

Ultrasound testing machines for CFRP components of the new Airbus A350XWB

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DGZfP-Jahrestagung
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An Airbus takes-off or lands every 2,5 Seconds ...

Passengers

Airbus facts: (End March 2010)
 9546 Orders
 6120 Deliveries
 3426 a/c backlog
 317 Customers
 ~ 17.000 Flights per day



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A350 XWB – Global market coverage

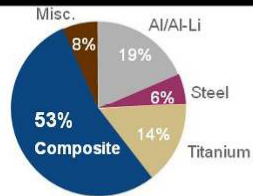


A350 XWB – Firm sales status end March 2010

25 Countries – 3 Alliances – 5 Leasing companies



An Intelligent Airframe by design



- Titanium
 - High load frames
 - Door surroundings
 - Landing gear
 - Pylons
 - No corrosion tasks

- CFRP
 - Wings
 - Centre wing box and keel beam
 - Tail cone (Section 19)
 - Skin panels
 - Frames, stringers and doublers
 - Doors (Passenger & Cargo)
 - No corrosion & fatigue tasks



November 2009 Shaping efficiency - CSML - Ref. VixiD08020303 - Issue 1

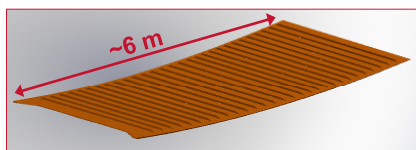
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Titel der Präsentation - Titel der Veranstaltung - Vortragender - Datum - Eigentum AREVA NP GmbH - NUR INTERN VERWENDEN - © AREVA NP - p.5

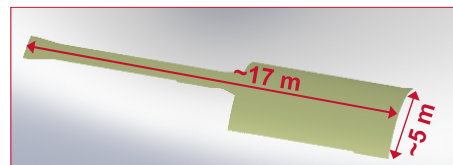
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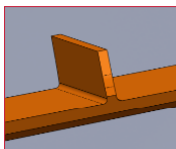
Examples for part spectrum (1)



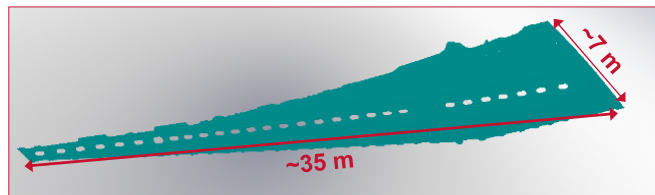
Center wing box part



Keel beam



T-stringer



Lower wing cover



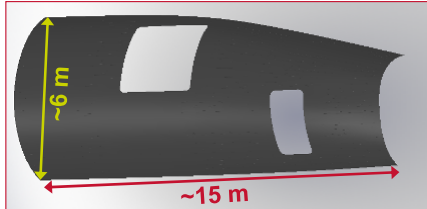
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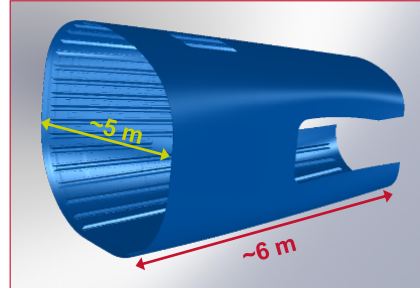
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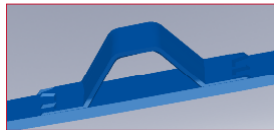
Examples for part spectrum (2)



Fuselage Side Shell



Barrel S19



Ω-stringer



In total more than 30 different parts with different stringers (T & Ω)

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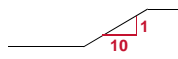
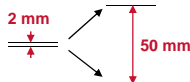
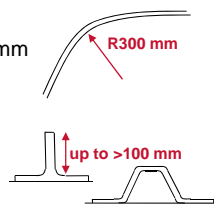
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Boundary Conditions

Spectrum of components (selected properties)

- ▶ skin curvatures as low as 300 mm
- ▶ spherical shaped skins
- ▶ T- and Ω-stringer to be tested
- ▶ different CFRP materials
- ▶ skin thickness 2 - 50 mm
- ▶ part length up to 33 m
- ▶ ramps up to 1:10



Testing performance

- ▶ 6x6 mm defects
- ▶ porosity evaluation
- ▶ measuring of wall thickness

Productivity

Operating and maintenance convenience

Costs

...



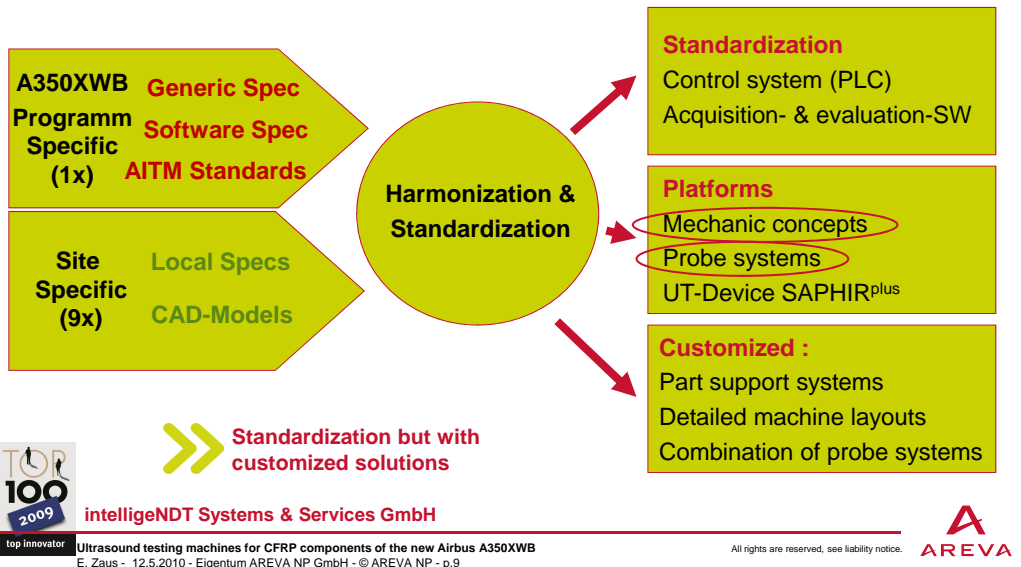
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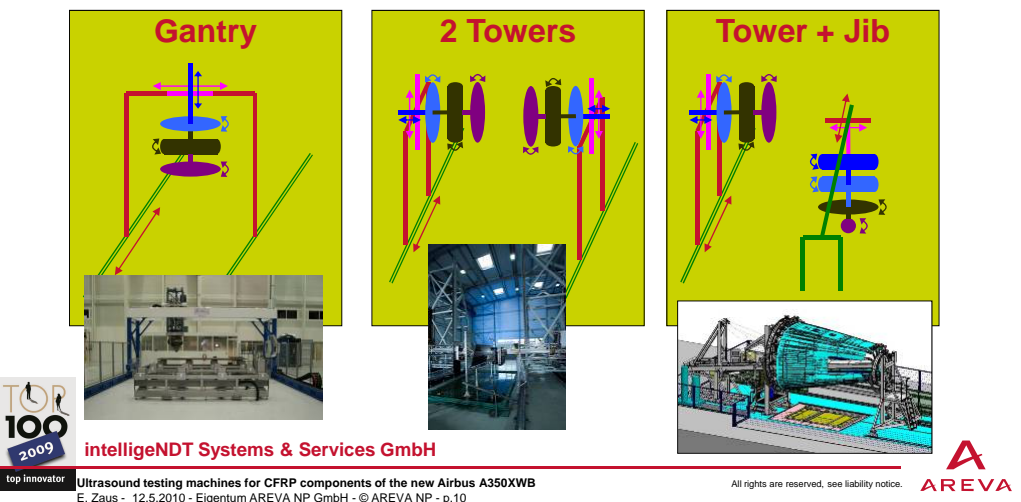


Harmonization & Standardization as a key mission from Airbus



Standardization of Manipulator

Reduction of the total manipulator types to a minimum of 3 based on the components and their inspection scope



Standardization of Probes: Skin



Line array probes

- ▶ 32 elements
- ▶ water delay line
- ▶ pre-wetting jets

element pitch 1 mm
special design for
edge inspection

element pitch 1 mm
for strongly curved
components

element pitch 2 mm
for slightly curved
components



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Standardization of Probes: T-Stringers



Stringer web

- Line array probes**
- ▶ plastics delay line
 - ▶ element pitch 2 mm

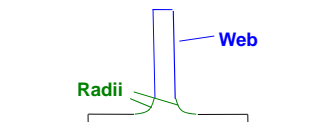
- ▶ 48 elements
- ▶ shorter delay line
for web of T-stringers
up to height 96 mm
up to thickness 18 mm

- ▶ 56 elements
- ▶ longer delay line
for web of T-stringers
up to height 112 mm
up to thickness 25 mm

Stringer radii

Phased array probes

- ▶ water delay line
for foot of T-stringer of
radius 5 mm



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Standardization of Probes: Ω -Stringers

Probes designed for a special geometry of Ω -stringers

Stringer top & sides

Line array probes

- ▶ plastics delay line
- ▶ element pitch 2 mm

▶ 19 elements

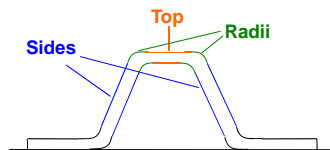
▶ 27 elements



Stringer radii

Phased array probes

- ▶ water delay line



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Summary

The relationships between Airbus and its partners for the A350XWB-project were a step for future projects... Harmonization & Standardization are keys on this way and means for Airbus :

- ▶ **Flexibility** → The relationships between Airbus and its partners for the A350XWB-project are setting a step for future projects.
→ Same parts can be inspected on different sites
→ Results of inspections are fully comparable
- ▶ **Logistic** → Most spare- and maintenance parts fits for all machines
→ Maintenance procedures follows standardization
- ▶ **Economy** → Cost cutting for new machines by harmonization
→ Developed tools & Software will be used for 9+ machines
- ▶ **Multi-Project-Management**
→ Standards for Critical Design Reviews, project-management, acceptance procedures etc.
supports multi-project-management for A350XWB



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Commissioning experience

Status spring 2010

- ▶ First machines in service at customer
- ▶ Other machines in installation phase near completion

1st machine very complex (inspection of skin, stringer web & stringer radii)

→ Kind of reference machine

- ▶ Mechanical fine-tuning of sensor system
- ▶ Interaction control – scanning technique
- ▶ Inspection software



Customer gets “series approved” inspection technology with so far surpassing inspection quality

From machine to machine further increase of commissioning efficiency by

- ▶ Mature technology
- ▶ Approved software
- ▶ Learning effect of commissioning personnel



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