EVIDENT

# *Non-Destructive Testing Using Mobile Robotic System*

**BINDT – AeroSpace Event**
**Bristol April 29th-30th 2026**

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# Introduction

# Background

*Structural integrity of aeronautic and aerospace components is critical for safety and performance. Traditional inspection solutions have real limitations.*

## Current Solution & Challenges

- **Manual:** inspection is hands-on and operator-dependent.
- **Time-consuming:** slow throughput limits production and maintenance.
- **Variable results:** outcomes varies with operator skill and conditions.
- **Lack of skilled operators:** shrinking talent pool makes staffing harder & more expensive

*Evident Scientific — Mobile Robotic NDT Platform*

## Our Proposed Alternative

*Evident Scientific — a mobile robotic NDT system combining:*

**Automation**
removes manual effort

**Precision**
consistent, repeatable results

**Adaptability**
handles varied components

**Versatility**
manufacturing + maintenance

# 02

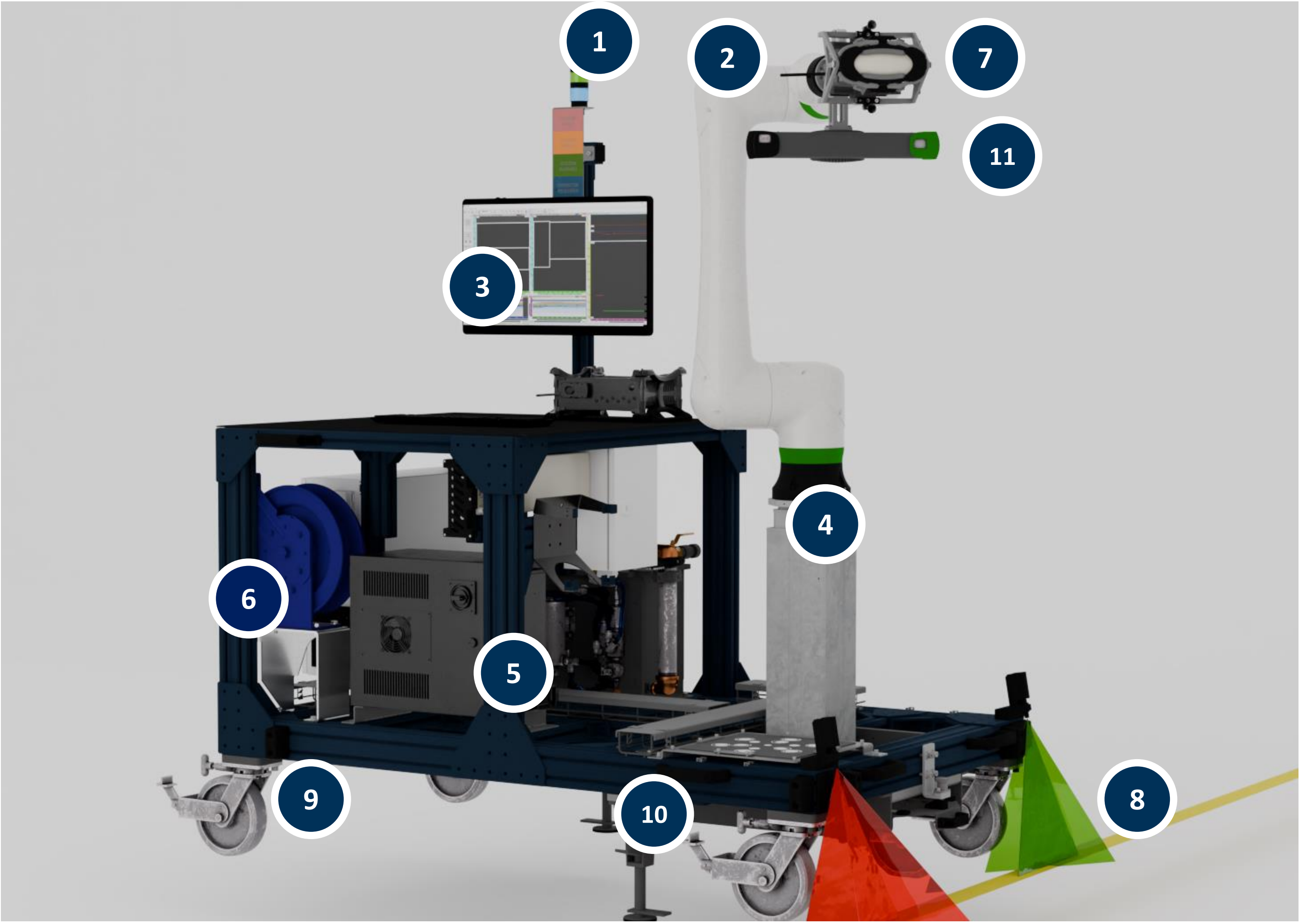
# Beyond Manual PAUT

# System Overview

*Mobile robotic NDT platform — principal components*

## Main Components

1. **Stack light** · Visual status indicator
2. **Collaborative robot arm** · 6-axis cobot, CRX-family
3. **HMI / Control PC** · Main control and acquisition interface
4. **Z platform** · Telescopic pillar
5. **Water management** · Water tank and filters
6. **Electrical components** · Controller, reel, electrical box, Phased-array unit
7. **AeroSpace Water Wedge EOAT** · Polymer wedge + PAUT probe
8. **Alignment lasers** · 2D scan for cart indexing
9. **Cart mobile base** · Manually controlled movement
10. **Leveling feet** · Stability during inspection
11. **3D Vision** · Surface recreation and trajectory planning



# Vision

*From 3D surface capture to collision-free trajectory planning*

## 1. Capture

*3D image acquisition*

**1** **Close capture imaging**

Robot moves the 3D camera close to the part and captures the first image.

**2** **Multi-view capture**

Robot repositions across the full zone and takes successive 3D images.

## 2. Point-cloud processing

*Build a clean surface model*

**3** **Merged PCD**

Full combination point cloud from all viewpoints.

**4** **Max Cluster & Cropping**

Largest connected group of points — filters stray noise. Cluster restricted to the inspection region.

**6** **Surface Mesh**

Triangulated surface from the point cloud.

## 3. Trajectory preparation

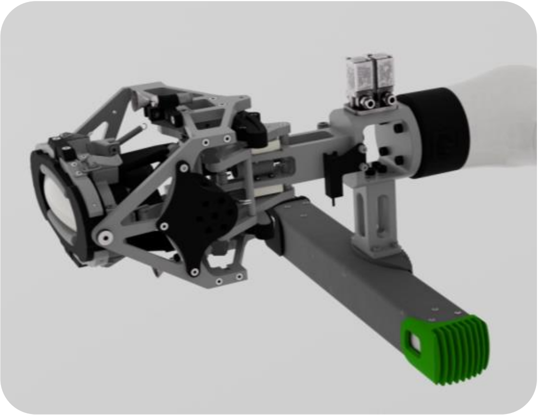
*ROI and path planning*

**7** **Inspection Region adjustments**

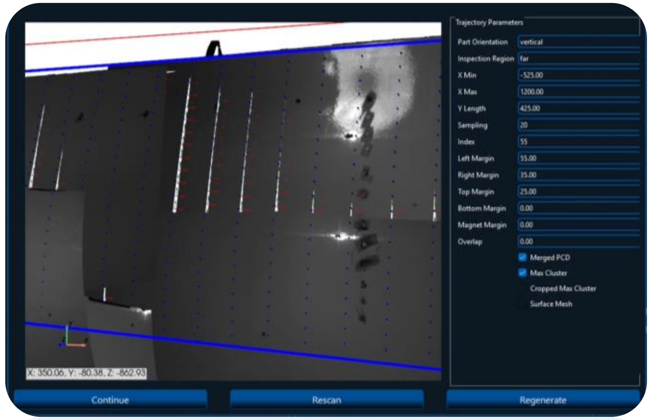
Define ROI within the inspectable zone.

**8** **Obstacle identification**

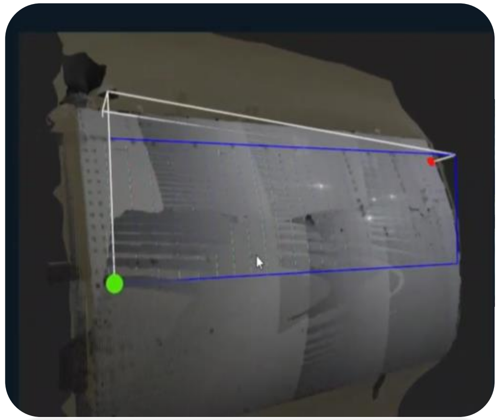
Identify obstacles in the ROI for trajectory exclusion.



*End-of-arm tooling — 3D camera + PAUT probe*




*Surface model — point cloud*



*Trajectory approval screen*

# Robotic Trajectory

*From 2D raster to collision-free robot path*

**1** 

## Configure the inspection frame

Define a 2D plane — vertical or horizontal — depending on the use case (manufacturing vs. maintenance).

**2** 

## Generate the raster scan pattern

Create a 2D raster on the plane: ROI width & height (bounds), point density (path step size) and index distance (probe indexing between lines).

**3** 

## Project onto the surface mesh

Project each raster point onto the 3D surface model to resolve its actual position and probe orientation (local X-Y-Z frame).

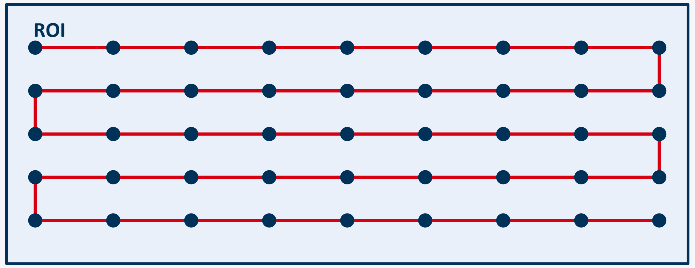
**4** 

## Convert to robot path

Pass the projected points to the post-processor script to produce the final robot trajectory.

### Raster → Projected path

**2D plane (raster)**

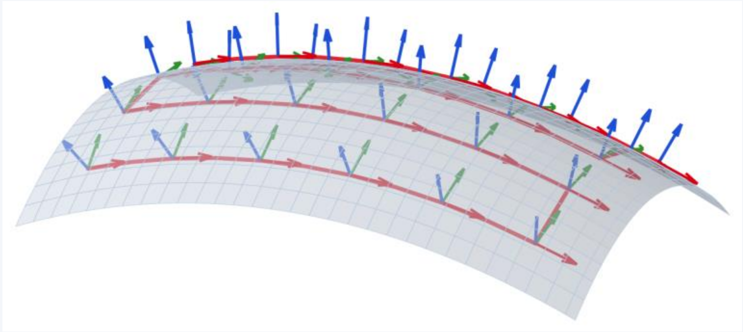



*point density*

*index distance*

*project onto mesh*

**3D projected path**



# AeroSpace Water Wedge

*Full coverage including edges, minimal water, self-adapting to curvature*

**Objective** Scan all edges of the part — no untested length & Limit water loss

## Main Components

### 3 axes of freedom

Mechanism articulates in three directions to optimally follow the surface of the part.

### Magnet to lock axis

Axes can be locked in position via integrated magnetic lock.

### Polymer interface to the probe

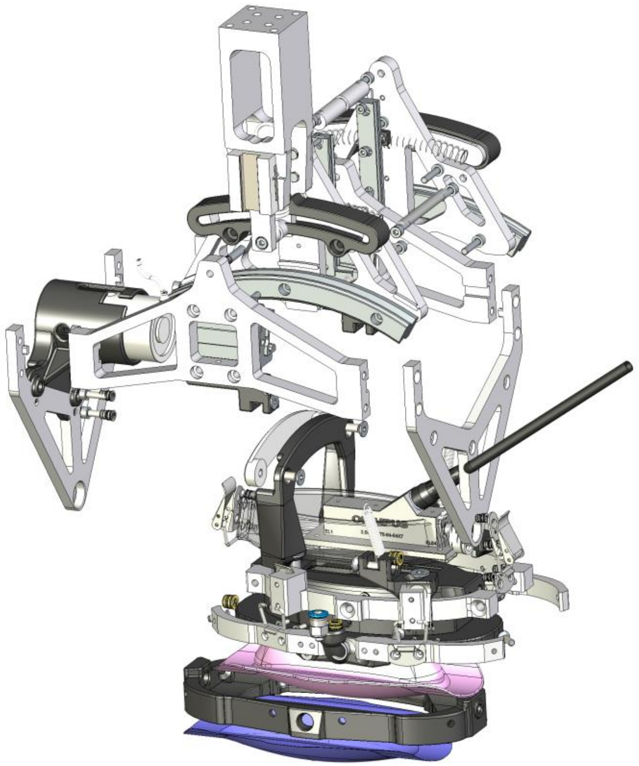
Protected by a rugged film in direct contact with the part.

### Integrated mist nozzle

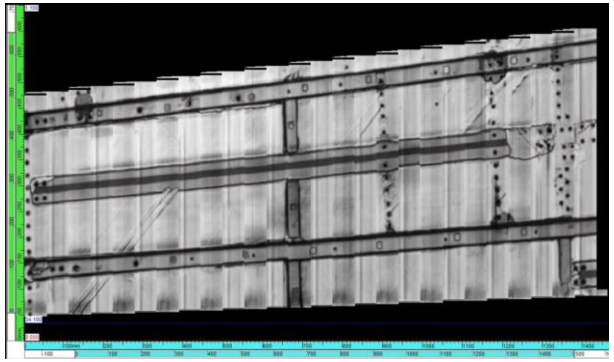
Small nozzle pre-wets the part for reliable acoustic coupling.

## Benefits

- ✓ No untested length
- ✓ Minimal water use — almost no water loss
- ✓ Self-adapts to surface curvature



*AeroSpace Water Wedge — exploded view*



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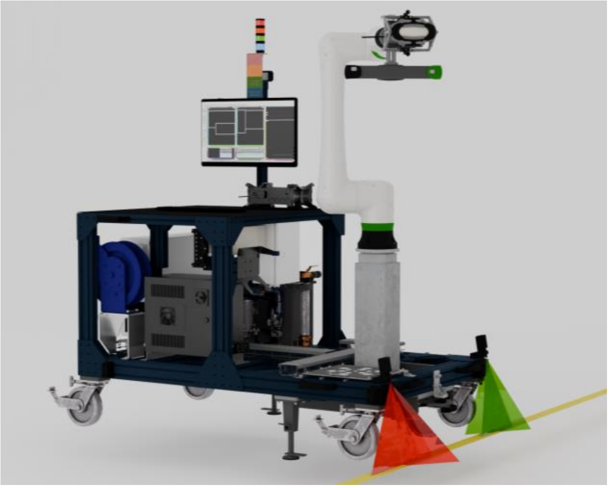
# Fully Autonomous PAUT

# Path Forward — The Next Step in Autonomy

*From the Aero Cart (operator-moved, mobile) to Aero AGV (self-navigating, AGV-based)*

TODAY **Aero Cart**



*Mobile robotic NDT — repositioned manually by the operator*

*next step*

NEXT **Aero AGV**

**Self-navigating AGV**

Noovelia AGV with LiDAR front+rear; 5 000 lb payload

**Extended envelope**

Up to 6.5 m working envelope (+3.0 m vs. Aero Cart)

**Up to 8 hrs of continuous operation**

Contactless inductive charging; off-the-shelf 48 V batteries

**Forklift moveable**

Integrated bumpers + fork slots for facility transport

## What this unlocks

- ✓ **Tall components** — Reaches full-height fuselages and longer wing sections
- ✓ **No manual operations** — AGV navigates between inspection zones autonomously
- ✓ **Continuous operation** — Inductive top-up — no shift-end plug-in
- ✓ **Easier logistics** — Forklift-compatible for facility moves between bays

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# Conclusion

# Conclusion

*Flexible, precise and adaptable NDT — today in the Aero Cart, tomorrow fully autonomous*

### From Automated to Autonomous

Mobile & autonomous robotic NDT replaces hands-on, operator-dependent scanning — faster throughput and consistent, repeatable results.

### Simple, less operator dependent

3D vision builds the surface, then projects a raster into a collision-free robot trajectory that self-adapts to each part.

### High Data quality, no untested lengths

The AeroSpace Water Wedge reaches every panel edge with minimal water — no untested length on complex geometries.

## From Aero Cart today to Aero AGV tomorrow

*Operator-moved mobility evolves into a self-navigating AGV platform — extended envelope, continuous operation*

- ✔ **Safety & quality**
- ✔ **Higher throughput**
- ✔ **Complex geometry coverage**
- ✔ **Ready for autonomy**

# Thank you!