

# **BioSpine Fortnightly Team Progress Meeting**

Max

# **Meeting 1**

25<sup>th</sup> of March 2025

# Component Research

Research for the required components, consisting of a radial dual axis (XY) load cell, ring encoder and bearing mount. Comparing functions, size and price.

## COMPARISON LIST

Encoder Cell

|                                                   | Price for two | Bearing Internal Diameter | Maximum size | Thickness | Static Load | Dynamic Load | Image                                                                             | Website                                                                                                                                                                                           |
|---------------------------------------------------|---------------|---------------------------|--------------|-----------|-------------|--------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BH0101-58-6000 With Ball Bearing Housing Assembly | \$90.00       | 10mm                      | 58mm         | 12mm      | 1,97 kN     | 4,8 kN       |  | <a href="https://shop.hpceurope.com/an/produit.asp?prid=2182&amp;produit=Single%20housed%20bearing">https://shop.hpceurope.com/an/produit.asp?prid=2182&amp;produit=Single%20housed%20bearing</a> |
| BH0101-58-6000 With Ball Bearing Housing Assembly | \$324.80      | 10mm                      | 58mm         | 12mm      | 1,97 kN     | 4,8 kN       |  | <a href="https://shop.hpceurope.com/an/produit.asp?prid=2182&amp;produit=Single%20housed%20bearing">https://shop.hpceurope.com/an/produit.asp?prid=2182&amp;produit=Single%20housed%20bearing</a> |
| 1603 Series Face Thru-Hole Pillow Block           | \$24          | 10mm                      | 40mm         | 6mm       | -           | -            |  | <a href="https://core-electronics.com.au/1603-series-face-thru-hole-pillow-block-10mm-bore.html">https://core-electronics.com.au/1603-series-face-thru-hole-pillow-block-10mm-bore.html</a>       |

## COMPARISON LIST

Encoder Cell

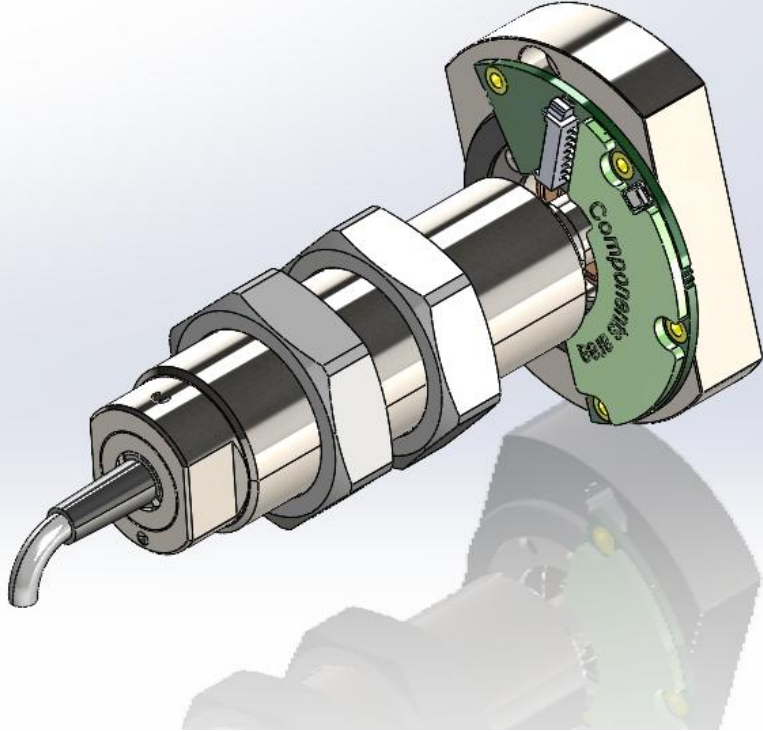
|                                         | Price for two    | Max Diamtere | Internal mm | Thickness | Image                                                                               | Website                                                                                                                                                                                                                                                                         |
|-----------------------------------------|------------------|--------------|-------------|-----------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AksIM-2                                 | \$243.60         | 38mm         | 10mm        | 8mm       |  | <a href="https://www.rls.si/eng/aksim-2-off-axis-rotary-absolute-encoder?openConfigurator=true&amp;partNumbers=MRA029BC010DSE00&amp;qty=2">https://www.rls.si/eng/aksim-2-off-axis-rotary-absolute-encoder?openConfigurator=true&amp;partNumbers=MRA029BC010DSE00&amp;qty=2</a> |
| Encoders without bearings - incremental | Waiting on quote |              | upto 48mm   |           |  | <a href="https://www.baumer.com/int/en/eb200e-ir-fn-812c2-0081/p/45205">https://www.baumer.com/int/en/eb200e-ir-fn-812c2-0081/p/45205</a>                                                                                                                                       |
| AksIM-2                                 | \$262.95         | 54mm         | 20mm        | 8mm       |  | <a href="https://www.rls.si/eng/aksim-2-off-axis-rotary-absolute-encoder?partNumbers=MRA039BC020DSE00&amp;qty=2">https://www.rls.si/eng/aksim-2-off-axis-rotary-absolute-encoder?partNumbers=MRA039BC020DSE00&amp;qty=2</a>                                                     |

# COMPARISON LIST

Radial Load Cell

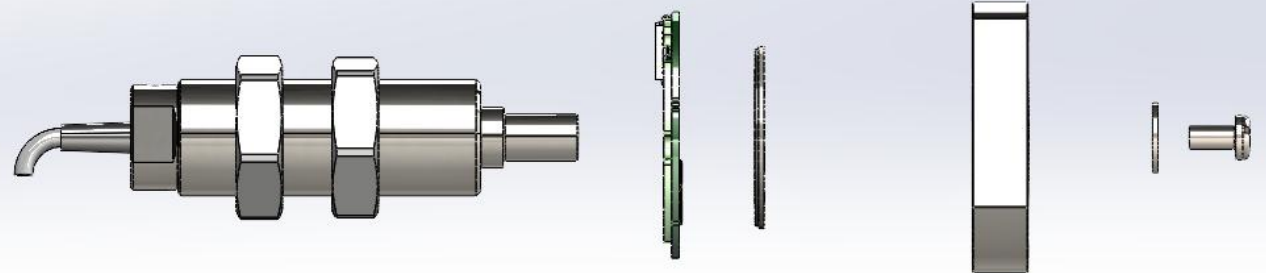
|                                                    | Price for two    | N                   | Image                                                                               | Website                                                                                                                                                                                                                                       |
|----------------------------------------------------|------------------|---------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biaxial Load Sensor MBA400                         | \$5,980          | 222.411 to 889.644N |  | <a href="https://metromatics.com.au/product/biaxial-load-sensor-mba400/">https://metromatics.com.au/product/biaxial-load-sensor-mba400/</a>                                                                                                   |
| Dynacell - Biaxial Dynamic Load Cell               | \$12,000         | 1kN                 |  | <a href="https://www.instron.com/en/products/testing-accessories/load-cells/dynamic-fatigue/2527-series-biaxial-dynacell">https://www.instron.com/en/products/testing-accessories/load-cells/dynamic-fatigue/2527-series-biaxial-dynacell</a> |
| RFS150-XYRadial force sensor with 2 measuring axis | \$6,979.90       | 400N                |  | <a href="https://www.checkline.com/product/RFS150-XY#">https://www.checkline.com/product/RFS150-XY#</a>                                                                                                                                       |
| RFS150-XYRadial force sensor with 2 measuring axis | Waiting on Quote | 400N                |  | <a href="https://www.abqindustrialnet/store/rfs150-xy-radial-force-sensor-with-2-measuring-axis-p-733.html">https://www.abqindustrialnet/store/rfs150-xy-radial-force-sensor-with-2-measuring-axis-p-733.html</a>                             |
| Piezoelectric load cell 9217A                      | -                | 500N                |  | <a href="https://www.kistler.com/INT/en/p/piezoelectric-load-cell-for-very-low-forces-9217a/000000000018007452">https://www.kistler.com/INT/en/p/piezoelectric-load-cell-for-very-low-forces-9217a/000000000018007452</a>                     |
| RFS150-XYRadial force sensor with 2 measuring axis | \$5,756.32       | 400N                |  | <a href="https://honigmann.com/i/456/2-axis-radial-force-sensor-RFS150-XY.html&amp;lang=2">https://honigmann.com/i/456/2-axis-radial-force-sensor-RFS150-XY.html&amp;lang=2</a>                                                               |
| F/T Sensor: Nano25                                 | \$8,000          | 250N                |  | <a href="https://www.ati-ia.com/products/ft/ft_models.aspx?id=Nano25">https://www.ati-ia.com/products/ft/ft_models.aspx?id=Nano25</a>                                                                                                         |

# Component Mock-Up



A 3D mock-up of the electronics order. Aligning the correct pieces with the correct rotating axis.

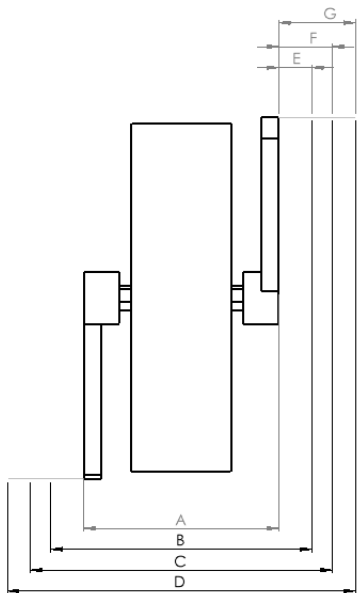
Collecting CAD models exploring connection options and sizes.



# Q-Factor and Model

Joining existing parts with existing crank and dimensions.

Researching q-factor to design for a comfortable and safe pedal width.

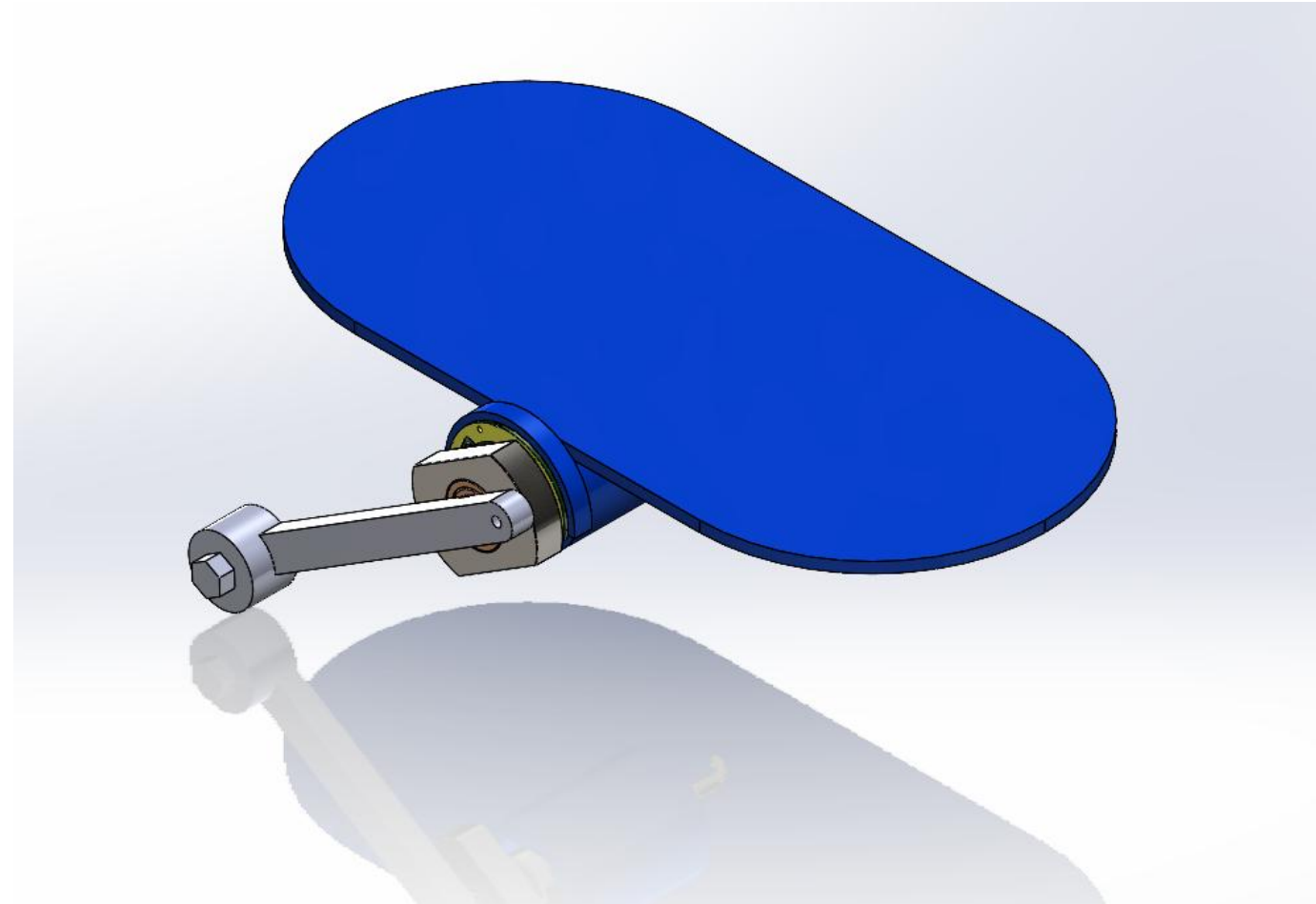


**PEDAL DISTANCES**

|   | NAME           | MEASUREMENT |
|---|----------------|-------------|
| A | Crank Distance | 112mm       |
| B | Min Rec        | 150mm       |
| C | Current        | 173.2mm     |
| D | Max Rec        | 200mm       |

**CRANK TO PEDAL**

|   | NAME    | MEASUREMNT |
|---|---------|------------|
| E | Min Rec | 19mm       |
| F | Current | 30.6mm     |
| G | Max Rec | 44mm       |



# What's Next?

- How to attach bearing mount to crank?
- How to attach magnet encoder to internal of bearing mount?
  - Pedal design additions
  - Encoder attachment
  - Load cell attachment

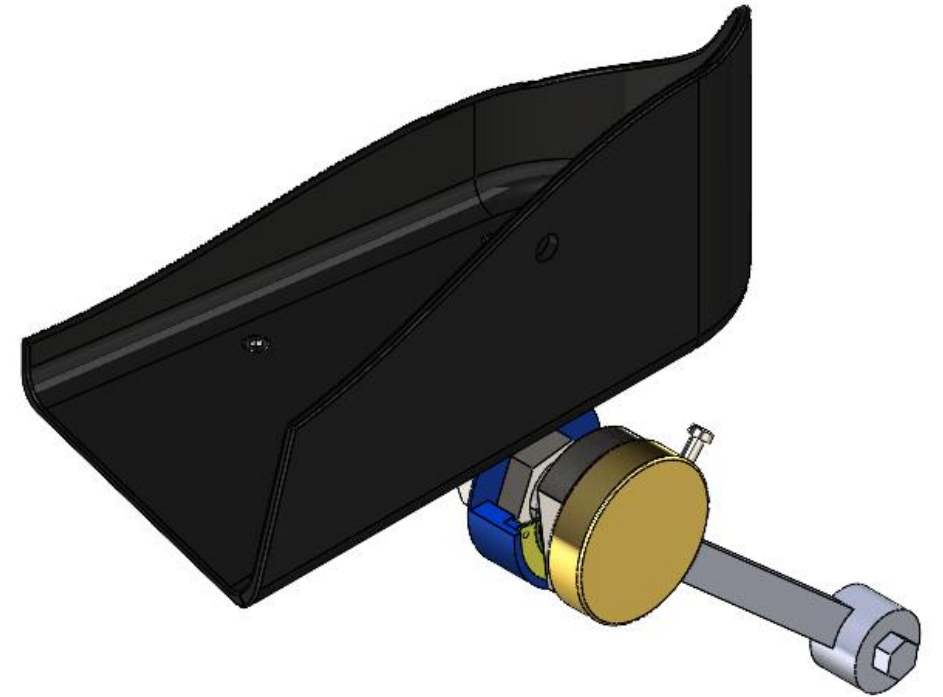
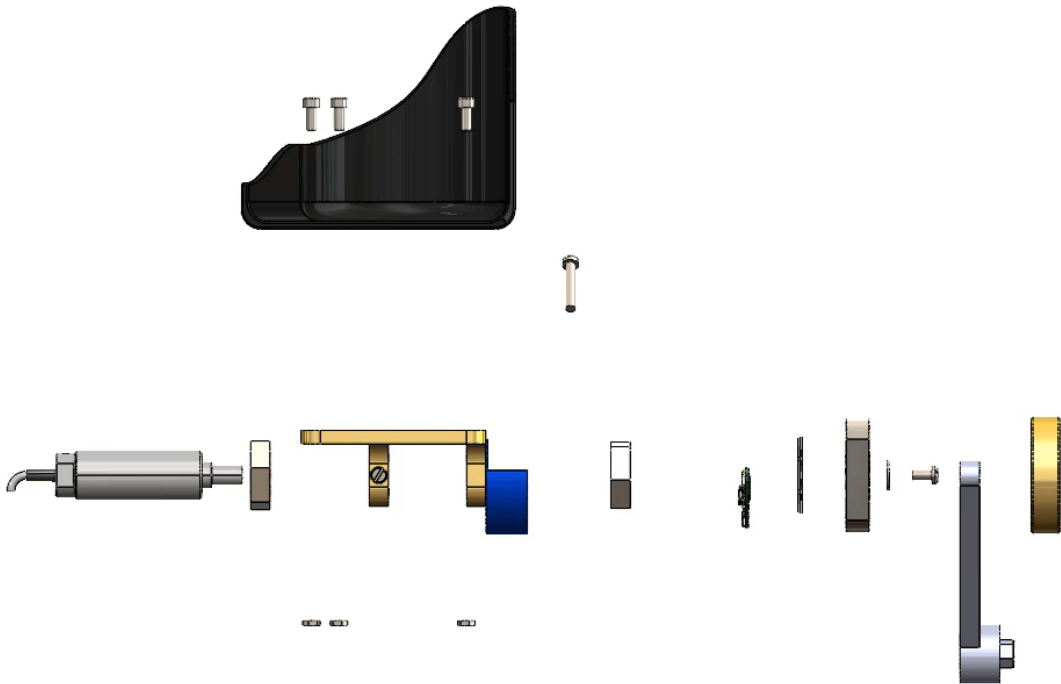
# **Meeting 2**

8<sup>th</sup> of April 2025

## Further Pedal Electronics Development

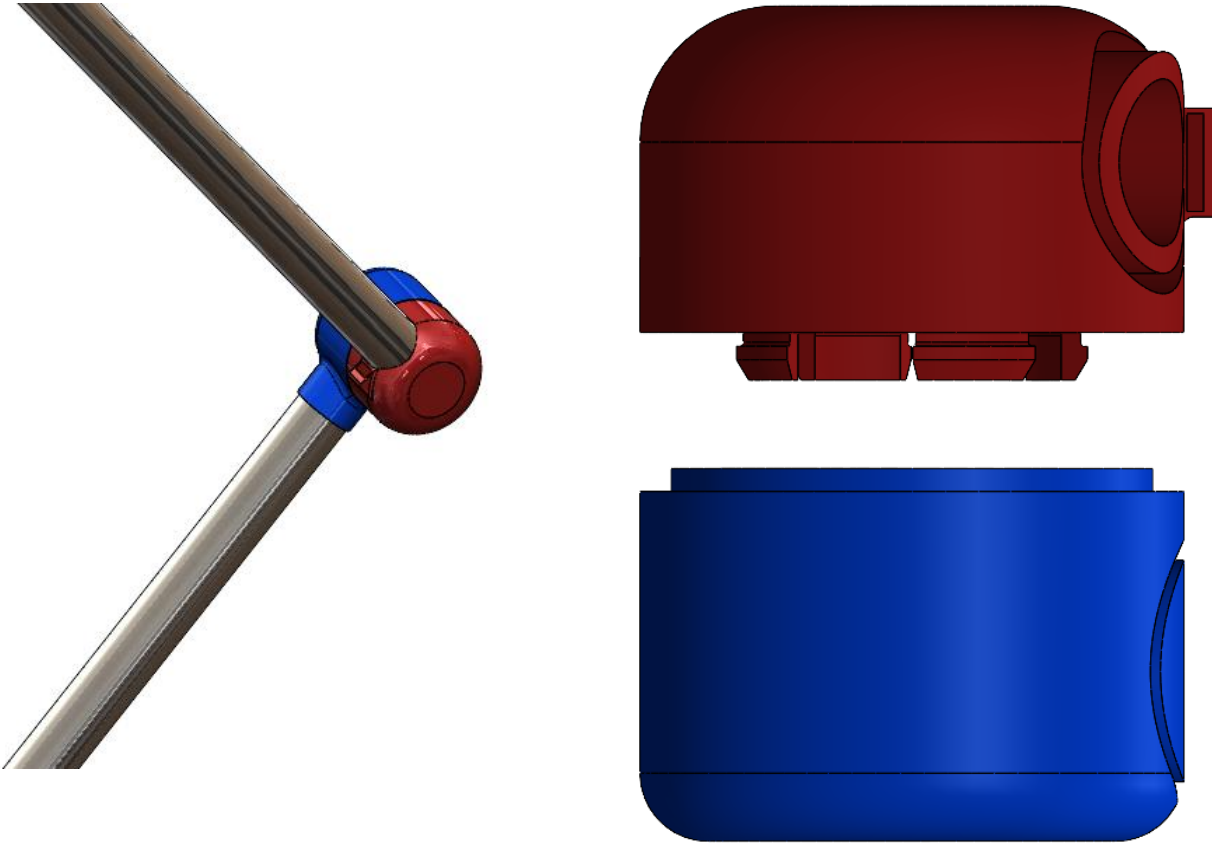
Adding all the electrical components which were previously explored.

Creating custom mounts to fix them all in the appropriate places beneath the pedal.

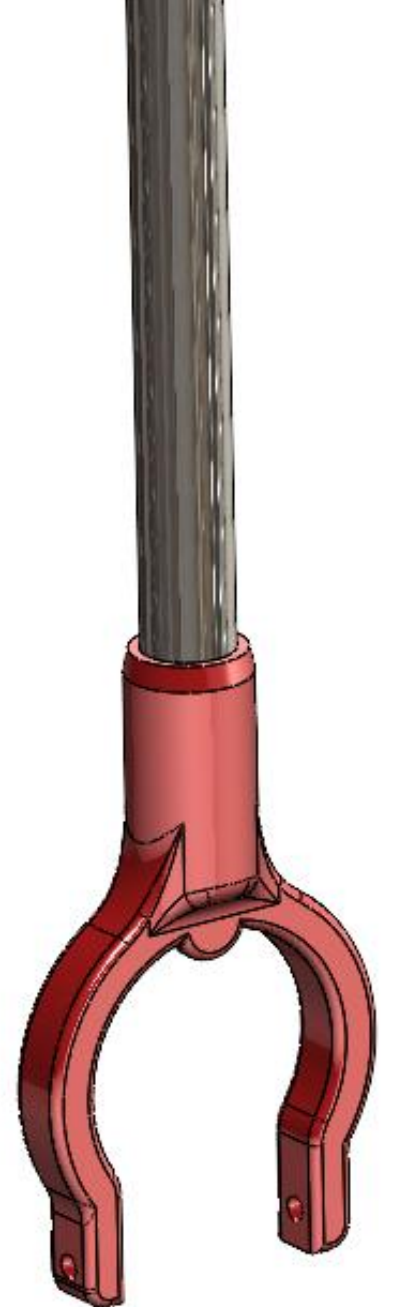


# Pole Hinge and Adaptor

Designing a hinge for the poles to connect to.  
Allowing for wire slack. Avoiding pinching



Redesigning the  
clamp to the end  
of the crank to  
allow for more  
rigidity.



**Meeting 3**  
22<sup>nd</sup> of April 2025

**Cancelled due to public holidays**

# **Meeting 4**

6<sup>th</sup> of May 2025

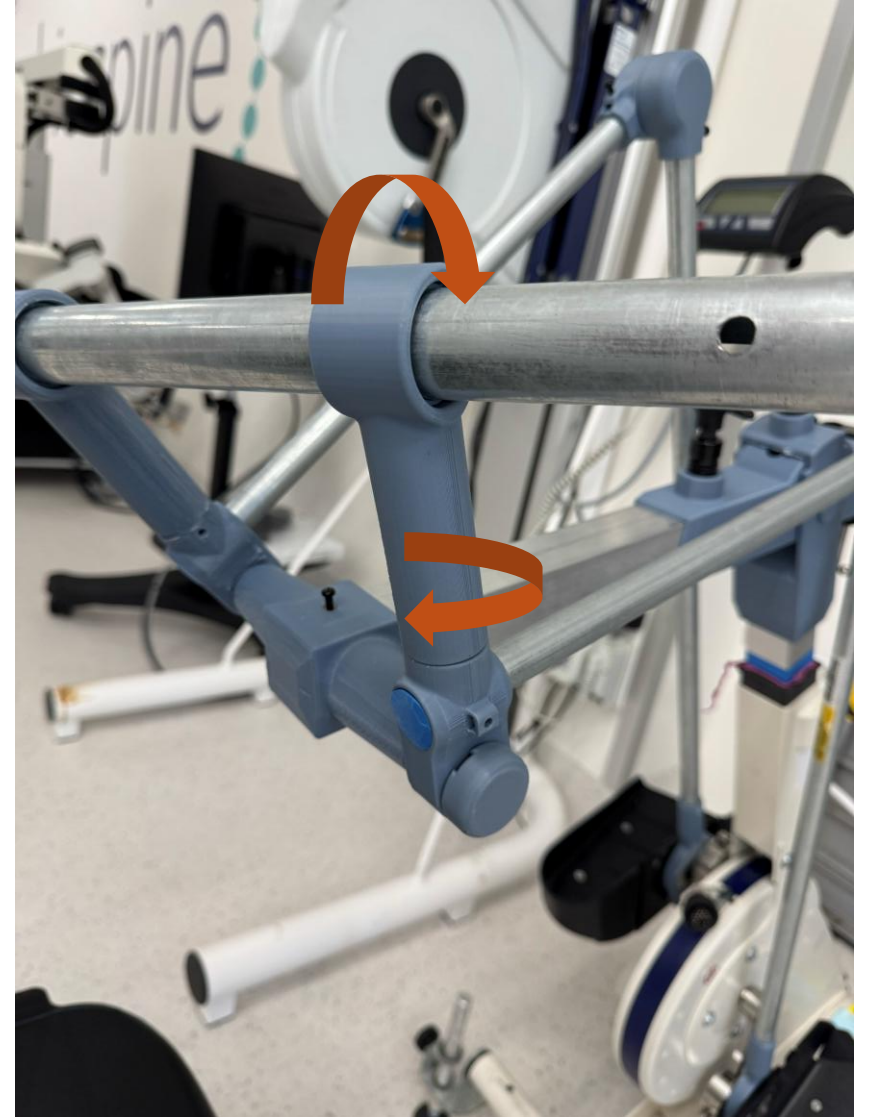
# Link length to pedal connection



# Handle mechanical linkage change

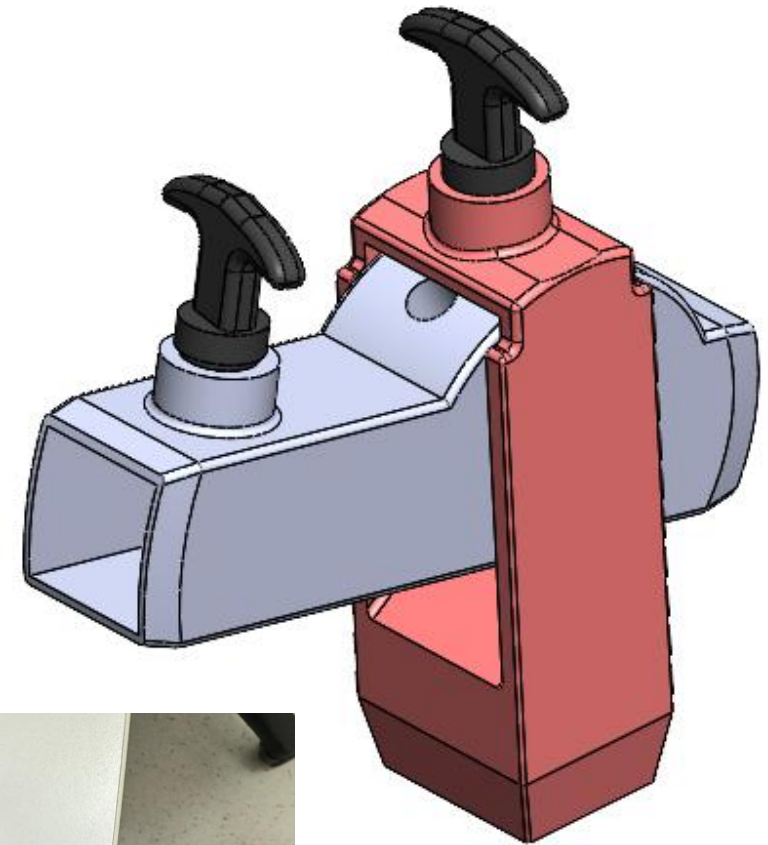
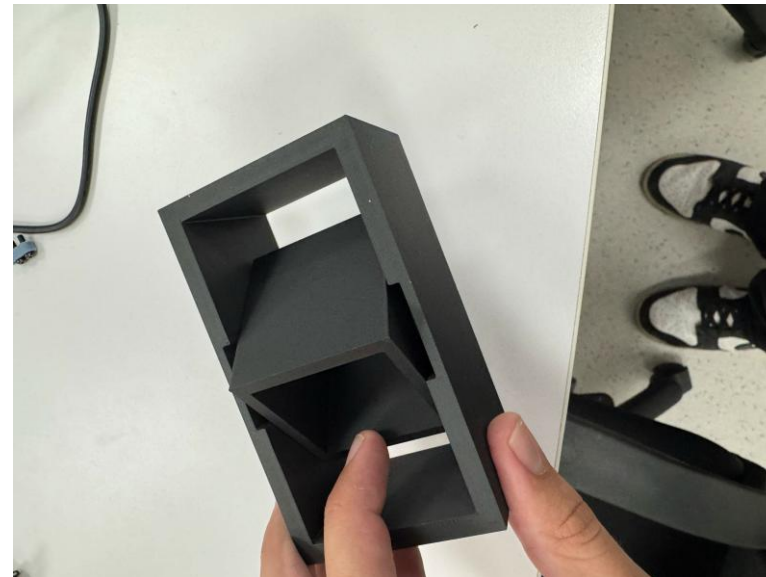
Ball and socket joint changed to double twist movement.

This helps improve the strength of the joint.

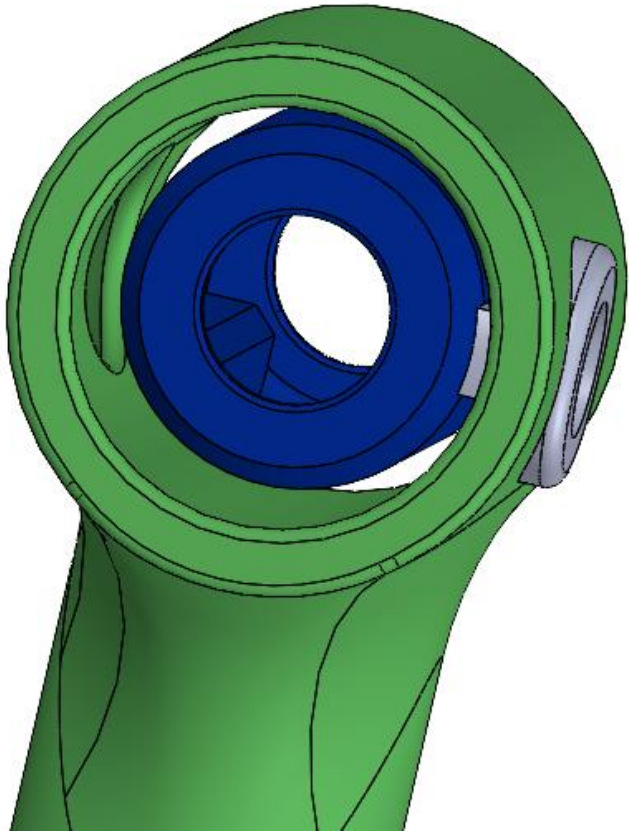


# Shaft and cross bar adjustable hinge

Shaft and cross bar adjustable hinge with pull pins and slot snap fitting.



# Handlebar spring pin movement system



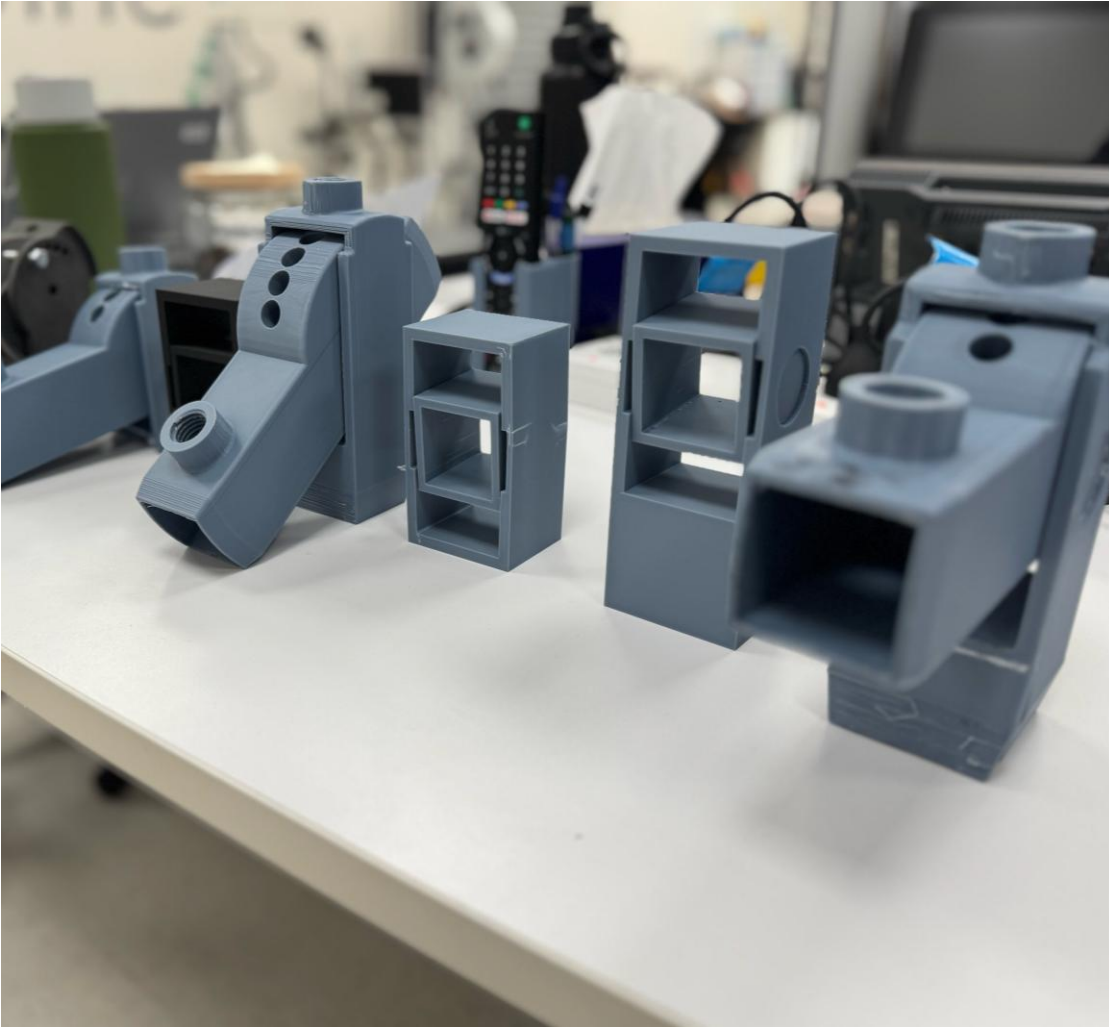
# To fix

- Tolerance of pins in cross bar hinge
  - Grub screw on pedal clip
- Move the grub screw on the cross-bar hinge down
- Reduce hole tolerance on the cross-bar hinge

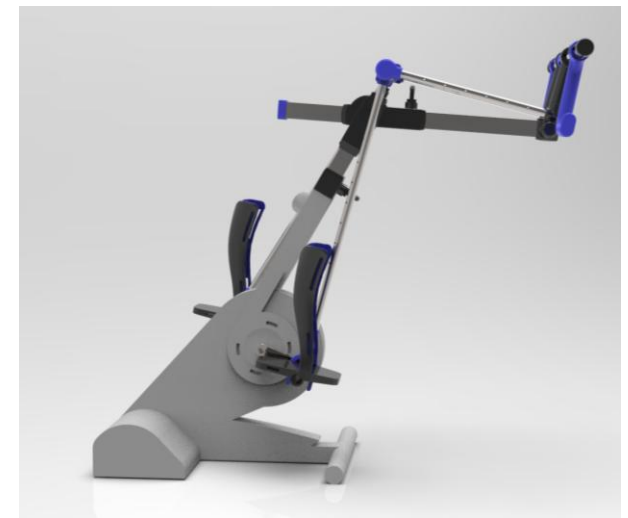
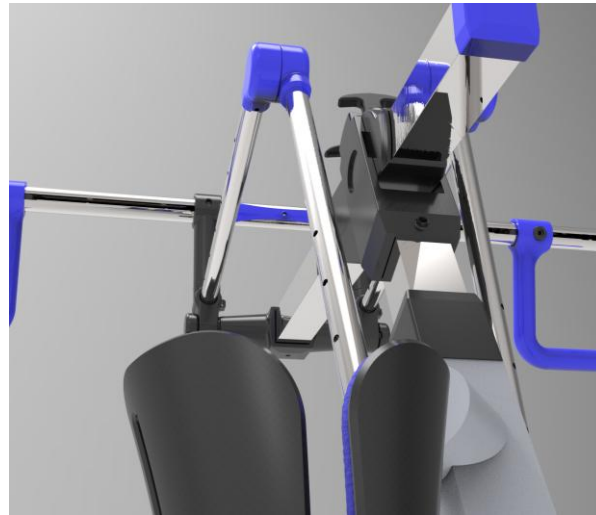
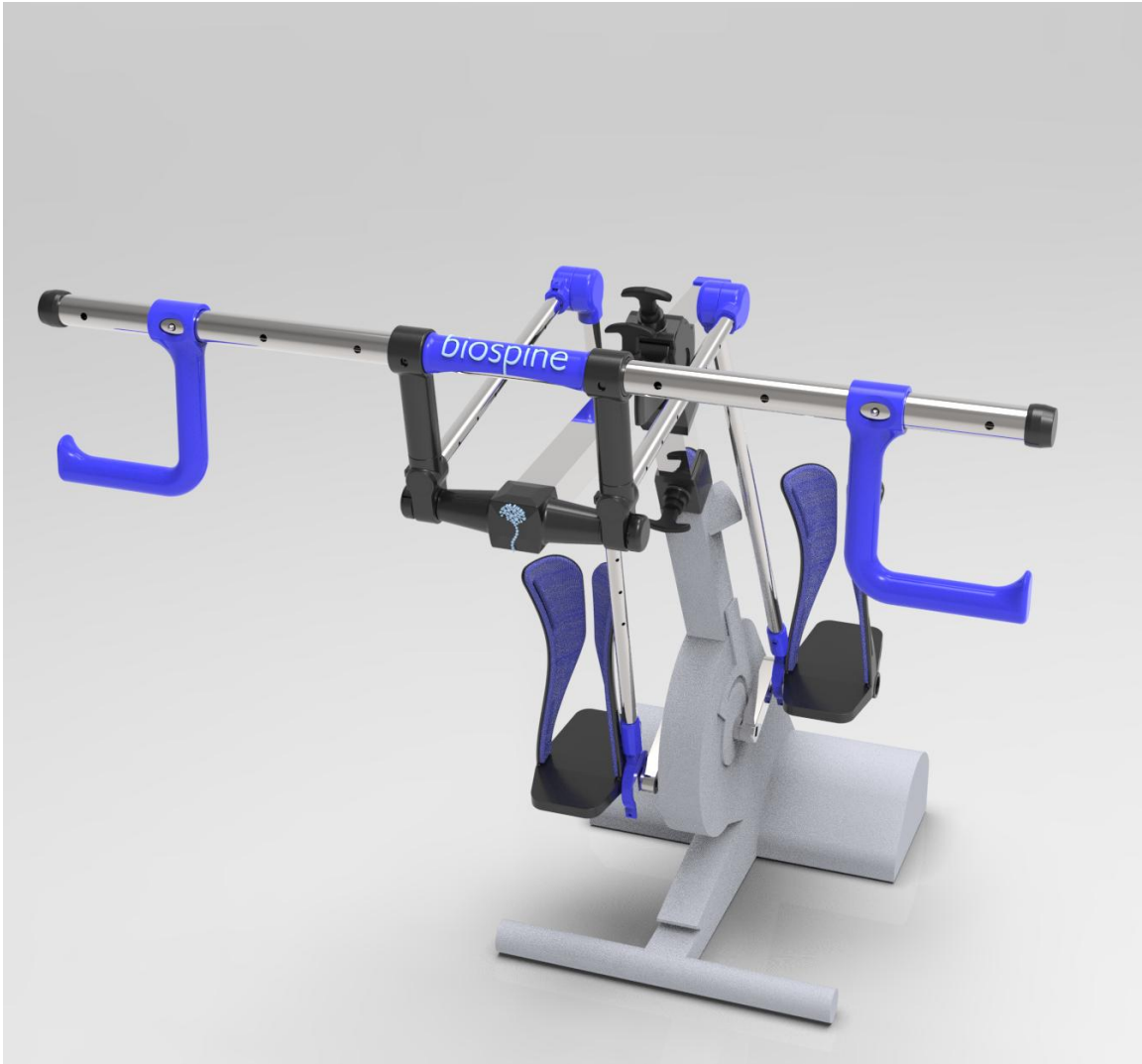
# **Meeting 5**

20<sup>th</sup> of May 2025

# Final prototypes and assembly



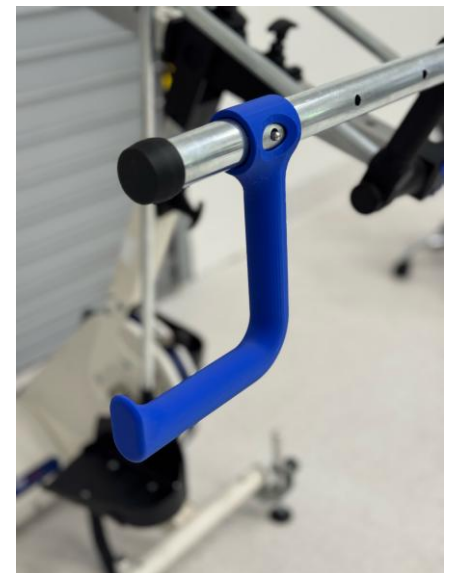
# Some Renders



# **Meeting 6**

3<sup>rd</sup> of June 2025

# Max's Final Prototype



# Thank you

