A350 XWB NDT
In-Service Damage Assessment

Presented by
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NDT Product Leader SEES4
Agenda

- News A350 ANDT Re-structured procedures
- A350 ANDT New tooling referencing
- A350 ANDT procedures for NDT specialists
- A350 ANDT procedures for Non-NDT specialists
- Conclusion
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ANDT (NTM) Procedures at Entry Into Service

- **General methods** description 51-9X-00
  - Description of methods for information
  - Link to international standards (ASTM International…)

- **General 51’s** procedures 51-9X-(1-9)X
  - Unscheduled In-service damage assessment & prior repairs
  - Called up in RDAS (Repair Design Approval Sheet), ASR (SRM), ISB’s
  - Customized & re-validated for new materials/designs/programs

- **Specific procedures**
  - Reference for scheduled maintenance tasks ATA 52 to 57
  - Called up in MPD, MP, ISB’s

General procedures & methods ready at Entry Into Service
A350 ANDT Re-structured Manual - General Overview

51-94 Ultrasonic

51-94-00 General
51-94-01 Phased Array General
51-94-10 Measurement Remaining Thickness - Metallic
51-94-20 Crack - Multi Layered Joints Metallic
51-94-22 Crack Length Evaluation Metallic

51-96 Eddy Current

51-96-00 General
51-96-10 Measurement Thickness - Coating
51-96-11 Measurement Conductivity - Aluminium alloy
51-96-12 Measurement Heat Treatment - Aluminium alloy
51-96-20 Crack Surface Breaking & Remaining Corrosion - Metallic
51-96-21 Crack - Multi Layered Joints - Aluminium
51-96-23 Crack Surface Breaking - Non Plated – Steel
51-96-24 Crack Surface Breaking - Cadmium Plated - Steel
51-96-25 Crack Length Evaluation - Metallic
51-96-50 Crack Bore Hole Rotating Test - Metallic
51-96-51 Crack Flat Bottom Hole Rotating Test - Aluminium alloy

51-97 Magnetic Particle

51-97-00 General

51-98 Penetrant

51-98-00 General
51-98-10 Non Porous materials

51-99-00 Visual

51-99-10 Detailed Composite
51-99-12 Remaining Corrosion - Metallic

51-90 NDT

51-90-00 General
51-90-01 Tooling List

51-91 Thermography

51-91-00 General

51-92 Radiography

51-92-00 General
51-92-11 Fluid detection - Composite Sandwich

51-93 Other Methods

51-93-01 General Resonance Frequency
51-93-10 Resonance Frequency - Composite

51-90 NDT Manual

A350

51-92-00 General
51-92-11 Fluid detection - Composite Sandwich

51-91 Thermography

51-91-00 General

51-92 Radiography

51-92-00 General
51-92-11 Fluid detection - Composite Sandwich

51-91 Thermography

51-91-00 General

51-90 NDT

51-90-00 General
51-90-01 Tooling List

52 Doors
53 Fuselage
54 Nacelle/Pylons
55 Stabilizers
57 Wings

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A350 ANDT New breakdown

Introduction & tooling specification
Dedicated to Non NDT specialist
General procedures managed by methods
Specific procedures

New breakdown & Task numbering
News A350 ANDT Re-structured procedures

- **Other method chapter 51-93-00**
  - Can be used by a non-NDT specialist

- **Procedures:**
  - 51-93-20: Line Tool - Fuselage
  - 51-93-30: Scratch depth measurement
  - …
News A350 ANDT Re-structured procedures

- Ultrasonic chapter 51-94-00
  - Used by a NDT specialist

- Procedures:
  - 51-94-41: Ultrasonic Phased Array
  - ...
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A350 ANDT New tooling referencing

- **NDT tooling** referenced by **Airbus codes** (ID)
  - **Specification** approach
  - **Technical Data Sheet** → **key tooling parameters** for the **inspection**

- **Objective**
  - **Guide** Maint. Eng., A/L & MRO on **up to date data**
    - **Clearer** tooling **Reference & Description**
    - **Easier** NDT **alternative tool selection** by NDT inspector (level II/III)
  - **Homogenise & Standardise** tooling
  - **Identify & manage** properly tooling **config. & obsolescence**
### A350 ANDT New tooling referencing - Example

**USP-DDAE**

1. **ID**: USP-DDAE  
2. **Item**: Search Unit  
3. **Designation**: Search Unit  
4. **Key Parameters**: <1>  
5. **Tooling List**:

<table>
<thead>
<tr>
<th>ID</th>
<th>Item</th>
<th>Designation</th>
<th>Key Parameters</th>
<th>Tooling List</th>
</tr>
</thead>
<tbody>
<tr>
<td>USP-DDAE</td>
<td>Search Unit</td>
<td>Search Unit</td>
<td>&lt;1&gt;</td>
<td>6E4NAA</td>
</tr>
<tr>
<td>USP-DDAA</td>
<td>Wedge</td>
<td>Wedge</td>
<td>&lt;2&gt;</td>
<td>SN441C02</td>
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<td>USP-COSA</td>
<td>Instrument</td>
<td>Ultrasonic</td>
<td>&lt;3&gt;</td>
<td>OMNISP/PAUT16 (OMNIP)</td>
</tr>
<tr>
<td></td>
<td>Calibration Block</td>
<td>Calibration Block Set</td>
<td>&lt;4&gt;</td>
<td>CALIB/STAND</td>
</tr>
<tr>
<td></td>
<td>Calibration Block</td>
<td>Calibration Block Set</td>
<td>&lt;4&gt;</td>
<td>STAND/CALEB</td>
</tr>
<tr>
<td></td>
<td>Wheel Encoder</td>
<td>Wheel Encoder</td>
<td></td>
<td>EN15</td>
</tr>
</tbody>
</table>

<1> Couplant: Any water-soluble couplant, for example ZGF.  
<2> Couplant for wedge assembly: Oil or similar high viscosity couplant.  
<3> System Software MMU-2 OR7 was used in the development of this procedure.

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**USP-DDAE**

1. **Basic Specification**

   - **Use**: Phased Array  
   - **Number of Elements**: 64 Elements  
   - **Frequency**: 5MHz  
   - **Geometry**: 60 x 15x 25

2. **Drawing**

   ![USP-DDAE Drawing](image-url)
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A350 ANDT procedures for NDT specialists

- **Procedures: Impact damage on composite**
  - 51-94-41: Ultrasonic Phased Array

- Both procedures alternatives
- Recommended to use the phased array as far as possible
- Wheel probe recommended for fuselage inspection

NDT specialists to be trained/familiar with Ultrasonic’s Phased Array technology
A350 ANDT procedures for NDT specialists

- Single element probe – A-scan inspection principle

A/C structure - Interior view

UT A-scan inspection needs experience and time
A350 ANDT procedures for NDT specialists

- Phased Array - C-scan example

Typical damage → Irregular form

C-scan thickness
"time of flight"

C-scan amplitude

NDT specialists to be trained/familiar with Utrasonic’s Phased Array technology
Delamination Damage Reporting

Missing material
Max. depth: 0.4 mm

UT delamination depth

Delamination area 120mm x 70 mm

Distance

Note: No stringer disbond
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Scratch Depth measurement

VIEWING DIRECTION THROUGH DIGITAL OPTICAL MICROMETER

PAINT LAYER SYSTEM
EXPANDED COPPER FOIL
CFRP

SCRATCH

FOCQUENCY TO OUTSIDE VIEW OF PAINT LAYER SYSTEM

FOCQUENCY TO EXPANDED COPPER FOIL AND END OF PAINT LAYER SYSTEM

FOCQUENCY TO BASE OF SCRATCH

ANDT 51-93-30
Paint borer

ANDT 51-93-4x candidate dedicated to radom
A350 ANDT procedures for Non-NDT specialists
Paint thickness assessment

- Advanced Eddy current gauge

External surface protection

Pigmented resin with ECF

CFRP

Expanded Copper Foil (ECF)

ANDT 51-93-4x candidate after repair
Microwave solution

Microwave is applicable on ECF as well as on the CFRP substrate without ECF.
A350 ANDT procedures for Non-NDT specialists
Fuselage damage assessment

• “Line tool” : In-service benefits
  - Prevent flight delay and cancellation due to NDT personnel availability
  - Provide quick and reliable statement
  - Easy impact localisation for recording

• “Line tool” : Functions

ANDT 51-93-20
A350 ANDT procedures for Non-NDT specialists
Fuselage damage assessment

- “Line tool” Airbus patent: Delamination detection function

No calibration / No need for internal knowledge of the structure
A350 ANDT procedures for Non-NDT specialists
Fuselage damage assessment

- "Line tool" Airbus patent: Stringer counting function

- Packaging
  - 600mm x 400mm x 200 mm
  - not exceed 8kg

- Design
  - For Airport usage

- Weather conditions
  - (-20°C/+55°C)
  - IP54 compliant.

- Stored
  - A/C cabin
  - cargo tempered conditions

- Battery
  - Autonomy 2H minimum
  - keep full as long as possible
  - fast charge on A/C

Useful to quickly identify stringer in the inspection area
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## Conclusions:

- General procedures & methods ready at Entry Into Service
- New breakdown & Task numbering
- Dedicated chapter for Non NDT specialists
- Key tooling parameters to ease tool selection & alternatives
- NDT specialists to be trained/familiar with Utrasonic’s Phased Array technology
- Line Tool is ready for Entry In-Service
- Airbus working on advanced solutions
THANK YOU