NDT for Non-Experts

2014 A4A NDT Forum

Jan O. Endrerud, VP Product and Marketing Dolphitech
Agenda

• Who is DolphiTech?
• Technical background to NDT for Non-Experts
• What we are doing right now...
• What we will be doing next...
• Discussion – Q&A
Who is DolphiTech?
DolphiTech

• Electronics, FPGA, signal Processing, ultrasound and software development.
• Founded in 2009.
• Located in Raufoss, Norway.
• Sales office in Chicago, IL USA.
• Ultrasound cameras for NDT of composite materials.
• Unique ultrasound and transducer technology.
Technical Background

Eskil Skoglund, Head of Development
The DolphiCam CF08

- Handheld, high resolution, mobile ultrasound NDT camera with a dry coupling transducer design, for Windows PCs and tablets
- 16,000 transducer elements on 31x31mm
- Up to 8 mm CFRP thickness
- 2D and 3D images
- A-, B-, and C-scan (Amplitude & Time of Flight)
- Manual Stitching of larger areas
- Easily operated by non-experts
- Accepted in Boeing 787 NDT Manual
Transducer

Transmitting on several elements

Element size 210x210μm
Gap 40μm
Pitch 250μm

250μm = ~10 mills
System Overview
DolphiCam Expert
DolphiCam Expert
DolphiCam Expert
Color palettes
“Traffic light” color palette

- Goal: Make it easy for non-expert NDT operators to interpret results.
- Discrete colors; white, red and blue
- Adjust «thumbs» to set transition depths.

- No transducer contact
- Red: Delamination or disbonding
- Blue: Backwall reflection
Manual Stitching

- Easily covers large areas
- Follow defect edges, or pre-marked grid on surface, stitch in any direction
- Manual or automatic activation of next tile
- Variable tile overlap
- Tile adjustments
- Cross-tile measurements
- Accepted in Boeing 787 NDT Manual 51-00-20 Rev 30 Aug 2014.
What we are doing right now
What we are doing right now

• DolphiCam CF08 revision
• New DolphiCam CF16 announced!
• DolphiTech TeamCenter
• Remote NDT
CF08 gets a new dry coupling

- More robust
- Material depth 8mm
- Updated pulse calibration
DolphiCam CF16 announced!

- Material depth 16 mm +
- Same SW & FW as CF08
- Offered separately, or bundled with the CF08
Market introduction of serial manufactured car with CFRP structure
Integrating DolphiCam with visual inspection procedures, guiding, documentation and automatic reporting

• Describe and embed expert knowledge in inspection procedure.

• Same equipment settings, every time.

• Add photos and webcam pictures.

• Automatic reporting.

• Designed for handheld Windows tablets.
DolphiTech TeamCenter (2)
DolphiTech TeamCenter (2)
DolphiTech TeamCenter (2)

TeamCenter/Expert

TeamCenter/Operator

TeamCenter Library
DolphiTech TeamCenter (2)

TeamCenter/Expert

<table>
<thead>
<tr>
<th>Brand</th>
<th>Model</th>
<th>Year</th>
<th>Part</th>
<th>Area</th>
<th>Description of the inspection procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing</td>
<td>787 Dreamlin</td>
<td>787 8</td>
<td>787 10</td>
<td>Skin on Stringer</td>
<td>Before starting an inspection, be certain all plates, access doors, fairings, and cowling have been opened or removed and the structure cleaned. When opening inspection plates and cowling and before cleaning the area, take note of any oil or other evidence of fluid leakage.</td>
</tr>
<tr>
<td>Airbus</td>
<td>737</td>
<td></td>
<td></td>
<td></td>
<td>Specify DolphiCam settings file to use during inspection: Settings file: Airbus Highgrade joe sample (used settings)</td>
</tr>
<tr>
<td>DolphiTech</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Specify images to include in the inspection report: Time of flight, B-Scan V, B-Scan H, A-Scan</td>
</tr>
</tbody>
</table>

TeamCenter/Library

TeamCenter/Operator

Image 1

Image 2

Image 3

Image 4

Image 5

Description:

Preparation

Inspection Procedure

Material Thickness

Viable Damage Size: 140 + 0.03

1/1

1/2

1/3

1/4

1/5

![Image of TeamCenter Library](image1)

![Image of TeamCenter Operator](image2)
DolphiTech TeamCenter (2)
DolphiTech TeamCenter (2)

TeamCenter/Expert

TeamCenter/Operator

TeamCenter Library
DolphiTech TeamCenter (3)
DolphiTech TeamCenter (4)
DolphiTech TeamCenter (5)
What we will be doing next
Remote NDT
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional NDT</td>
<td>A certified inspector performs an inspection of an object on-site according to an inspection procedure.</td>
</tr>
<tr>
<td>Remote NDT</td>
<td>A certified inspector performs an inspection of a remotely located object, according to an inspection procedure, with the assistance of one or more helpers at the site of the object, and aided by realtime video-, sound- and NDT data transferred over a communication channel.</td>
</tr>
<tr>
<td>Simplified NDT</td>
<td>An individual with necessary training performs an inspection with the use of a procedure, supporting technology and clearly defined acceptance criterias.</td>
</tr>
</tbody>
</table>
Expected market development

Traditional NDT + R&D market develops with CFRP use.

Manufacturing

• Quick check tool for borehole inspection, bond testing, accidental damages
• Inline manufacturing: will be low volume, tailored, project delivery and needs a dedicated business model.

Remote and Simplified NDT scales with

• Cost focus; salaries, training, travel and equipment
• Rollout of planned cars/aircraft
• Increasing level of integration between manufacturers, maintenance organizations and service providers.
• Regulatory changes
Remote NDT

Manufacturer & OEM NDT service provider

NDT Expert

Participant(s)

Low Latency needed!

Camera control
Multiple Video Cameras
2 Way Sound
Real time images and Raw data

Expert and Operator Catalog

Inspection log (video, sound)

Inspection results Reports, Images, raw data

Inspection procedures

NDT operator

DolphiCam

Participant(s)
bit.ly/rndt2
View, control and monitor
...on any device
Thank you for your attention!

www.dolphitech.com