



Inspections After Blending-out Scratches on Aircraft Fuselage Made of Aluminium Alloy

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Speaker



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1.1. Summary

- The **cladding** is a **corrosion protection layer** made of “pure” aluminum applied on the surface of the **aluminum alloys** constituting the **aircraft** parts.
- After **blending-out scratches** unintentionally created during assembly or maintenance operations, the cladding layer can be **penetrated**.
- AIRBUS requested TESTIA, its affiliate, to develop and industrialize a portable inspection kit, in order to detect and assess the unprotected areas.
- To streamline operations, the solution must be developed for Level 1 Limited and Level 2 Certified Operators. The focus should be on conducting efficient, flexible, and reliable inspections in manufacturing and in-service environments.
- The device is based on ultrasonic testing and eddy current testing methods, including probes, instruments, calibration blocks and software.

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30+ years
of expertise



600+ talented
people

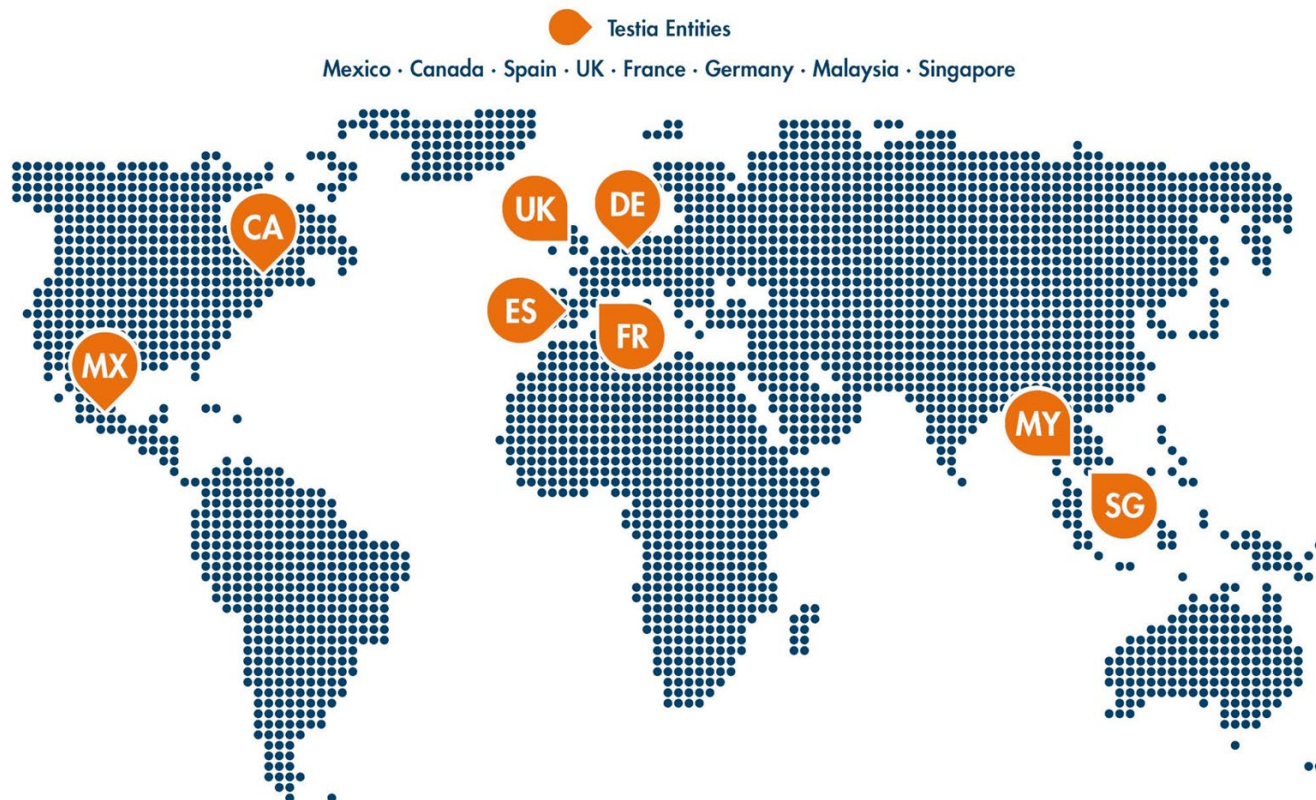


18 sites
worldwide



1,500+
customers trust us

Our entities worldwide



Our global end-to-end solutions focus on structural integrity



Training & Qualification

Multilingual courses & accreditations
across aerospace NDT methods

Inspection

NDT inspection from elementary parts &
throughout asset life cycle

Engineering

A broad range of engineering services
guaranteeing structural integrity

Products & Solutions

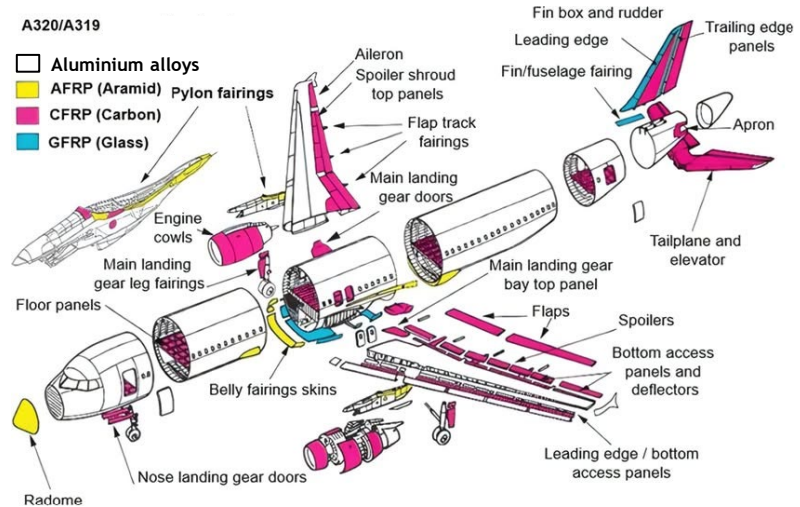
Augmented inspection, process
automation and embedded intelligence

MOC
(Maintenance in Operational Condition)
Guarantee the readiness of your inspection
tools throughout their life cycle

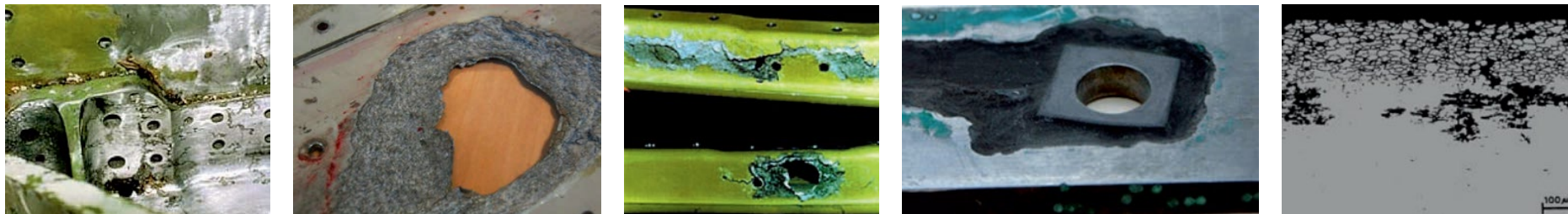


2. Introduction

1. Corrosion & consequences
2. Cladding as a protection
3. Traceability: pledge of security



2.1. Introduction - Corrosion & consequences



Corrosion examples on airframes made of aluminium alloys [1]

- **Corrosion** can damage some **aircrafts** despite protection caution [1].
- **Accidents** rarely happen thanks to maintenance plans [4].



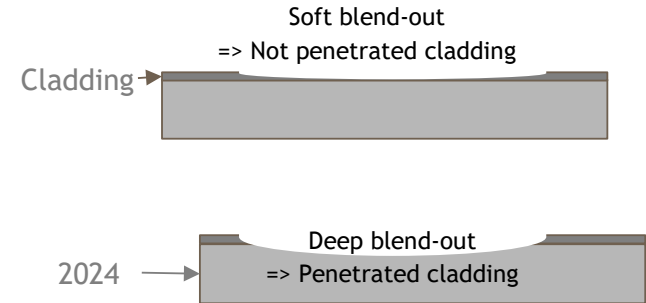
Aloha Airlines Flight 243 - Boeing 737-200 - 04/1988
Cause: fatigue cracks + corrosion [2]



2.2. Introduction - Cladding as a protection

- Cladding: thin layer made of Al (1000 serie) on plates made of 2024.
- Thickness ~ 2 or 4% plates thickness, i.e. [0.04mm; 0.40mm].
- Goal: protection against corrosion.
- Penetrated cladding (after blend-out): invisible.
- Electrical conductivity of cladded plates made of 2024:

26 to 36 MS/m acc. to thickness, versus 17 to 18 for non-cladded plates made of 2024 (~ 1 MHz measurements).



Eddy current testing (ET) is the most relevant method to detect clad missing areas.

2.2. Introduction - Traceability: pledge of security

Any accidental **scratch** must be **blend-out** then the areas must be **inspected** following procedures...

AITM6-6002 (ET)

AITM6-4016 (UT)

in **production**



NTM 51-10-30 (ET)

NTM 51-10-04 (UT)

in **maintenance**

Image source : <https://airinsight.com/airbus-celebrates-three-program-milestones>

3. The solution

1. Requirements
2. Specifications
3. Tailored solutions



3.1. Requirements

Detection

- Self-test by the operators in charge of blending-out scratches
- Required certification: Level 1 Limited (acc. to EN 4179)
- Perfect repeatability
- POD (Probability of detection): 90/95 + Minimum false calls rate



Assessment

- Locating & contouring areas without clad by ET Level 2 Certified operators
- Fast results reporting
- Wall remaining thickness measurements with UT

3.2. Specifications

Hardware

- **Instrument:** 1 single to control ET & UT probes, operated by ET1-L/UT1-L & ET2/UT2
- **Accessories:** facilitating the right probes positioning/pressure
- **Calibration block:** cautiously selected & verified!
- **Connectable** to MES



Software

- **Bespoke GUI**, dedicated to the use-case
- **Guiding** the ET1-L/UT1-L operators along the steps, esp. calibration
- **Gatekeepers** to eliminate any mistake
- **Direct reading** measurements

3.3.1. Tailored solution for Level 1 Limited

Ref. block
2024

Instrument
SmartUE1

Software
CladTool

ET probe
2MHz



<https://www.youtube.com/@testiaworldwide>

3.3.1. Tailored solution for Level 1 Limited

Instrument
SmartUE1



Ref. block
2024

Software
TG_direct

UT probe
20MHz

3.3.2. Tailored solution for Level 2

Instrument
SmartUE1

Software
Galvano

ET probe
2MHz

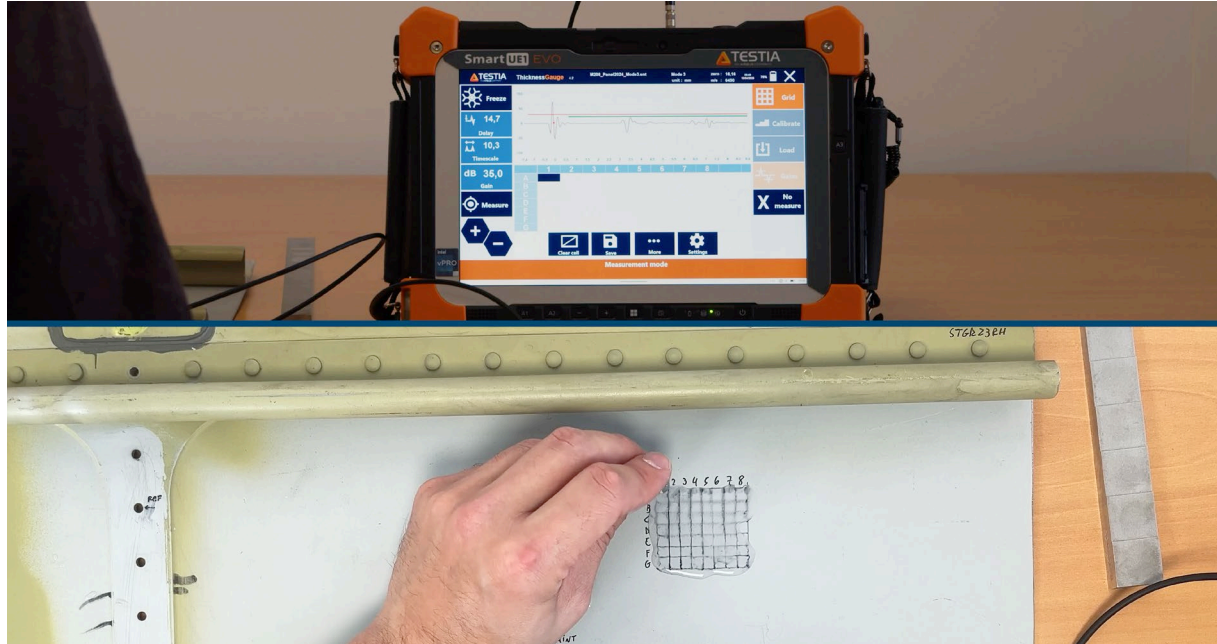
Ref. block
2024



<https://www.youtube.com/@testiaworldwide>

3.3.2. Tailored solution for Level 2

Instrument
SmartUE1



Ref. block
2024

Software
TG

UT probe
20MHz

<https://www.youtube.com/@testiaworldwide>

4. Conclusions



4. Conclusions

- The **Smart UE1** is a portable solution that streamlines inspections and improves the reliability and traceability of detecting penetrated cladding areas on aircraft fuselage panels made of 2024.
- For **Level 1 Limited operators**, it **speeds up the detection** process and reduces downtime related to the lack of Level 2 personnel.
- For **Certified Level 2 operators**, it enables **advanced assessment** of the area and assures digital continuity of the data for reporting purposes.
- The unit can also perform **flaw detection using UE, ET, and resonance**, and is **referenced in 185 NTM** procedures for maintaining AIRBUS aircraft.
- The Smart UE1 is currently used in **several plants** involved in fuselage section assembly and final assembly lines (FALs). It is also widely used in **maintenance operations**.



6. References, acronyms & acknowledgement

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font_download
volunteer_activism

References

Acronyms

Acknowledge-
-ment



6.1. Références

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6.2. Acronyms

Acronym	Meaning
A/C	Aircraft
ADR	Automatic Defects Recognition
AI	Artificial Intelligence
DAQ	Data Acquisition
DMU	Digital Mock-Up
ECA	Eddy Current Array
ERP	Enterprise Resource Planning
ET	Eddy current Testing
FAL	Final Assembly Line
GUI	Graphical User Interface

Acronym	Meaning
HW	Hardware
OEM	Original Equipment Manufacturer
MCA	Medium Component Assembly
MES	Manufacturing Execution System
NDE/NDT	Non-destructive Evaluation / Testing
PA	Phased Array
PLC	Programmable Logic Controller
SW	Software
TCP	Tool Center Point
UT	Ultrasonic Testing

THANK YOU!

Want to see the Smart UE1 in action? Visit us at booth #13

You can also contact us at: contact@testia.com