

# **ADDITIVE MANUFACTURING FOR CARDIOVASCULAR TRAINING PLATFORMS**

## AM EXPERT-TALK 2024

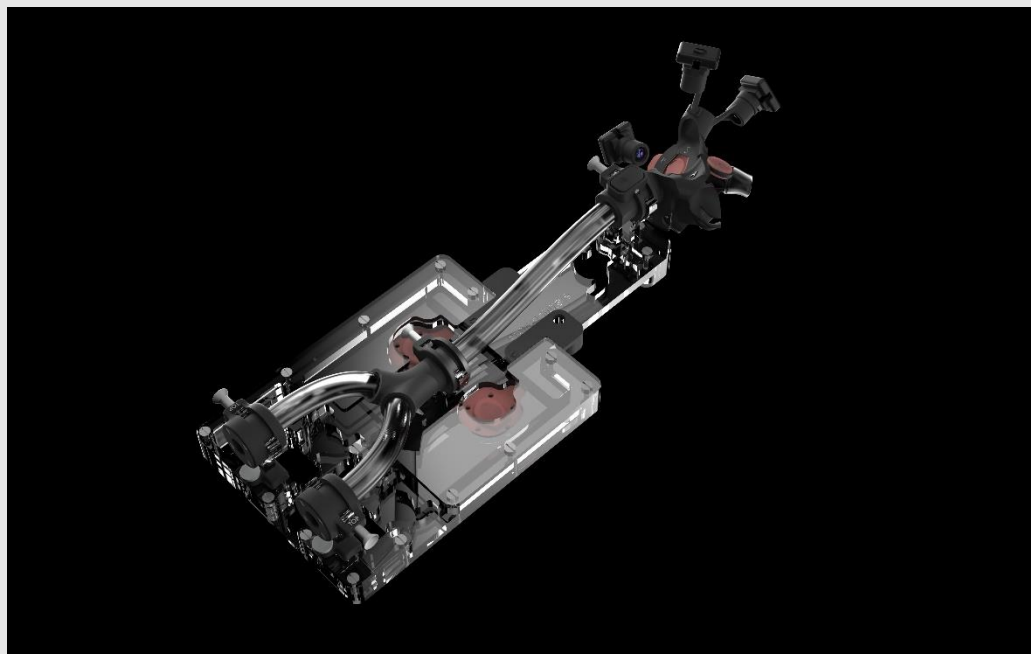
September 2024

# SIMULANDS

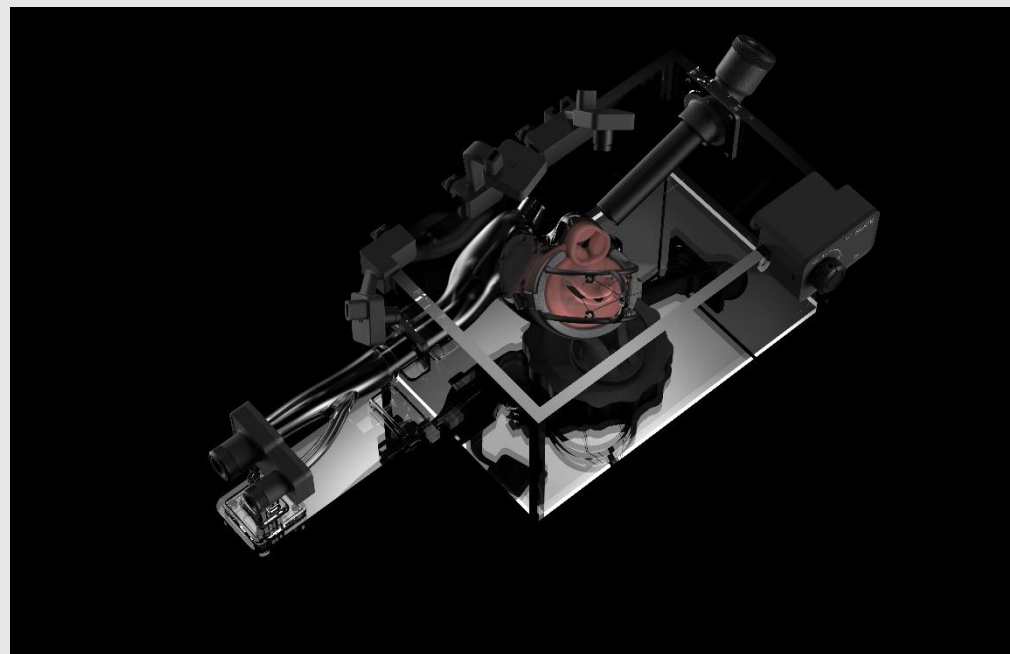
## WHO WE ARE

- Medtech startup founded in 2019, Zurich
- 17 employees
- SIMULANDS designs and manufactures cardiovascular simulators that are human-grade and therapy-specific
- Our goal: revolutionize education and R&D with solutions that are more ethical, cost effective, and practical versus traditional animal-based research and training

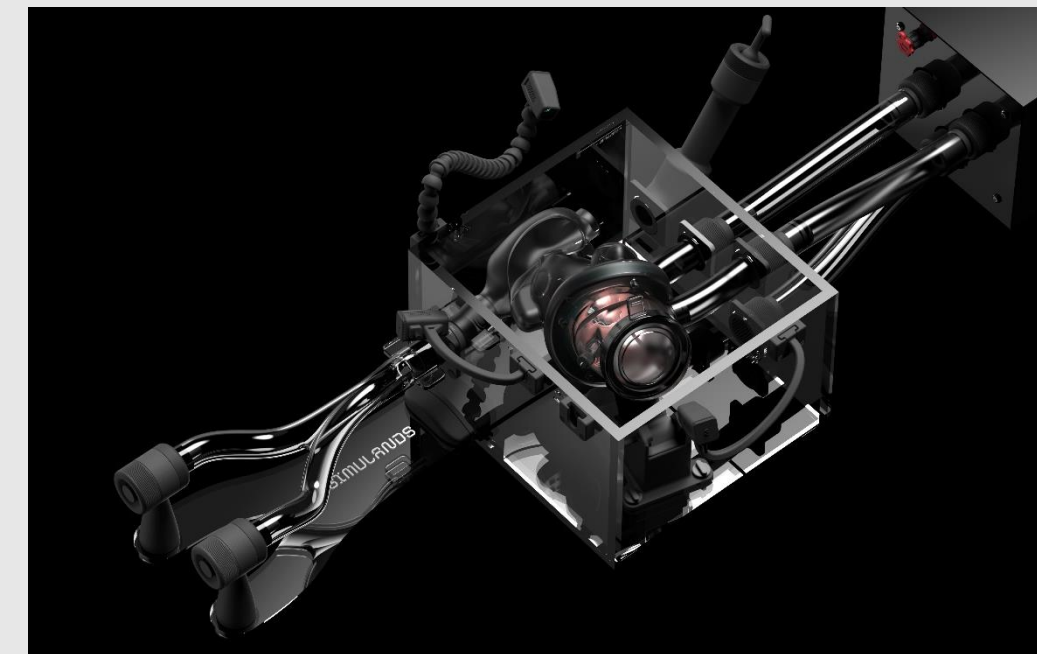
SIMU DRY



SIMU SLICE



SIMU PULSE



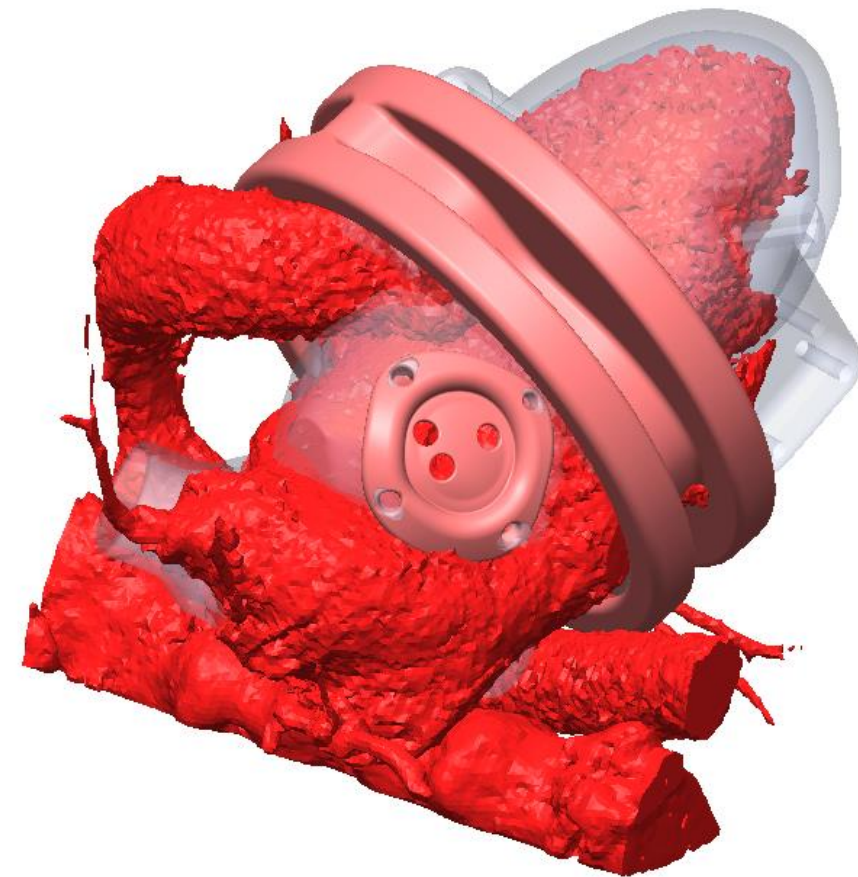


# HUMAN-GRADE AND THERAPY-SPECIFIC PRODUCTS

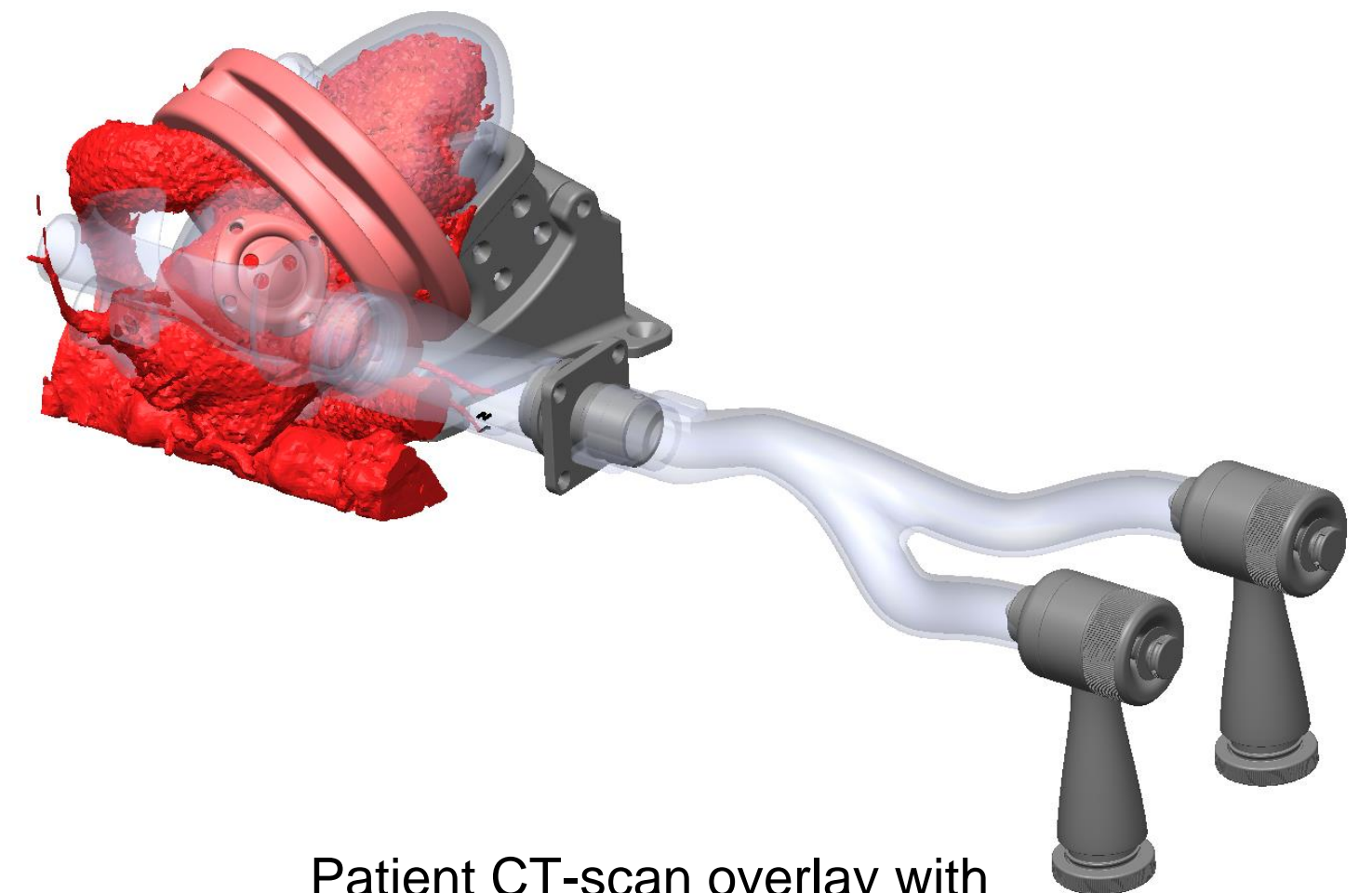
## THE WAY WE DESIGN



Patient CT-scan



Patient CT-scan overlay with  
key anatomy structures

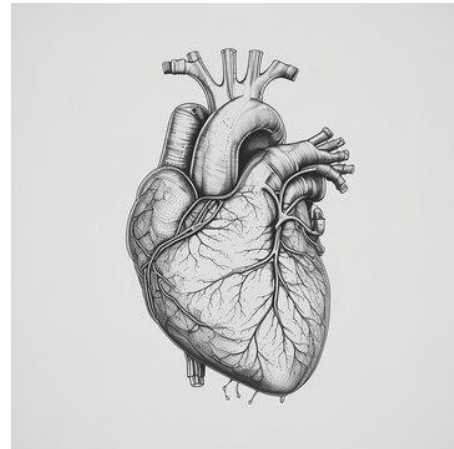


Patient CT-scan overlay with  
key anatomy structures and  
standard components



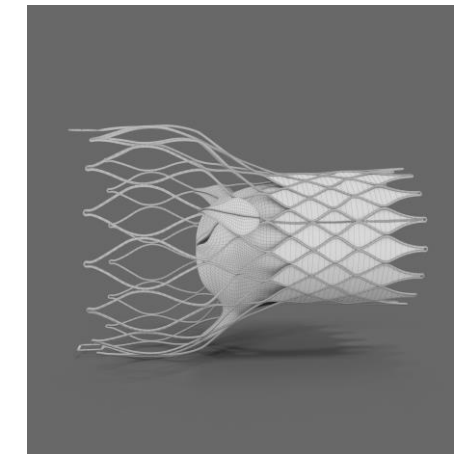
# HUMAN-GRADE AND THERAPY-SPECIFIC PRODUCTS

## WHY AM MEETS OUR NEEDS



### Human-grade:

- Reproduce anatomies with complex geometries
- Realistic haptic feedback and motion of heart structures
- Recreate imaging conditions



### Tailored:

- Therapy/patient -specific
- Low production volumes
- Rapid prototyping

→ Not suited for traditional subtractive or large-scale manufacturing processes



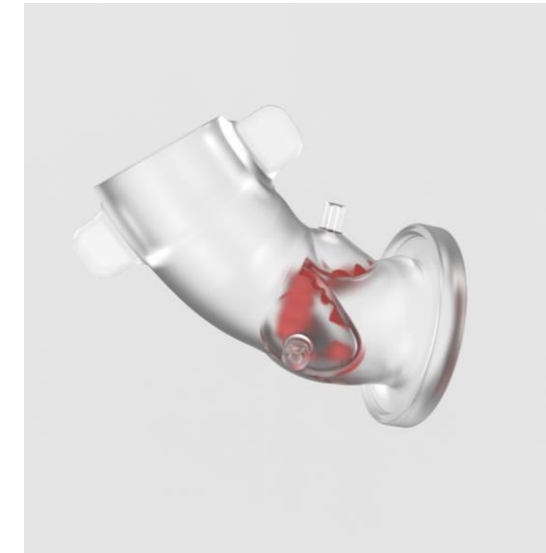
# AM & SIMULANDS

## HOW AM IS USED AT SIMULANDS



### Finished goods:

- Need of excellent and consistent surface finish quality
- High resistance to aging and wear
- Exposure to water at 37°C
- Extended aesthetic & design abilities



### Prototyping and manufacturing tools:

- Molds for silicone injection
- Drilling guides, jigs and positioning tools

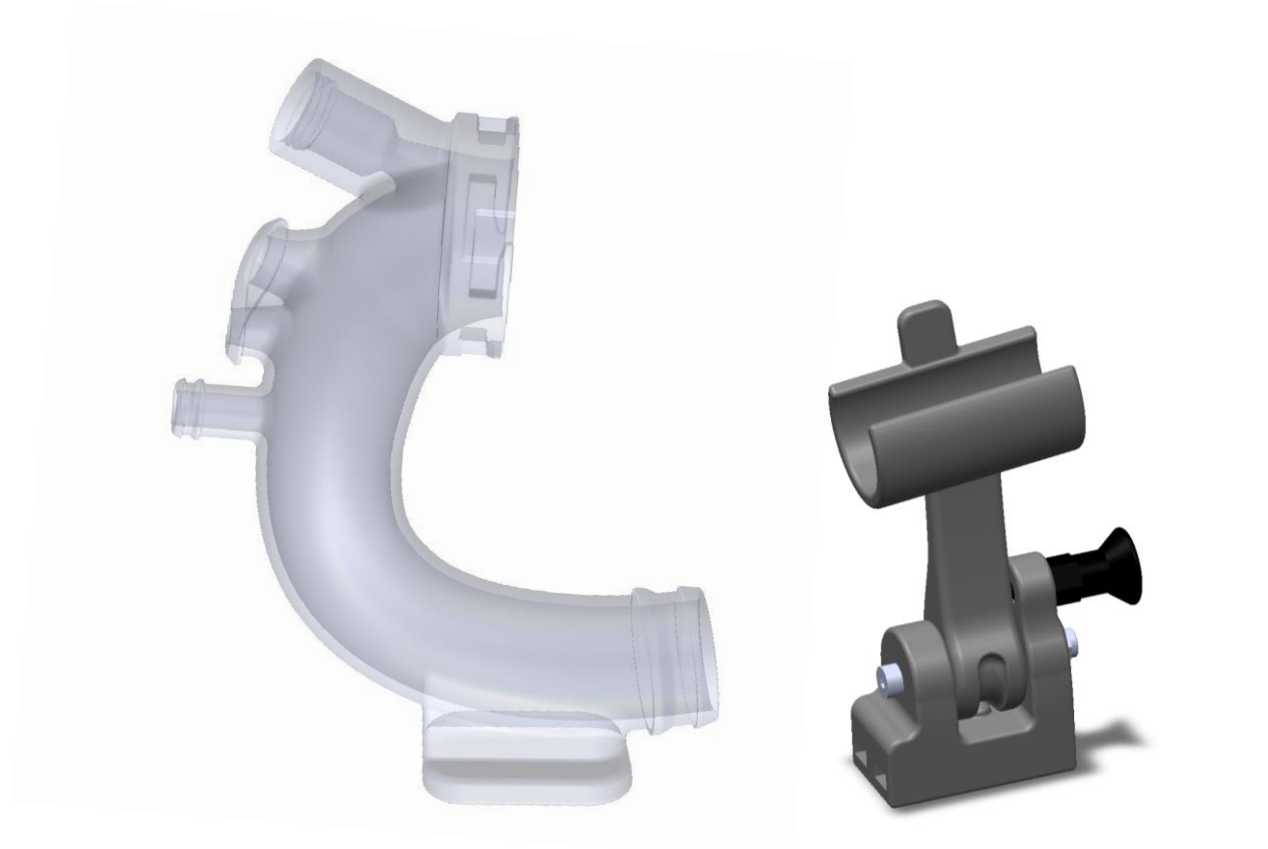
# AM & SIMULANDS

## WHICH TECHNOLOGIES?



### SLA

- Best compromise between affordability and print quality
- Versatility
- Broad range of materials available with various properties (high temperature resistance, transparency)



- Prototypes
- Molds
- Finished goods
  - Anatomical parts
  - Connectors
  - Compact mechanisms
  - Clear parts

### Challenges

- Printing accuracy dependent on orientation
- Time-consuming post-processing
- Aging and wear





# AM & SIMULANDS

## WHICH TECHNOLOGIES?



### Polyjet

- Printing speed and accuracy
- Broad creative possibilities



- Finished goods



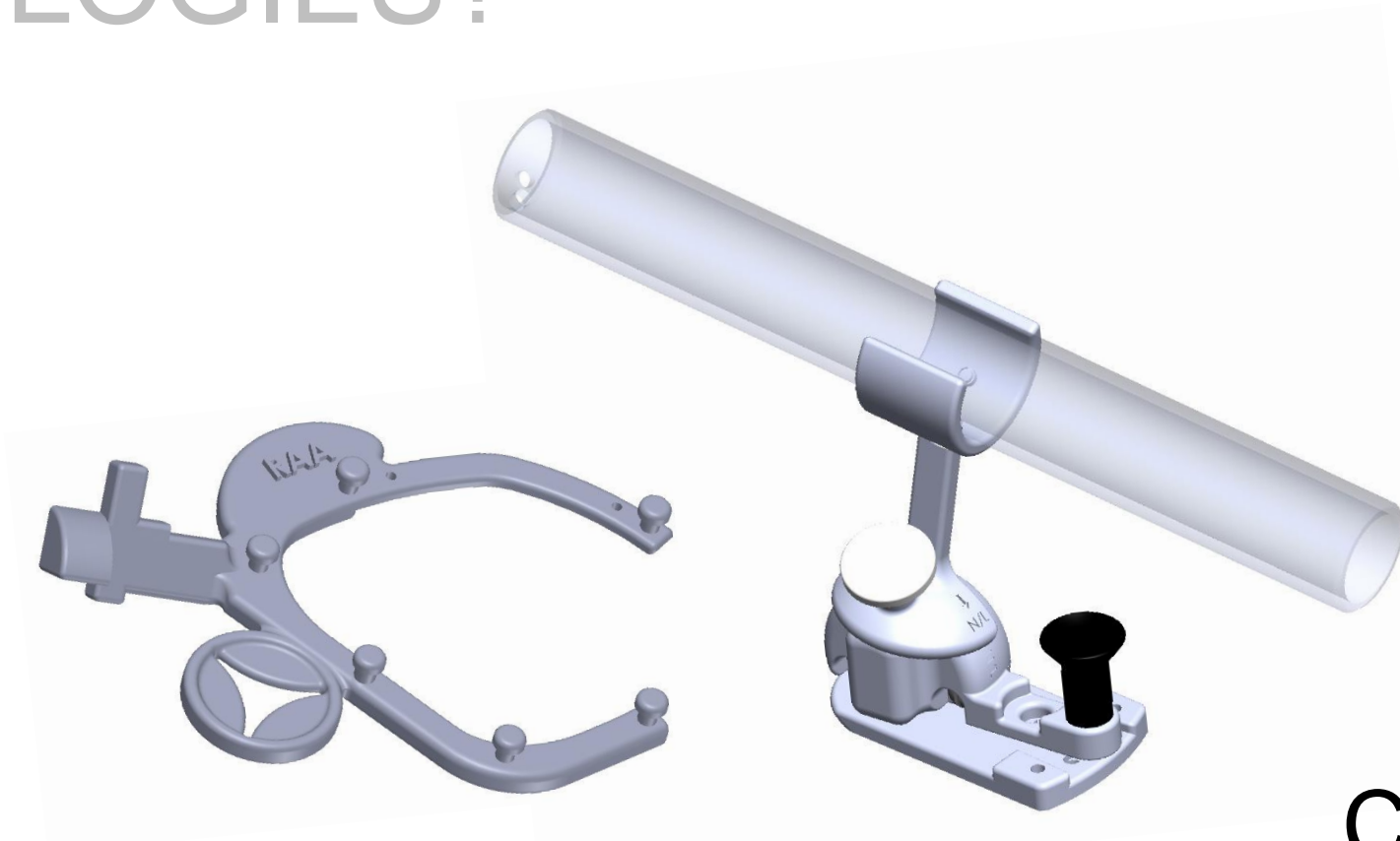
### Challenges

- Low temperature resistance (~45°C)
- Time-consuming post-processing
- Silicone curing inhibition



# AM & SIMULANDS

## WHICH TECHNOLOGIES?



### DMLS

- Lightness and stiffness
- Small features
- Compact mechanisms

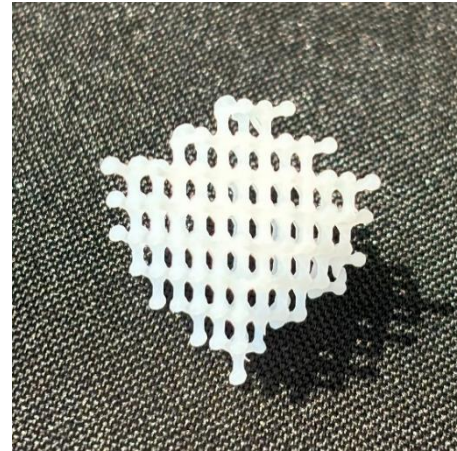
- Finished goods
  - Compact mechanisms
  - Anatomical parts with structural reinforcement

### Challenges

- Poor dimensional accuracy
- Wear
- Rough surface quality



# AREAS OF DEVELOPMENT IN AM OF INTEREST FOR SIMULANDS



## Silicone printing

- No mold design required
- Unlocks complex flexible geometry possibilities
- More durable/stable than current 3D-printed flexible material

## Current limitations

- Small build plate dimensions (130x110x70mm)
- No transparency

# AREAS OF DEVELOPMENT IN AM

## OF INTEREST FOR SIMULANDS



### Multi-material printing

- More anatomically accurate models
- Provide more design possibilities

### Current limitations

- Fragile
- Great for educational and demo tools, but not for training

**JOIN THE  
SIMULANDS  
REVOLUTION**



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