JTEG Joint Technology Exchange Group

Joint Solutions for Depot Maintenance

Welcome to the JTEG Monthly Teleconference

Topic:

Maintenance Innovation Challenge Finalists

26 January 2016

AGENDA

1300-1309: Welcome and JTEG Background - Kurt Doehnert (JTEG Co-Chair)

1309-1310: Administrative Notes – Debbie Lilu (NCMS)

1310-1335: MIC Description and 2016 Timeline – Kurt Doehnert (JTEG Co-Chairman)

1335-1400: Using Voice Directed Technology for Transforming Maintenance & Inspection Operations from - Prakash Somasundaram (Honeywell)

1400-1425: Automated Debris Analysis for At-line Maintainers – Steve Odom (GasTOPS Inc.)

1425-1450: Phased Array Ultrasonic Testing for Increased Accuracy & Repeatability" – LT Chris MacLean (Pearl Harbor Naval Station & IMF)

1450-1500: Wrap Up and JTEG Principals' Comments

Technology Forum Protocol

- Please keep your phones on mute unless you are presenting. Do *NOT* put your phone on hold. Should you have to temporarily drop off please hang up and call back.
- Questions will be addressed via “Private Chat” on DCS. Send questions to “Langlais, Raymond R Jr”.
- Presenters - slides will be advanced by Ray
- This is an open forum. Briefs and Q&A are available for public release and will be posted on the JTEG website.

http://jteg.ncms.org

MAINTENANCE INNOVATION CHALLENGE

Monday, December 7, 2015
Room: North 129AB
3:00 – 4:30 p.m.

What is the MIC?

A competition designed to raise the awareness of the DoD maintenance community to available technologies, best business practices, and innovative maintenance processes

The MIC provides a venue to showcase your maintenance innovation in front of a large audience of maintenance leaders, professionals, and peers from DoD, industry, and academia.

2015 MIC Event Sequence

- June 1st "Call for Abstracts" – Senior maintenance leaders advocated the MIC and encourage paper submittals
- SAE/NCMS marketed the MIC to pull industry submittals
- **70 MIC submissions** were received by 4 Sep
- Joint Technology Exchange Group (JTEG) assessed and selected (6) semi-finalists
- The MESC/JGDM/P2P leaders selected an overall winner
- (6) semi-finalists presented during MIC at 2015 Mx Symp.
- Winner was announced during maintenance Symposium plenary session and presented with the 2015 Maintenance Innovation Trophy

MIC Submission Process

- Industry/Academia/DoD submit abstract (300-500 words) & quad chart
  - Innovation that improves maintenance agility and affordability
  - Includes technology, unique partnerships, novel processes
  - Quad Chart (Problem, Solution, Benefits, Graphic)
- Original contribution that is feasible or practical
- Performance claims supported by test data, demonstrations, pilots, or operational results

MIC Submittal Ranking

– JTEG Principals review submissions and select six finalists based on:
  - Maintenance centricity
  - Originality of the idea
  - Projected benefit to maintenance
  - Avoidance of commercialism
  - Technical maturity
  - Cross-Service applicability
  - Feasibility and practicality

MIC Finalists Ranking

- MESC/JGDM/P2P is provided a package containing the 6 finalists submissions and rank all 6
  - White paper explaining the capability
  - Quad chart
  - Presentation slides for each innovative submission

What's in it for the Submitters

- Idea reviewed and ranked by OSD/Service Mx tech ldrs
  - Past "Great Ideas" winners technologies now part of DoD Mx operations (Laser Coating Removal, EFAC, IFDIS, AWTS)
- Idea documented in MIC publication
- Finalists receive opportunity to present at Mx Symposium and to display tech at Exhibit Hall
- Winner receives:
  - Trophy presented by DASD Mx at plenary session
  - Exhibit hall space at 2016 Mx Symposium

Tentative Timeline

- Jun 1: SAE & DASD(MPP) issue "Call for Abstracts" email blasts
- Sep 1: Submissions Due
- Sep 15: JTEG down-selects to six finalists
- Oct 15: Finalists packets to MESC/JGDM/P2P members
- Oct 31: MESC/JGDM/P2P selects winner
- Dec 6: Finalists present innovations at Mx Symposium
- Dec 7: Winner presented at plenary session

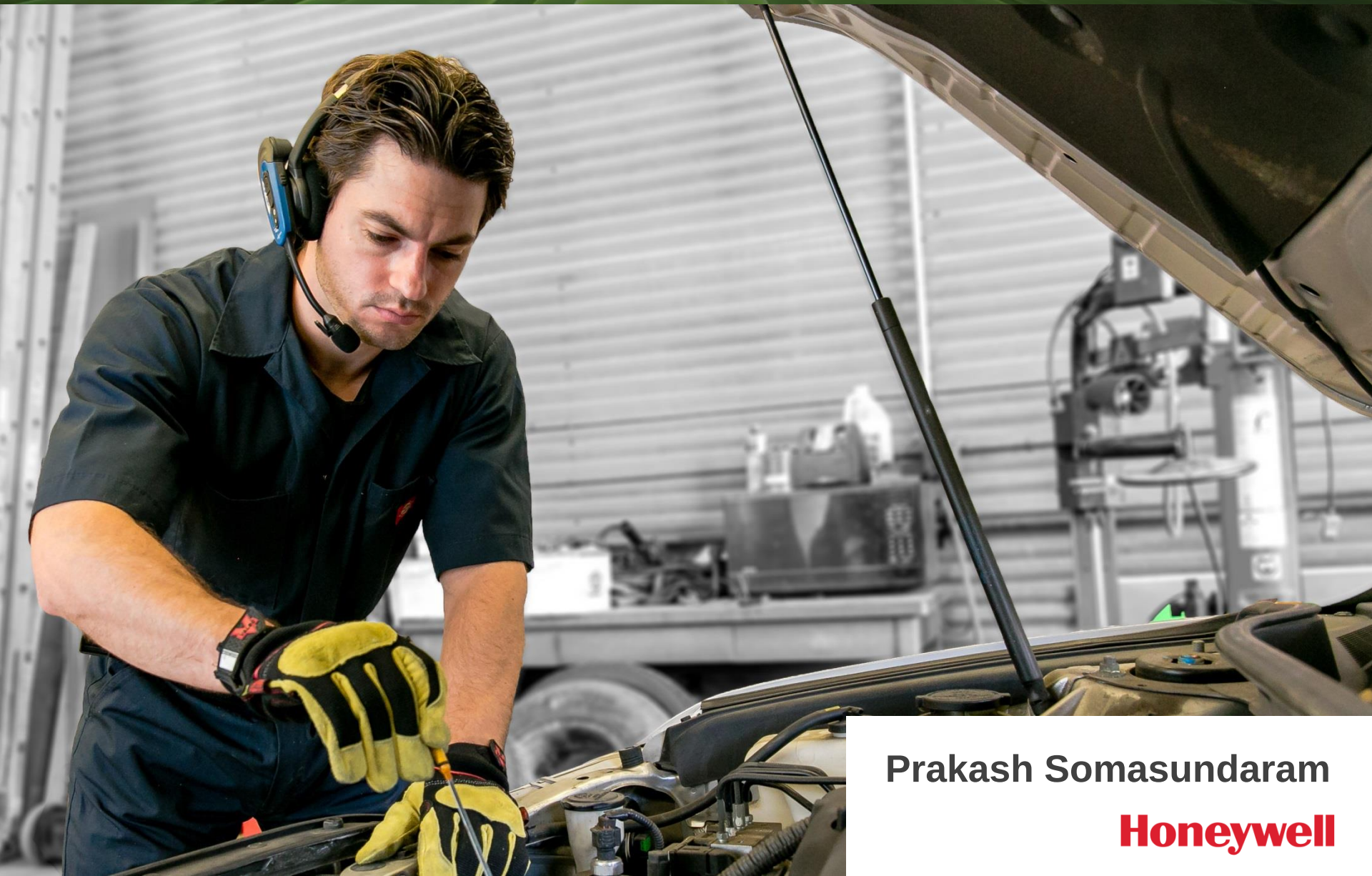
2015 Maintenance Innovation Challenge Finalists

Steve Odom	Automated Debris Analysis for At-line Maintainers
Prakash Somasundaram	Using Voice Directed Technology for Transforming Maintenance & Inspection Ops
LT Christopher G. MacLean	Phased Array Ultrasonic Testing for Increased Accuracy and Repeatability
Bryan J. Neva	NOKOMIS Advanced Detection of Electronic Counterfeits (ADEC)*
Rusty G. Waldrop**	USCG Aviation Bonded Material Inspection System*
Corey Kopp	Assembled Replacement Integrated Circuits (ARICs)*

** Briefed at previous JTEG Forum* *** 2015 MIC Winner*

2015 DoD Maintenance Innovation Challenge

Voice Directed Inspections



Prakash Somasundaram

Honeywell

High Value, Mission Critical Assets

AIRCRAFTS

SHIPS

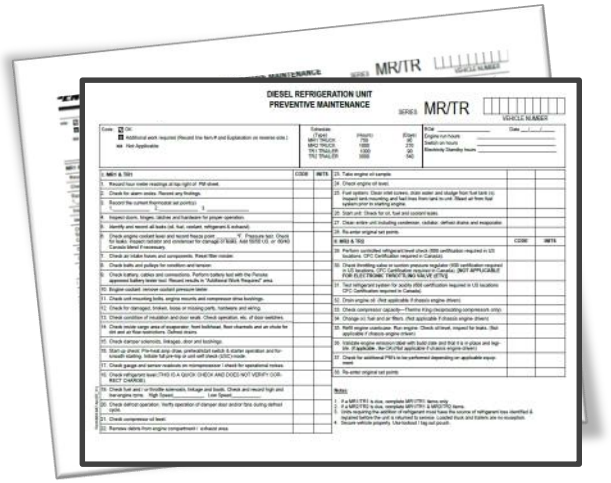
COMBAT VEHICLES

INFRASTRUCTURE

Go through regular preventive maintenance process

Currently Used Documentation Methods

are heavily paper based



moving towards using consumer and industrial handhelds

Vocollect voice is a hands-free, eyes free system to get work instructions and document in real time.

- Step by step process guidance
- Real time date capture
- Dynamic inspections based on asset type and condition

Proven technology over 25 years

Vocollect Voice Users
Almost 1,000,000

Increased Productivity
10% to 35%

35%

Annual Customer Savings
$20+ Billion

Reduction of Errors
25% to 50%

25%

Installed in
60 Countries

Reduced Training Time
Up to 50%

50%

Languages Supported:
35

Turnover Reduction
15% to 30%

30%

Members of Global Team
2,000+

Reduced Safety Incidents
5% to 20%

20%

with measurable impact

Video of Vocollect Voice

AVIATION VIDEO

Benefits in Maintenance & Inspections

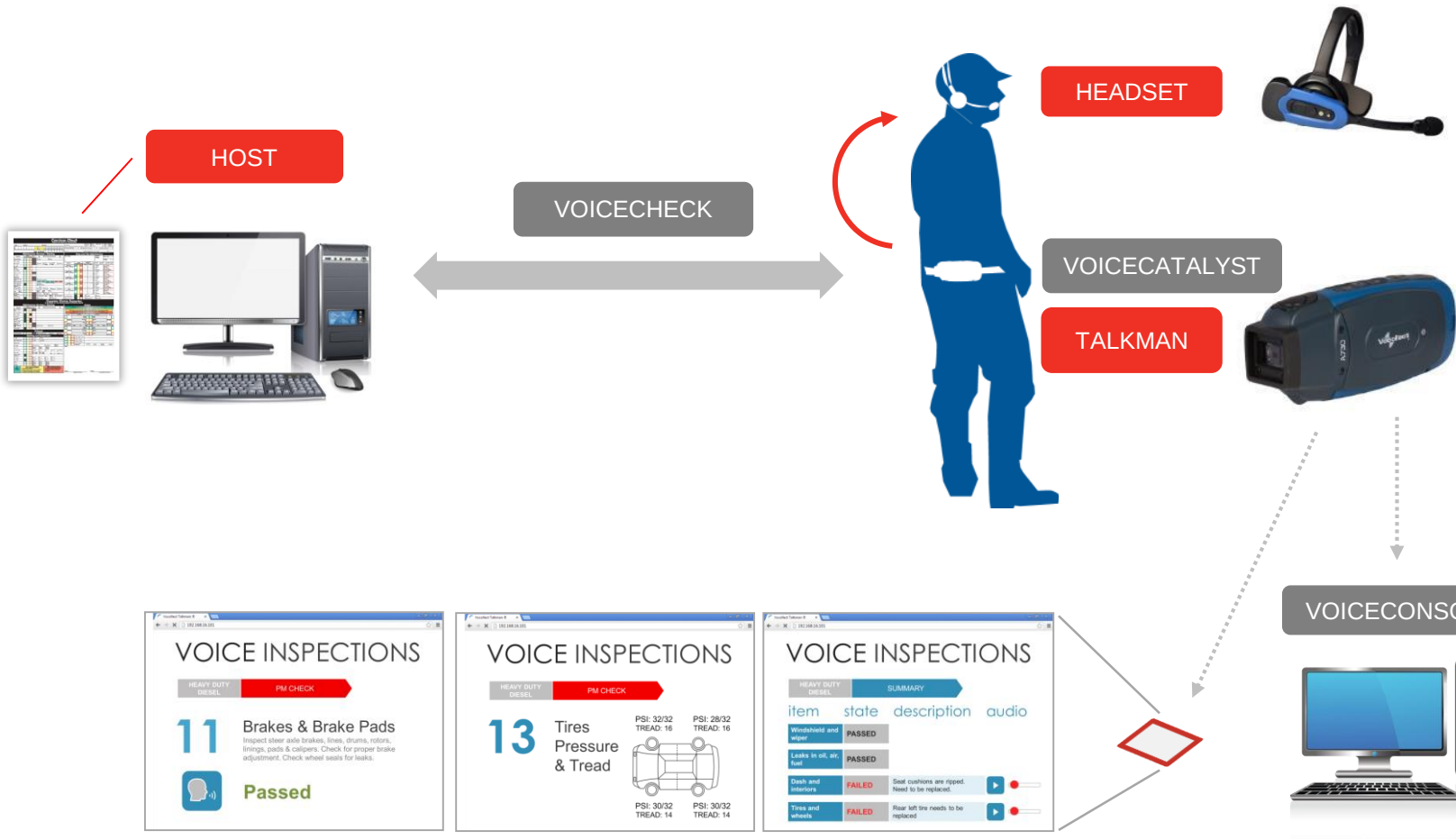
What does it enable?

- **Strict process compliance** and standardization across all sites.
- **Documentation time eliminated** while capturing accurate data.
- **Detailed visibility** into site operations.

What does that mean for you?

- **Increases quality and consistency of service**
- **Reduces maintenance costs/** increases capacity.
- Enables constant **process improvement**

How it Works?


HOST
VOICECHECK
HEADSET
VOICECATALYST
TALKMAN
VOICECONSOLE
VOICE INSPECTIONS
HEAVY DUTY DIESEL
PM CHECK
11
Brakes & Brake Pads
Passed
VOICE INSPECTIONS
HEAVY DUTY DIESEL
PM CHECK
13
Tires Pressure & Tread
PSI: 32/32 TREAD: 16
PSI: 28/32 TREAD: 16
PSI: 30/32 TREAD: 14
PSI: 30/32 TREAD: 14
VOICE INSPECTIONS
HEAVY DUTY DIESEL
SUMMARY
item
state
description
audio
Windshield and wiper
PASSED
Leaks in oil, air, fuel
PASSED
Dash and interiors
FAILED
Seat cushions are ripped. Need to be replaced.
Tires and wheels
FAILED
Rear left tire needs to be replaced

Customer Success

Savings With Voice

Honeywell Aerospace

Induction Process for Jet Engine Auxiliary Power Units (APUs) live since June 2014 with 35+ mechanics using voice system

30%+

reduction in data entry cycle time

Large Truck Fleet Company

Preventive Maintenance and repair of leased trucks with a fleet of 206,000 Trucks serviced across 500 locations with 4000 techs

25%

reduction in inspection time

Hill Air Force Base

Maintenance and induction of APUs at one site Live since July 2015. Multiple mechanics trained and using the system

20%+

reduction in inspection time

Lufthansa Technik

Maintenance and induction of APUs at one site Live since April 2015. Multiple mechanics trained and using the system

Elimination of all redundant documentation

Other DoD sites such as

- Cherry Point - USMC Air Station on F16 and Osprey APUs,
- US Army ANAD - Anniston for A1A tank parts inspection
- USMC Blount Island - MPS for AAV inspections
- Warner Robins AFB

Implementation Methodology

1 Project Definition

- Thoroughly evaluate environment, operations, processes and systems
- Identify and document process or system differences
- Determine and review best design and costs benefits
- Define success criteria

2 Development

- Create SOW
- Build project team
- Define overall project communication plan
- Define change management plan
- Software development & workflow configure
- Define software operation and integration test plan

3 Pre-Implementation

- Validate site readiness
- Hardware installation
- Software installation
- Perform software operation and integration test plan
- Create worker program
- Train the trainers and end-user planning

4 Implementation

- System rollout
- Review performance measurements and project expectations
- Monitor worker awareness and effectiveness
- Plan for additional training if needed
- Transition to technical support center team

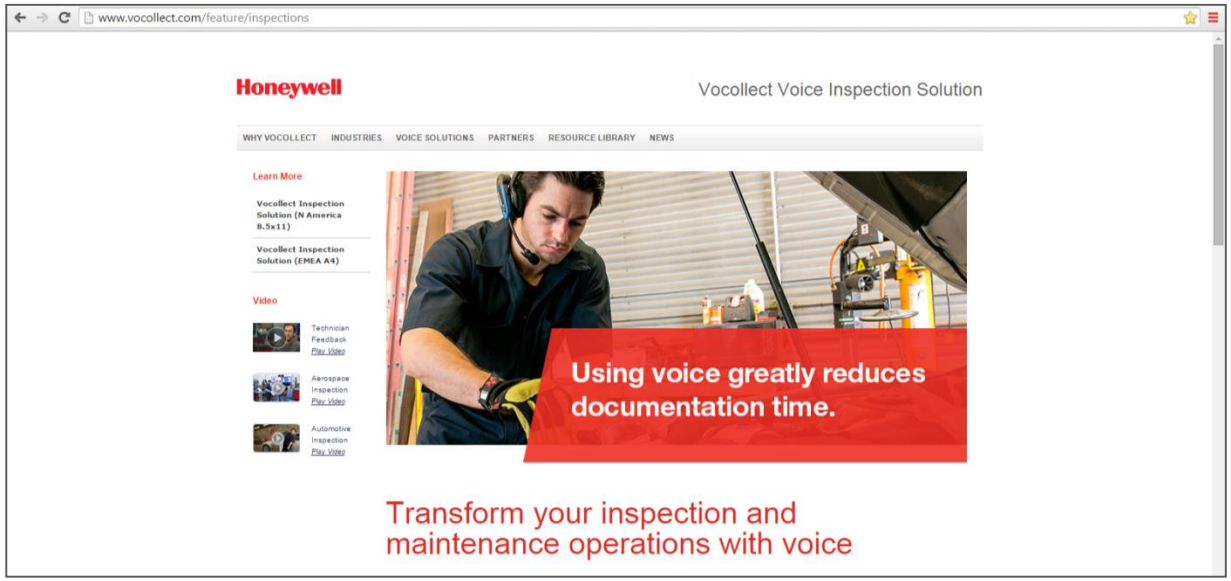
5 Implementation Review

- Review state of project
- Review business metrics to ensure success criteria is being met
- Review outstanding issues (training needs, parking lot items)
- Review all technical items
- Project completion

What to do if you are interested?

Contact us at: vocollectinfo@honeywell.com

More info and videos on www.voiceinspections.com



Thank You

Prakash Somasundaram

Prakash.somasundaram@honeywell.com

Is voice a good fit?

FIT FOR VOICE	NOT A FIT FOR VOICE
• Repetitive process • Structured data • Hands-free/Eyes free need • Need for guidance • Documentation required	• Highly variable process • Free form data • Hands free is not an issue

2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

Steve Odom
VP Business Development
GasTOPS Inc.
steve.odom@gastops.com
256-975-6479

2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Problem

- Correct and rapid alloy identification of debris from oil wetted components
  - Traditional methods are visual – highly subjective
  - Alternative is lab analysis – logistics tail (cost & delays) – expeditionary considerations
  - Impacts safety
  - Impacts cost – improper diagnosis, high NEOF rates
- Multiservice application






Rotary & Fixed Wing
(Air Force, Army, NAVAIR, Marines)

Ground Vehicles
(Army, Marines)

Marine Vehicles
(Navy, Coast Guard)

(Turbine Engines, Gearboxes, Transmissions, Diesel Engines)

Ex. $8.7M potentially addressable from Army Aviation Integrated Priority List

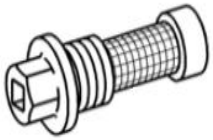
2015 DoD Maintenance Innovation Challenge

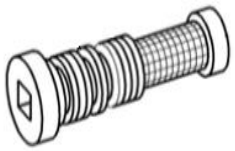
Automated Debris Analysis for At-Line Maintainers

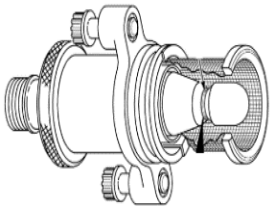
GASTOPS

SENSE/CAPTURE	INSPECT	ANALYZE	ACTION

Scavenge Screens

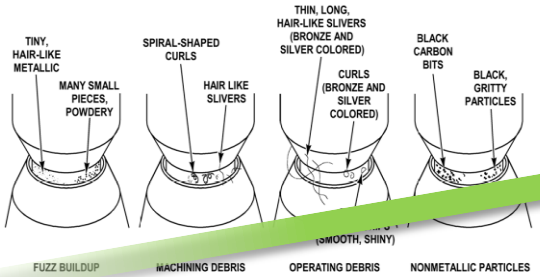




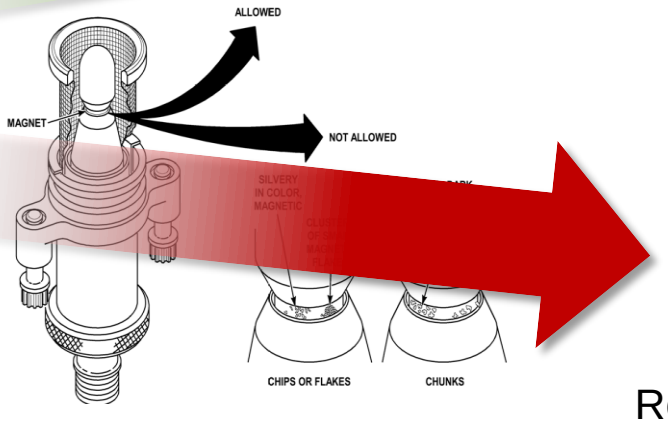


Chip Detector

Visual



Release for Service



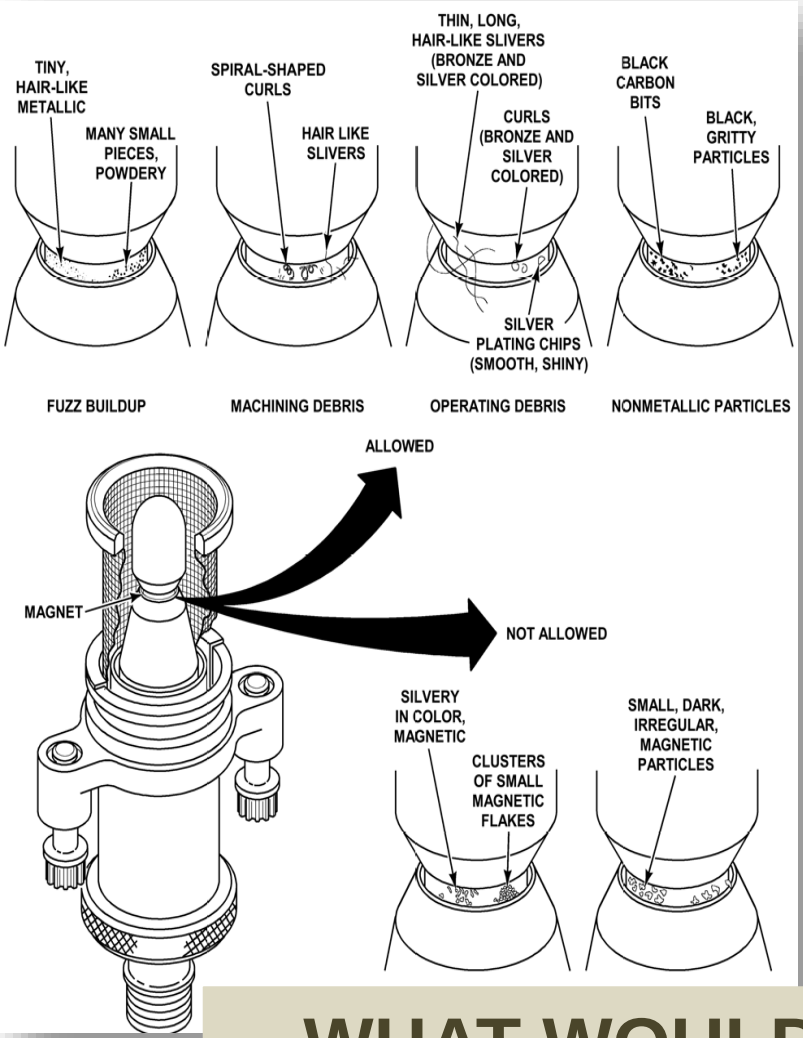
Remove/Repair Component

SUBJECTIVE VISUAL ANALYSIS

2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

GASTOPS



WHAT WOULD YOU DECIDE?
GO OR NO GO?

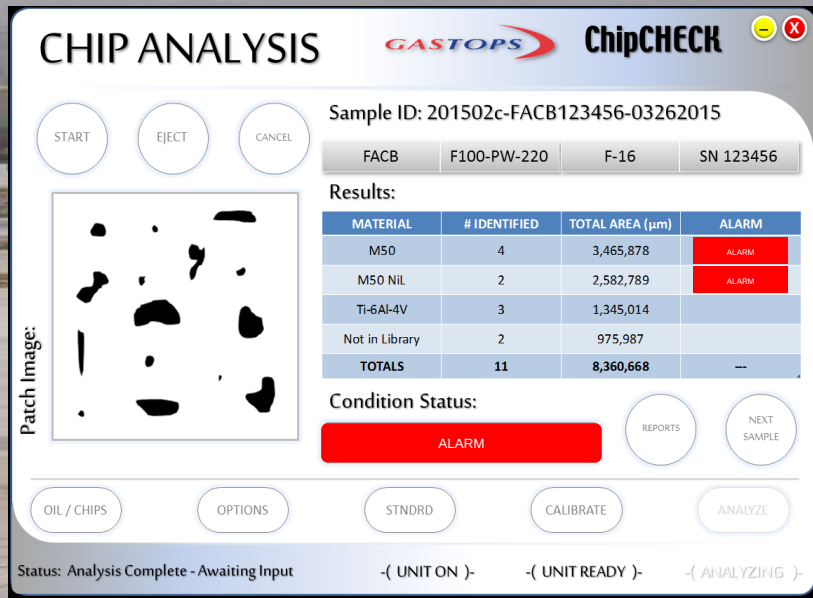
2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Solution

- Deployable, rugged, self-contained instrument for automated analysis of chip detector debris
- Immediate **GO/NO-GO** equipment assessment and maintenance decisions by **At-Line Maintainers**
- Automatic analysis of each individual particle determines **alloy type** & **particle size**
- Innovative application of laser spectroscopy
- Simple to operate
- Reliable - two level maintenance



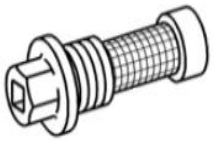
2015 DoD Maintenance Innovation Challenge

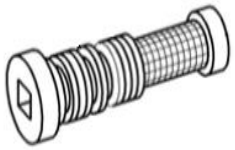
Automated Debris Analysis for At-Line Maintainers

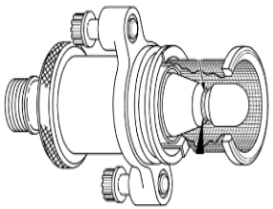
GASTOPS

SENSE/CAPTURE	INSPECT	ANALYZE	ACTION

Scavenge Screens

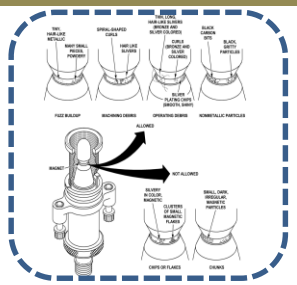






Chip Detector

Visual



Release for Service

Remove/Repair Component

TECHNOLOGY DRIVEN ANALYSIS

2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Benefits

IMPROVE SAFETY

- Eliminate risk of launching a damaged asset based on subjective debris analysis
- Confirm damage debris to drive appropriate maintenance decisions

DRAMATICALLY REDUCE O&M COSTS

- Eliminate NEOF Removals/Overhauls driven by non-critical 'normal' debris
- Reliably identify damage events in progress & reduce likelihood of secondary damage

MAXIMIZE AVAILABILITY OF CRITICAL ASSETS

- Consistent, analysis-based decisions by at-line maintainers within minutes
- Eliminate aircraft status decision based on subjective debris review

2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Challenges & Risks

- Changing the status quo
  - Proven technology applied to field environment
  - Move of lab class analyses to at-line
- DoD Community Awareness/Exposure
  - Requires shift in current process
  - Multiple stakeholders
  - Identification of appropriate decision makers
- Risk
  - Resistance to change

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Innovation Status

- TRL/MRL 7 Demonstrated capability with trial activities in an operational environment:
  - USAF: Trials at Shaw AFB & Carswell Field. Demonstrated correlation with SEM-EDX
  - RCAF: Initial units fielded and processing damage debris from CH149 Cormorant. Demonstrated correlation with SEM-EDX
  - US Army: Collaboration with AOAP to address 701D NEOF rates
  - Commercial rotorcraft: Initial unit fielded processing debris from S-92 (engines & gearboxes)
- Probable Applications:


Pratt & Whitney F100


GE T-701 Engine


Cummins VTA-525 / 903 cubic inches


Honeywell AGT 1500c


GE LM2500 Gas Turbine


V16 Alco Diesel Engine

Rotary & Fixed Wing (Air Force, Army, NAVAIR, Marines)	Ground Vehicles (Army, Marines)	Marine Vehicles (Navy, Coast Guard)

(Turbine Engines, Gearboxes, Transmissions, Diesel Engines)

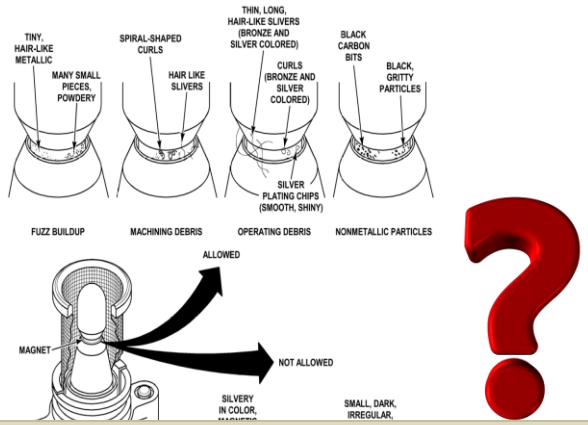
- Obstacles & Competing alternate solutions: Laboratory class equipment (SEM-XRF) / Traditional lab analysis. Resistance to change in process.

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Vision / Final Thoughts

- Integration into DoD maintenance processes
  - Initially supplement current subjective processes
  - Establish GO/NO-GO limits for high value components
  - Document process and limits in appropriate TMs/TOs
- Thoughts to leave with you



Equip and empower at-line maintainers to make informed decisions

2015 DoD Maintenance Innovation Challenge

Automated Debris Analysis for At-Line Maintainers

GASTOPS

Questions

2015 DoD Maintenance Innovation Challenge

Phased Array Ultrasonic Testing (PAUT)

Phased Array Ultrasonic Testing for Increased Accuracy and Repeatability of Structural Hull Weld Inspections

LT Christopher MacLean P.E.

Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY&IMF)

Christopher.maclean@navy.mil

Phased Array Ultrasonic Testing (PAUT)

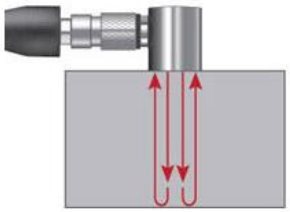
Background

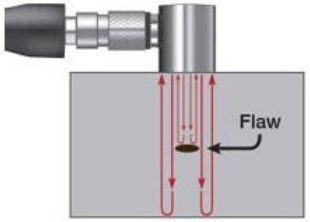
- Maintenance Environment - Hull Cuts
  - SUPSHIP 1-3-8 Rule
  - Rigging path / services
- SUBSAFE
  - Maximum Reasonable Assurance
  - Dives = Surfaces
  - “Keep Water Out of the People Space”

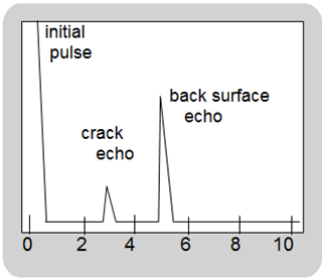
- URO MRC - NDT Requirements
  - NDT surveillance inspections of hull cut welds
  - Ultrasonic statistical sampling inspections of hull welds
  - Ultrasonic monitoring inspections of hull welds with known discontinuities

Phased Array Ultrasonic Testing (PAUT)

Conventional Ultrasonic Testing - Challenges

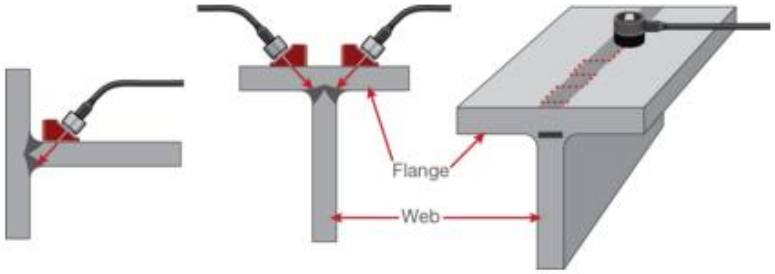






- Discontinuity length and location are measured manually and are only recorded on paper.
- No permanent record of raw inspection data.
- Detection of discontinuities is highly dependent on orientation and the angle of the single fixed ultrasonic beam used.
- Follow-up ultrasonic scans to determine critical flaw size requires multiple set-ups utilizing several angles (transducers) and significant time.

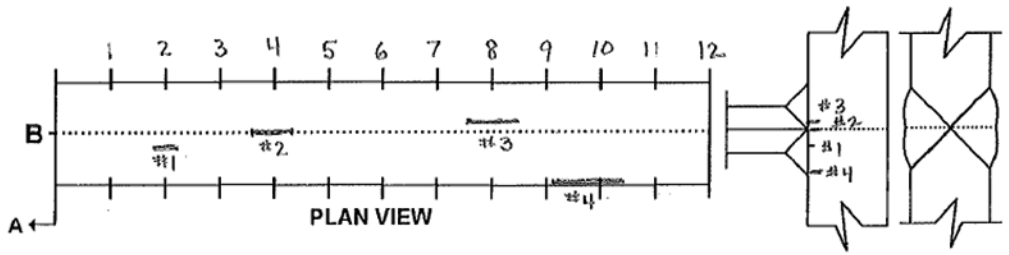
Phased Array Ultrasonic Testing (PAUT)



ULTRASONIC WELD INSPECTION REPORT

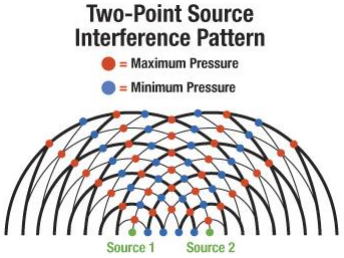
1. SHIP 138-2	2. WELD IDENTIFICATION TMD138-2													
3. FRAME 138	4. ☐ PORT ☒ STBD	5. STATION 0"	6. ☐ BOT. ☒ OTHER	7. NO.	DISTANCE 8. FROM A	DISTANCE 9. FROM B	10. LENGTH	DEPTH 11. MIN	DEPTH 12. MAX	13. AMPL.	14. BEAM DIREC	15. ACC OR REJ
16. ☐ FULL SKIP ☐ COMP ☒ HALF SKIP ☐ OTHER	17. UT IN LIEU OF ☐ MT ☐ OTHER ☐ RT ☒ N/A			1	1.81	.50A	.63	.00	.05	3	A	Acc
INSPECTION SURFACE				2	3.68	.00	.63	.00	.10	5	A	Rej
				3	7.50	.18F	.78	.00	.10	8+	A	Rej
18. ☒ ACCEPTABLE ☐ UNACCEPTABLE	19. PROBED FROM ☐ INSIDE ☐ OTHER ☒ OUTSIDE			4	9.13	1.19A	1.25	.00	.15	9	F	Rej
20. PLATE MATERIAL	21. PLATE THKNS	22. WELD WIDTH										
INSTRUMENT												
23. MANUFACTURER and MODEL NUMBER GE USN 60		24. SERIAL NO. GE-3										
TRANSDUCER												
25. FREQUENCY 2.25	26. SIZE 3/4" x 1.0"	27. SERIAL NO. M27136	28. ANGLE 45°									
29. COUPLANT Glycerin		30. CALIBRATION STANDARD 38396										
31. TEST PROCEDURE NDTP 138-UTW		32. ACCEPTANCE STANDARD MIL-STD 2035A										
33. INSPECTED BY KEL	34. REVIEWED BY JC Stg	35. DATE 10-30-15	37. WELD LENGTH REQUESTED 12.0" WELD LENGTH INSPECTED 10.0"								38. ☐ ACCEPT ☒ REJECT	

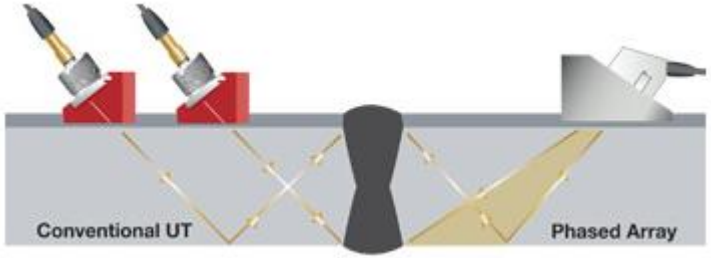
39. WELD JOINT DETAIL ☒ F (FORWARD, PORT, UPWARD) ☐ A (AFT, STARBOARD, DOWNWARD)



Phased Array Ultrasonic Testing (PAUT)

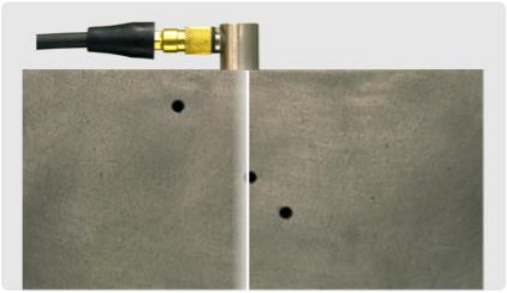
Solution: Phased Array Ultrasonic Testing



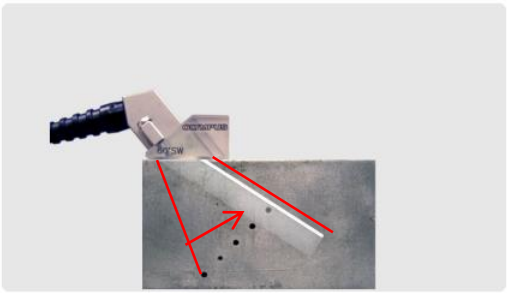


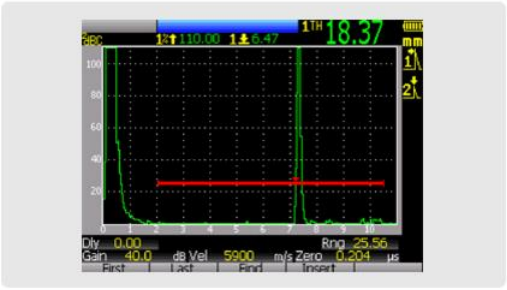
Phased array technology uses multiple ultrasonic elements (up to 256) and electronic time delays to create beams that can be steered, scanned, swept, and focused electronically for fast inspection, full data storage, and multiple angle inspections.

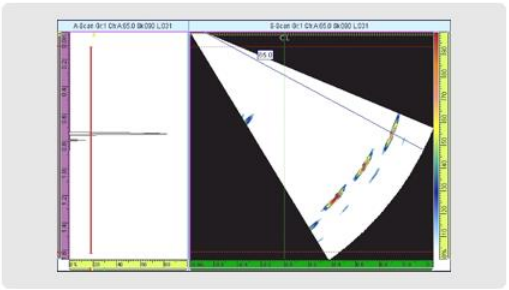
A-scan Data



+35° to +70° Sectorial Scan







Phased Array Ultrasonic Testing (PAUT)

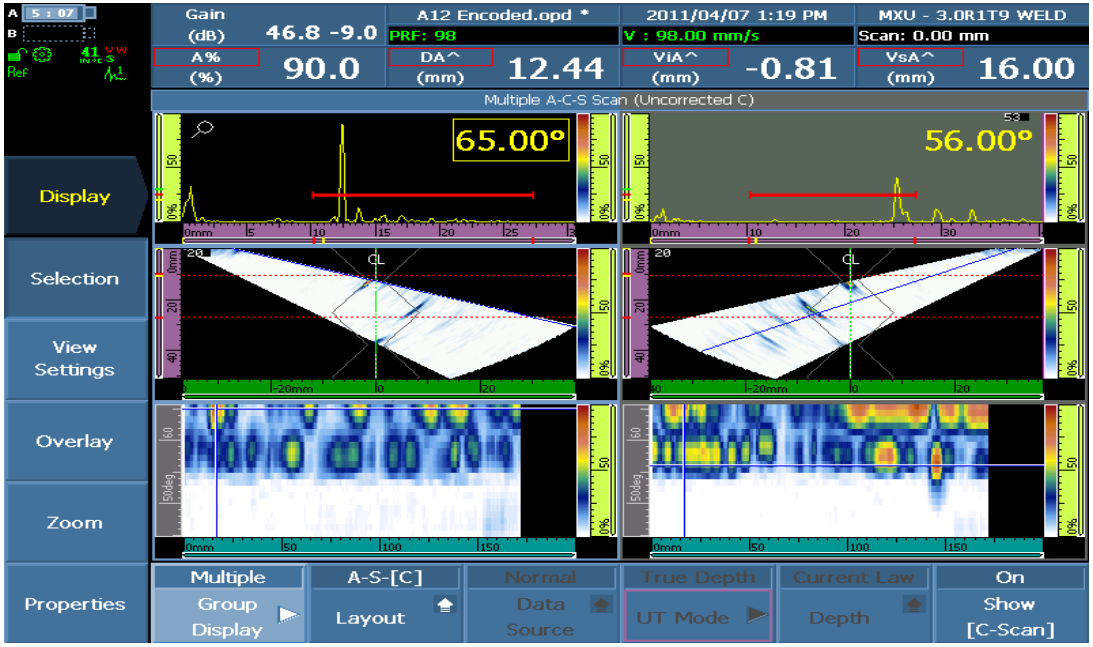
PAUT Displays & Reports Provide

Traditional A-Scan (depth & amplitude)

S-Scan (Section view) Volumetric location, depth, height

C-Scan (Top view) Length, location, width

B-Scan (End view) Length, location, depth



Phased Array Ultrasonic Testing (PAUT)

Video

Phased Array Ultrasonic Testing (PAUT)

Benefits

- Inspection data is encoded and stored digitally providing composite images of discontinuities, reducing dependence on the operator to visually identify discontinuities while scanning manually.
- Encoded data provides consistent location and length measurements resulting in increased accuracy for determination of indication growth for baseline and monitoring inspections.
- Less time is required for inspection, saving on cost and schedule.
  - Calibration off ship, quick scan, analyze in shop/lab with supervisor.
  - Example: King's Bay

Phased Array Ultrasonic Testing (PAUT)

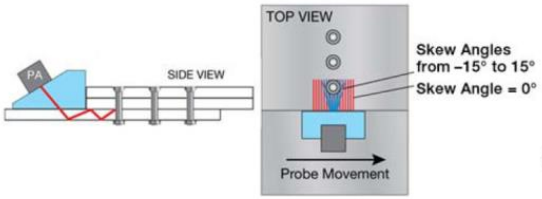
Challenges & Risks

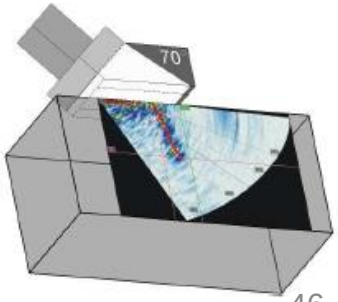
- Initial purchase cost of equipment ~$78,000.
- Training of inspectors and oversight ~$1,400 and 80 hours / person minimum training.
  - Level II Analyst
  - Level III Test Examiner
  - Maintaining certified personnel
- Possible obstacle: Need to develop requirements for personnel, equipment, and procedure qualification.
- DoD community awareness/exposure – Today.
- Transition to a new program – Current work at PHNSY, validating the technology / cost savings.

Phased Array Ultrasonic Testing (PAUT)

Innovation Status

- Not only proven more accurate and reliable over traditional methods, also faster and less expensive.
- This is a mature technology with demonstrated capability.
  - Recently approved for use on USN Carbon steel pipe inspections, eliminating costly Radiographic Testing (RT)
  - Widely used in industry
- Current improvements:
  - Beam steering (-15 to +15).
  - Surface scans using creep waves.





Vision / Final Thoughts

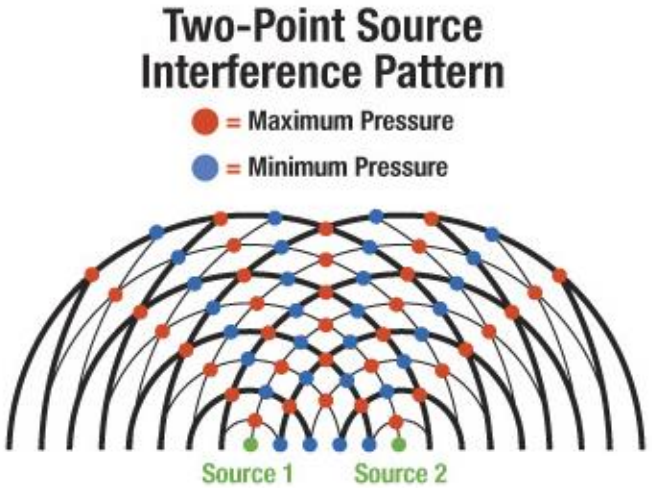
- With awareness and testing this can be integrated into other Navy and DoD maintenance processes, structural or otherwise.
- Technology is currently being further developed for increased use in materials other than carbon steel.
- Thoughts to Leave with You: Champion Change.

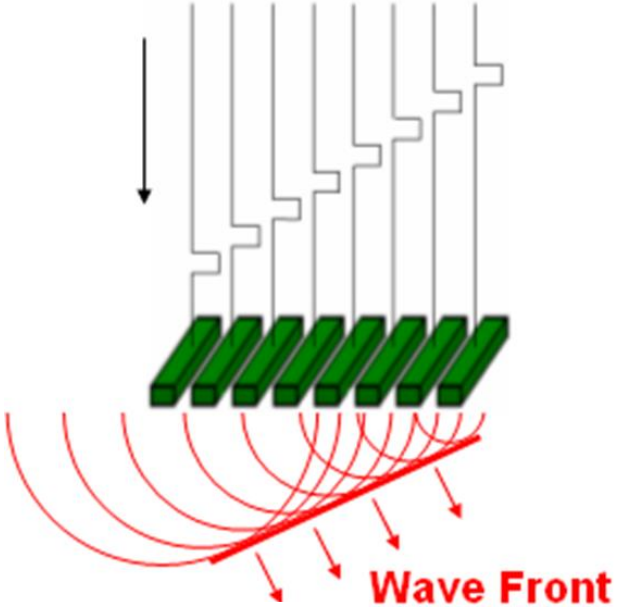
Phased Array Ultrasonic Testing (PAUT)

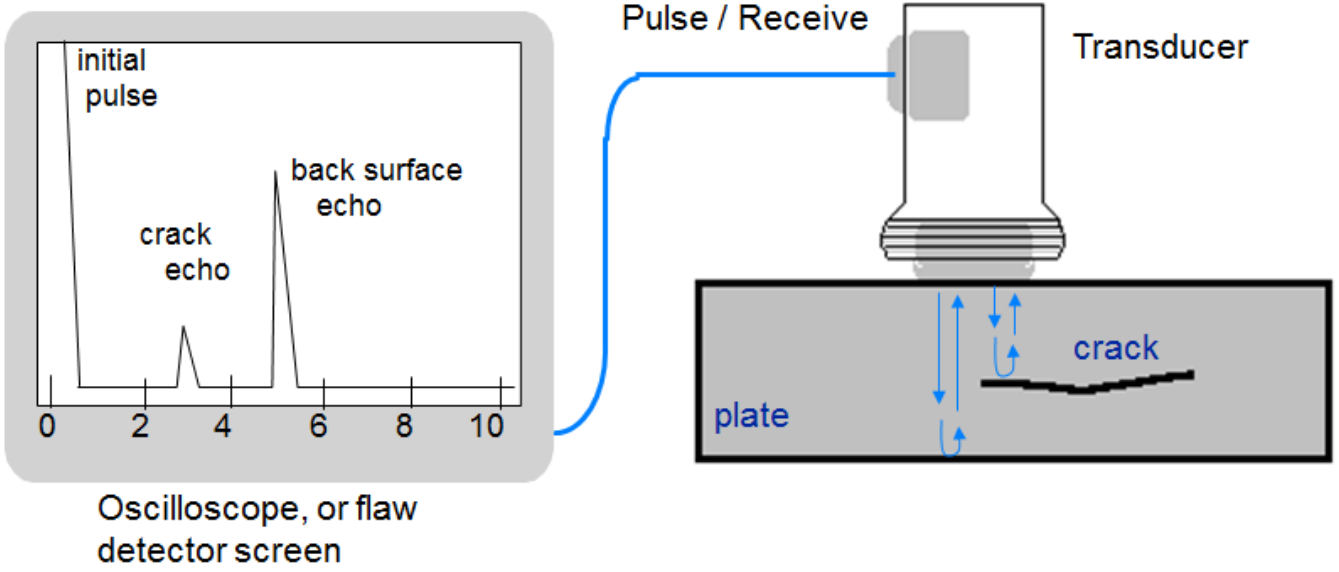
Questions

Phased Array Ultrasonic Testing (PAUT)

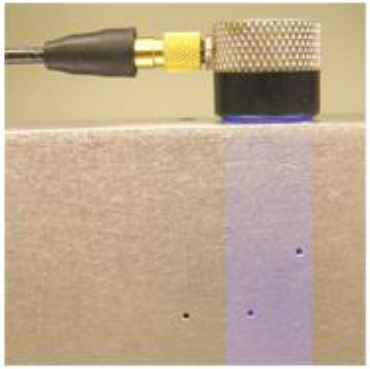
- Backup







Phased Array Ultrasonic Testing (PAUT)



Generalized beam profile

Straight beam A-scan image

JTEG Joint Technology Exchange Group

Joint Solutions for Depot Maintenance

Maintenance Innovation Challenge Finalists

Review & Wrap-Up

26 January 2016

JTEG Joint Technology Exchange Group

Joint Solutions for Depot Maintenance

Next JTEG Technology Forum

Cyber-Security: Overcoming Challenges to Innovation

23 February 2016