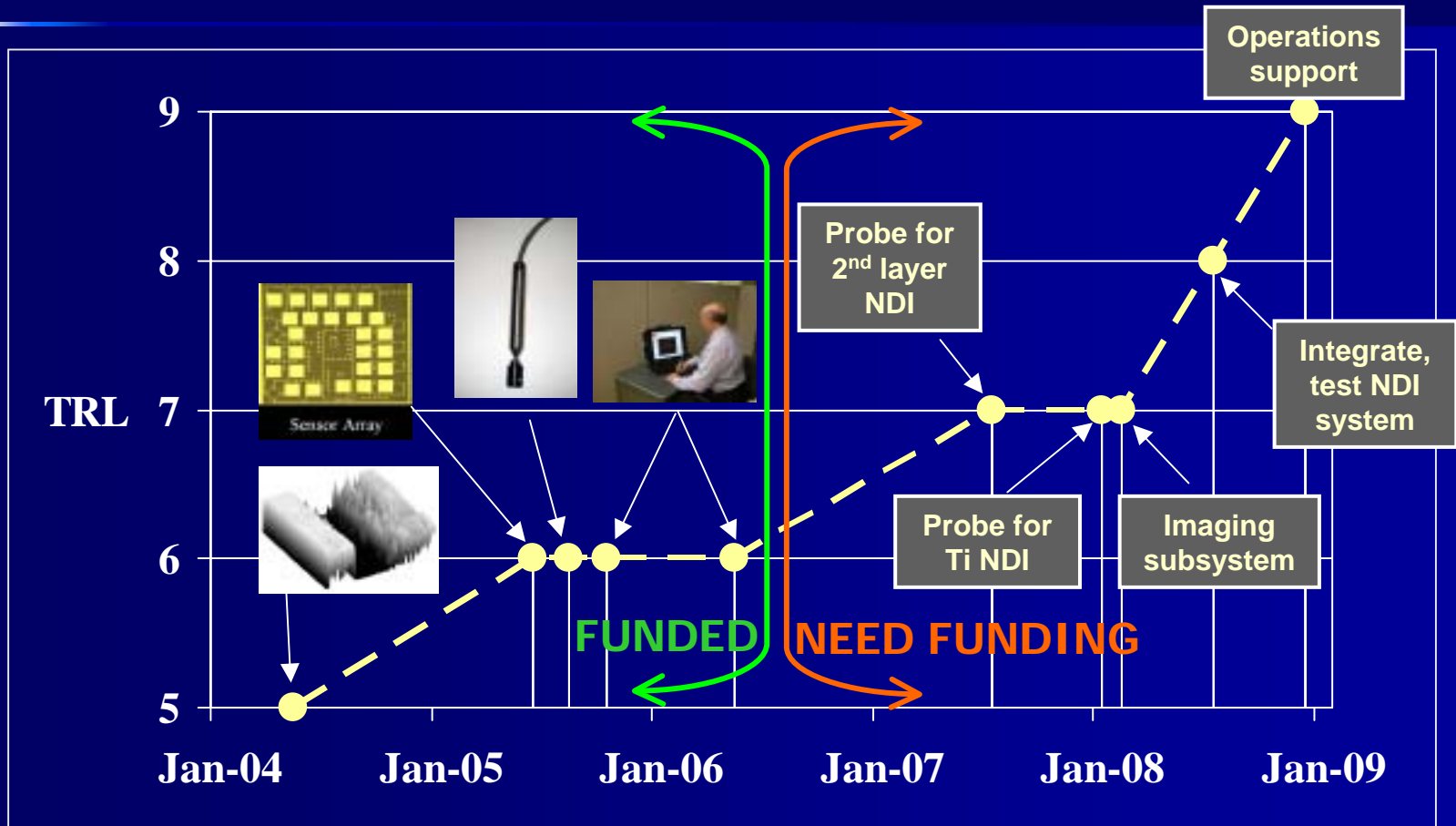
- Milestones achieved in Phase I/II
 - Detected:
 - hidden 5 mil crack in 3/8" hook shank (TRL 5)
 - < 1 mil defects on interior of Ti tubes (TRL 6)
 - 2 mil defects in Al underneath rivet head (TRL 6)
 - Designed & fabricated sensor arrays (TRL 6)
 - Developed signal processing and imaging subsystem (TRL 6)

Field Tests

- Phase II prototype system successfully demonstrated to NDI group at NAVAIR/NAWCAD, Oct. 2005



Transition to the Fleet



Partners Sought

- RMD seeks to supply and develop its innovative NDI technology for :
 - Defense Program Managers
 - Navy aircraft maintenance
 - DoD Prime Contractors, System Integrators
 - Commercial industrial partners

About RMD, Inc.

- National leader:
 - Sensors, instrumentation systems, detector applications
- 77 employees
 - Most with advanced degrees in science and engineering
- Manufactures, markets, supports products for
 - government: DoD, DoE, research labs
 - industry: NDI, medical
- ISO 9000 compliant manufacturing facility
- Tibett's award from SBA for SBIR excellence, 2002

RMD Related Products

- Inspector® lead paint analyzer



- Navigator™ intra-operative surgical probe



- PCB inspection system for INTEL, Inc.



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