



# Compensation Of Cobot Inaccuracies By Innovative Sensors And Intelligent Path Planning Software

3D Metrology Conference, London, 07.11.2019

## Contact persons

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Industrial Sensors

Automation Experience

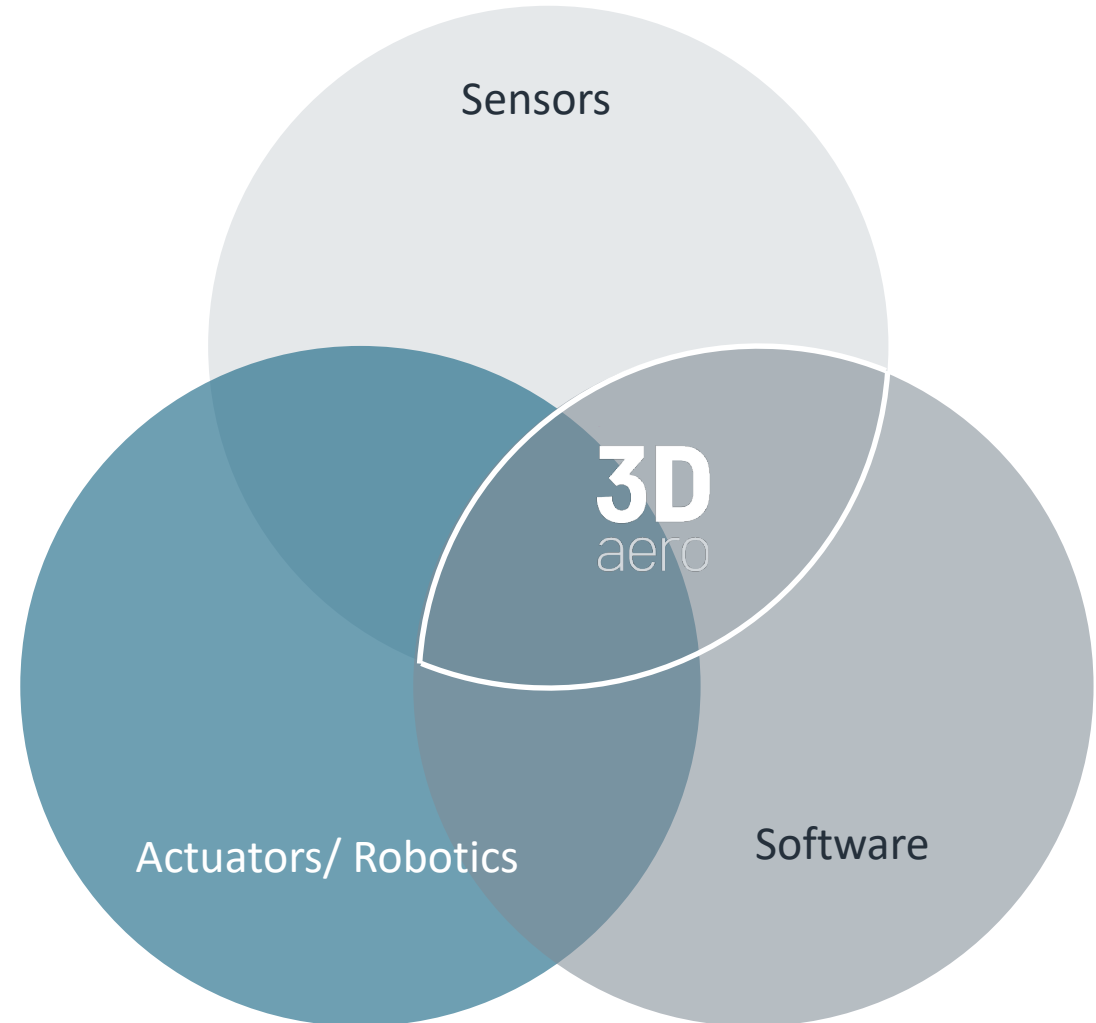
Experience in aircraft industry

strong need



**3D**  
aero

„intelligent enabler systems for  
aircraft production and  
maintenance“





High degree of **manual work**, which makes it hard to keep up with the progress of automation



Specific process knowledge about **component properties** is required:

- Small batch sizes
- Large components
- High task complexity
- Valuable components



Ensured all relevant **aviation safety requirements** from different authorities

- Use of mobile robotic platforms
- Use of light weight robotics
- Use of Human-Robot Collaborations
- Increasing modularity and flexibility of the systems



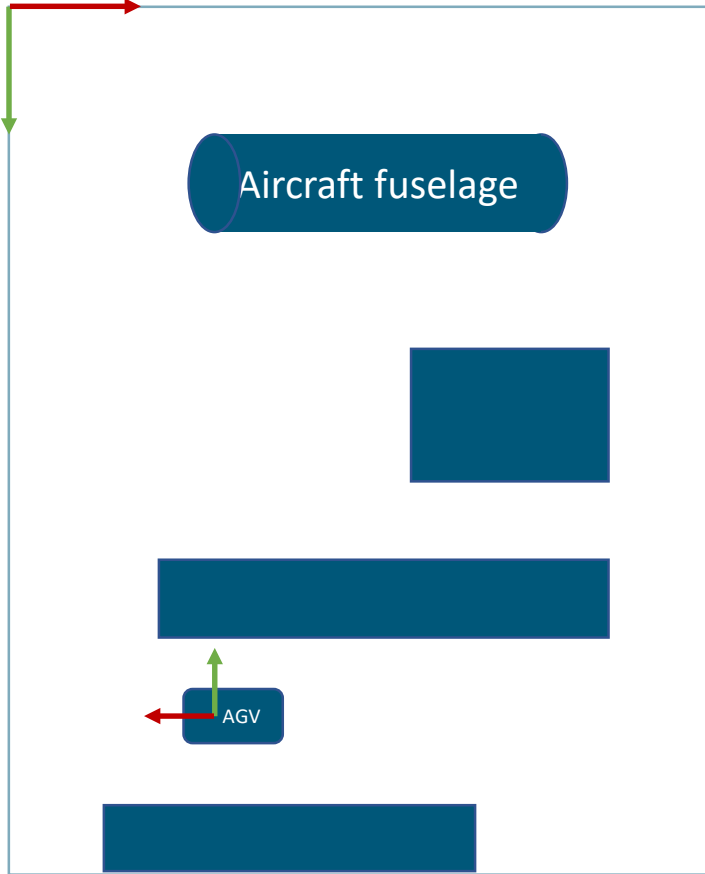
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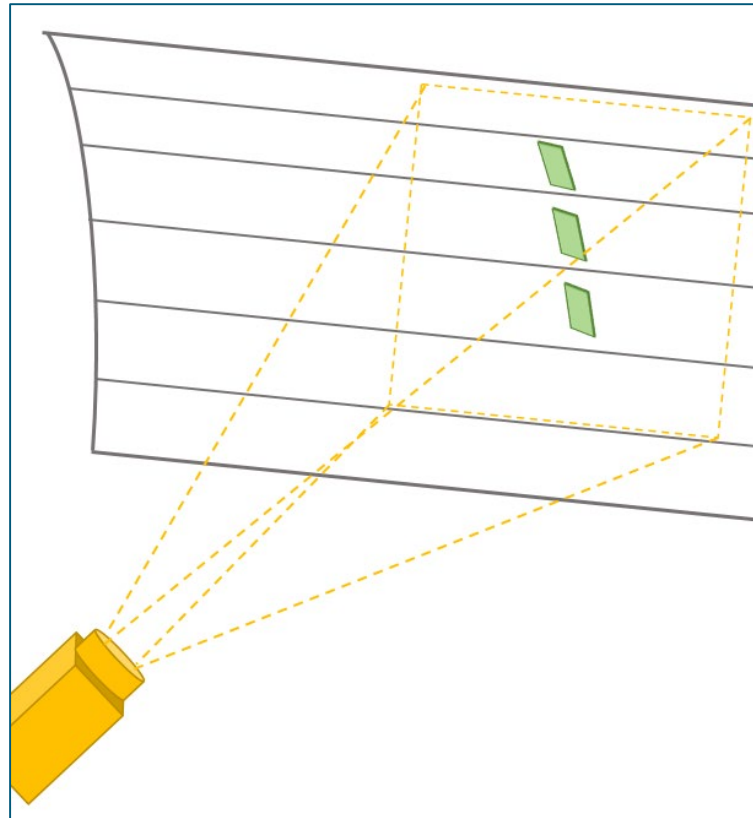
Federal Ministry  
for Economic Affairs  
and Energy

on the basis of a decision  
by the German Bundestag

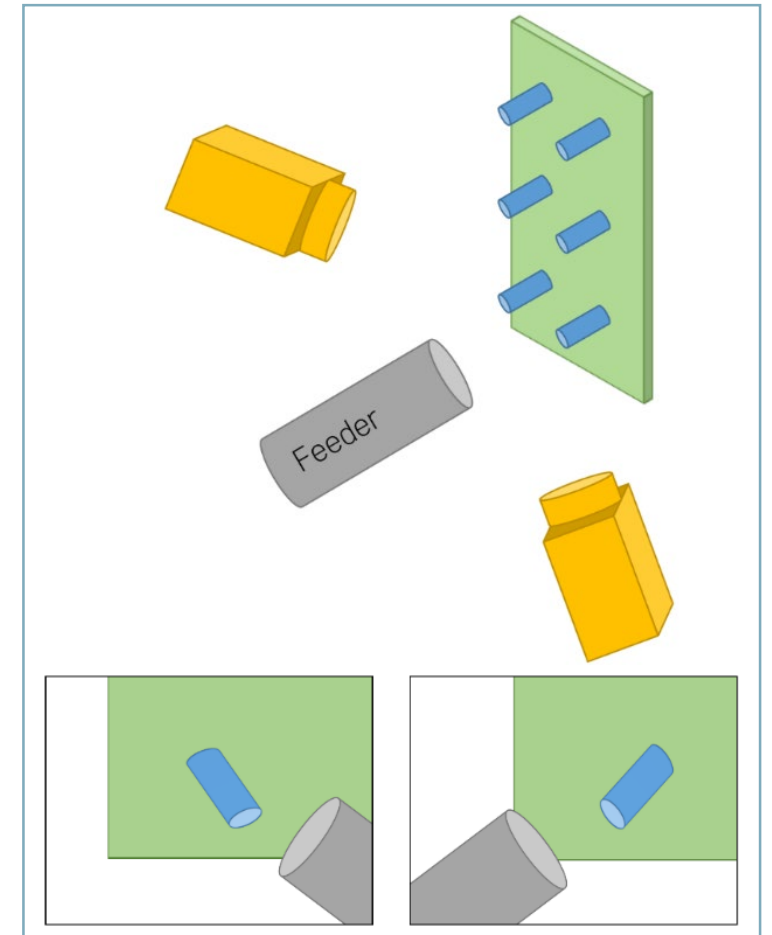
## Shop Floor



## Aircraft fuselage



## Feature (Pin)

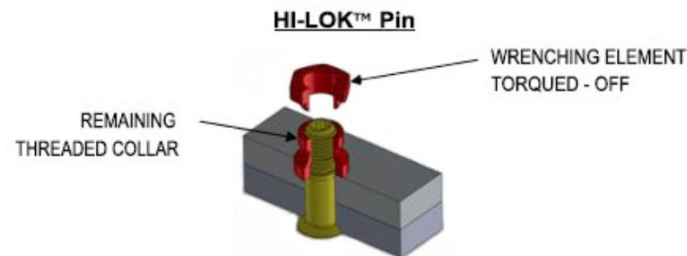
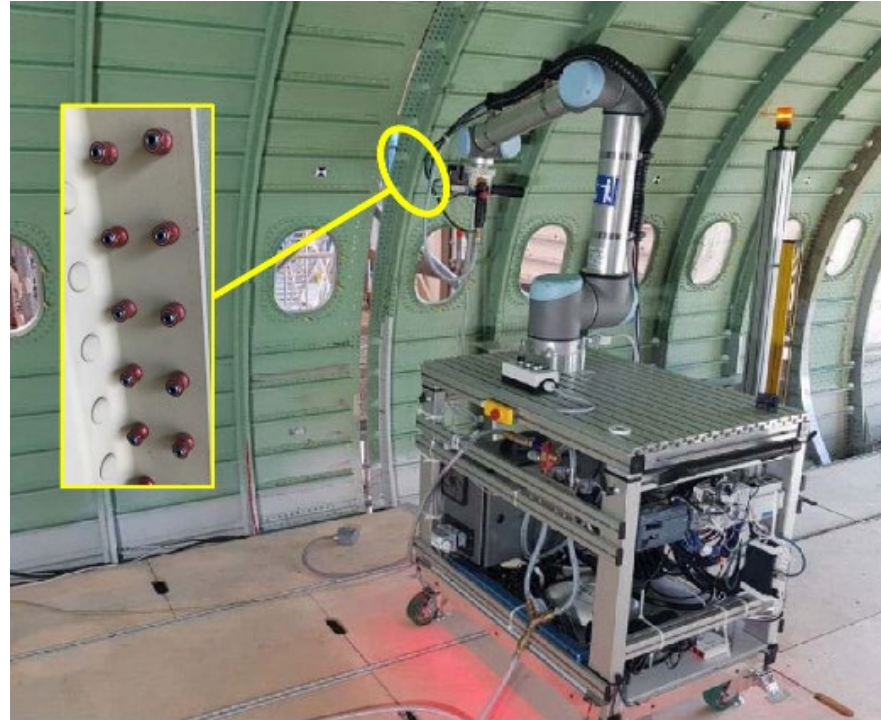


## Challenges for mobile robotic platforms

- Unknown relative position
- Dynamic environment
- Position accuracy of < 1mm

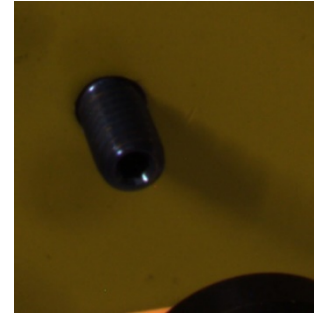
## Solution

- Referencing with local features (pins)
- Online referencing during process execution
- High resolution cameras in a stereo vision setup



## Proof of Concept

- Use of two Cameras
- Implementation of Image Processing
- Calculating pose of a single Pin
- Look and Move Approach



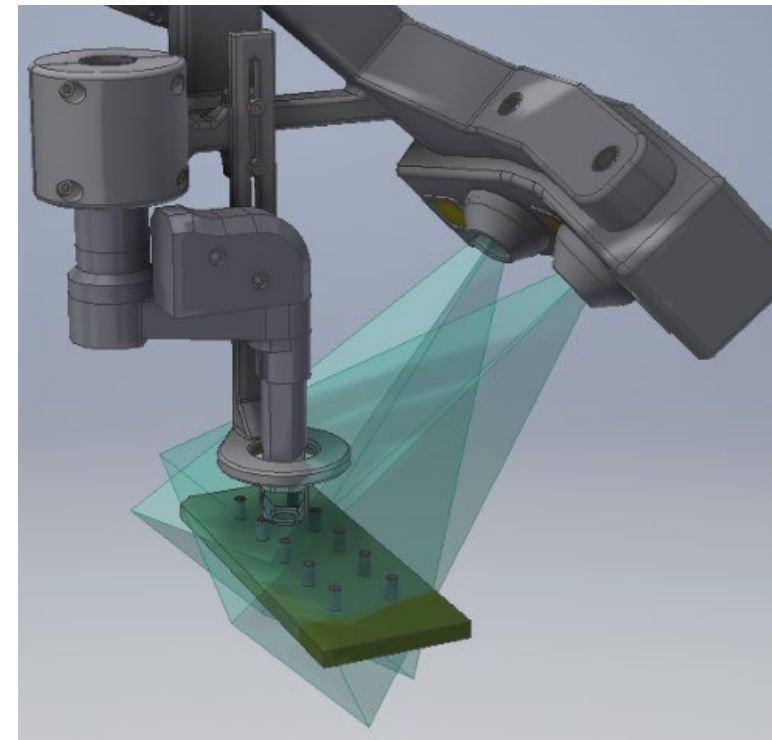
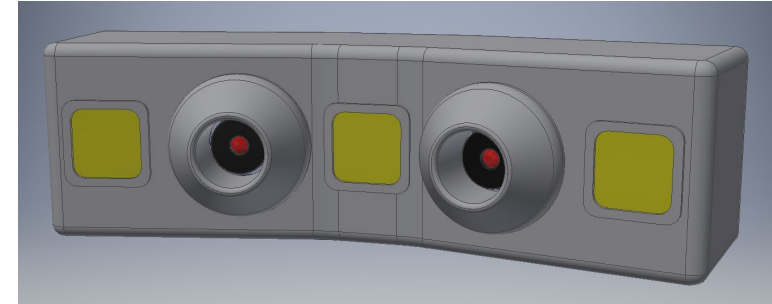
## Evaluation and Conclusions

- Evaluation of accuracy with a 5,1mm bush
- Image processing takes about 40ms
- Lightning solution required
- Configuration can be optimized for use case

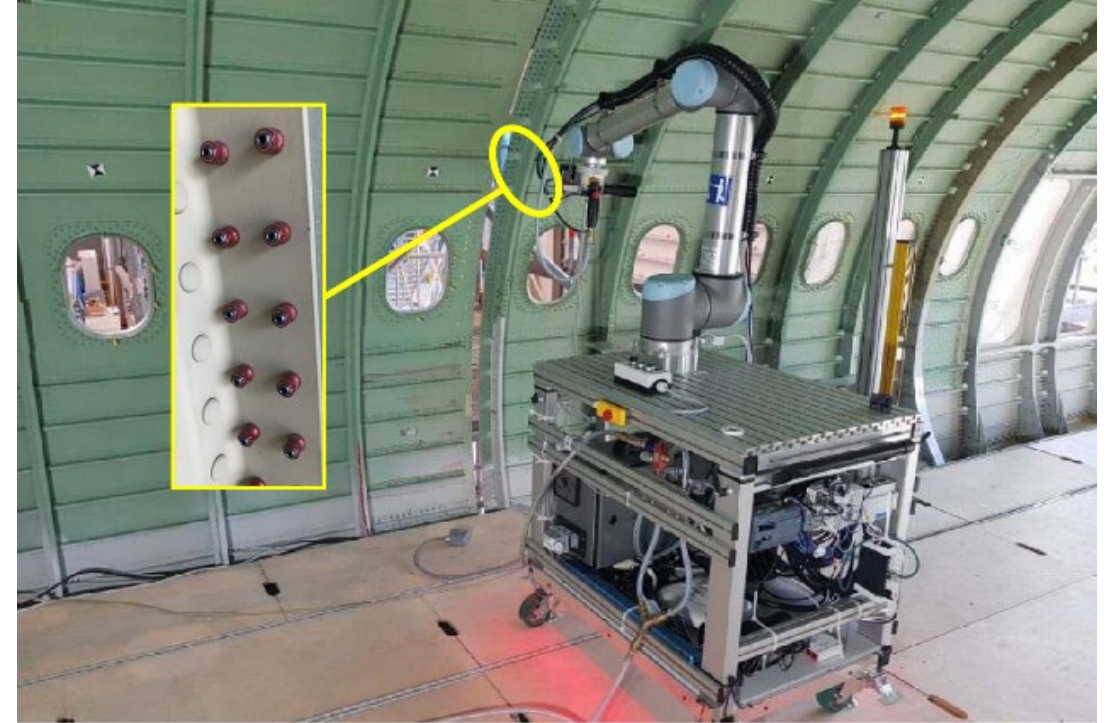




- Use of single board cameras
- Optimizing the configuration for the use case
- Integration of Lighting
- Use of control loop with visual input



- Decreasing the image processing time
- Integration of own image processing in control loop
- Increasing the intelligence of the system
- Evaluate solution under real condition
- Integrate solution into the final setup
- Addressing the other referencing levels
  - Localization and Navigation in Shop Floor
  - Referencing platform to aircraft fuselage



# Thank you!

## Do you have questions?

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