

FINGER 2.0 Thumb Exoskeleton

Mechanical Design

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Background

- FINGER 1.0 was designed to aid in the rehabilitation of the forefinger and middle finger of stroke victims
 - Guiding and aiding the fingers in movement and building strength
- FINGER 2.0 added a thumb module to the current design to help rebuild the connection between the fingers and the thumb

Objective

- Adapt the current FINGER project to be changeable to a left-handed configuration
- Reduce friction and play in thumb module joints

Value Proposition

- Augmented design of the FINGER robot
- Aid simple motions of the fingers and thumb
- Measures user input to aid

Key Requirements

- Quick and efficient switching from left to right
- Comfortable fit and function when completed
- Minimal slop (play) in all of the link-bearing connections

Current Designs

Fixed Link:

- Bearing placement same as previous
- Aluminum machined upper
- ONYX printed base

Adjustable Thumb Piece:

- Follows an axis from the sphere's center through the middle of the thumb

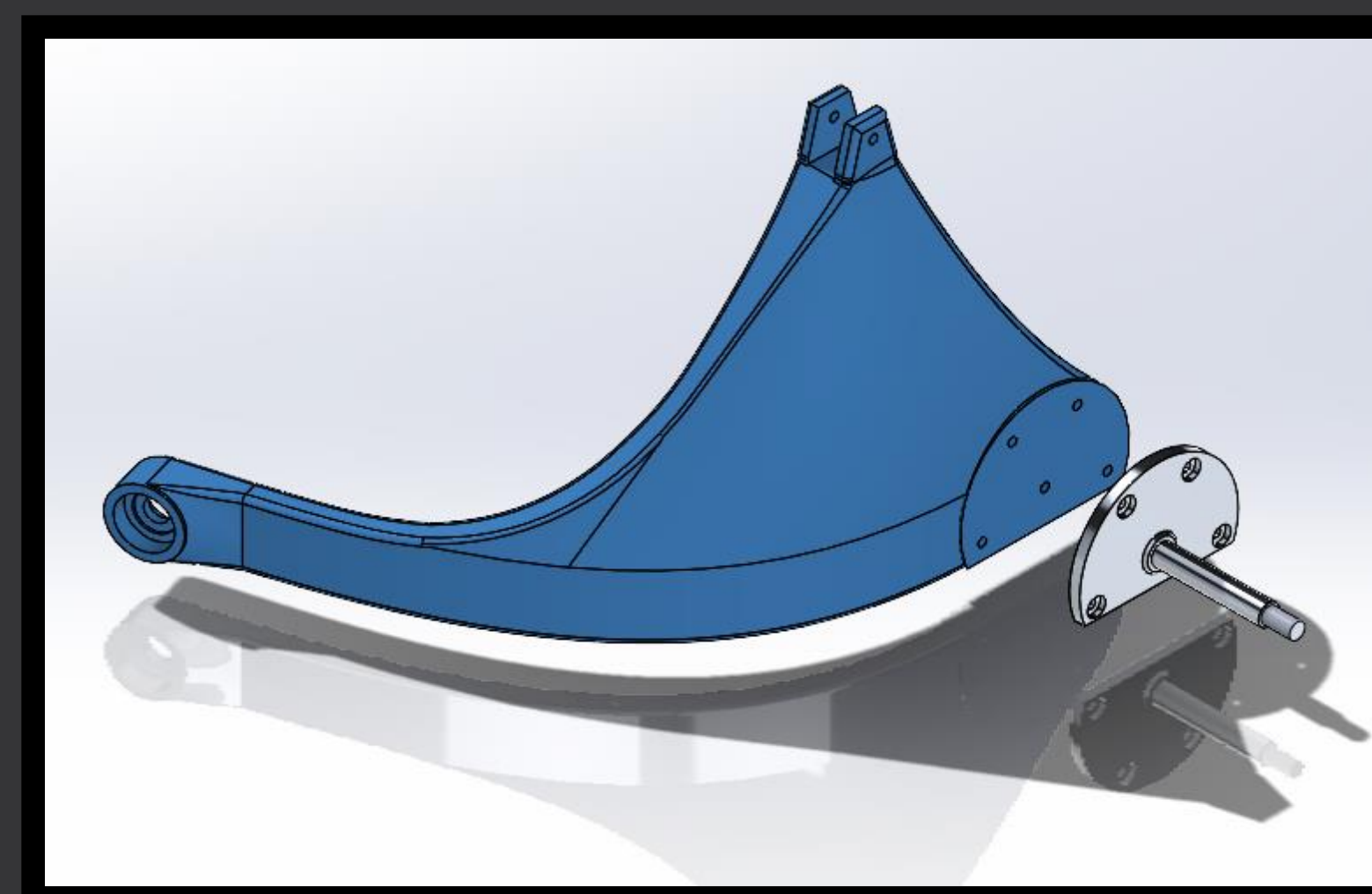
Actuator Mounts:

- Combining machined top with printed ONYX base

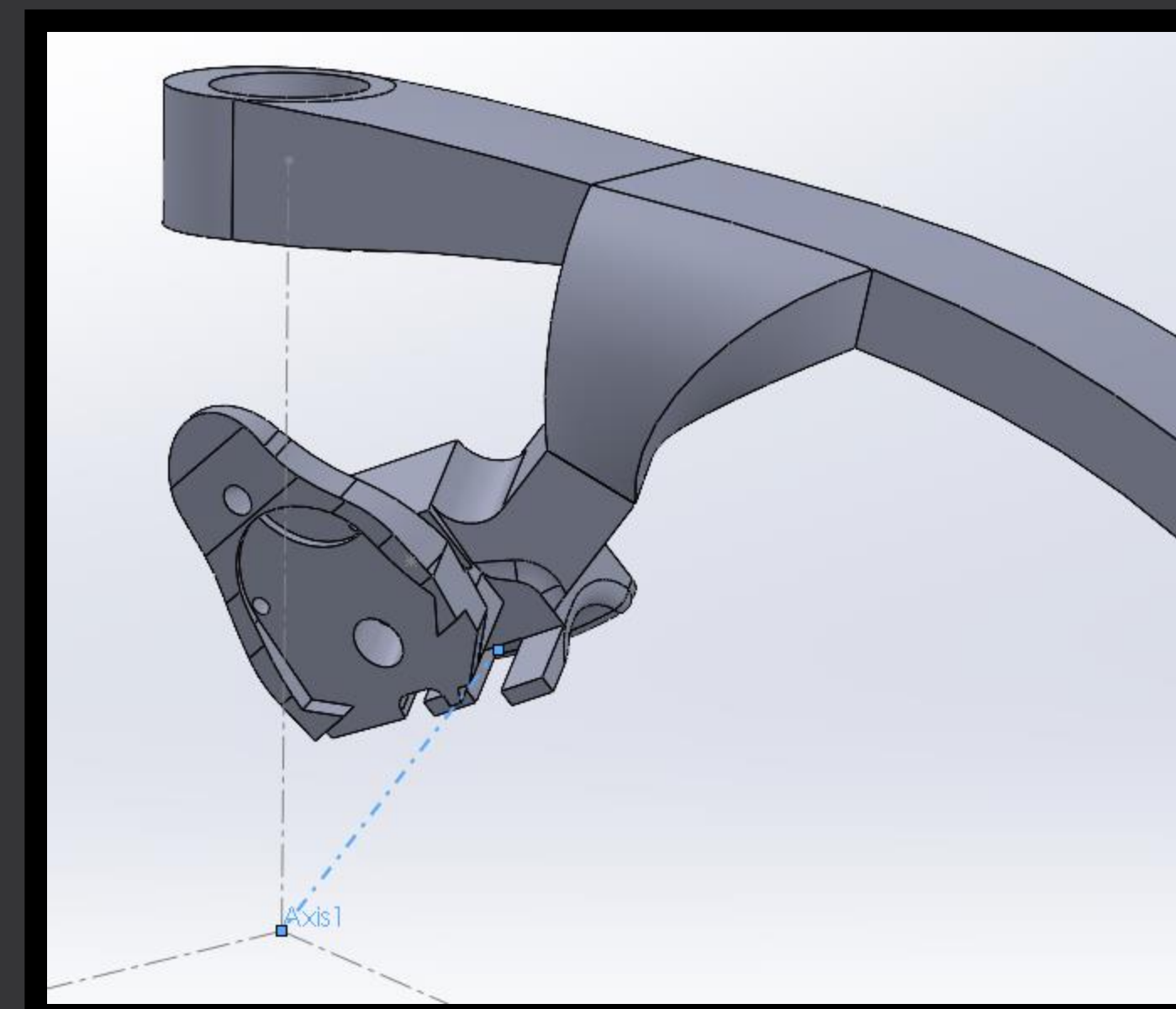
Conceptual Development

Joint connection redesigns:

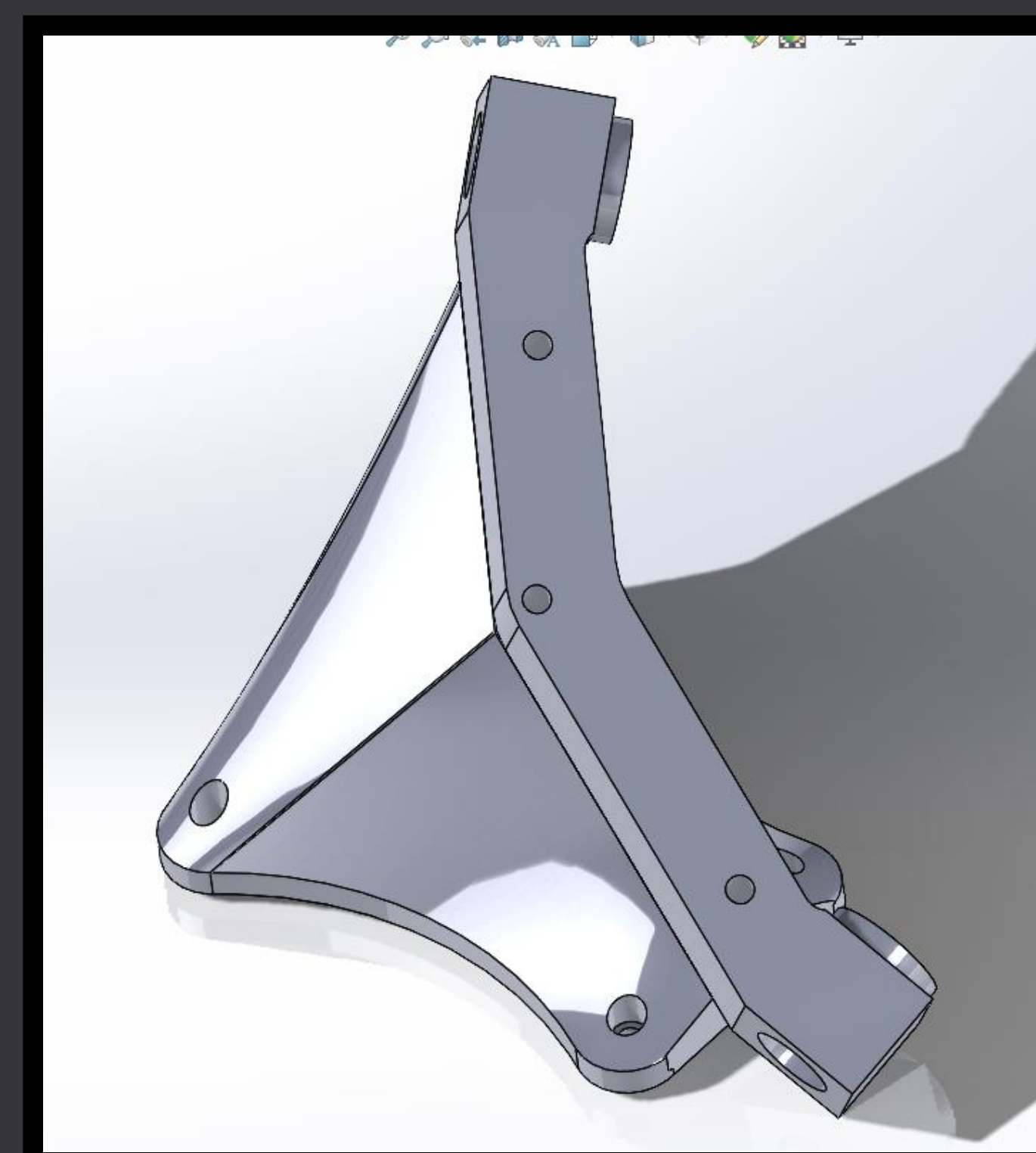
- Face Mount Joint
 - High precision
 - Large contact area for stability
- Custom Snap-Ring and Clamp Shafts
 - Rigid attachment to clamping link
 - Compressive fit on bearings with use of spring washers



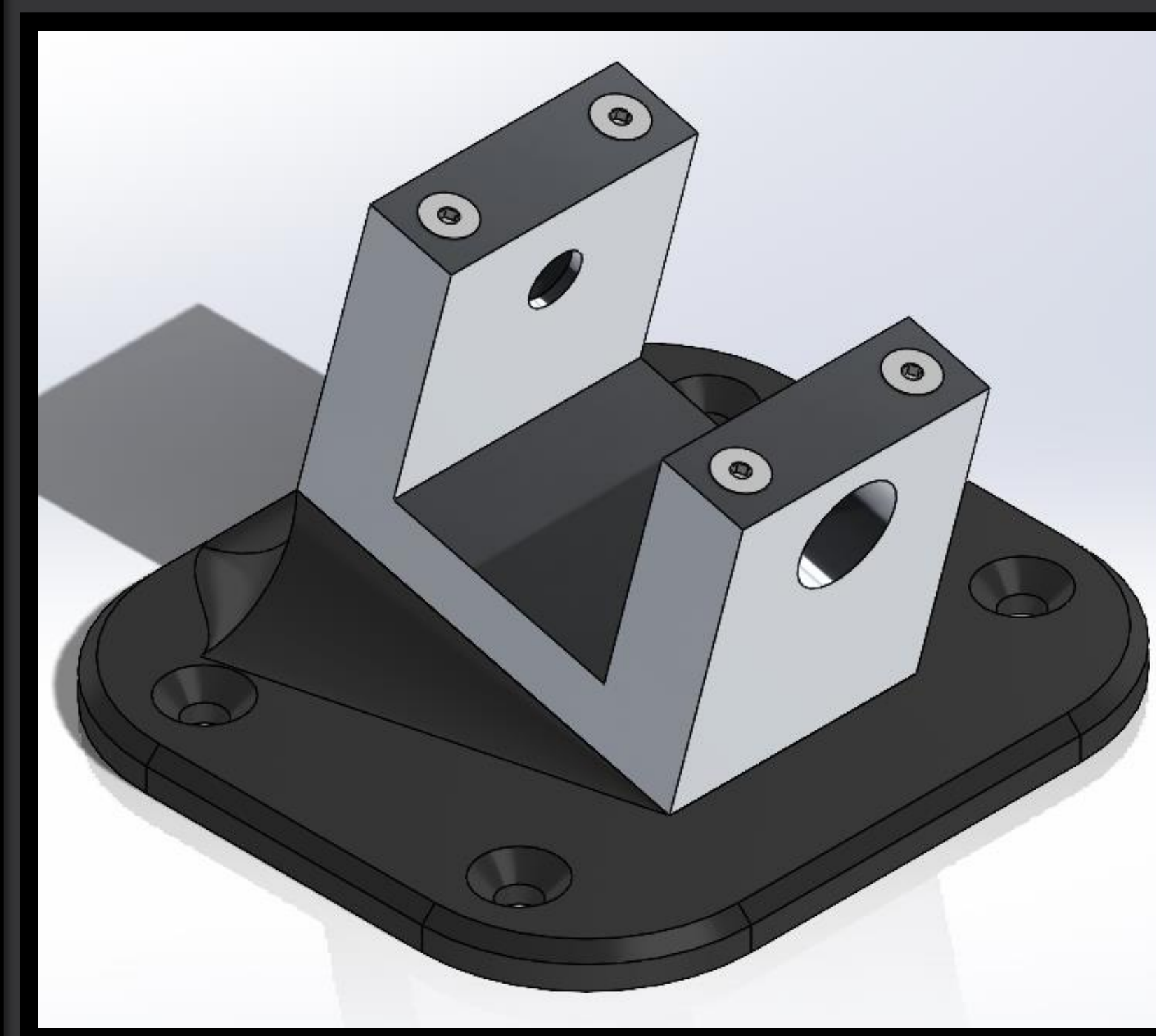
Link 12 and Face mount



Adjustable Thumb Piece



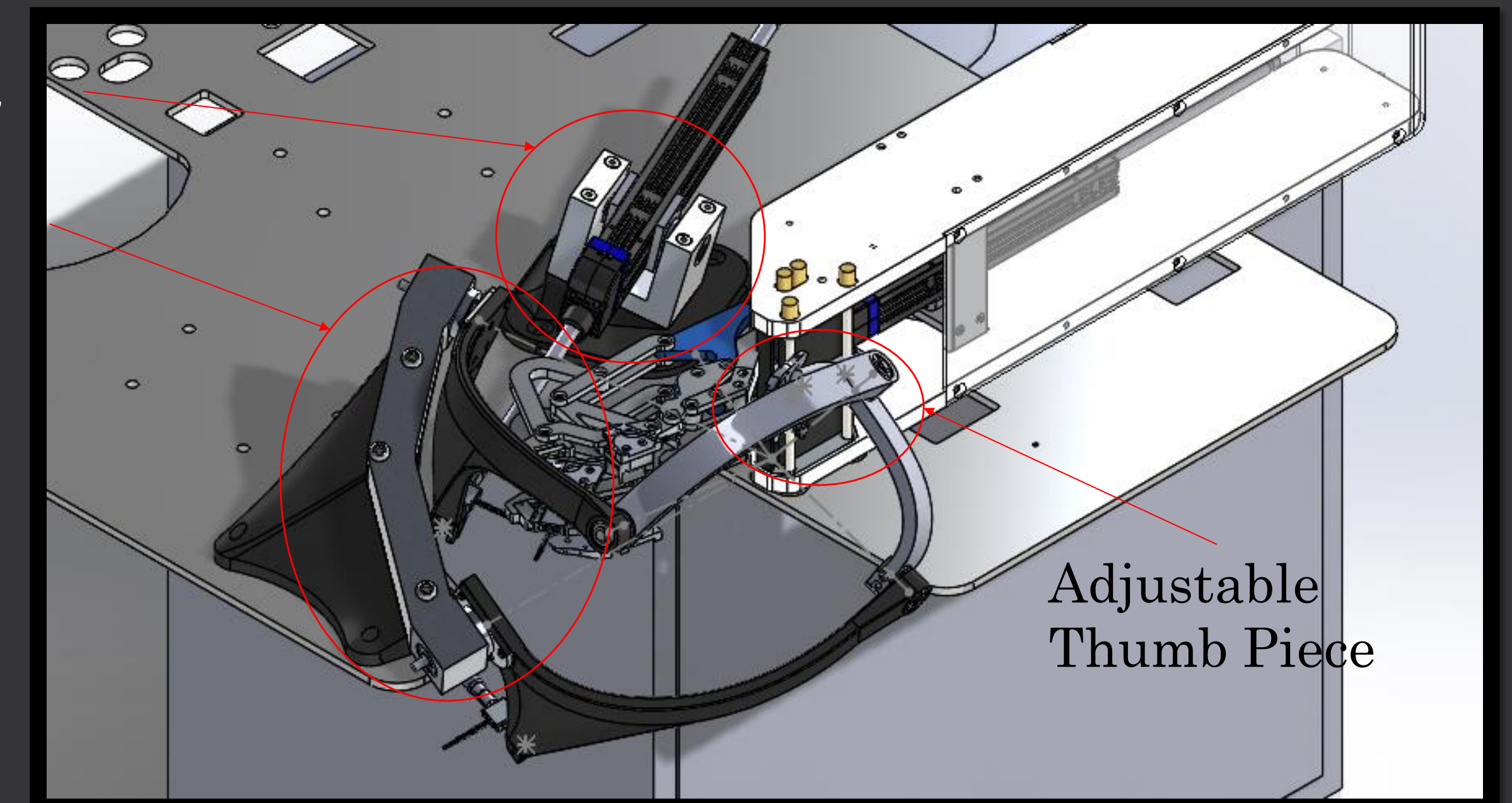
New Fixed Link Design



Actuator Mounts

Actuator Mount

Fixed Link



FINGER 2.0

Validation

Fixed Link:

- Bolt hole alignment with new baseplate
- No deflection in machined part when in use
- Bearing axes line up with common vertex

Thumb Size Adjustment:

- Matlab Model
 - Track Thumb piece for different sizes and follow them in Solidworks Model

Links:

- Deflection tests
 - Hang weights off end of different infill percent links

Summary, Conclusion, Recommendations

- Working on getting all the 3D parts printed for the left side
- U of I machine shop building fixed link and actuator mounts
- Vish working on completing code and making all actuators move with each other
- Sending to California when completed

Acknowledgments

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