1 Slide

F-15 WWR 2022

JENTEK Eddy Current Array Inspections and Field Portable Systems

Dr. Neil Goldfine jenteksensors.com



...Introducing new field hardened jETi in 2023 for bolt-hole and other NDT



Slide 1

Copyright © 2021 JENTEK Sensors All Rights Reserved

JENTEK Sensors, Inc.

- Bolt-Hole inspection for challenging holes
 - Multi-material layer stackups
 - Challenging surface conditions
 - Challenging access
- Surface-breaking cracks on complex surfaces
- Sub-surface cracks on curved and variable thickness structures





- 7 Simultaneous Impedance Measurements
- 3 Frequencies Simultaneously
- Supports the MWM and MWM-Array Sensor Technologies
- Weight less than 1 pound
- Best of class impedance measurement





7-Channel MWM & MWM-Arrays

GridStation[®] GS8200



- Standard 19 and 39 Channel Systems standard
- Stackable up to 119 Channels
- 3 frequencies simultaneously
- All channel impedances and real and imaginary parts (or mag. & phase) recorded simultaneously
- Support for both inductive and magnetoresistive (MR) sensing element arrays



39-Channel MWM-Array



JENTEK Sensors, Inc.

jET Handheld Scanner for Bolt-Hole Inspection



Example Result: 3 Layer Stack-up (50 x 25 mil; mid-wall flaw) 6



Study Specimen 1701 Hole 3 (30 x 15 mil; mid-wall flaw)



JENTEK Sensors, Inc.-

Study Specimen 1701 Hole 4 (Two flaws)



Real Crack Specimen Fabrication



JENTEK[®] Sensors, Inc.

Real Crack Specimen 1

- 1/4 in. hole; Al alloy
- Left inside: No defect
- Right inside: 0.044 in. corner crack (0.018 in. external surface crack)

Note the jagged nature of real cracks



JENTEK[®] Sensors, Inc. –

Real Crack Specimen 1 – (44 x 18 mil; corner crack)



Copyright © 2021 JENTEK Sensors All Rights Reserved

Real Crack Specimen 2

- 1/4 in. hole; Al alloy •
- Left inside: No defect
- Right inside: 0.093 in. crack near edge • (no external surface crack visible)
- Appears to be three nearly coalesced cracks of lengths 0.040 in., 0.016 in., and 0.034 in.





All Rights Reserved

Real Crack Specimen 2 – (93 mil mid-bore/coallesced)





All Rights Reserved

Surface Crack Detection at fillets with MWM-Arrays



Liftoff & coverage verification

Six EDM notches at fillet



Depth 0.03 in., 0.02, 0.15, 0.01, 0.007

Filtered by size

All detected, with "air calibration"



Unfiltered (top) and Filtered C-Scans

JENTEK[®] Sensors, Inc. —

Slide 14

Copyright © 2021 JENTEK Sensors All Rights Reserved

Automatic Rescaling of Crack Response with Lift-off



Automatic Rescaling of Crack Response with Position within Array

16 Slide



Copyright © 2021 JENTEK Sensors All Rights Reserved

Automatic Correction for Part Conductivity (and Temperature)



Subsurface cracks in curved and complex parts 18

- Air Force funded POD study
- Fractography for largest defect shown below
- Real crack generated with starter EDM notch



Sub-surface Real Crack Response



Sub-surface Real Crack vs. EDM Notch Responses





JENTEK Sensors, Inc.

ŝ

<u>S</u>

Copyright © 2021 JENTEK Sensors All Rights Reserved



- 2023 introduction of jETi[™] field hardened bolt-hole and other inspection system for aircraft NDT with eddy current arrays
- POD studies completed for surface and buried cracks, including cracks in fillets
- POD studies planned for 2023 for bolt hole inspection, including anomaly identification and suppression
- Focus is on ease-of-use, durability
- Goal is to replace conventional ET and penetrant inspections
- Less surface preparation requirements and improved inspection reliability is needed compared to conventional ET

JENTEK[®] Sensors, Inc.