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NONDESTRUCTIVE  
TESTING FORUM

## Supporting NDT Tasks with B1 Mechanics

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SINCE 1991

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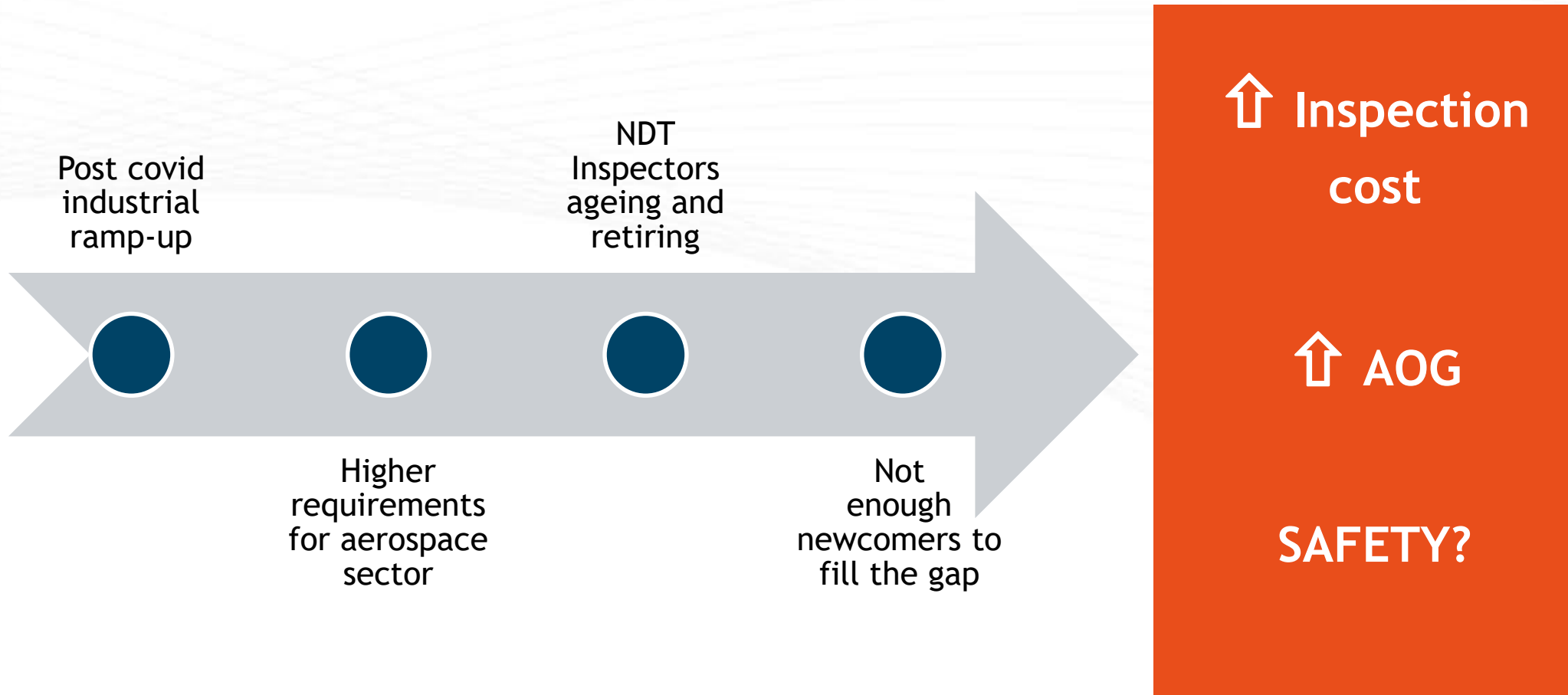
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# Content

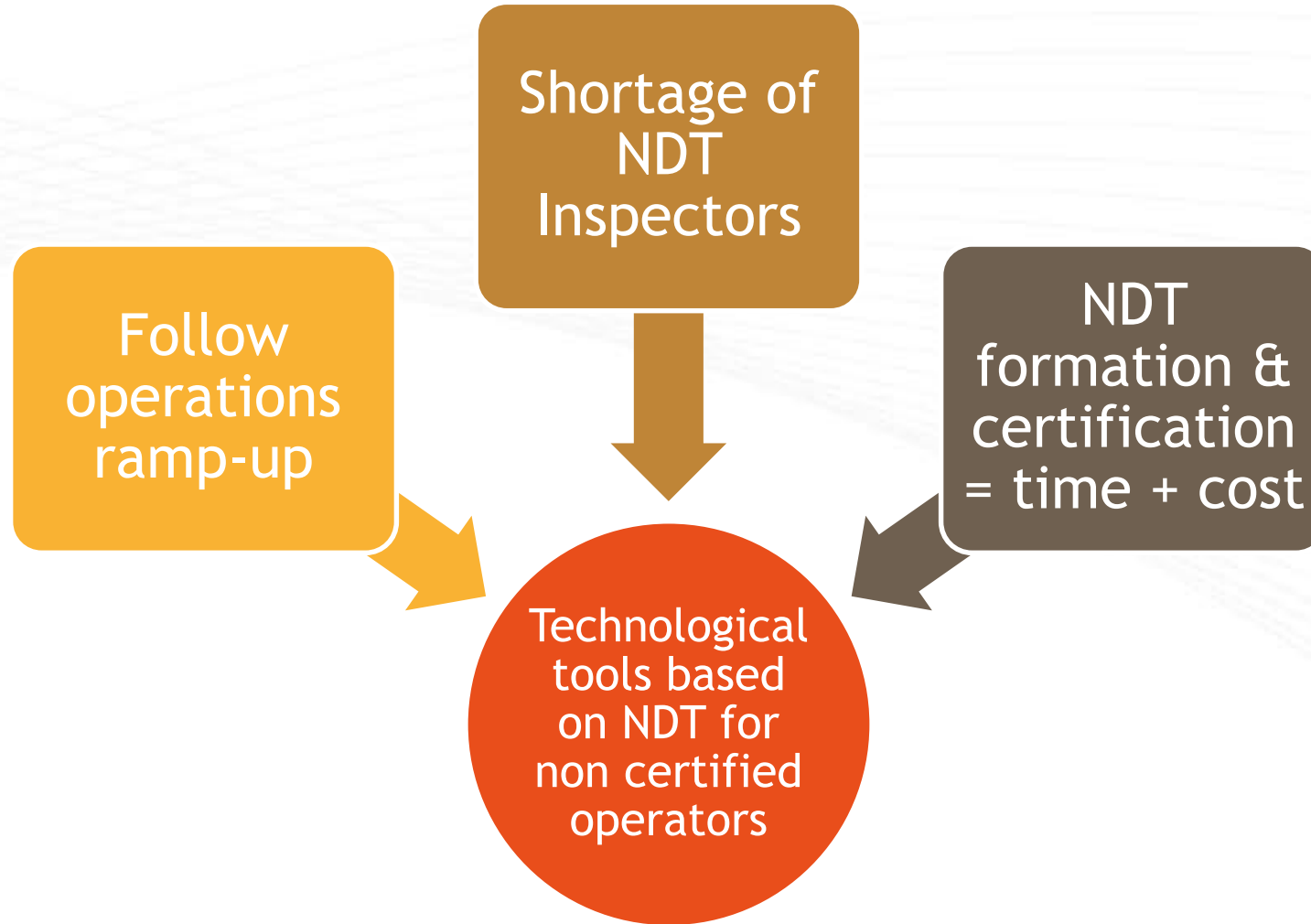
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- ▶ Global context for NDT Experts
- ▶ Case 1: cladding on aluminum
- ▶ Case 2: damage on monolithic composites
- ▶ Case 3: damage on sandwich structures
- ▶ Additional tools to support inspections
- ▶ Conclusions

# NDT Specialist current global scenario



# How can we help?



# Case 1: cladding on aluminum

## Context

- ▶ Many structural repairs require blend-out, turning into very frequent clad losses.
- ▶ Those blends-outs remove the clad layer reducing corrosion protection and stiffness.
- ▶ To control this operators need to call a NDT inspector, depending on availability.
- ▶ Overall this may ends in bottlenecks and additional costs.

**Clad turns-out to be a very small but critical issue in aerospace.**

## The challenge

- ▶ Take fast repair decisions thanks to Go/No-Go diagnosis.
- ▶ Save time and materials thanks to painted areas detection capabilities.
- ▶ Every certified or non-certified personnel can operate its very intuitive interface.
- ▶ Avoid misconfiguration issues with automatic set-up.

**Instant resolution of all your clad assessments after blend-outs.**



# Tailored solution: CladTool



- ▶ Fast and cost effective Go/No-Go clad diagnosis for any technician available on-site.
- ▶ Diagnosis mode for non-NDT certified personnel, such as B1 mechanics.
- ▶ Instant resolution of all your clad assessments after blend-outs.
- ▶ Specifically tailored for the aerospace industry.
- ▶ Designed for accuracy regardless the level of expertise.
- ▶ Referenced in NTM procedure 51-10-30 to maintain Airbus aircraft.



# Tailored solution: CladTool





# Case 2: damage on monolithic composites

## Context

- ▶ Composite materials are getting more and more importance in the aircrafts, because their lighter weight and high resistance.
- ▶ Most recent aircrafts like A350 have many components made of monolithic composite materials.
- ▶ A350 fuselage is made of monolithic CFRP laminates.

**CFRP materials are sensitive to impact.**



## The challenge

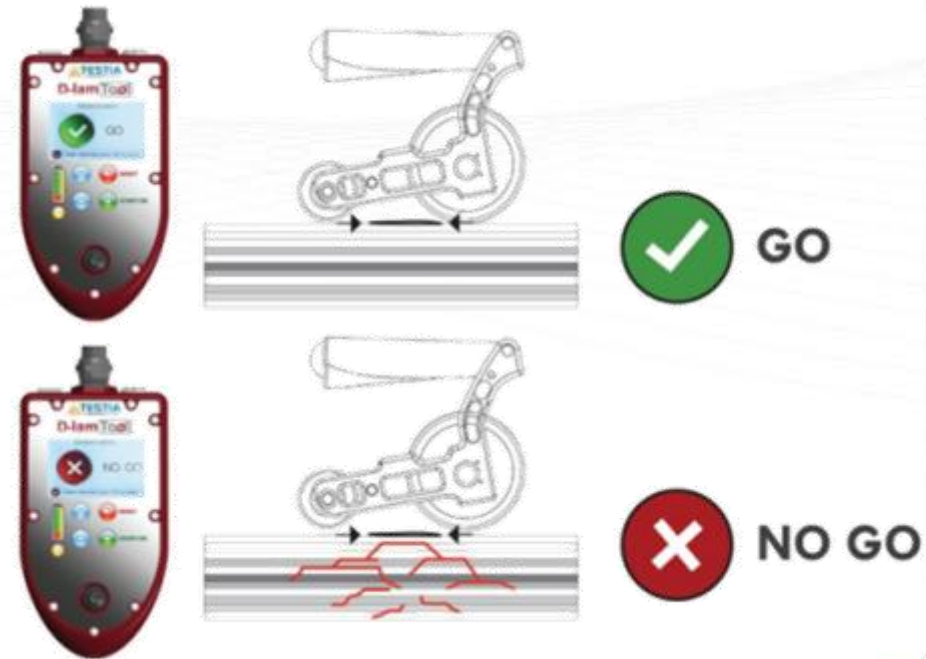
- ▶ When an accidental impact is reported or when a mark is visible on the fuselage of the aircraft, then it is required an inspection.
- ▶ Consecutive, delamination have to be detected, located, sized & reported.
- ▶ Certified UT inspectors are not available in every airport for line maintenance.
- ▶ Hourly AOG cost for A350 = \$10,000 USD

**Quick detection, location and sizing of delaminations is critical.**

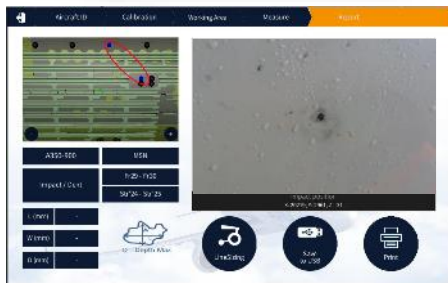
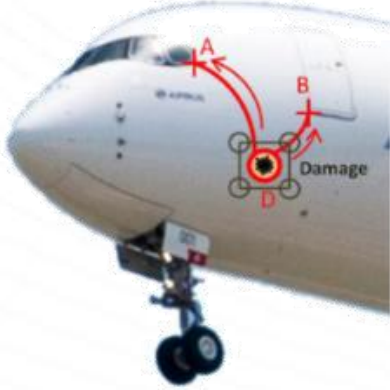


# Tailored solution: LineTOOL

- ▶ The **LineTool** is a phased array ultrasound instrument, to **detect** any delamination larger or equivalent to Ø6mm FBH (Flat Bottom Holes), and starting from 1st layers under the surface.
- ▶ ‘Go/No-Go’ Operated by B1 mechanics (selfcheck, acoustic coupling monitoring, automatic detection, etc.)
- ▶ Width inspected with a single line scan: 40mm.
- ▶ Inspection time: less than 5 minutes (self-check included).
- ▶ Maintenance kit qualified on the A350 fuselage (see NTM 51-93-20).



# Tailored solution: LineMAP

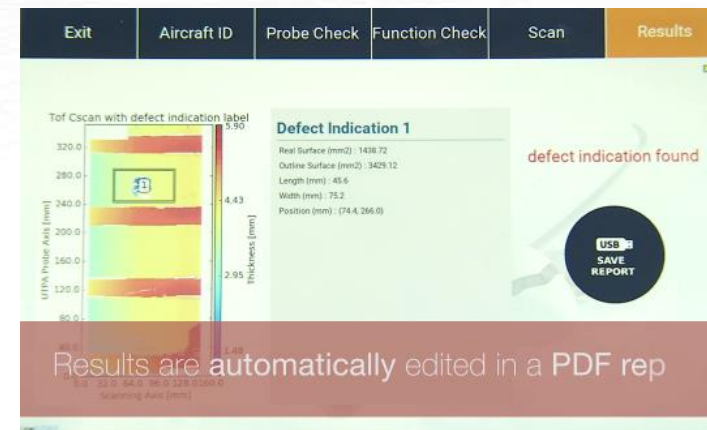


- ▶ LineMap is able to **position** and **record** any damage in the aircraft, combining an ultra precise device with an aircraft digital mock-up.
- ▶ Resulting outputs: X, Y, Z of the centre + shortest distances to close stringer/rib/frame with a positioning accuracy = <1 cm.
- ▶ Technology: positions encoders + correspondence with reference points on DMUs + geodesic surfaces computation.
- ▶ Operated by B1 mechanics (step-by-step user friendly software), with inspection time = <5 minutes.
- ▶ Maintenance kit qualified on the A350 & A320 family.



# Tailored solution: LineSIZING

- ▶ **LineSIZING** is able to **size** any delamination larger than  $\varnothing 6\text{mm}$  flat bottom holes and detect stringers disbonding.
- ▶ Electronically scanned width for each path: 40mm.
- ▶ Technology: phased array ultrasound testing, contact mode.
- ▶ Operated by B1 mechanics (auto-test, acoustic coupling monitoring, automatic sizing, etc.).
- ▶ Line maintenance kit qualified on A350 fuselage (see NTM 51-93-21).



# Tailored solution: LineFamily



# Case 3: damage on sandwich structures

## Context

- ▶ The A320 is the first subsonic aircraft to incorporate composite primary structures.
- ▶ Damages of aircrafts often occur after collisions with birds or if a gangway hits the plane.
- ▶ Delamination and flaws can be the result of the impact (e.g. debonding, honeycomb ruptures etc.), which will cause a loss of structural stiffness.

**CFRP materials are sensitive to impact.**

## The challenge

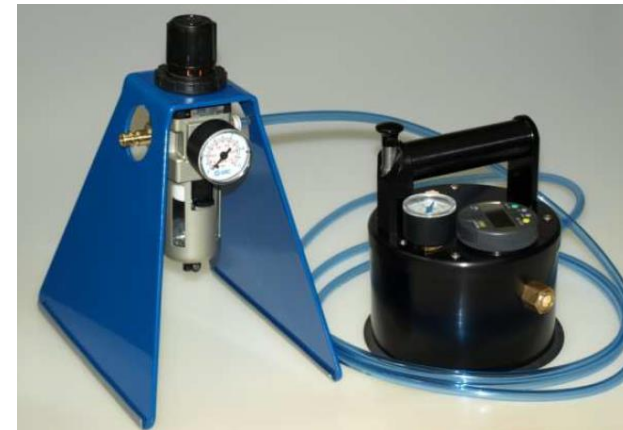
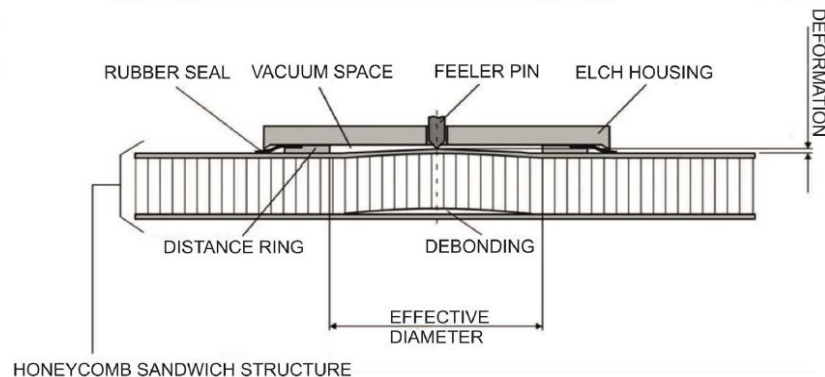
- ▶ When an accidental impact is reported or when a mark is visible on the fuselage of the aircraft, then it is required an inspection.
- ▶ Delamination and flaws should be detected in order to decide, whether the plane can continue its flight or it requires to be repaired before.
- ▶ Certified UT inspectors are not available in every airport for line maintenance.
- ▶ Hourly AOG cost for A320 = \$10,000 USD

**Quick detection of damages is critical.**



# Tailored solution: ElasticityTOOL (ELCH)

- ▶ Vacuum generator device for detection of disbonding by measuring the elasticity on both sides of honeycomb panels.
- ▶ This tool Operates to the principle of deformation measurement of the honeycomb structure under vacuum.
- ▶ Capable of detecting rear side disbanding with direct reading measurement, either for indoor and outdoor application.
- ▶ Airbus certificated tool for A318 to 321 (NTM 51-10-26-220-801-A01).

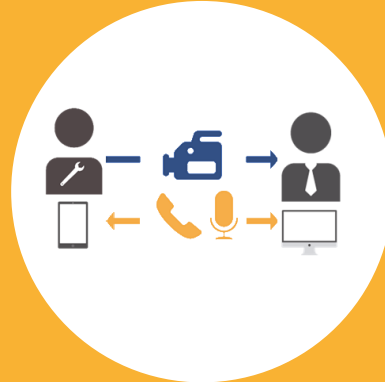


# Additional tools to support inspections



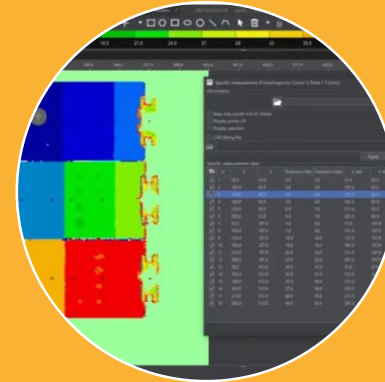
## Asset Manager

Inspection data management cloud based software.



## Remote Assistance

Web-based platform for real-time expert quality assurance.



## NDTkit UT

Safe decision making by automated analysis and assisted reporting.

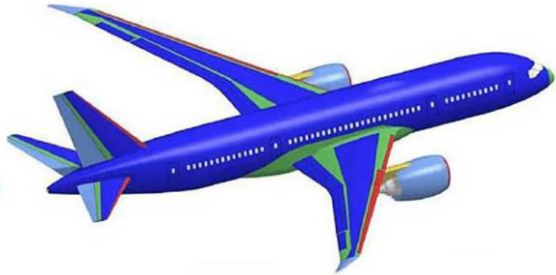
← **NDT Expert support** →



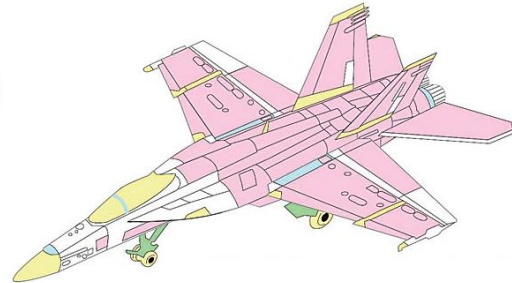


# Tailored solution transferable

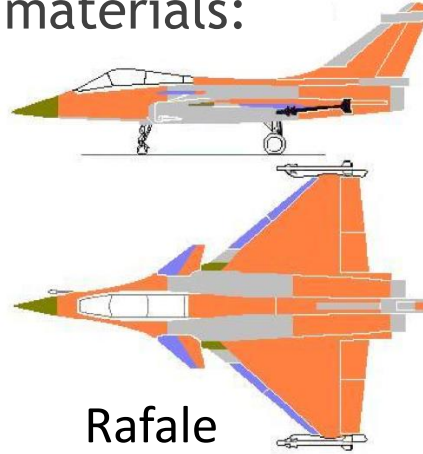
- ▶ Civil airliners & fighters with composite materials:



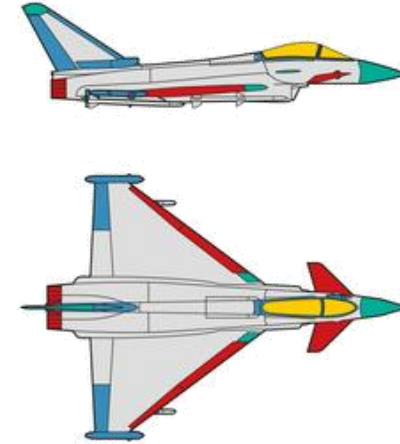
787



Navy F18



Rafale



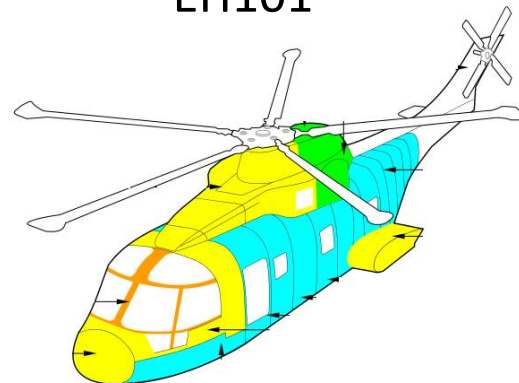
Eurofighter

- ▶ Helicopters with composite materials:

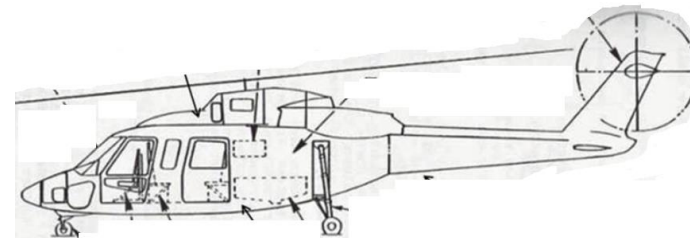
EC145



EH101



S-75



# Conclusions

## Technology

- Advanced NDT tools to optimize aircraft inspections.

## Human Factor

- Inspections by non-certified personnel are feasible.

## Flexibility

- Current tools can be adapted to aircrafts out of Airbus.

## Synergy

- We can develop new inspection tools to relief other pain-points.

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WE...



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... THANK YOU