10

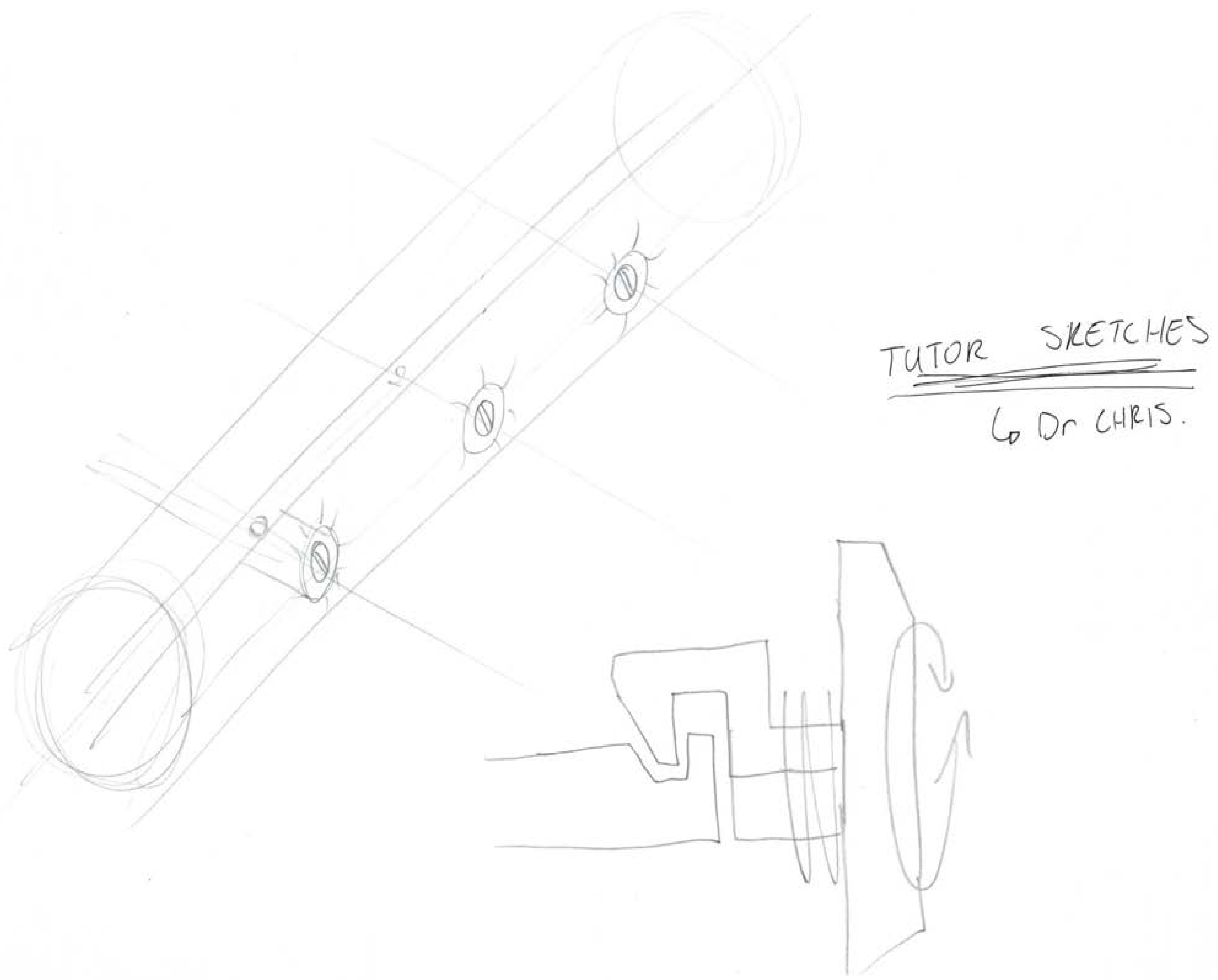
WEEK TEN

29th Sep - 5th Oct

Goals:

- Gather feedback from tutors
- Finalise overall design
- Benchmark existing mechanisms
- Begin more refined prototyping

Kristen Harrison - k_harrison16@hotmail.com



I explained to Dr Chris what I have worked on during the mid sem break and my current concept. He encouraged me to persue it and to focus on macking the mechanism one of the main innovations of the design. He said that the design is playful and engaging and I am on track.

Additionally, he recommended that I bench mark existing mechanisms to draw inspiration and show how mine is different and novel.

Movingf forward, I will research and benchmark existing designs. From there I will finalise the design of my own mechanisms and begin material selection. I will likely use Bamboo composits and materials as from previous study I know it is a sustainable, strong, and viable material for the context.

Feedback

1 TWIST (UNLOCK)

2 ↑ LIFT

3 TWIST (LOCK)

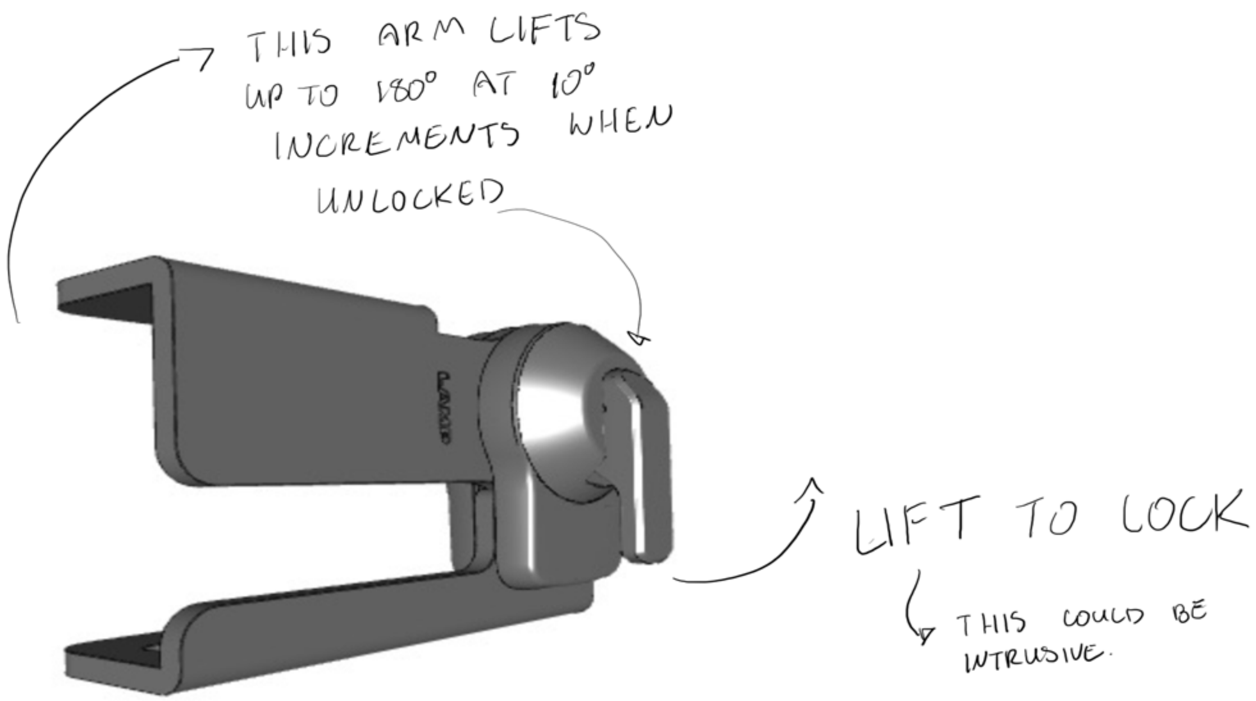
SIMILAR PROCESS TO EXTEND THE LENGTH OF THE TUBE HOWEVER INSTEAD OF REMOVING IT, THE USER LOCKS IT IN.

Kristen Harrison - k_harrison16@hotmail.com

Detent hinges

MULTI ANGLE LOCKING HINGE A WITH LEVER

Easily adjusts the flap angle by toggling the lever.
Lock allows the hinge to be held in position from 0° to 180° in 10° increments.
The flap is temporarily unlocked while the lever is pushed.
The flap stays unlocked when the lever is lifted.
Hinge can be used with free axis hinge A (15-7-3568 or 15-7-3569).
Lever, pin, cover: plastic.
Recommended screws: M5.
Unlocking torque: 45 N.m.



Components of a Ratchet Mechanism

Ratchet Wheel: This is the toothed wheel that rotates in one direction. The teeth of the ratchet wheel are designed to allow motion in one direction and prevent it in the other direction.

Pawl: This is the lever that engages and disengages with the ratchet wheel. The pawl is designed to move in a linear motion, and its tip is shaped to fit into the teeth of the ratchet wheel.

Spring: This is the pawl back to its original position after each engagement with the ratchet wheel.

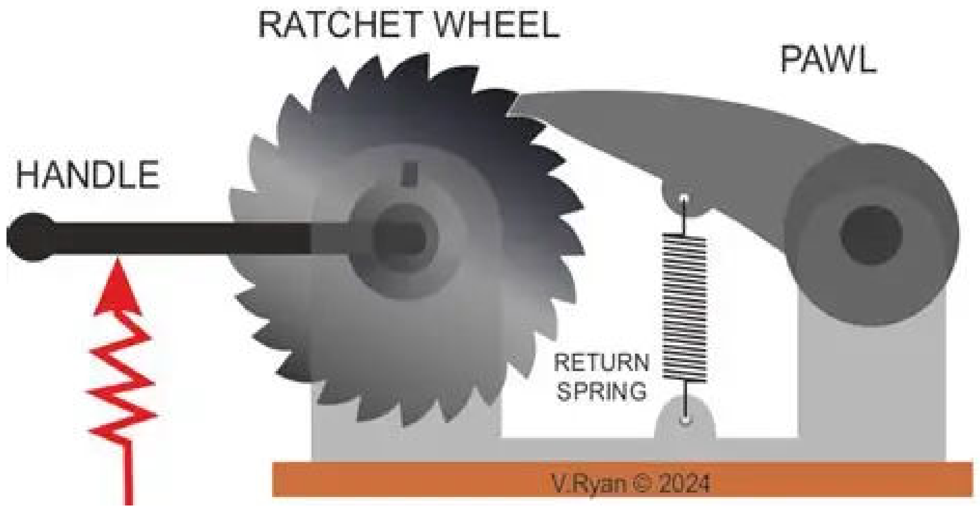
How Does a Ratchet Mechanism Work?
The operation of a ratchet mechanism can be explained in the following stages:

Stage 1: Engagement
In this stage, the pawl engages with the ratchet wheel, and the tip of the pawl fits into one of the teeth of the ratchet wheel. This engagement allows the ratchet wheel to rotate in one direction.

Stage 2: Rotation
As the ratchet wheel rotates, the pawl moves in a linear motion, and its tip remains engaged with the tooth" of the ratchet wheel. The rotation of the ratchet wheel is restricted to one direction due to the design of the teeth.

Stage 3: Disengagement
When the rotation of the ratchet wheel reaches a certain point, the pawl disengages from the ratchet wheel, and the spring returns the pawl to its original position. This disengagement allows the ratchet wheel to rotate in the opposite direction. (See Also: What Does a Ratchet Mean? Essential Guide)

Stage 4: Repeat
The process of engagement, rotation, and disengagement is repeated continuously, allowing the ratchet mechanism to operate efficiently.



Kristen Harrison - k_harrison16@hotmail.com

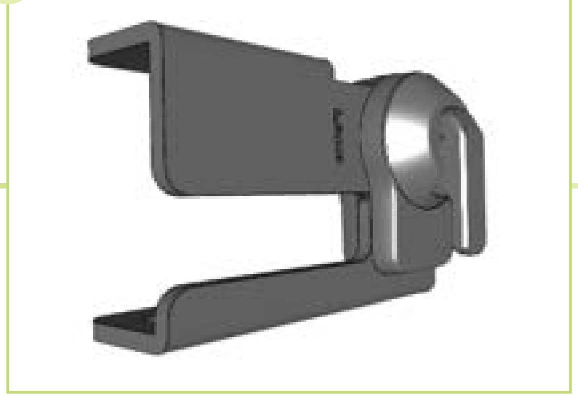
Con

Pro

Has potential

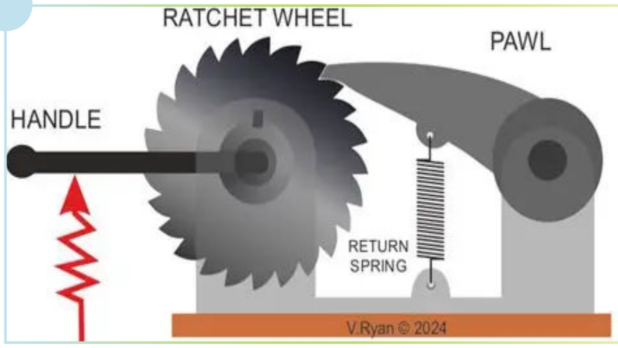
The design is playful/engaging

Lever locking system can be intrusive



Not secure enough for furniture application

Secure enough for furniture applications



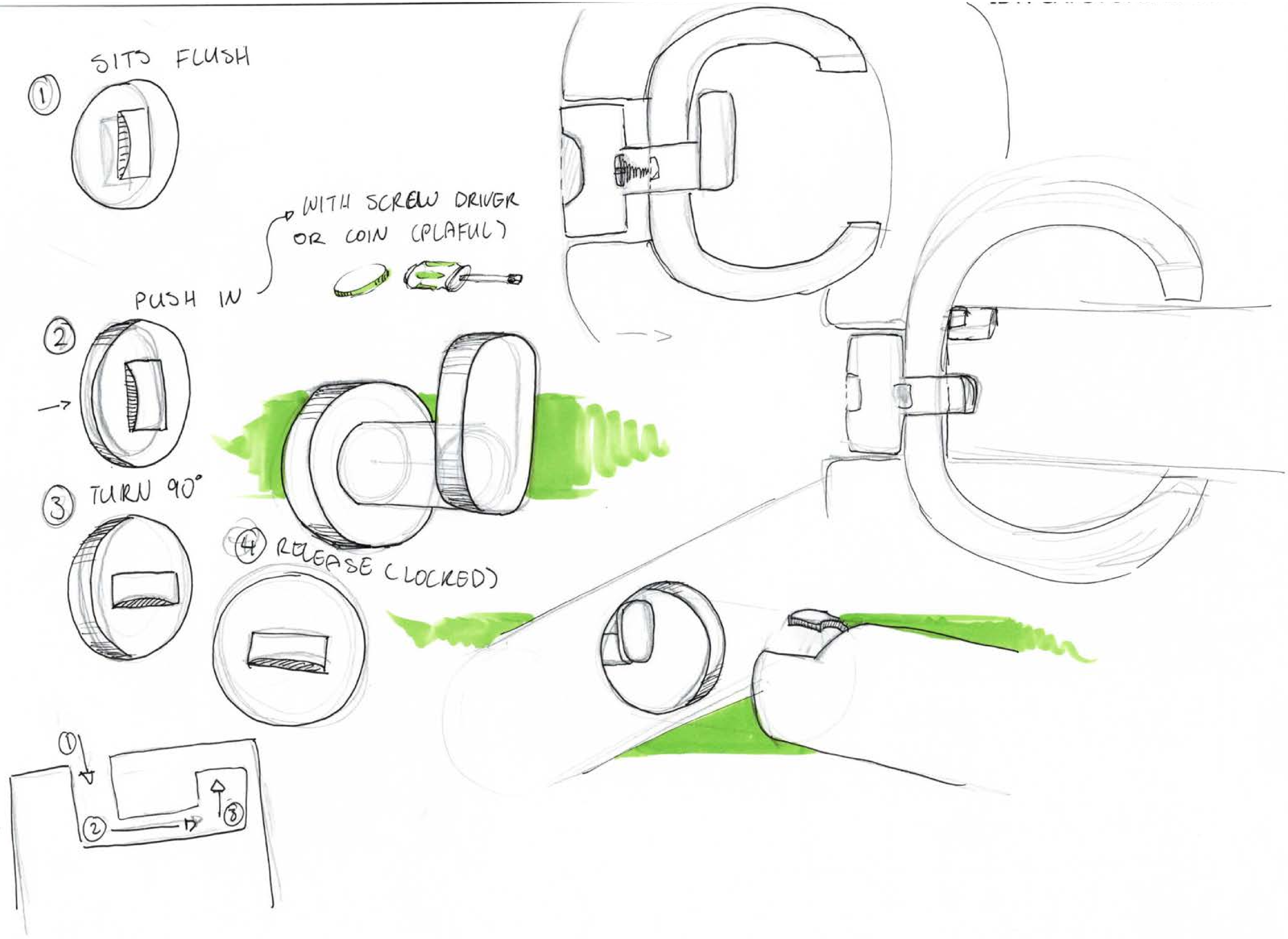
Not very secure and could cause harm.

Sensory input

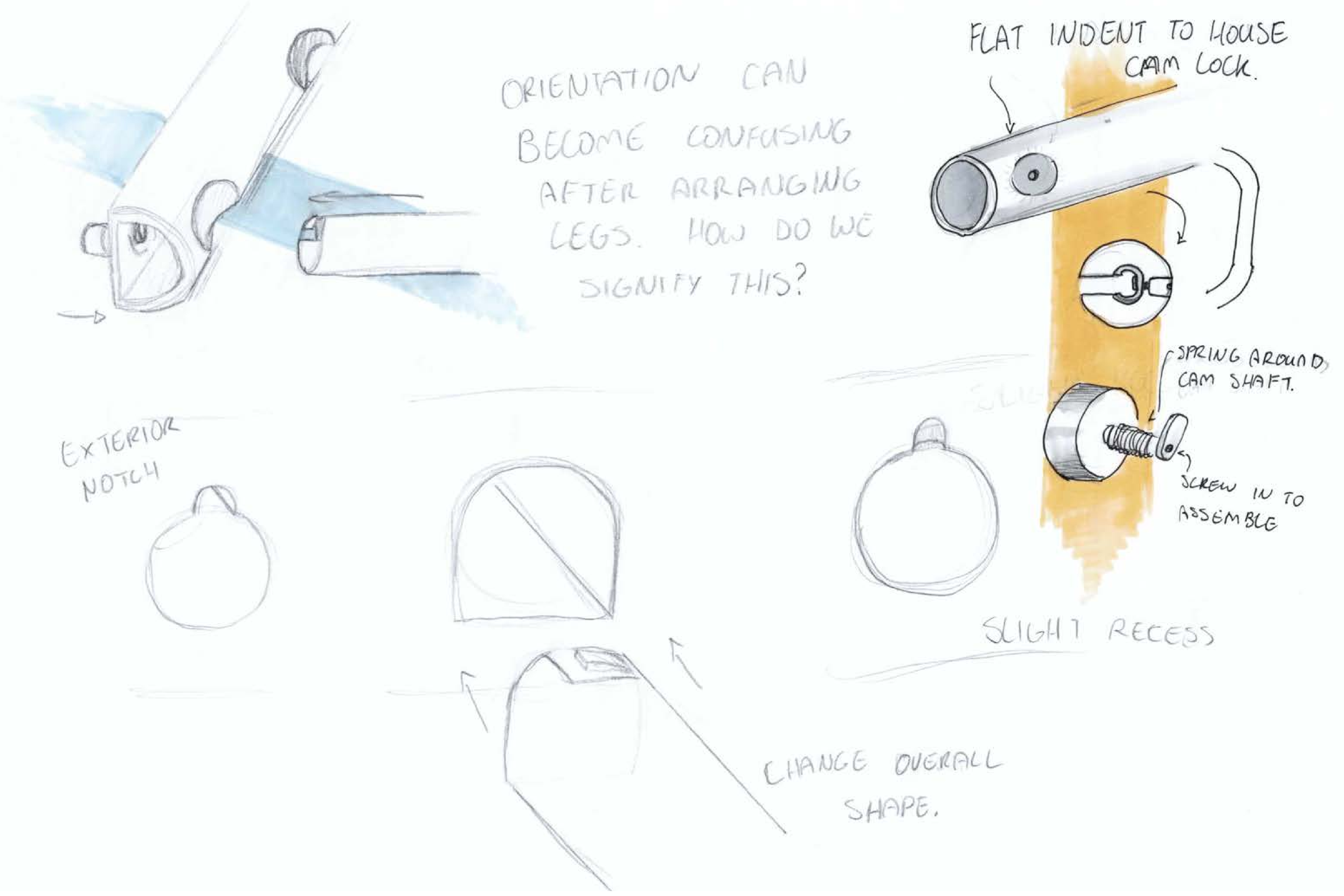
Design is not playful/engaging

Benchmarking | Mechanisms

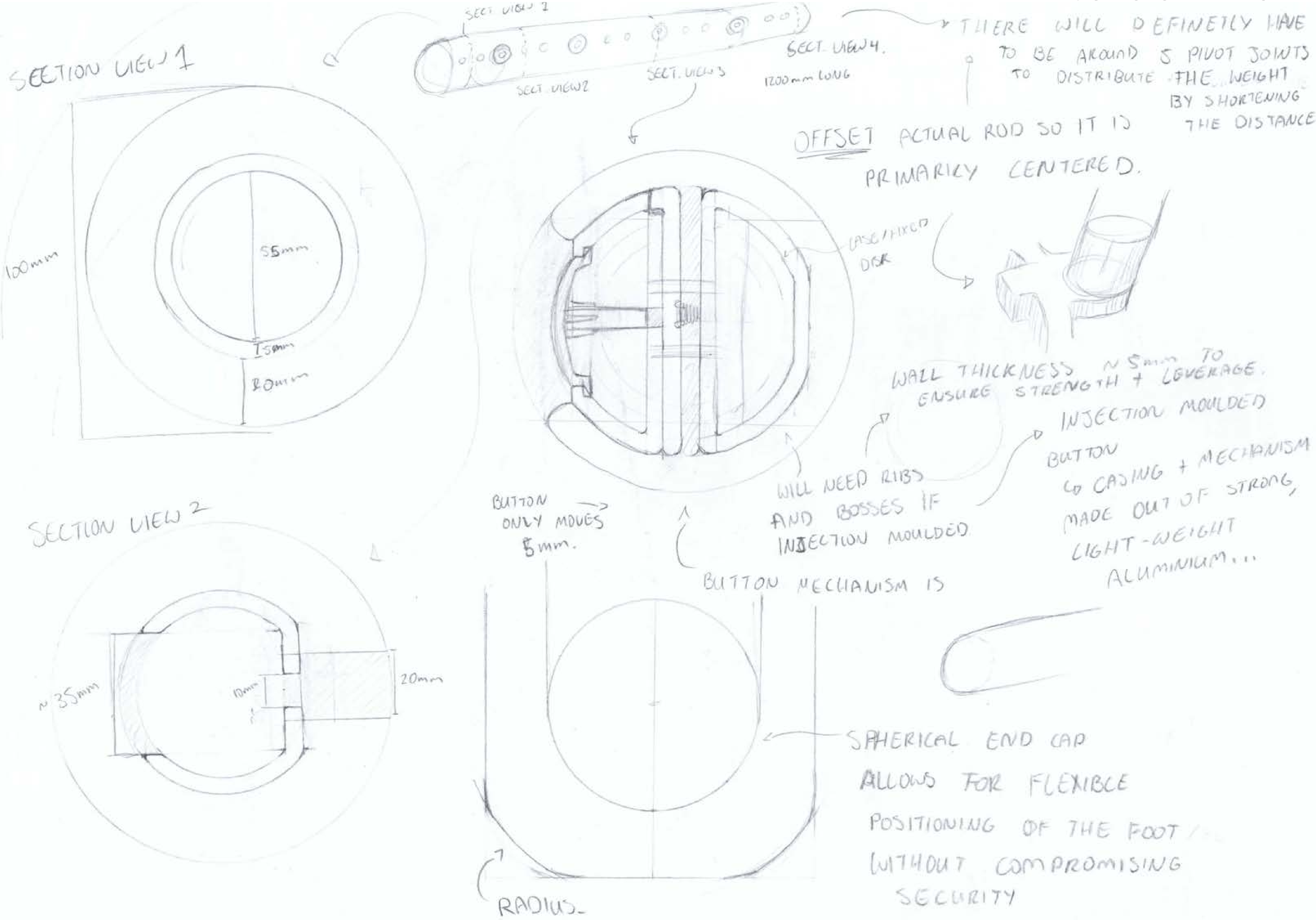
Kristen Harrison - k_harrison16@hotmail.com



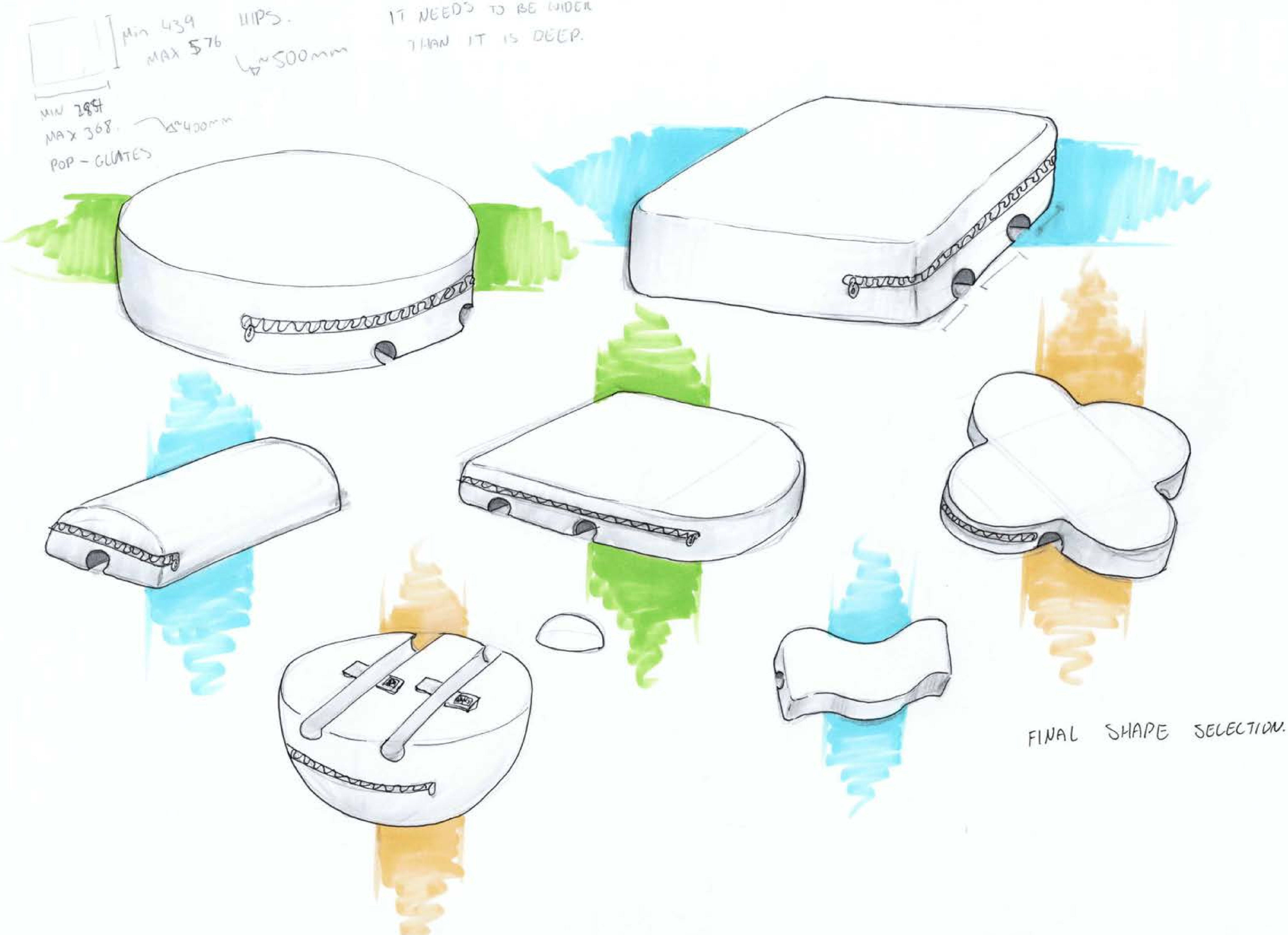
① SITS FLUSH
WITH SCREW DRIVER OR COIN (PLAFUL)
PUSH IN
②
③ TURN 90°
④ RELEASE (LOCKED)
①
②
③



Kristen Harrison - k_harrison16@hotmail.com



Kristen Harrison - k_harrison16@hotmail.com

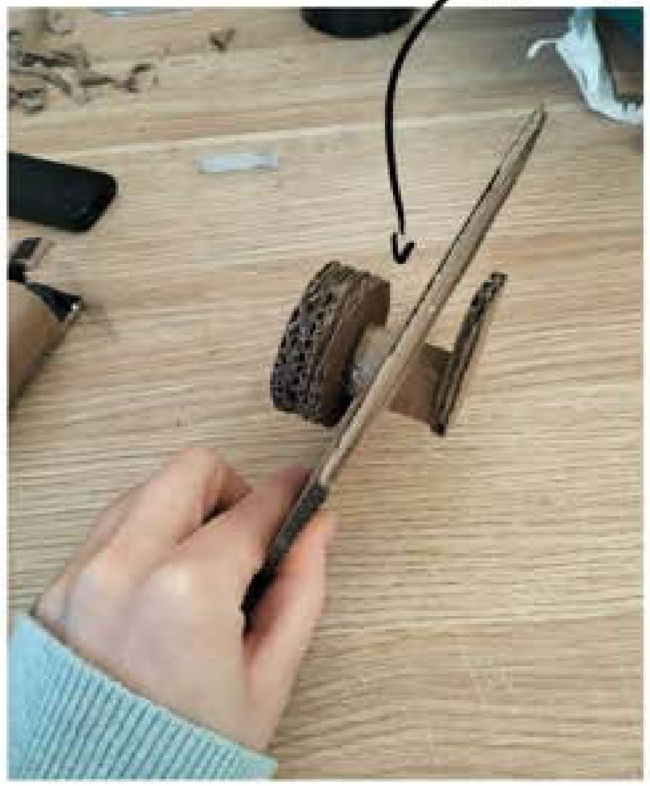


Ideation

Kristen Harrison - k_harrison16@hotmail.com

CAM LOCK

SPRING WOULD BE POSITIONED HERE

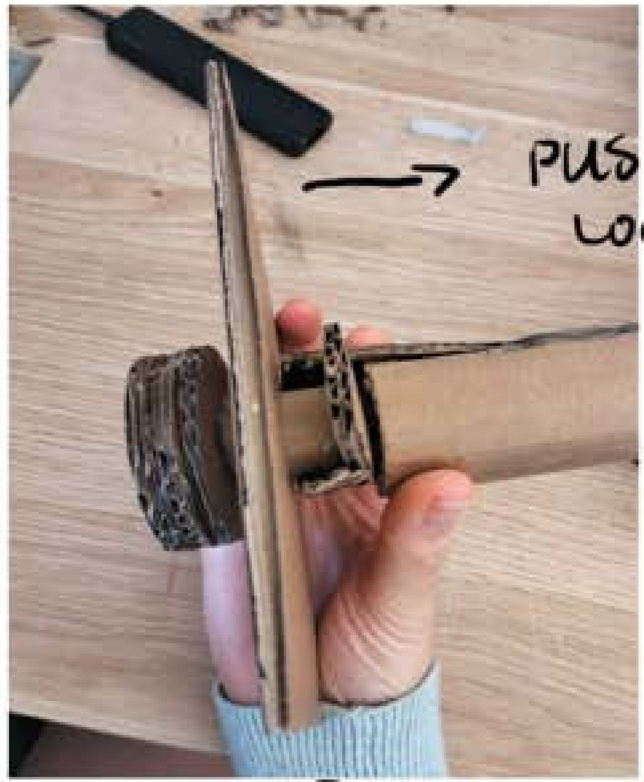


SEAT SUPPORT

INSERT SEAT SUPPORT

1

PUSH CAM LOCK FORWARD



2

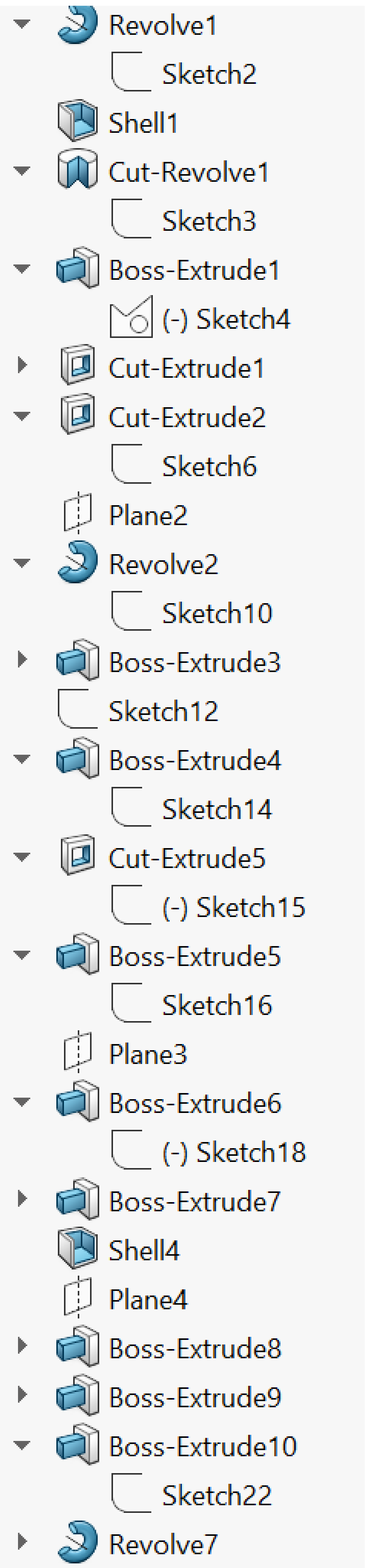
TURN CAM LOCK 180°

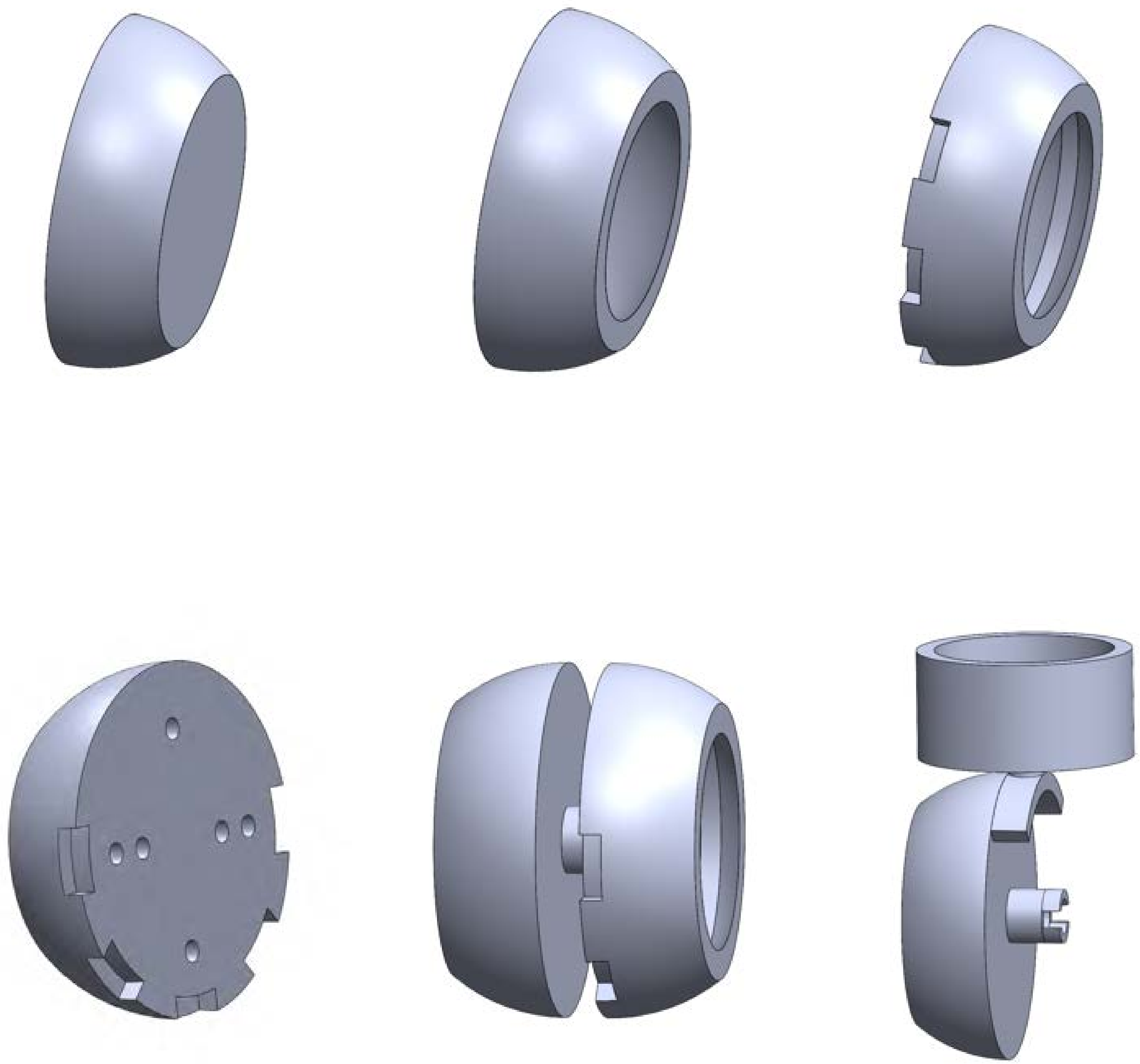
3

RELEASE CAM LOCK WHICH WILL LOCK IN PLACE AS THE SPRING RESISTS.

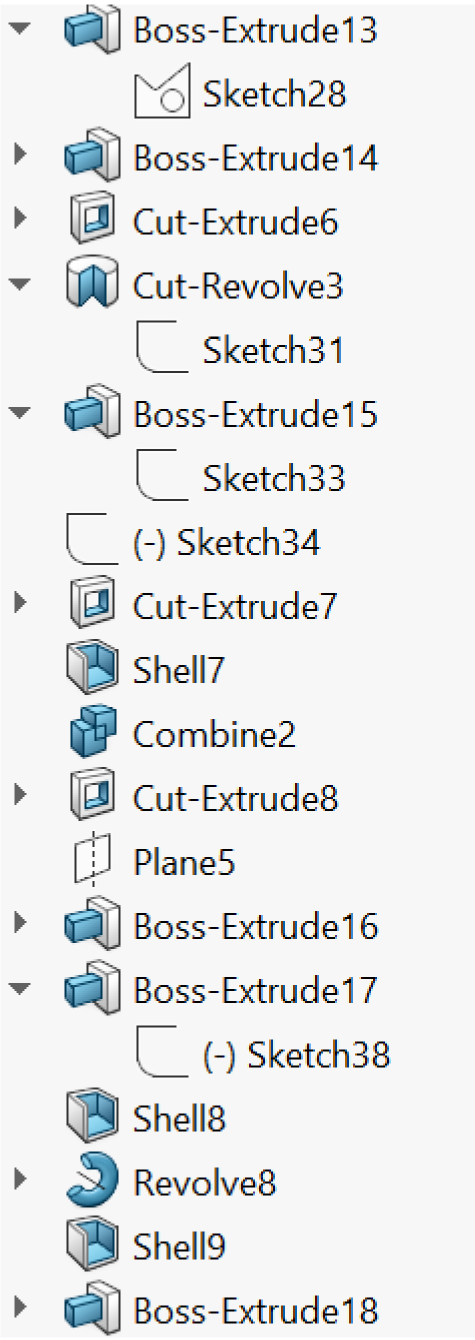
4

Kristen Harrison - k_harrison16@hotmail.com



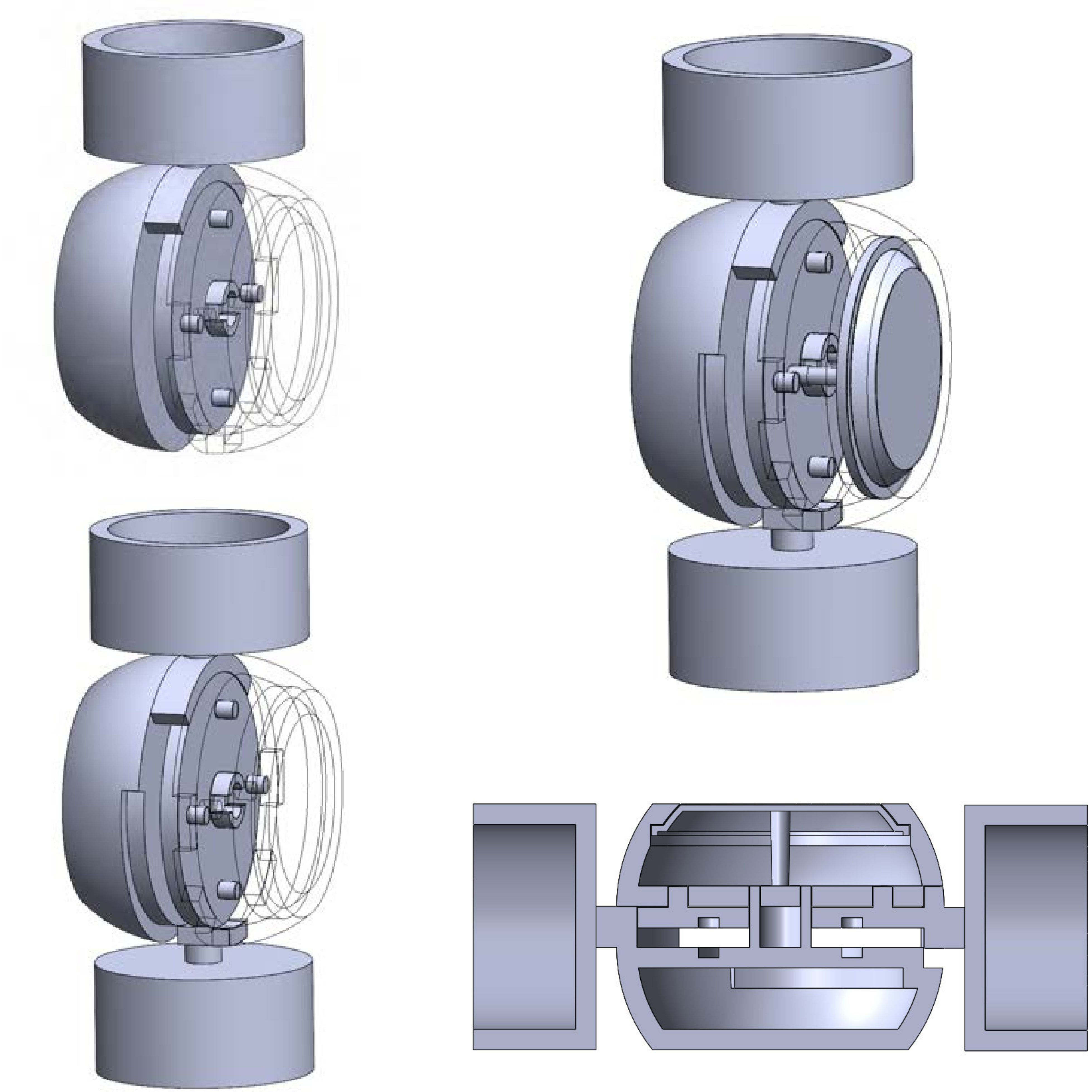


Kristen Harrison - k_harrison16@hotmail.com

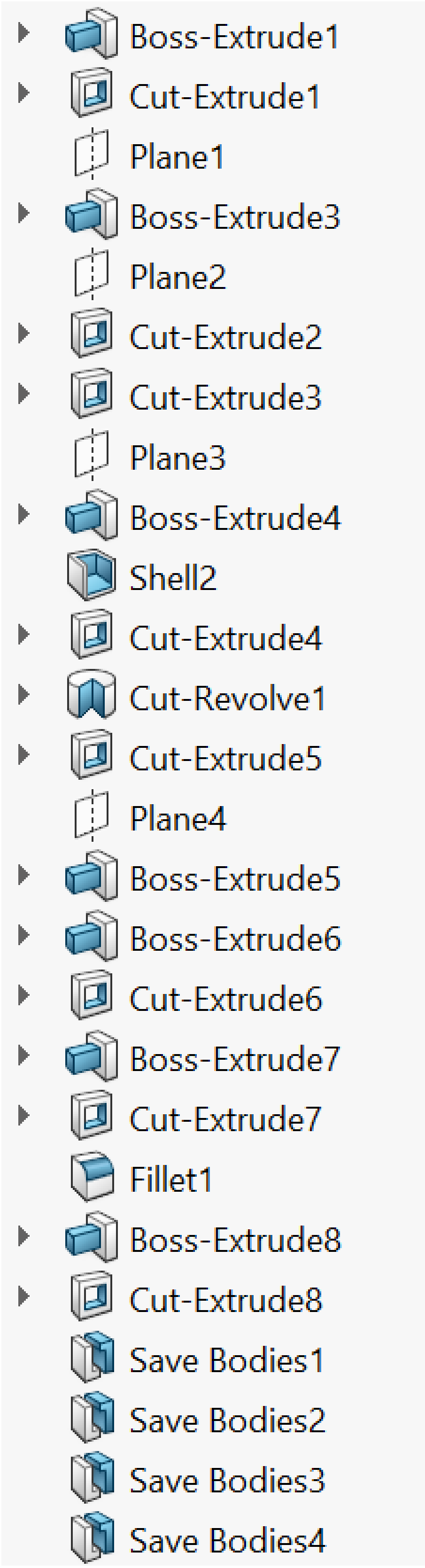


The purpose of this model is to help visualise the current design and 3D print it to test its feasibility and make adjustments where necessary.

When CAD modelling the final design, I will apply manufacturing rules such as material thickness, bosses, and radii more thoroughly. As for now, they are lightly considered as I conduct rapid prototyping.

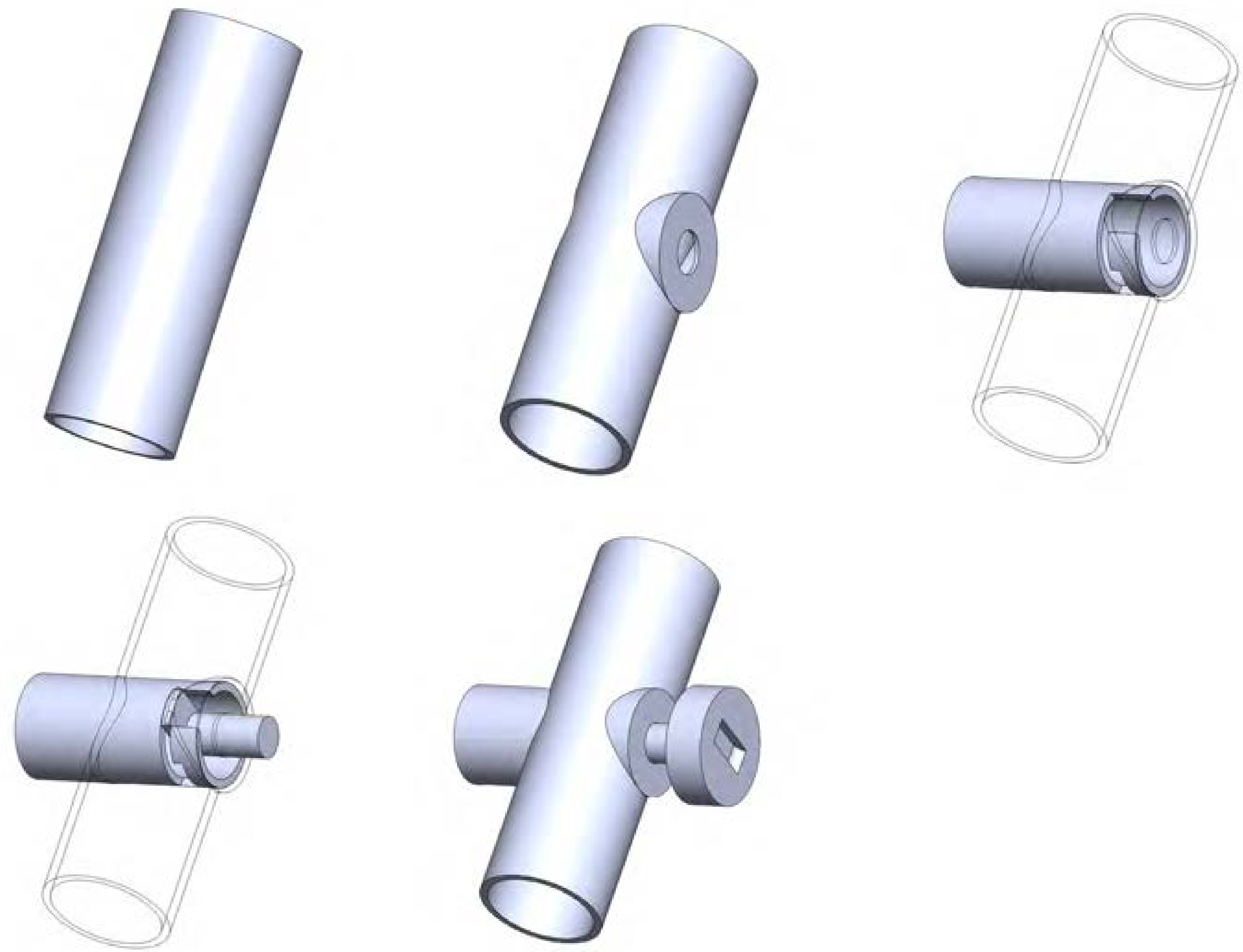


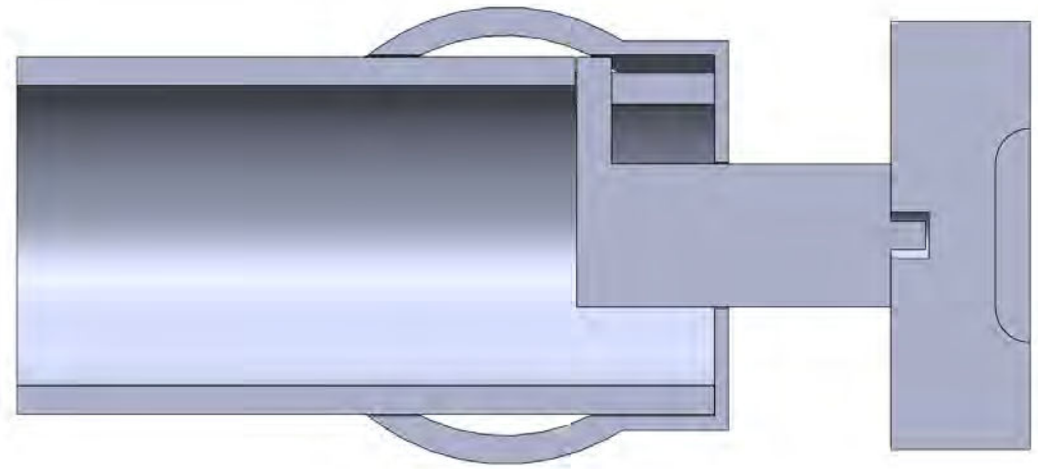
CAD Modelling



The purpose of this model is to help visualise the current design and 3D print it to test its feasibility and make adjustments where necessary.

When CAD modelling the final design, I will apply manufacturing rules such as material thickness, bosses, and radii more thoroughly. As for now, they are lightly considered as I conduct rapid prototyping.



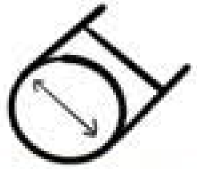


CAD Modelling

Kristen Harrison - k_harrison16@hotmail.com

50mm

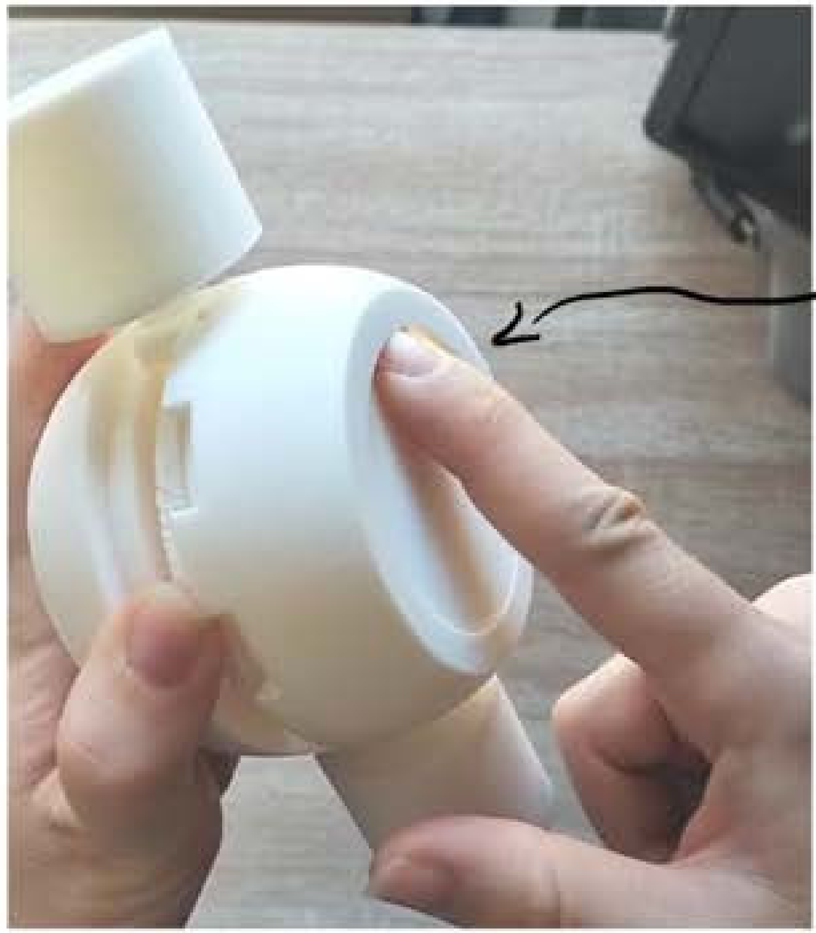
40mm



I went to Bunnings with the intenion of getting a PVC pipe of 50mm diamter to use for prototyping however once I picked it out it was much larger than I was expecting. So I looked at other sizes and found that the 32mm was more appropriate and adjusted the 3D model where applicable.

This is another change I will make in the final design.

Kristen Harrison - k_harrison16@hotmail.com



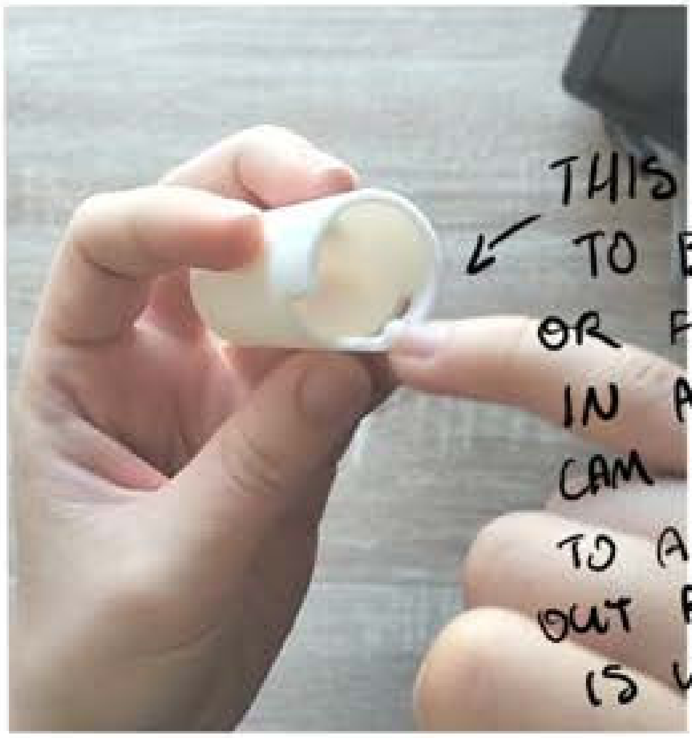
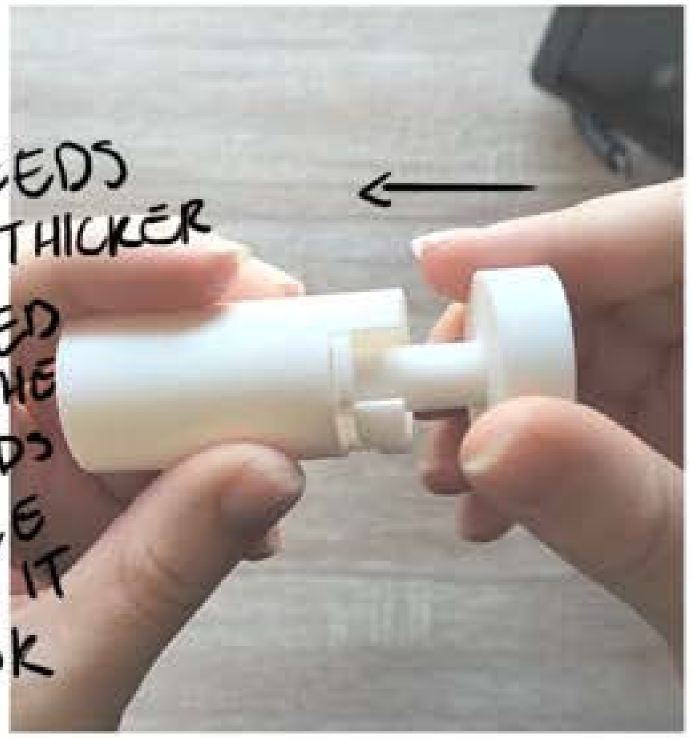
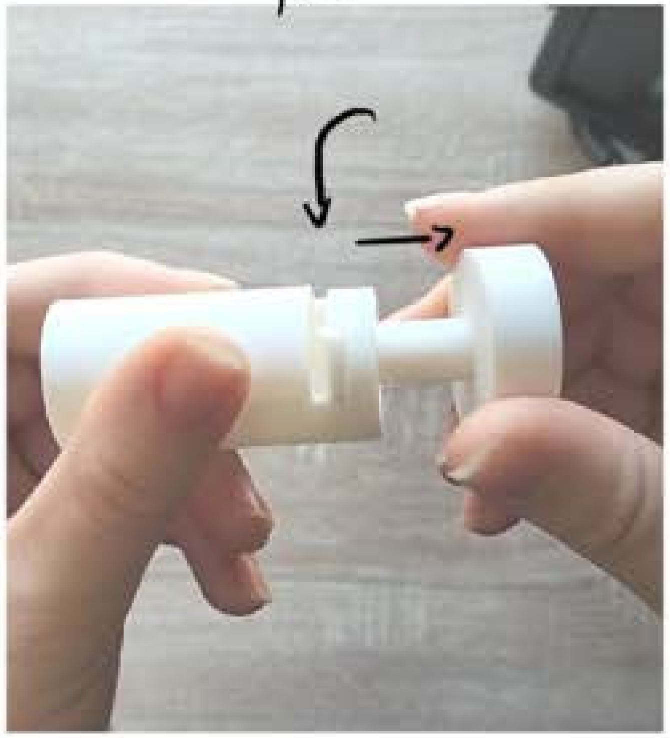
RISK OF LITTLE FINGERS
BEING JAMMED

I REMOVED ONE OF THE
FOUR SUPPORT PINS.

- IMPROVE TOLERANCES
- REDUCE WALL THICKNESS.

Kristen Harrison - k_harrison16@hotmail.com

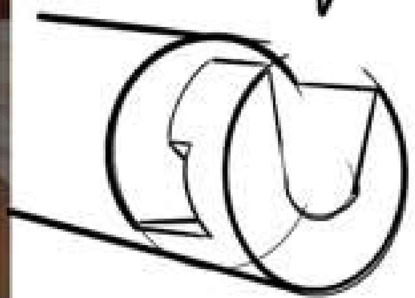
MOVES SUCCESSFULLY

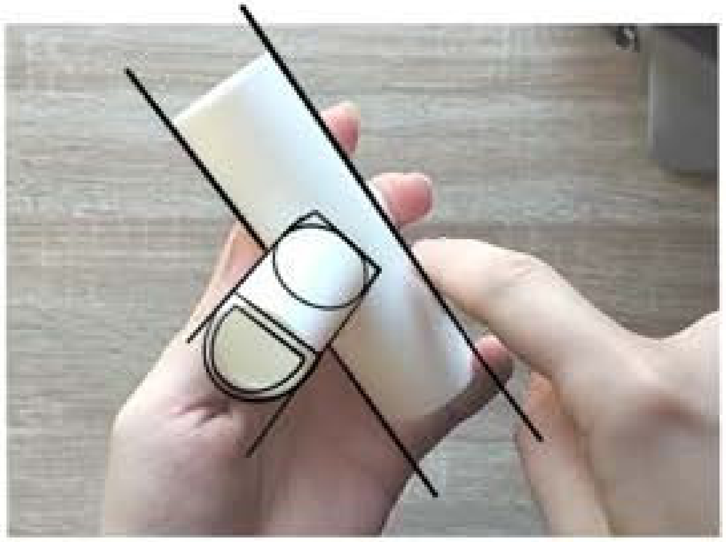





THIS NEEDS TO BE THICKER OR FILLED IN AS THE CAM TENDS TO ANGLE OUT AND IT IS WEAK

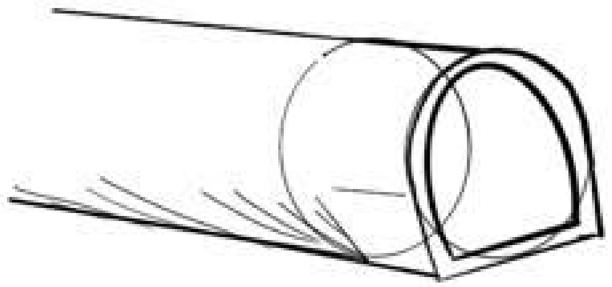
DIFFICULT LINING UP SEAT SUPPORT

MAKE MATERIAL SOLID + CNC CUT 'TRACK' FOR CAM.

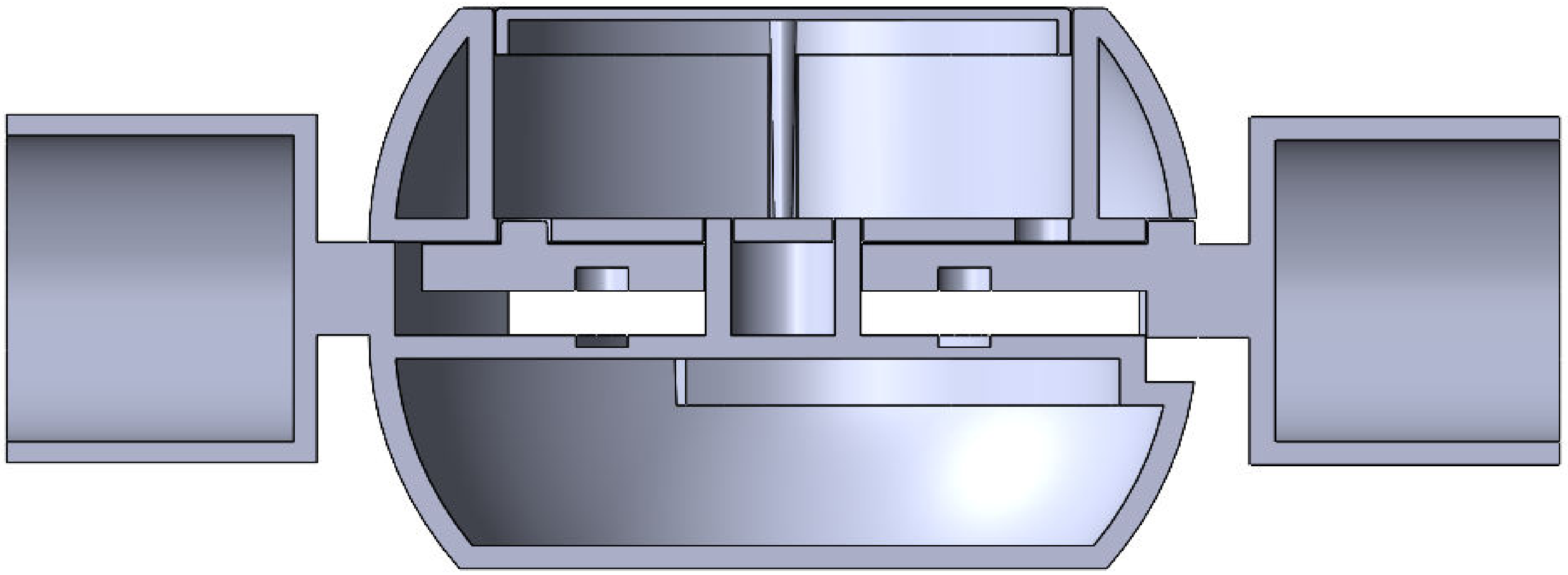




REDESIGN SHAPE TO ALLOW FOR GUARANTEED, CORRECT PLACEMENT.

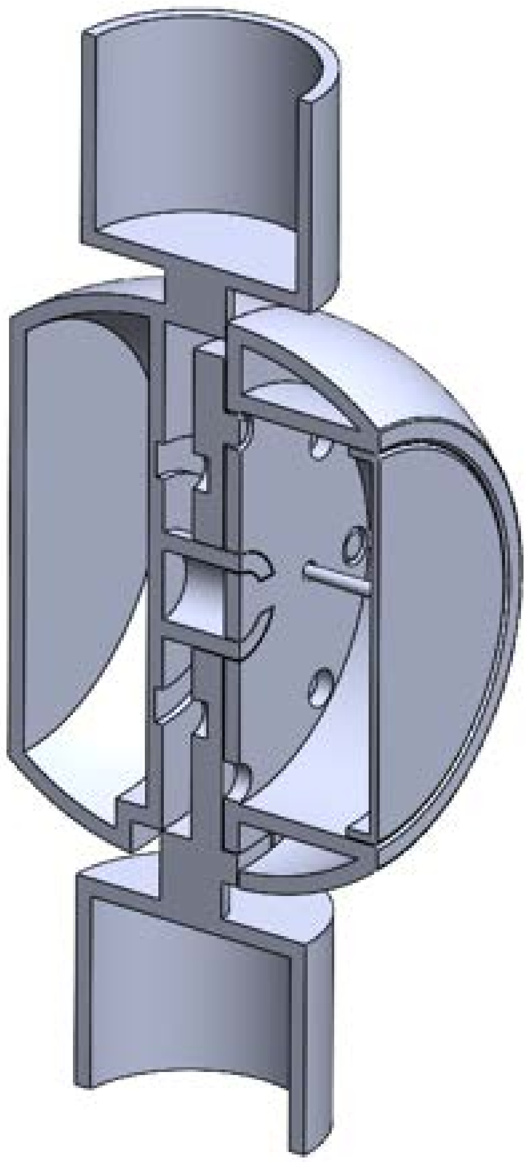


Kristen Harrison - k_harrison16@hotmail.com

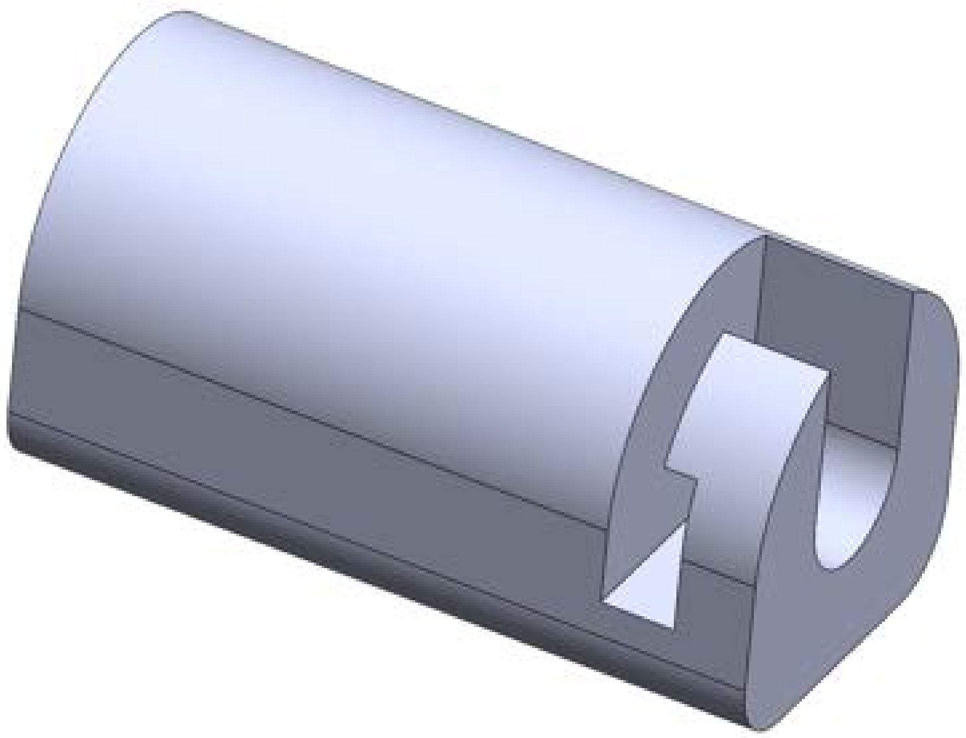


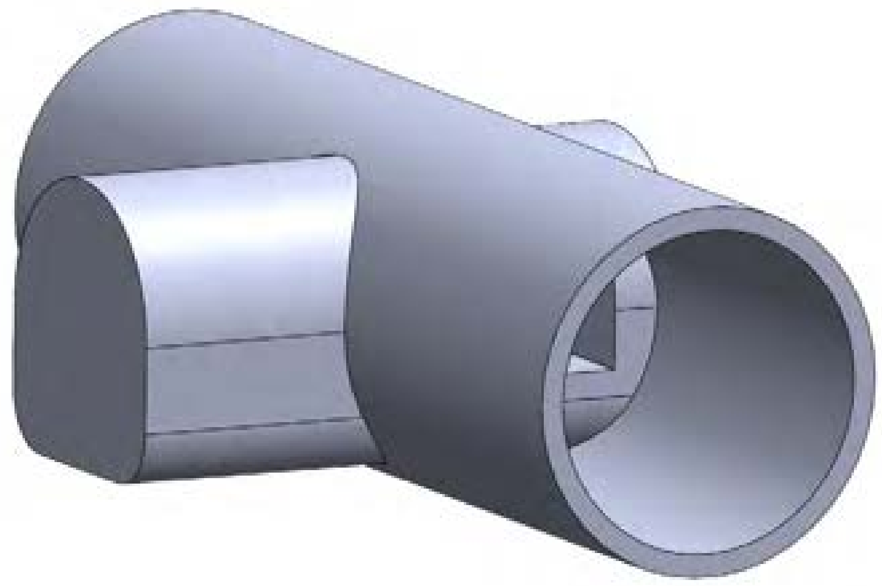
Changes made to the model include:

- Reducing wall thickness from 5mm to 2.5mm
- Improved tolerances
- Remove one support pin on the rotating disk
- Adjust how the button fits with the case.



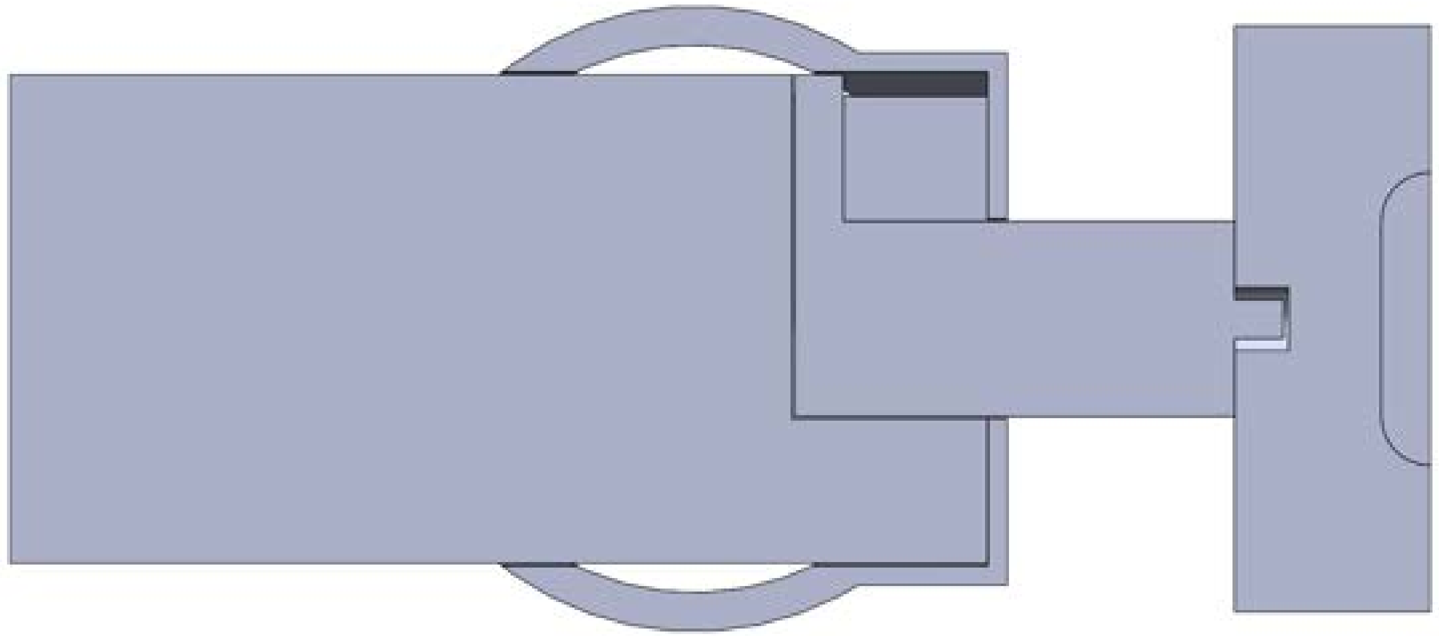
Kristen Harrison - k_harrison16@hotmail.com





Changes made to the model include:

- Adjusting the shape of the seat support and the cavity it slots into
- The seat support has been redesigned in terms of how it may be manufactured, removing less material so that it is stronger.



Kristen Harrison - k_harrison16@hotmail.com

11

6th - 12th Oct.

WEEK ELEVEN

Goals:

- Gather feedback from tutors
- Begin finalising CAD modelling
- Continue prototyping

To get an idea of the size of the shapes, I used the 4 year old model and cardboard profile cut outs. The shapes were within 400mm x 400mm.

Placing the model against the shapes showed they were a lot bigger than they needed to be. More testing will be conducted to find a more ideal size.

The overall dimensions were reduced by 50mm, making the shapes at largest 350mm x 350mm.

This is a much more realistic size for the seats without making them too small that they can't be used in the playful way.

Next step is to CAD model them.

Prototype 2 is mostly successful however the cam itself doesn't stay upright. To accomodate for this, the CAD model will be changed to have a recess that the cam fits into when not in use.

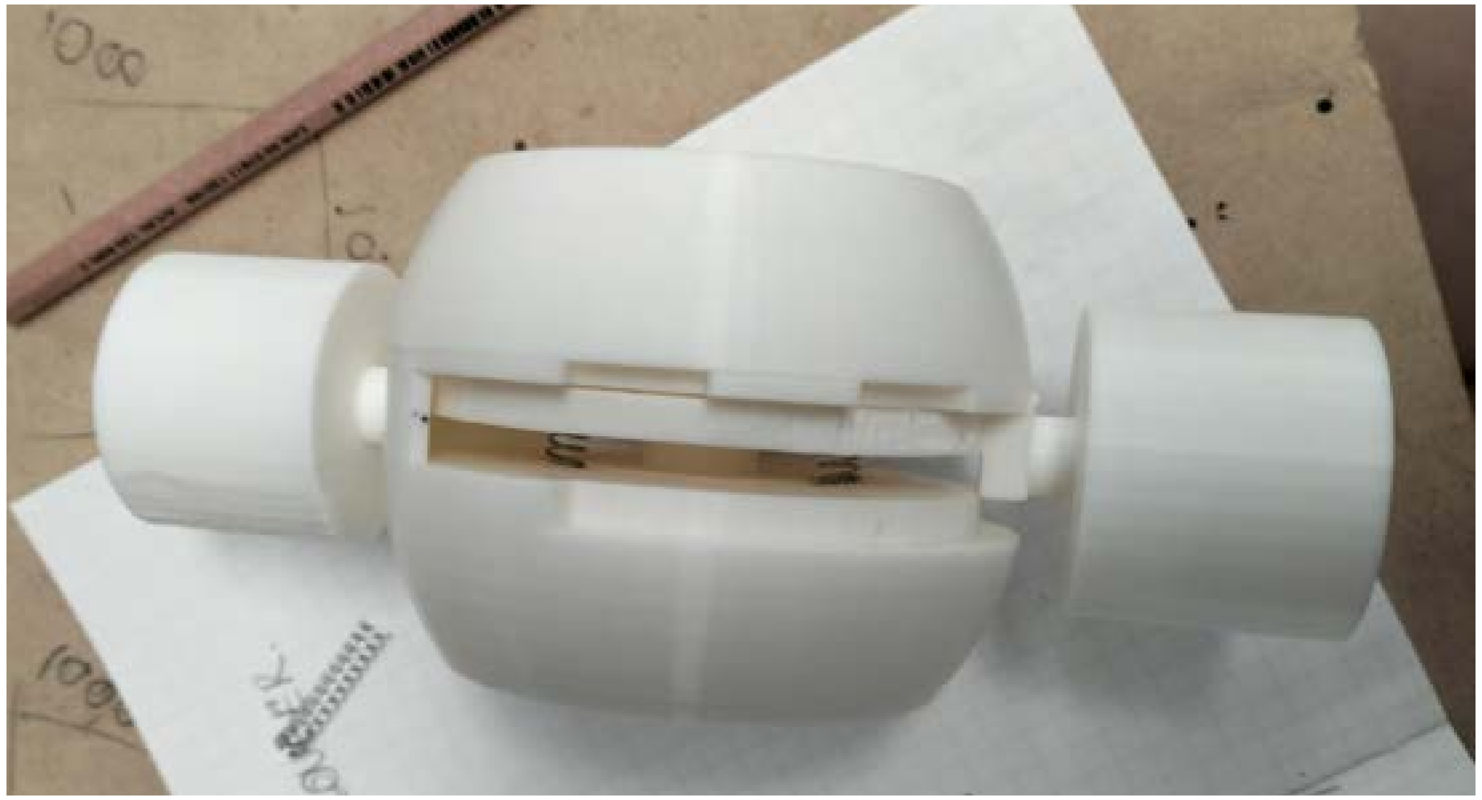
Otherwise the seat support slots in the right way up without it twisting.

Kristen Harrison - k_harrison16@hotmail.com

This test was a success in terms of wall thickness and improved spring application however there are some weak points.

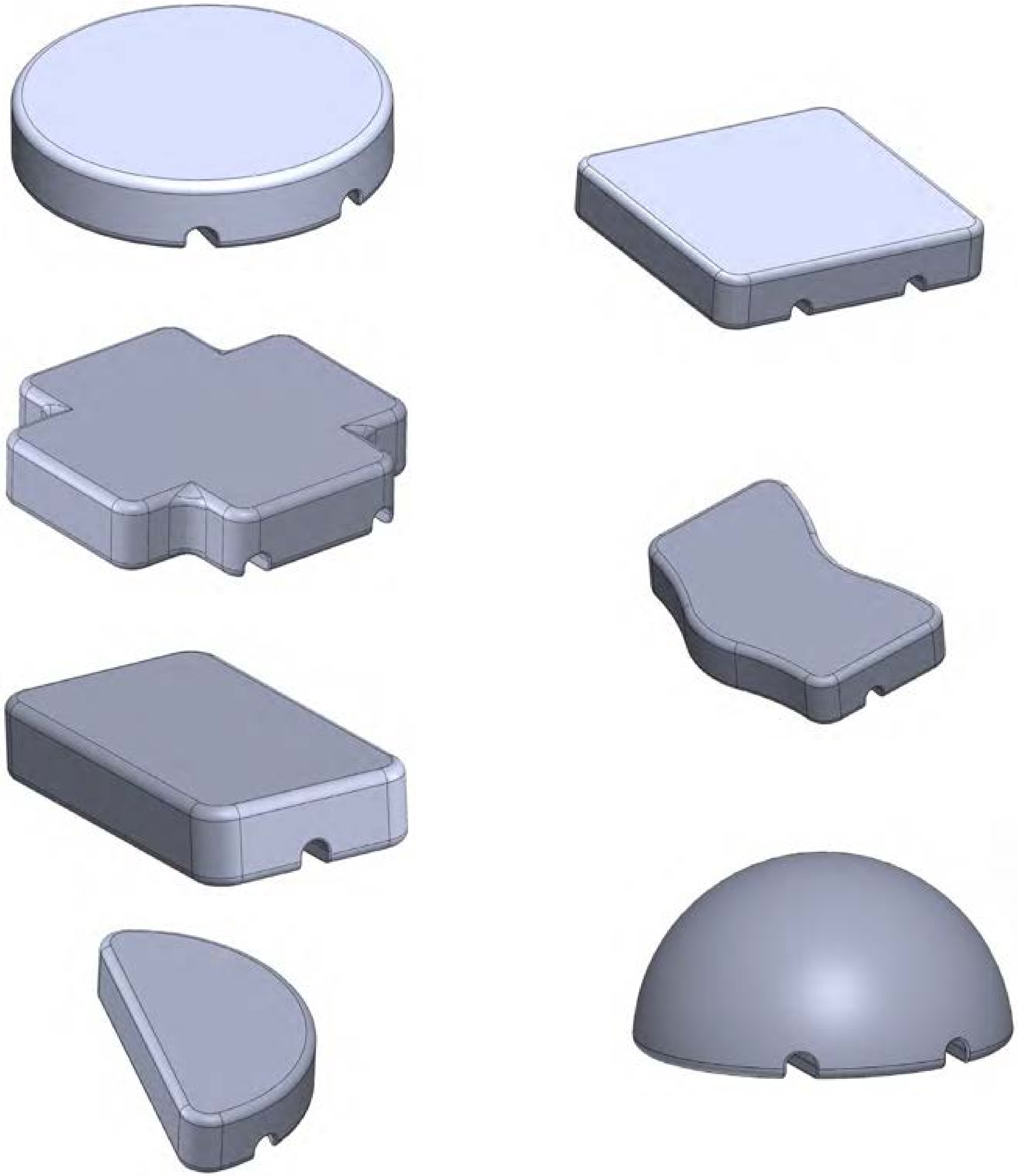
The pushers in the button were every weak and broke after a few pushes. Additionally, the track the button runs down to prevent it from falling out pivots and is unstable.

To improve this, I will set it to 3 pushers and tracks for stability.



Kristen Harrison - k_harrison16@hotmail.com

CAD modelling the shapes helped visualise the size and proportions. The depth of the shapes is currently 70mm. Upon review, I will finalise the measurements of the legs and adjust the depth.



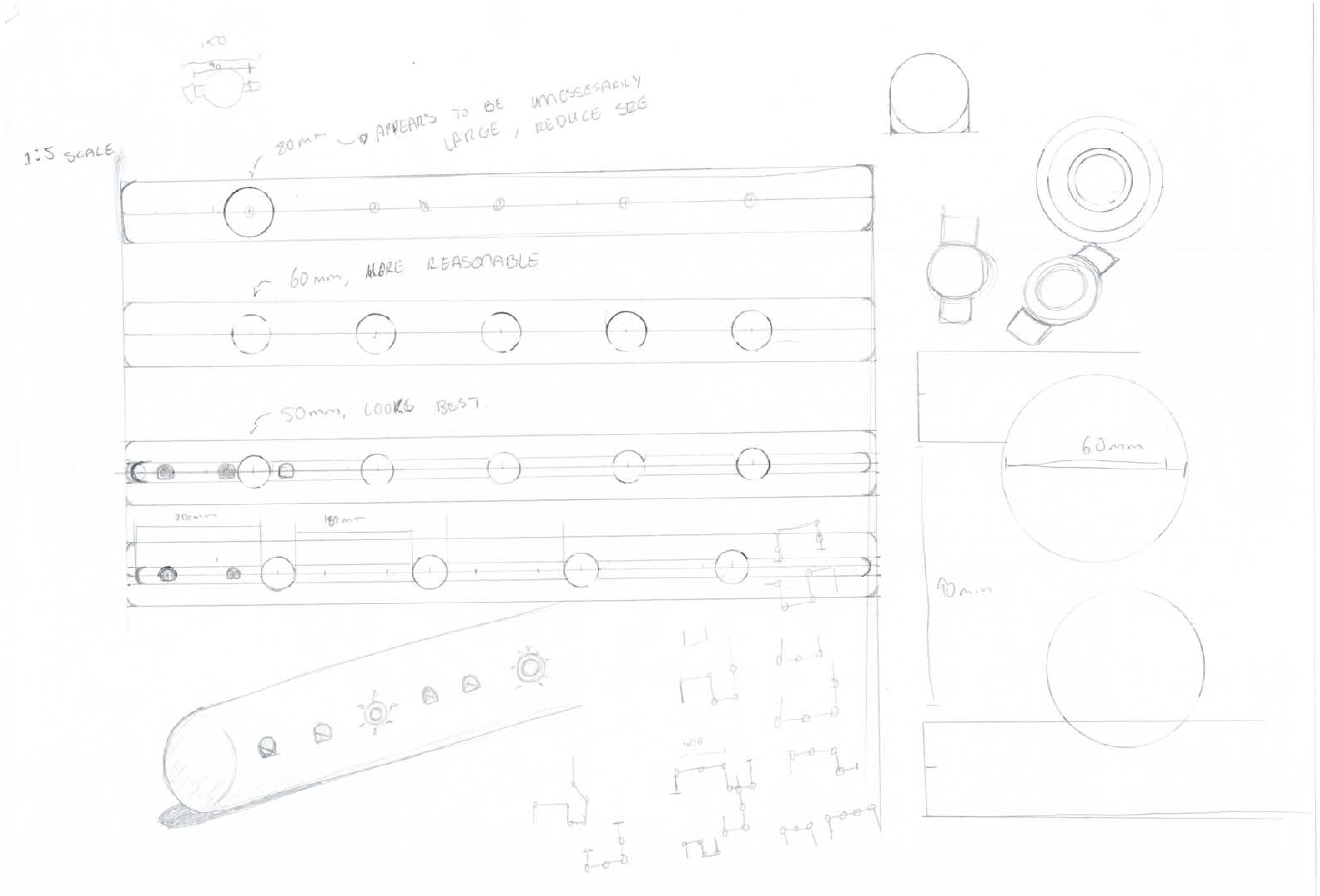
CAD modelling

The recess was successful however it should be more prominent than what it currently is.

This model was a good indication of the stability that 3 pushers provides however it must be done with the right springs. As of right now there is a lot of resistance which can make it difficult for the children users to engage with.

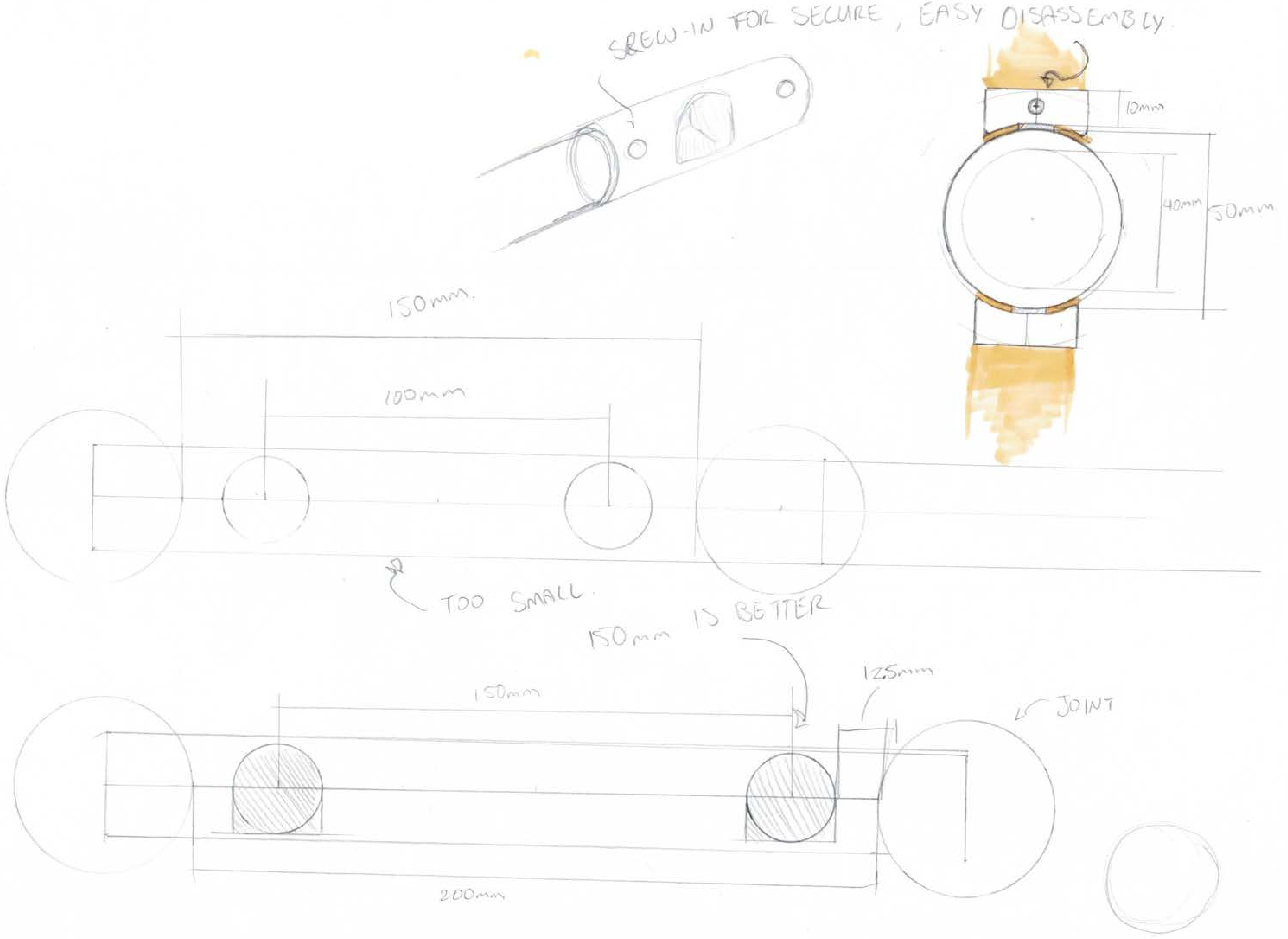
From here final touches that are relavent to manufacturability will be applied as well as realistic measurements.

Kristen Harrison - k_harrison16@hotmail.com

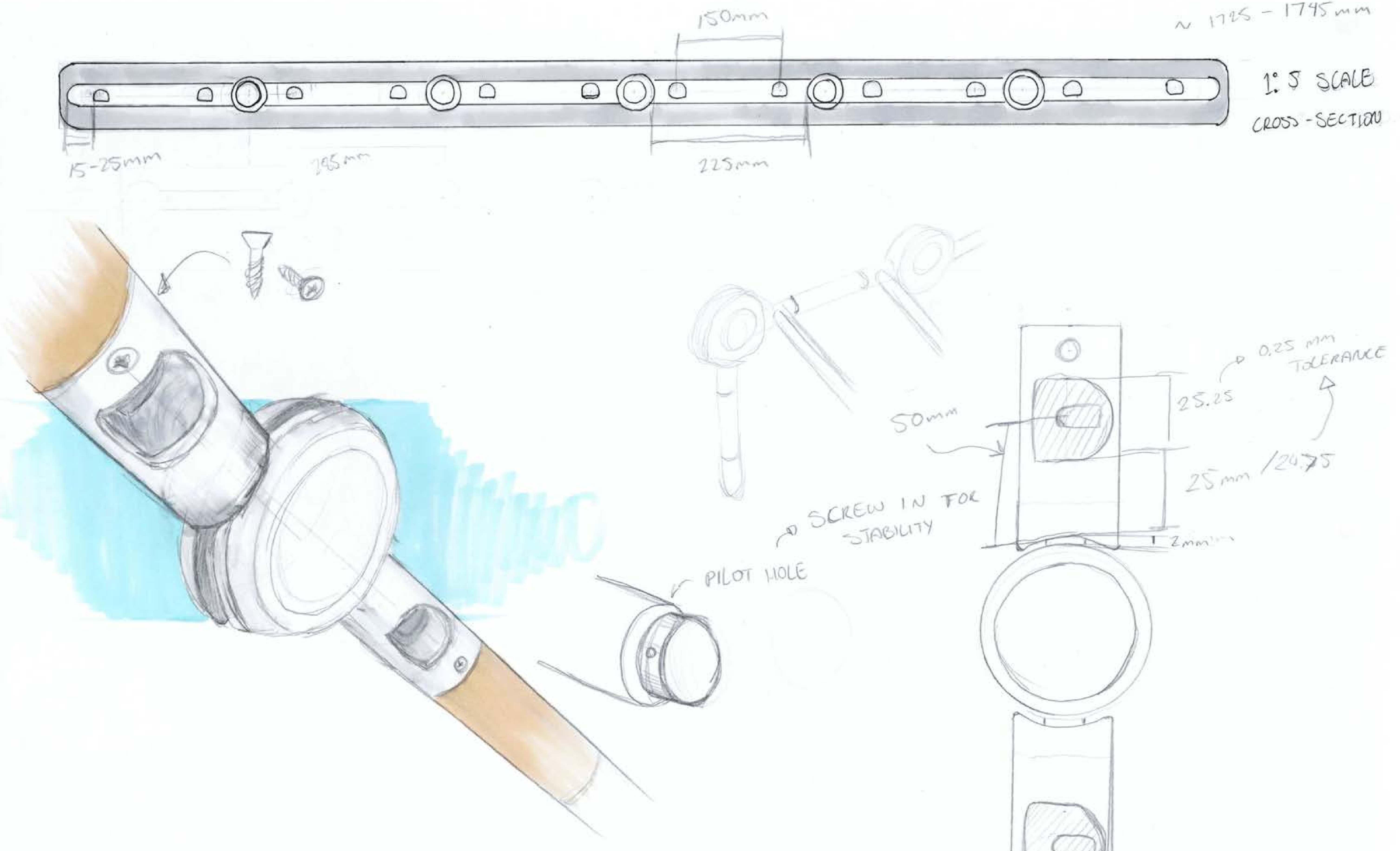


Dimensioning

Kristen Harrison - k_harrison16@hotmail.com



Dimensioning



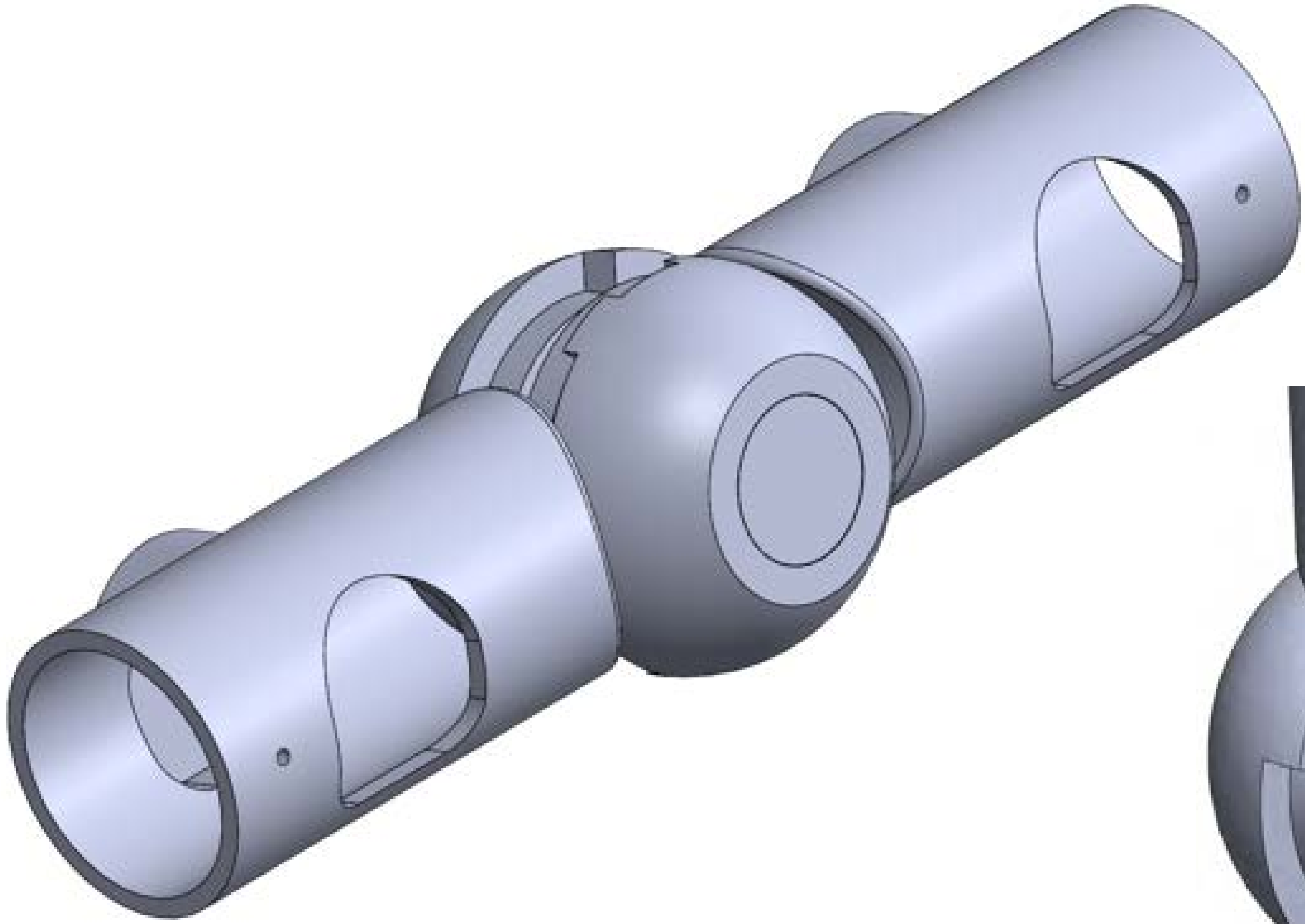
Dimensioning

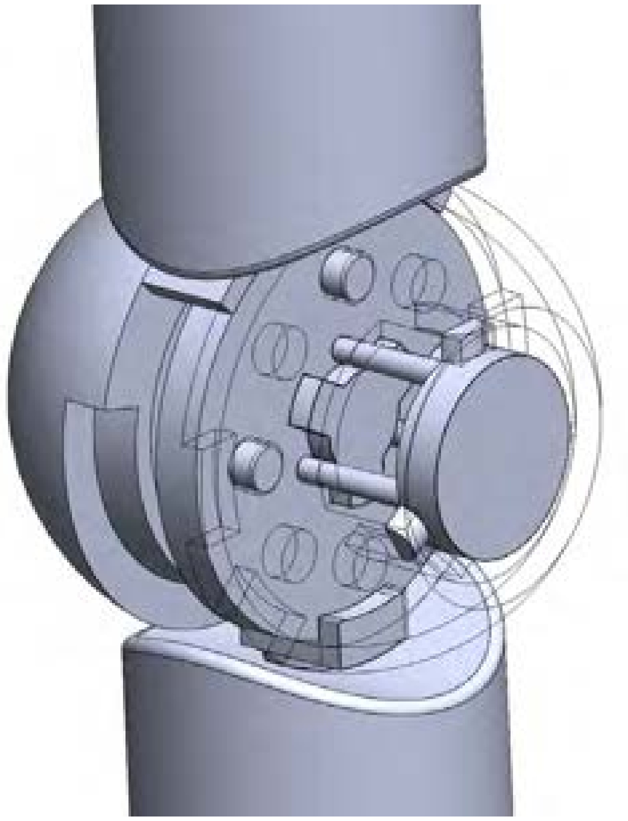
Kristen Harrison - k_harrison16@hotmail.com

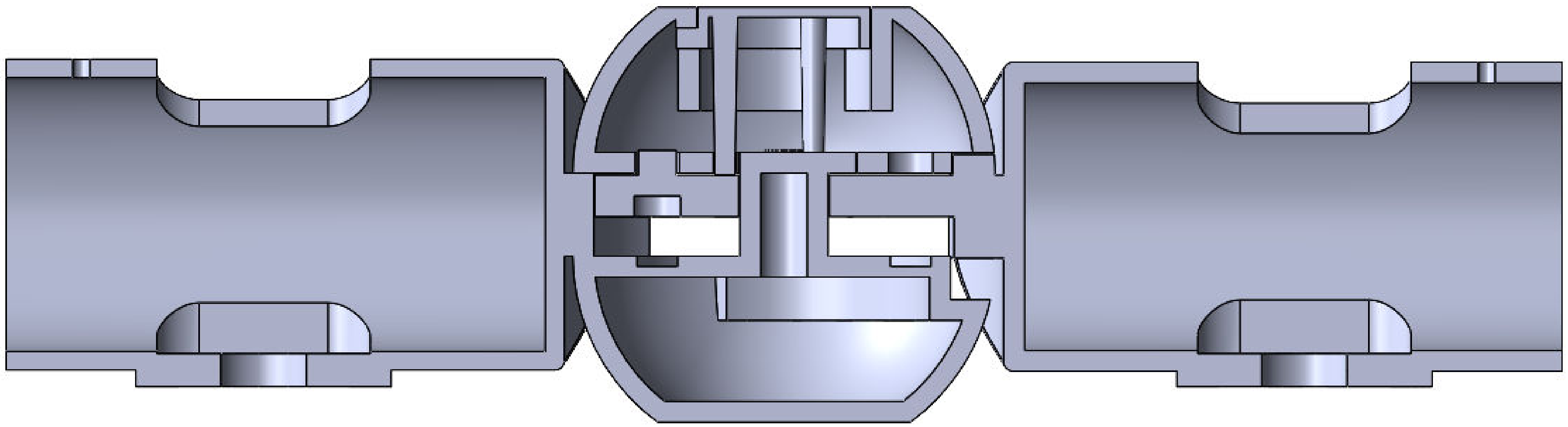
CAD modelling

The CAD model has been adjusted. The overall dimensions have been reduced and the two concepts have been combined to reflect how it would be in the final product.

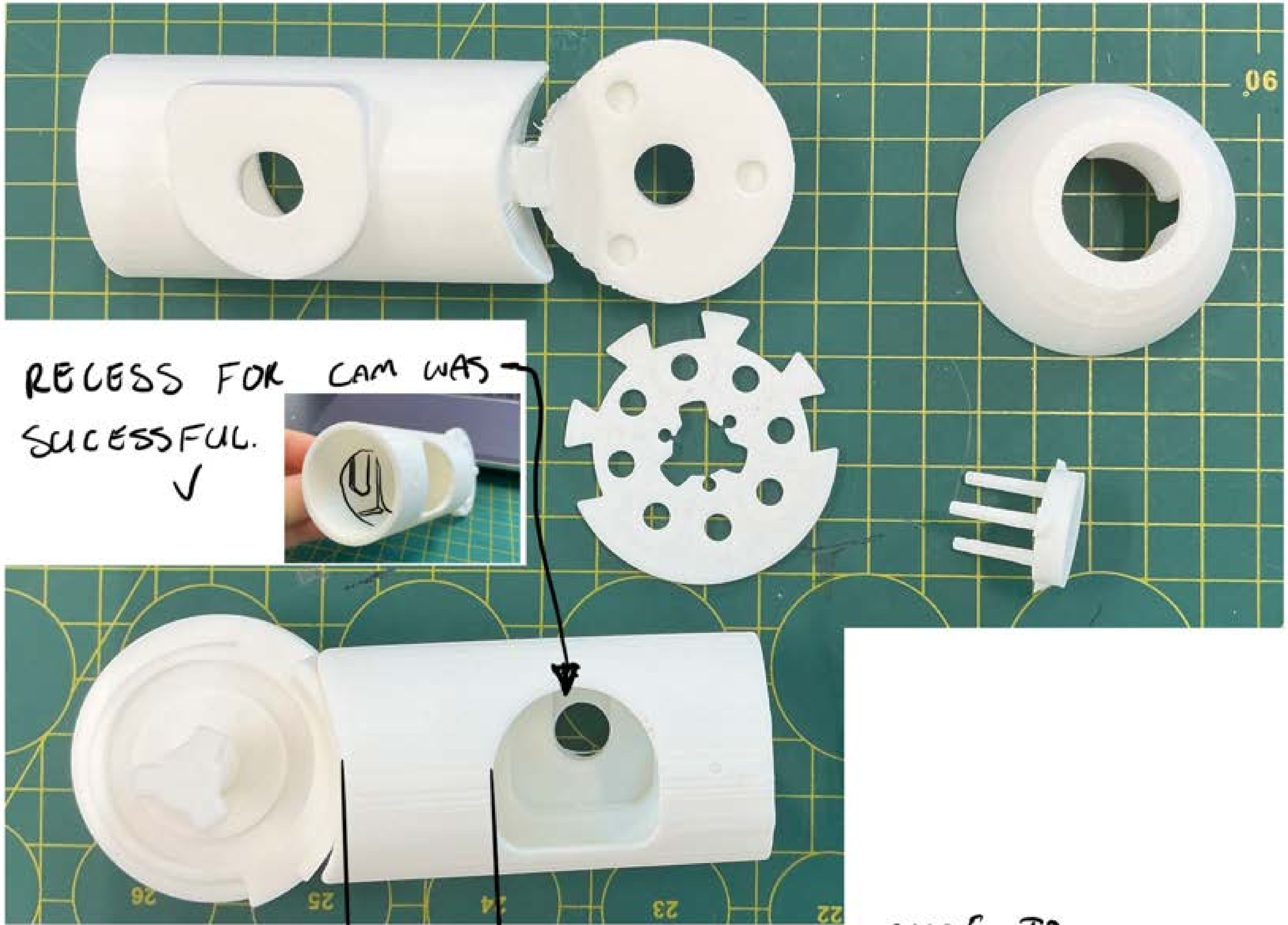
This will be sent to 3D print, hopefully for the last time.







OVERALL FORM WORKS HOWEVER THE SCALE IS WAY TOO SMALL.



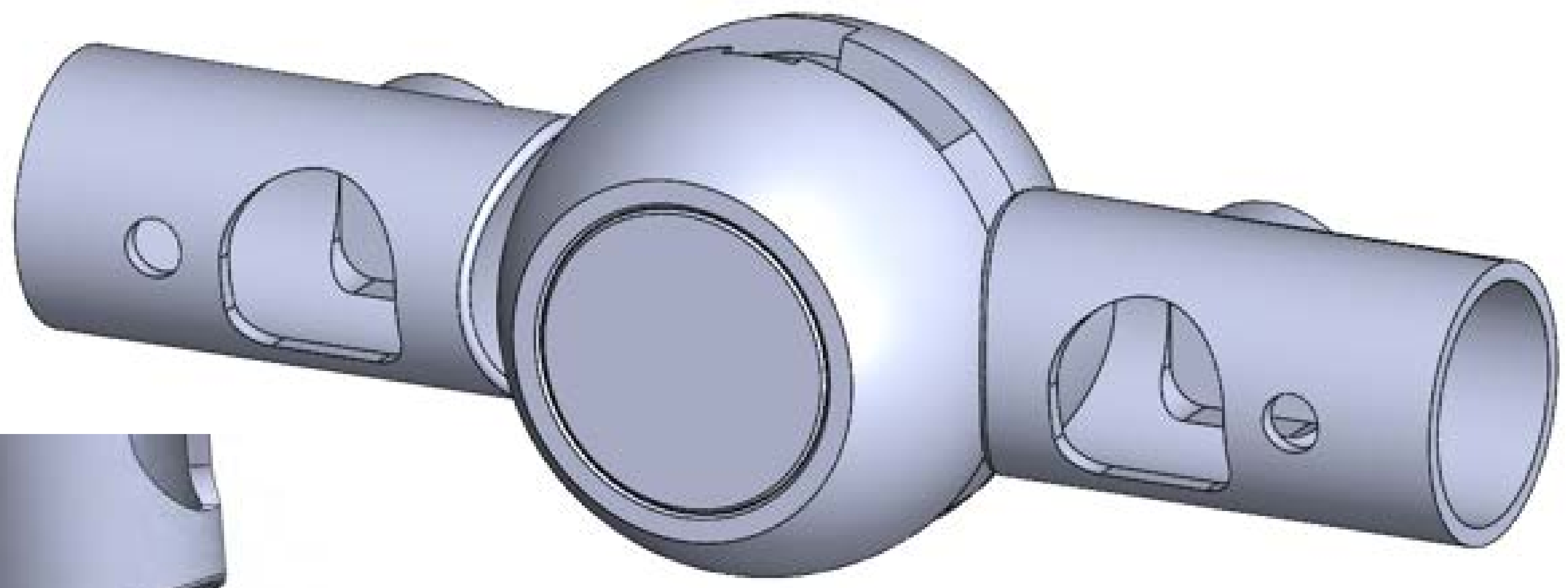
RECESS FOR CAM WAS SUCESSFUL. ✓

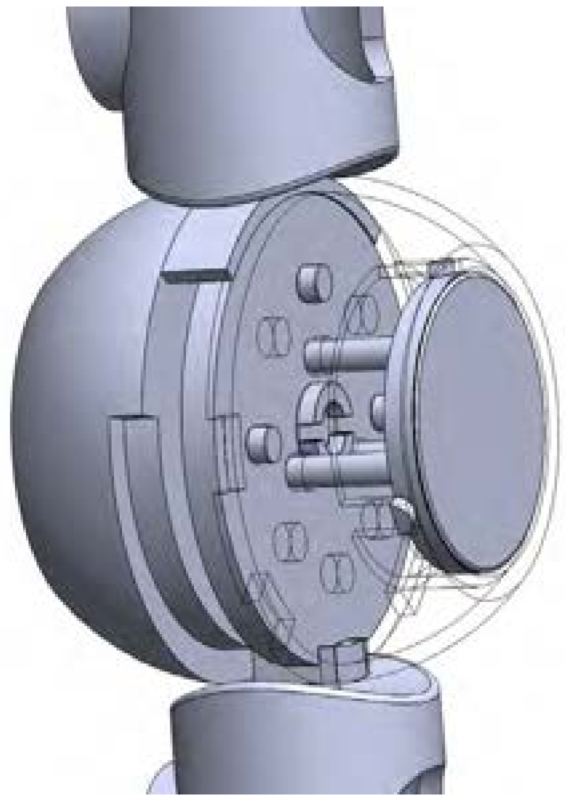
REDUCE THIS DISTANCE TO ALLOW FOR A LARGER MECHANISM.

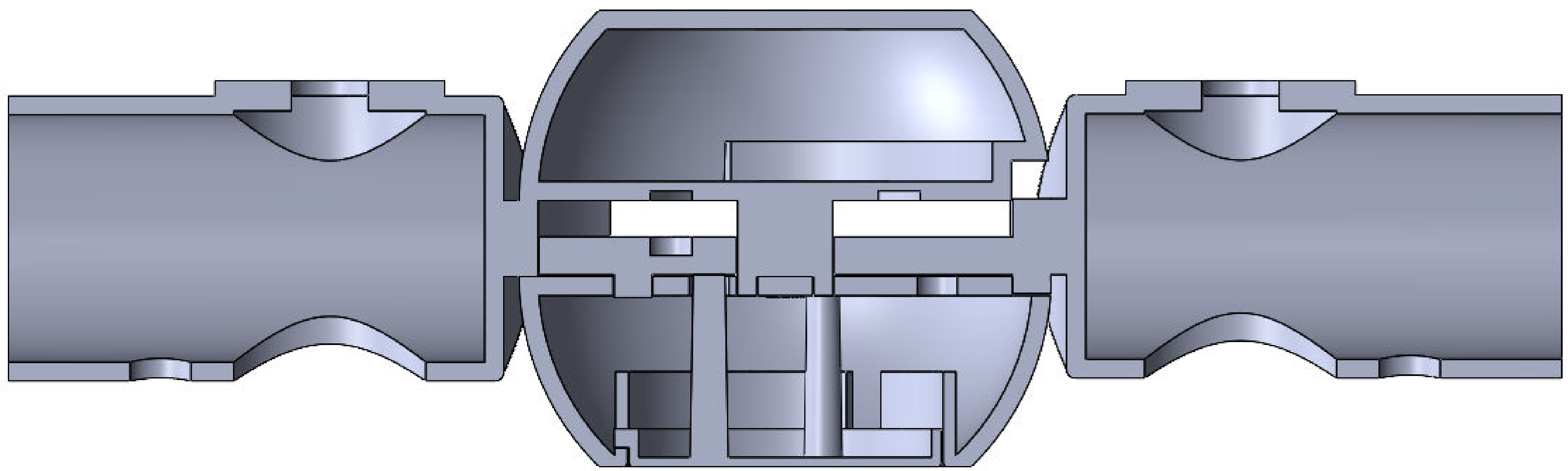
Kristen Harrison - k_harrison16@hotmail.com

The CAD model has been adjusted. The overall dimensions have been adjusted to a more realistic size without reducing the distance between the seat support slots.

Hopefully after this test I can move onto the next stage and finalise the CAD.







Kristen Harrison - k_harrison16@hotmail.com

12

13th - 19th Oct.

WEEK TWELVE

Goals:

- Finalise CAD modelling
- Start manufacturing report
- Start creating final presentation
- Complete tech drawings

This final print is a great success. The mechanisms are working smoothly and as inteneded. From here, I will figure out how the foam may be attached to the frame, complete CAD work and move onto tech drawings, BOM, rendering and other finalising steps.

Kristen Harrison - k_harrison16@hotmail.com

To tackle the foam leg problem, I spoke to a seamstress about my design and intensions. She confirmed that the pivot will be an issue.

We talked about how the manufacturer might approach this and came to the conclusion that they would have a pattern cut into the foam which would be in 2 separate parts, one for the pivot mechanism and one for the arms. These would be glued to their respective components as well as the fabric cover. Due to the complicated form and recesses, designing the cover to be removable would not be realistic or viable so instead it will be glued onto the foam using a stretchy fabric with pleats for the pivot mechanism.

As much as I wanted to make this component as disassemblable as possible for sustainability and repairability, it will overcomplicate and increase the cost. Moving forward I will find a material for the cover that has the characteristics I am looking for and is easy to clean by wiping off dirt.

THE BIGGEST CONCERN I HAVE IS HOW THE MATERIAL ACTS WHEN THE PIVOT MECHANISM IS USED

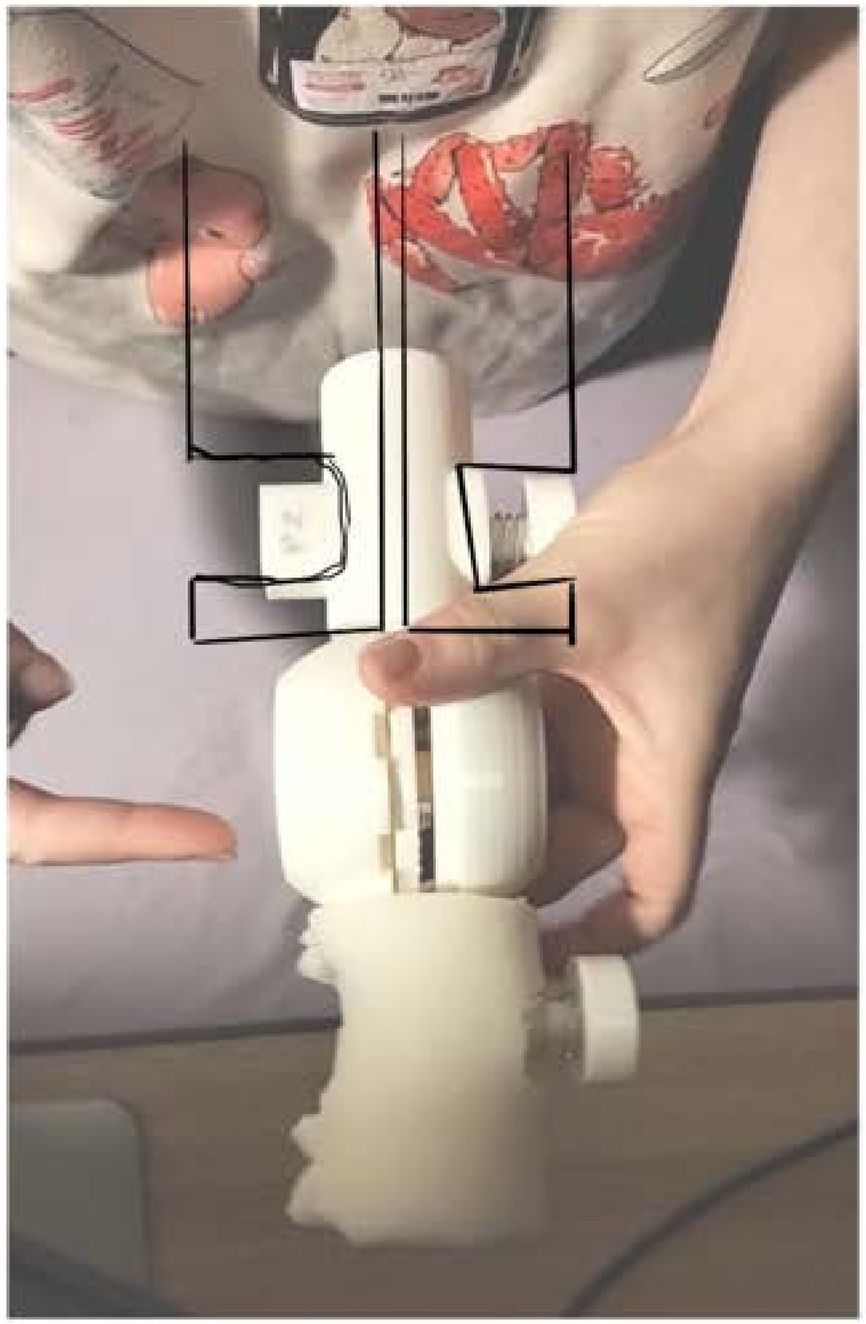
SQUISH

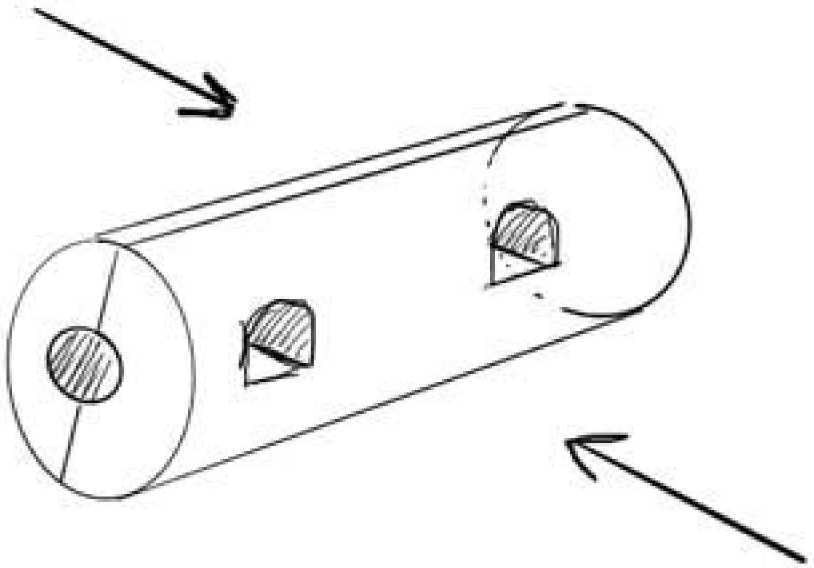
STRETCH

CAN'T COVER THE TRACK OTHERWISE IT WON'T FUNCTION.

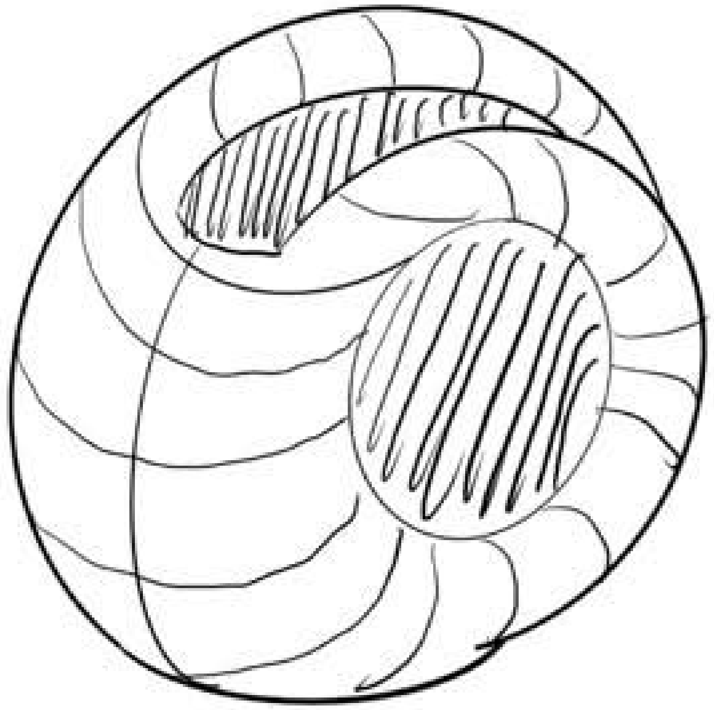
Kristen Harrison - k_harrison16@hotmail.com

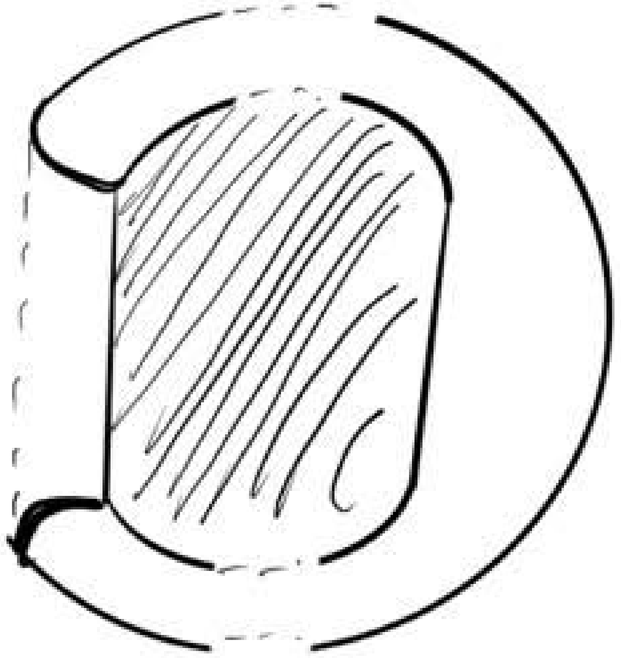
THE FOAM COVER WOULD BE IN TWO HALVES, COMING IN FROM THE SIDES SIMILAR TO INJECTION MOULD

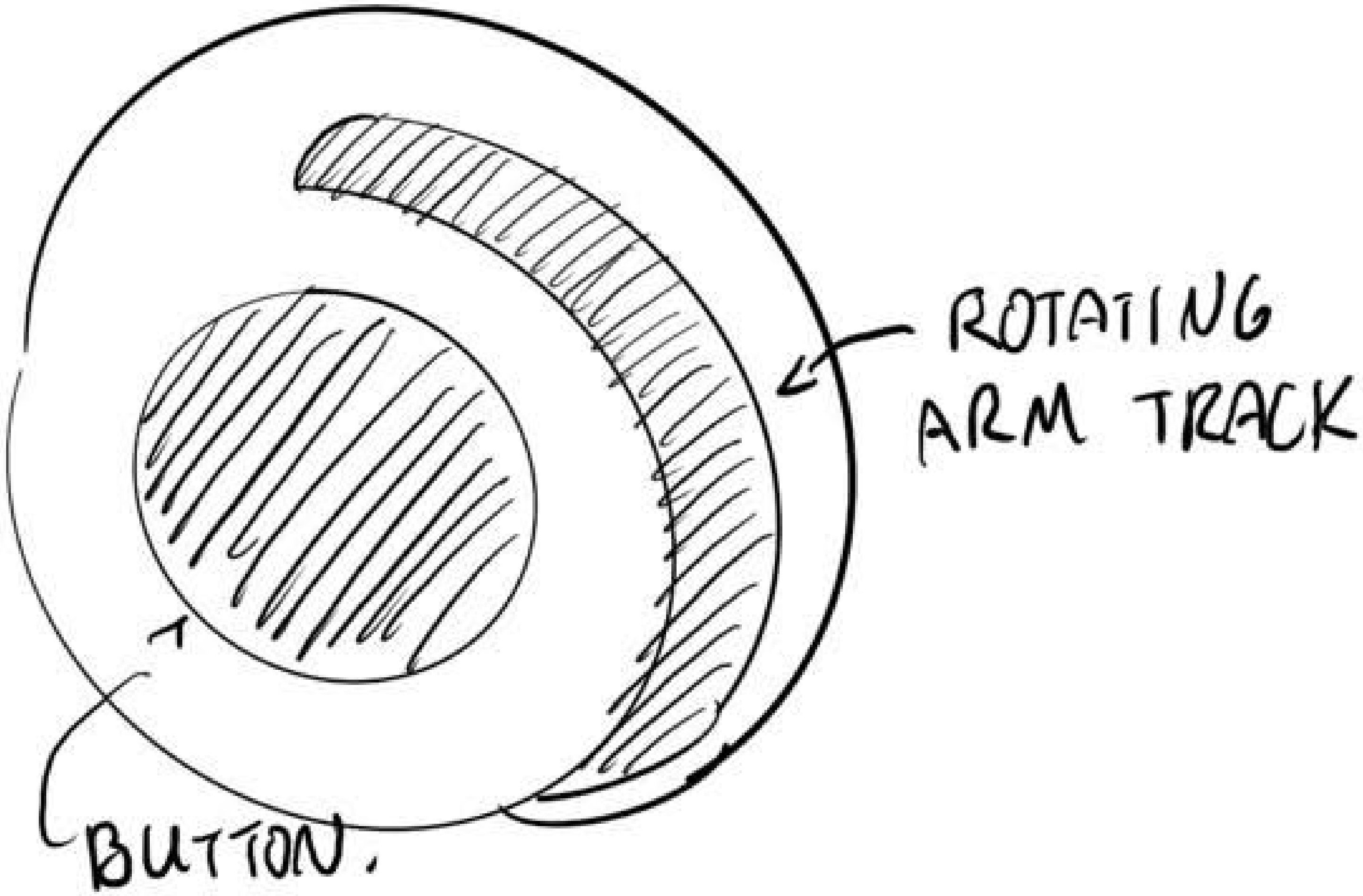




Kristen Harrison - k_harrison16@hotmail.com





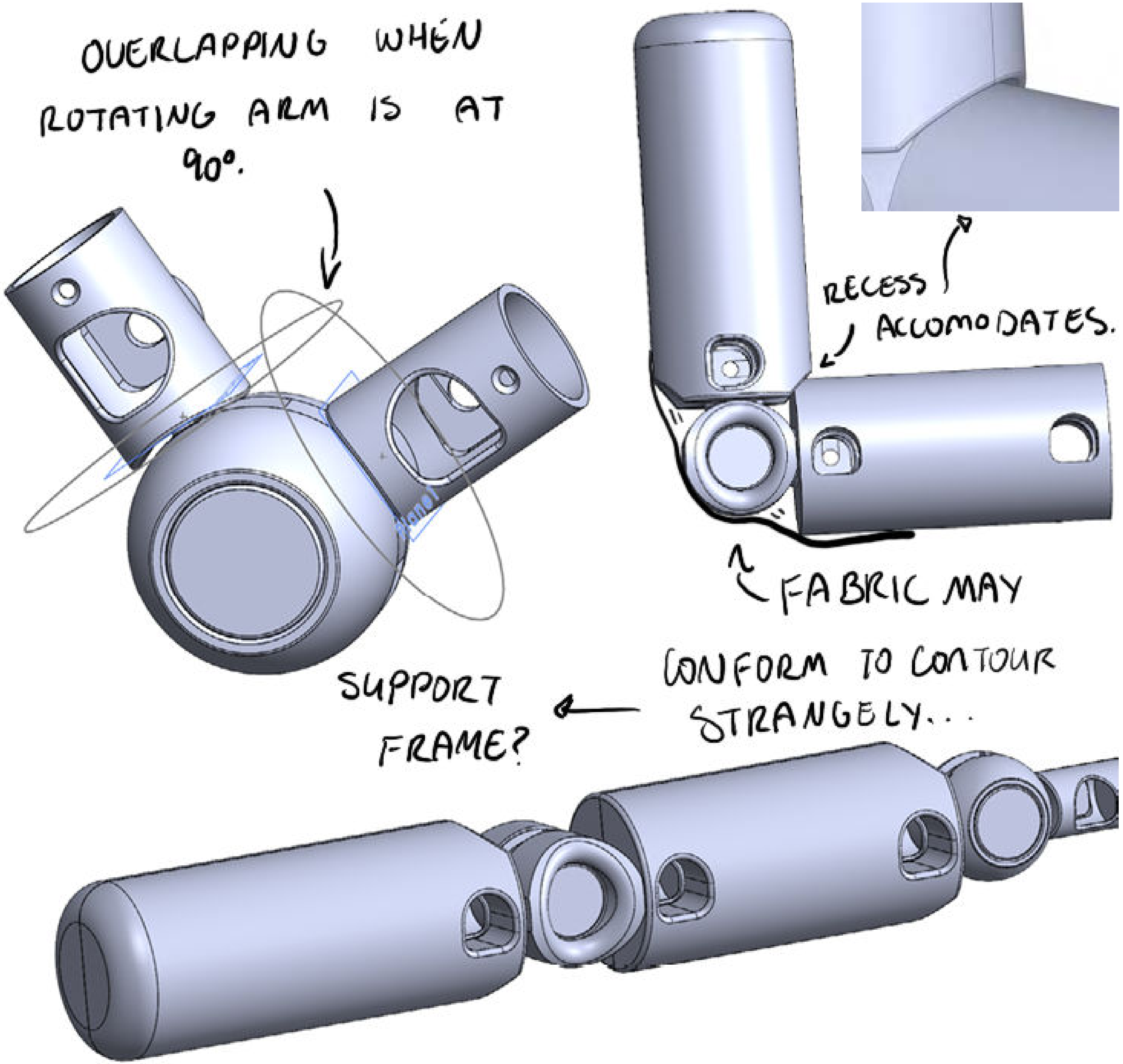


Kristen Harrison - k_harrison16@hotmail.com

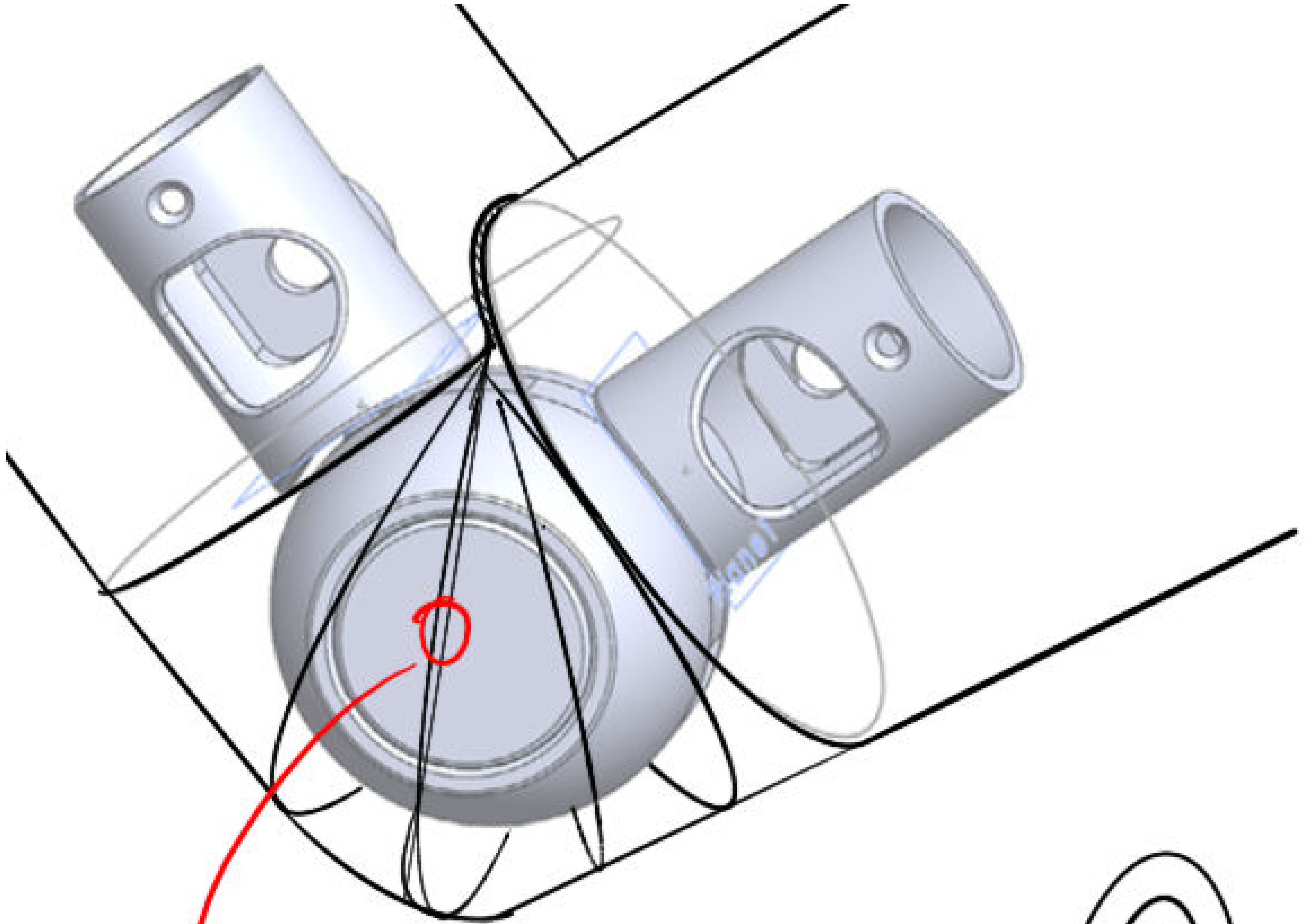
CAD modelling how the foam would have to be placed and shaped to allow for movement resulted in the model to the right. Accomodations had to be made for when the mechanism is at a right angle as the foam would intersect and allowing for the rotation to happen in the first place.

This has created a slight problem however in the structure of the tube over the pivot joint as shown to the right. This could throw off the aesthetic in the final model.

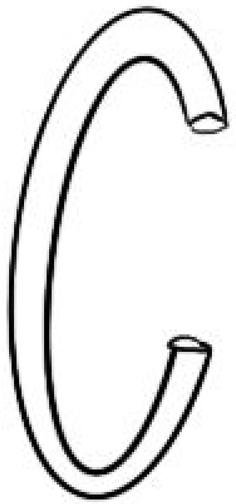
Moving forward, I will do some sketching and prototyping to solve the problem. Perhaps a frame that extends with the joint will solve the problem.

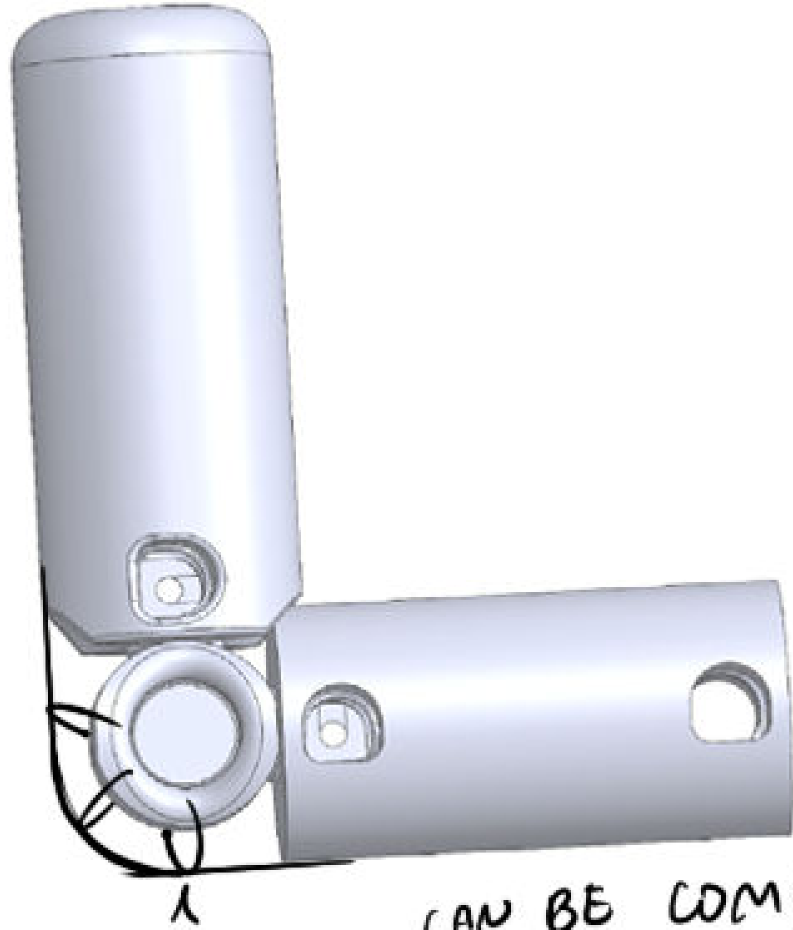


CAD modelling



NEEDS TO PIVOT HERE AS IT WILL BE MIRRORED

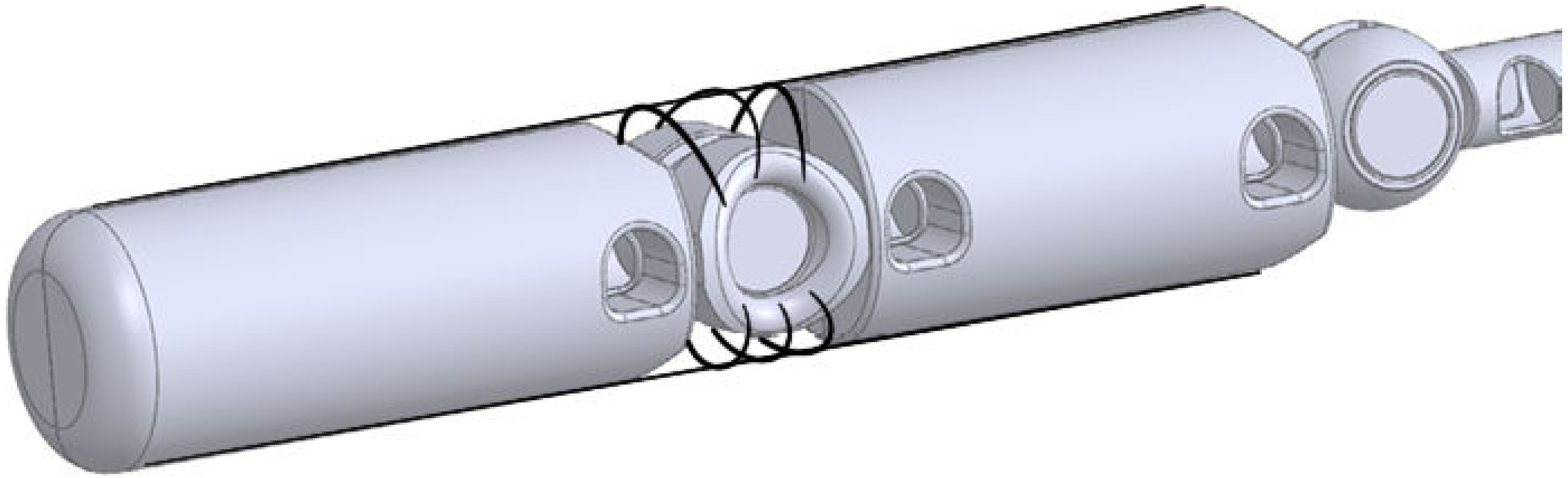




TUBES

CAN BE COMPRESSED

OR FOAM DISKS?



Kristen Harrison - k_harrison16@hotmail.com

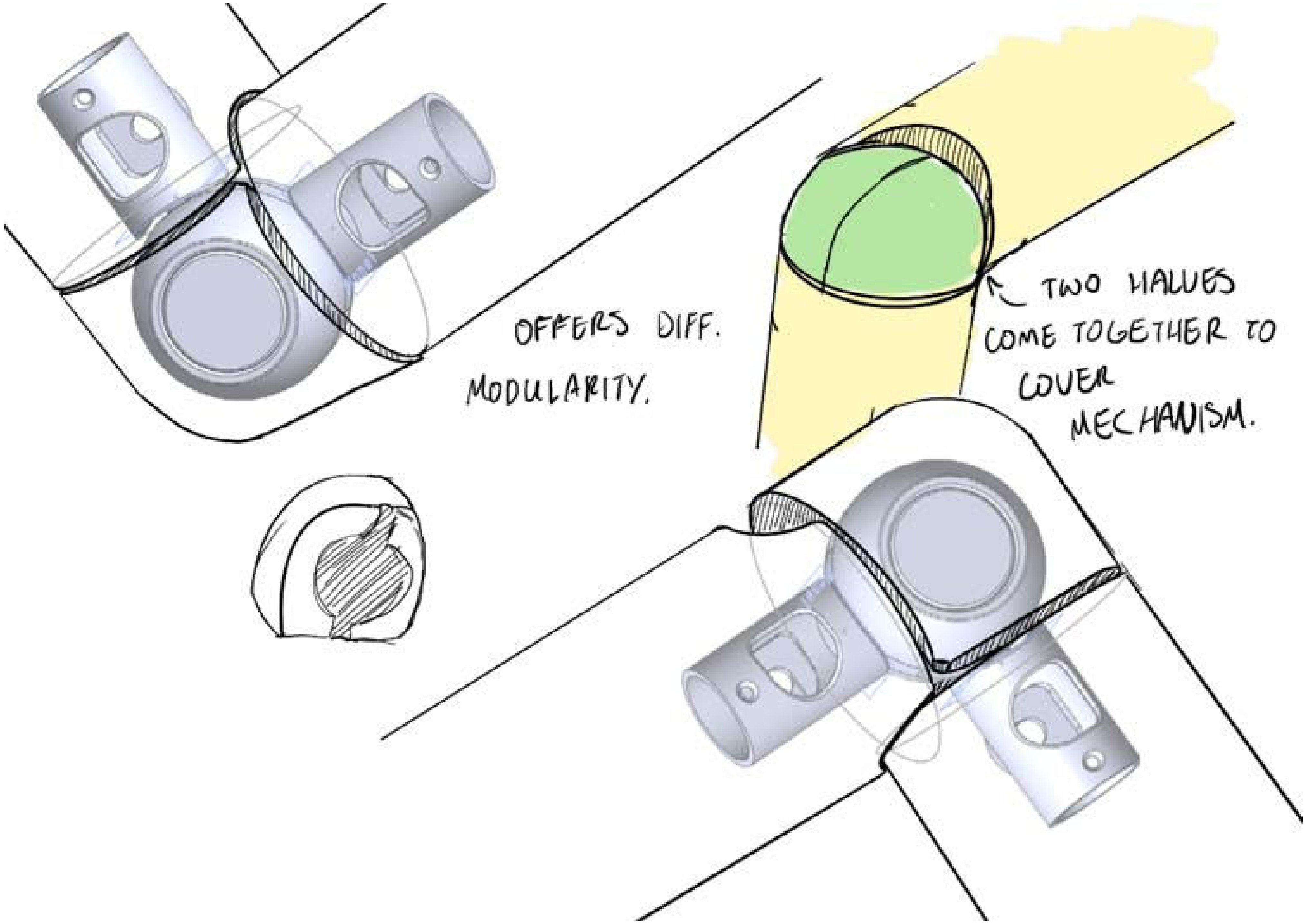
My current dilemma is that I don't know if I should compromise the function for the aesthetic or compromise the aesthetic for the function. Alternatively I may have to redesign the mechanism altogether which will be time-consuming which I would rather not do as I still have a lot to do and the due date is approaching.

After explaining this to Alex she recommended two things:

1. I could design the foam to be attachable to the pivot mechanism rather than permanently attached to it.

2. I could adjust the dimensions of the arms to be longer to accomodate for more foam on the mechanism.

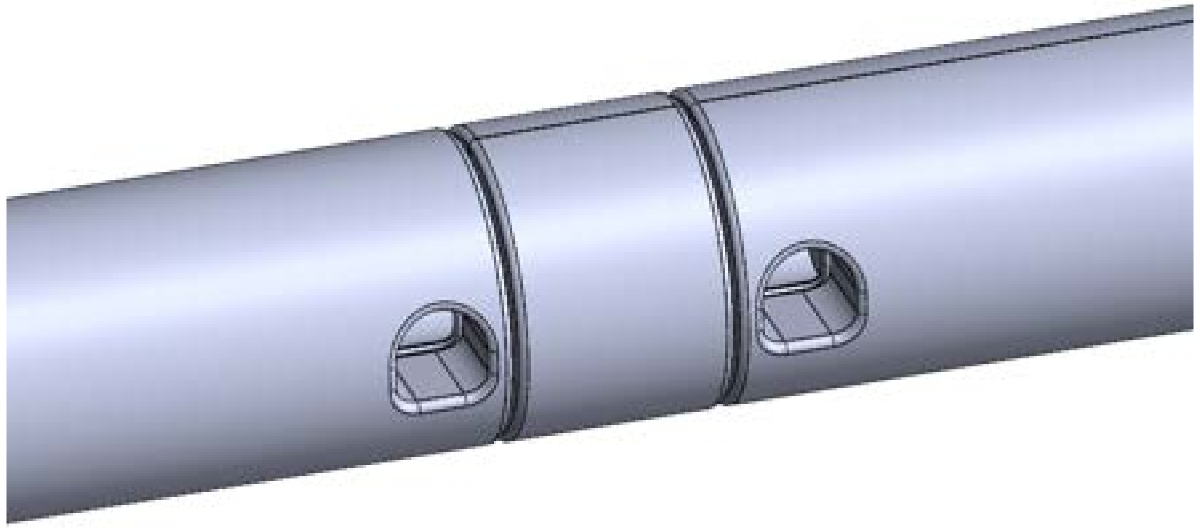
Considering the time I have and the risk of compromising the mechanism's strength, I will go ahead and design the foam to be attachable. Redesigning and dimensioning the arms will become time consuming and will affect the measurements of a lot of different components such as the leg frames. Additionally, this can impact the strength of the mechanism and arms as this can increase the leverage and stress applied to it.

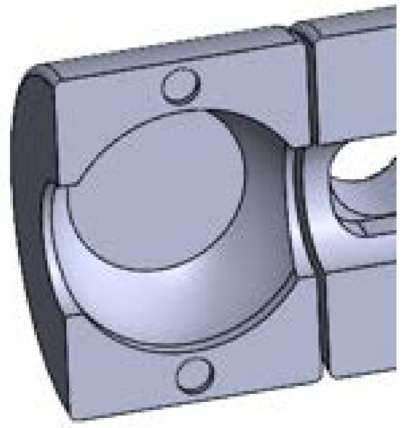


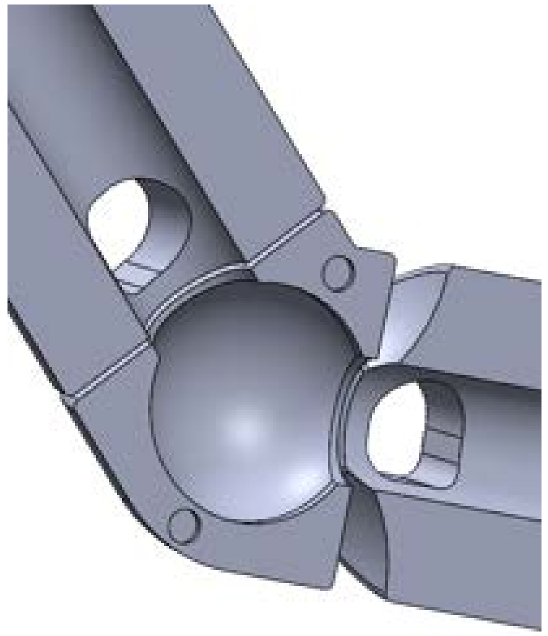
Kristen Harrison - k_harrison16@hotmail.com

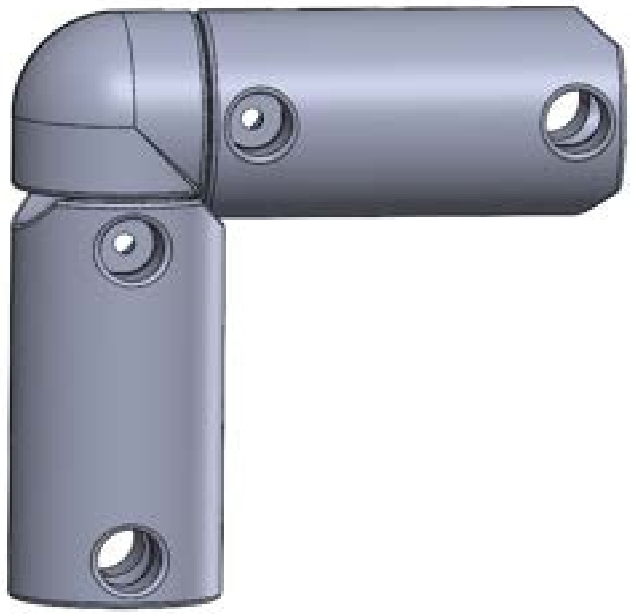
The pivot caps have been CAD modelled in three types. One for when the arms are straight, at a right angle and in between the two.

These will be assembled over the pivot point and secured via magnets.









CAD modelling

Ploypropylene

Polypropylene will be used for the rotating mechanism's button for a number of reasons. This material has characteristics suited to the use such as chemical resistance (cleaning agents), good weight to strength ratio, resistance to stress, cracking, and warping. Additionally, it is can take on a range of textures and appearances. The piece will be injection moulded using a multipart mould to increase production output.

(https://www.specialchem.com/plastics/guide/polypropylene-pp-plastic)

Aluminium (6061)

Aluminium alloy 6061 will be applied to the rotating and cam locking mechansims. This is due to its favourable properties such as its manufacturability, ease of welding, and corrosion resistance. Above all else however, is its strength to weight ratio. This material is highly warp and fatigue resistant and is used in applications subject to repetitive loading. Further, appearance applications such as anodising and textured finishes are viable for this material.

(https://www.thomasnet.com/articles/metals-metal-products/6061-aluminum/?msockid=214e21c3e7cf69f726fa3290e623688f)

Bamboo Plywood/Dowel

Bamboo plywood will be used for the framing components of the product for the material's excellent furniture application properties. This material is incredibly sustainable, fast growing and affordable because of this. Further it is similar to aluminium in its strength to weight characteristics making it durable for modular use.

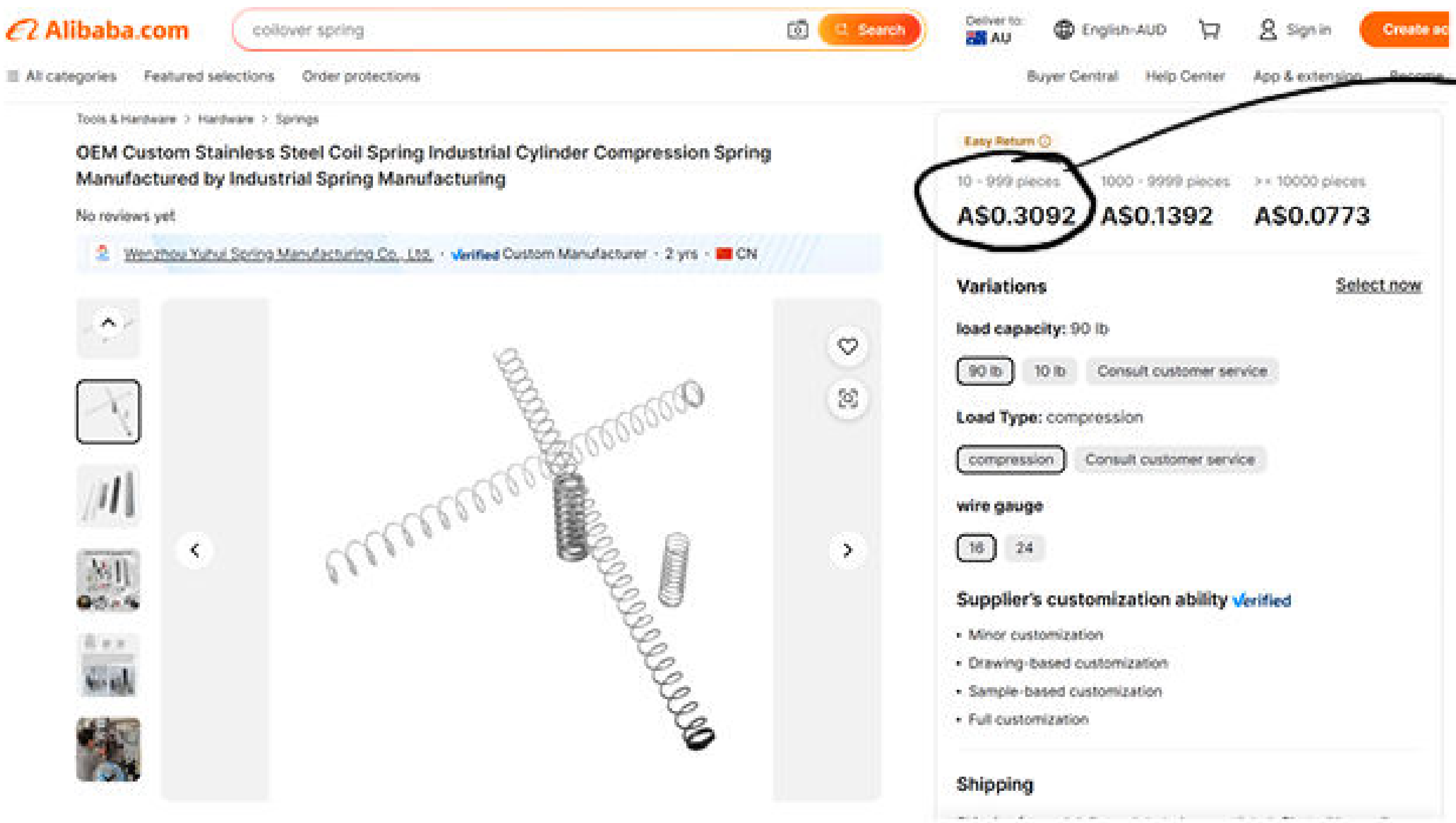
(https://buildingrenewable.com/consider-bamboo-plywood-sheets-pros-cons/)

Bamboo Foam/Fabric

Similar to its wood composite properties, bamboo foam and fabric are highly durable, sustainable, and versatility in applications. Unique characteristics to this form is that bamboo foam and fabric are breathable temperature regulating materials and antimocrobial, meaning they are easy to keep clean and odorless. This is important for a child-present environment as they require clean surfaces and they themselves can become dirty and pass that onto the objects around them.

(https://knowingfabric.com/bamboo-fabric-properties-softness-durability-and-more/)
(https://www.olara.com.au/blogs/lifestyle/the-science-behind-bamboos-temperature-regulating-properties)

Kristen Harrison - k_harrison16@hotmail.com



$0.31 \div 10 = \$0.03$ for 1 piece? 6cm

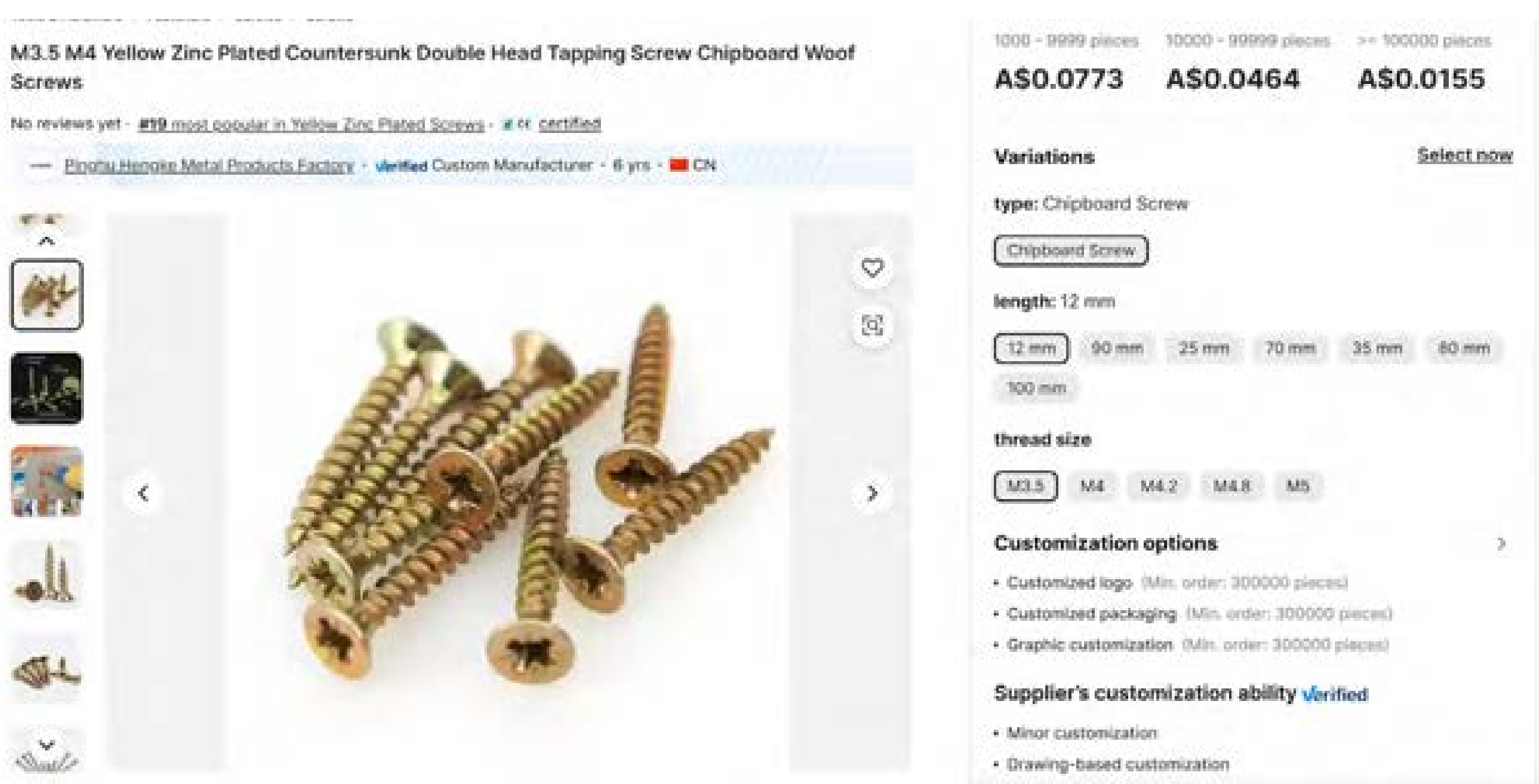
6cm long

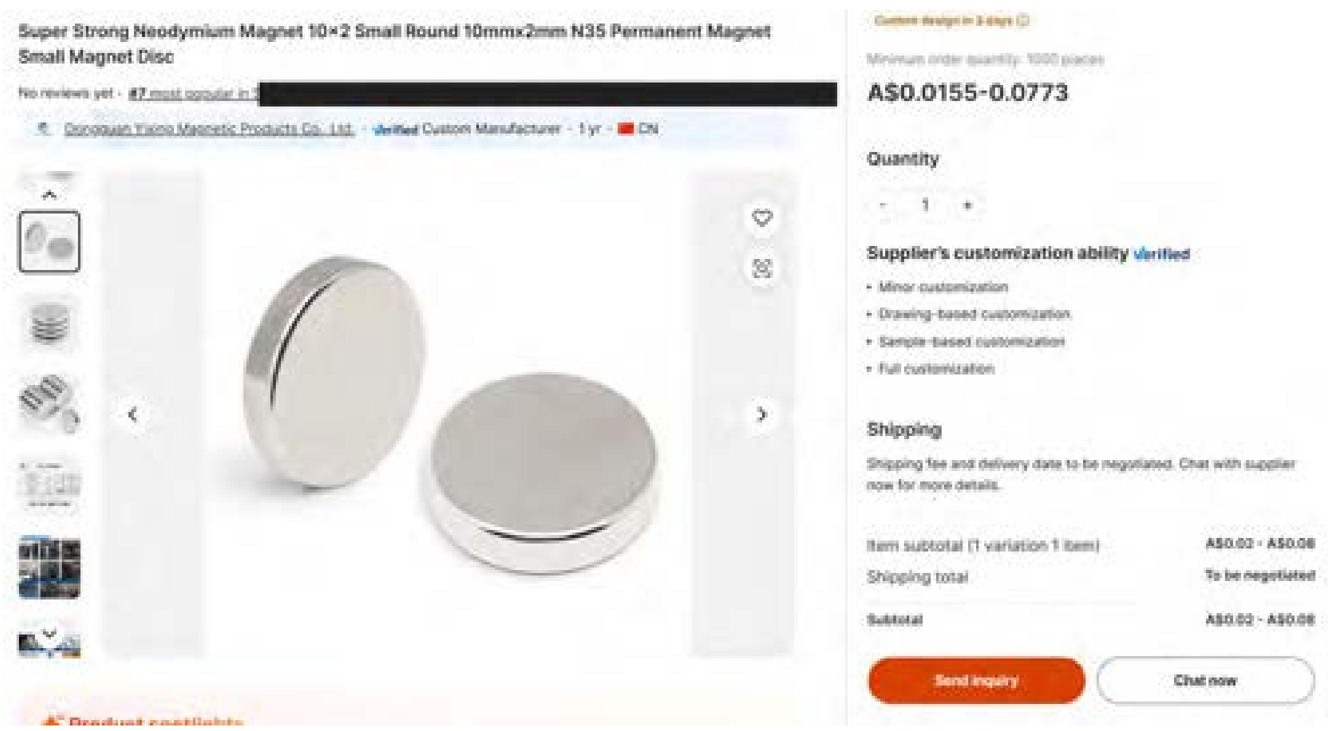
mm mm

$60 \div 15 = 4$ parts.

↳ $0.03 \div 4 = \$0.0075$

15mm because the springs' lengths range 10 - 20mm





13

20th - 26th Oct.

WEEK THIRTEEN

Goals:

- Render images
- Make video
- Complete bill of materials
- Complete manufacturing report
- Presentation slides
- Construct prototypes
- Finalise DDR

Alex recommended that I base the price of the components on similar products.

This will be done by researching similar products, comparing them to my components, removing 10% from the price for gst and calculating from there in terms of volume or length where necessary.

Home › Products › HART Speed Bumps

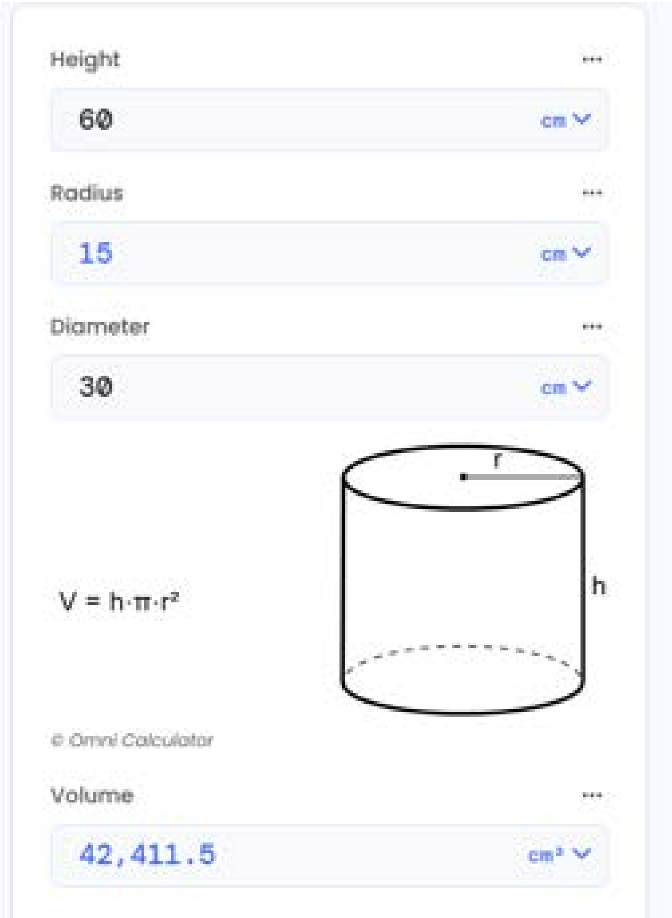
HART Speed Bumps

SKU: 33-424
Warehouse Availability: In Stock

$199.00 incl. GST

Quantity: − 1 + **ADD TO C**

Size: 60cm (length) x 30cm (diameter) x15cm (height)



Cylindar volume: $\sim 42{,}411 cm^3 \rightarrow \frac{1}{2} = 21{,}205 cm^3$

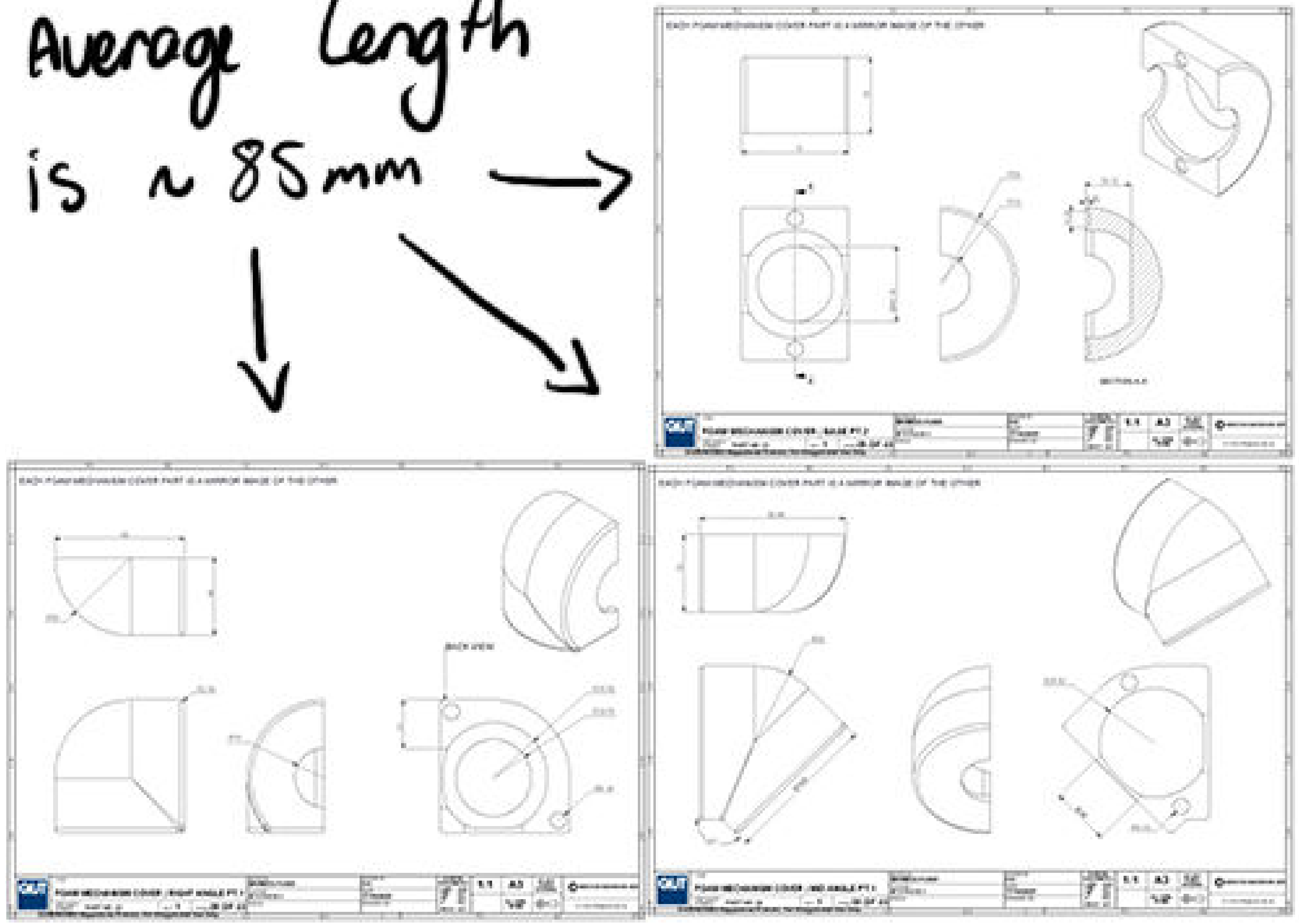
↳ $21{,}205 \div 4 = 5300$

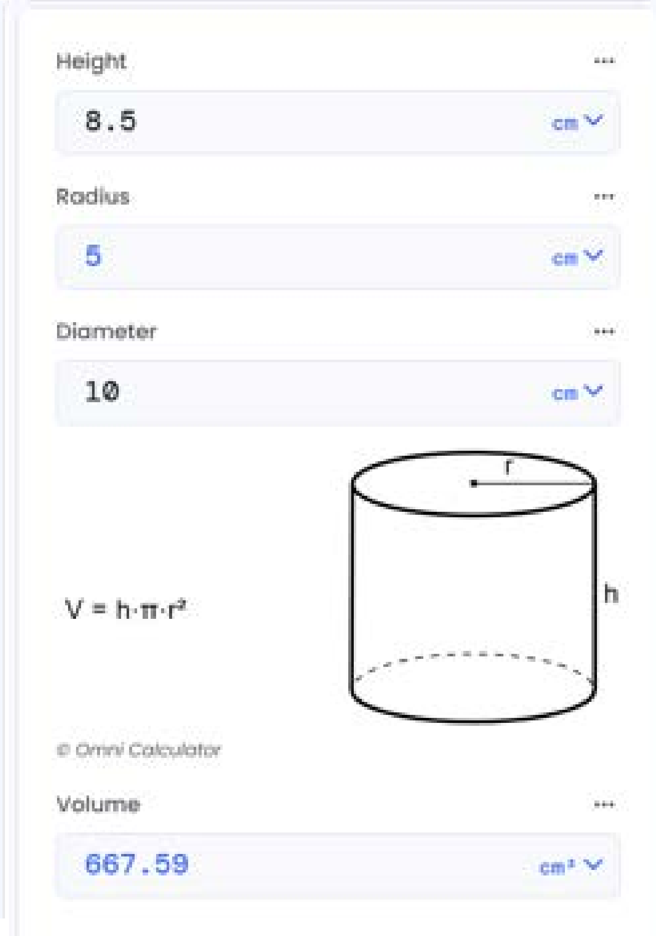
GST

Price per comp. $= (199 - 10\%) \div 4 = \sim\$45$

Kristen Harrison - k_harrison16@hotmail.com

Average length is ~ 85mm





Volume = 667

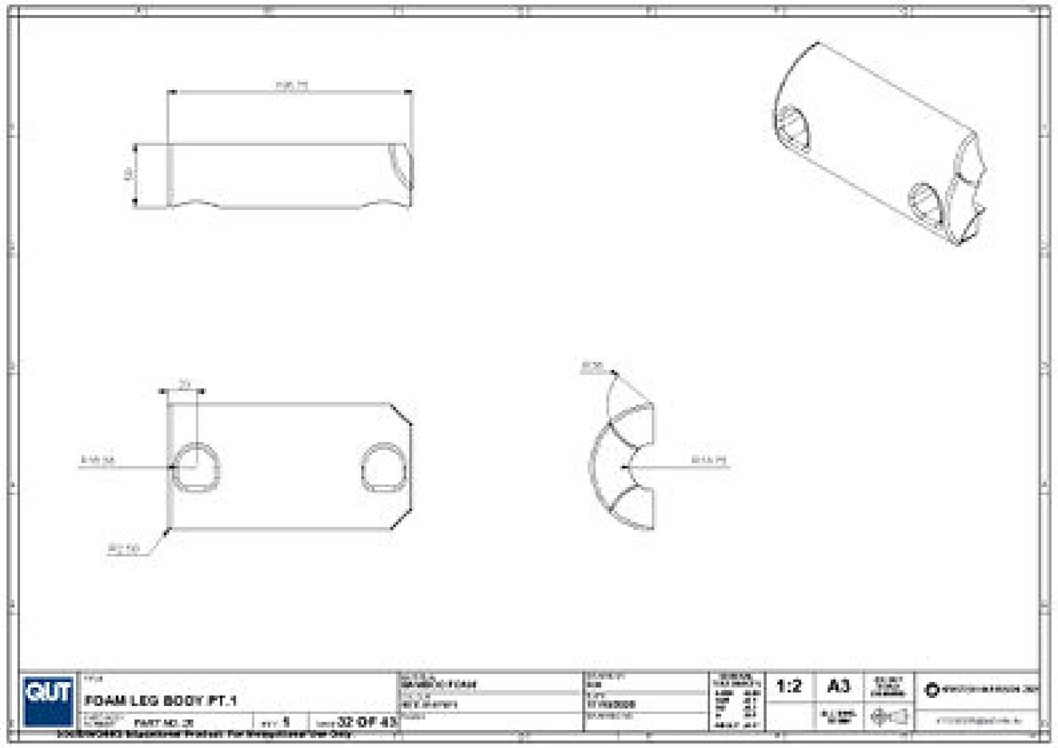
↓ (21,205 ÷ 667)

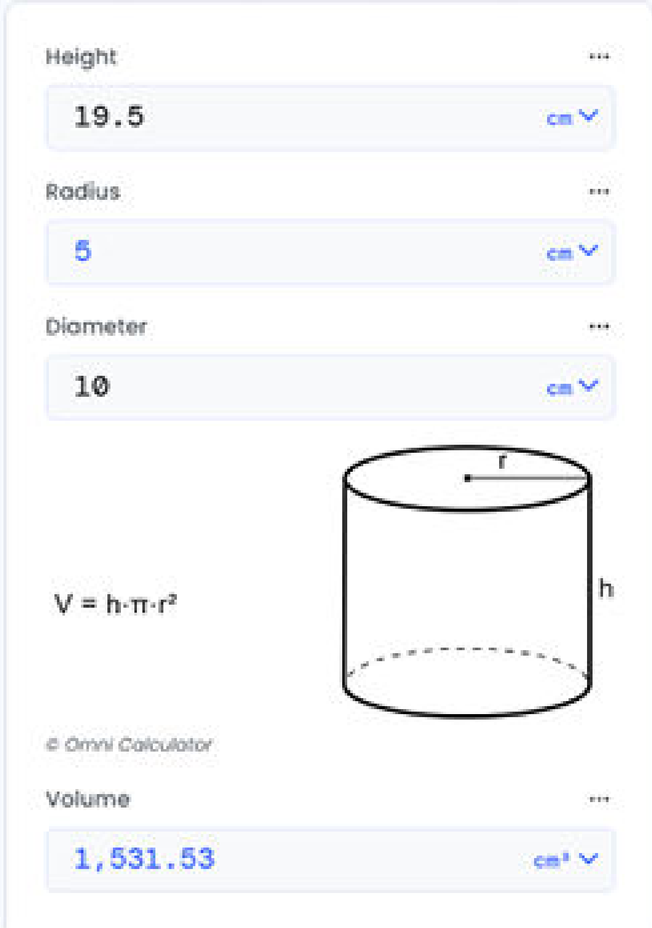
~32 will fit into the sample shapes.

(45 ÷ 32)

↓

Price = ~$1.41 for the full assembled comps, $0.70 for each half.





(21,205 ÷ 1531)

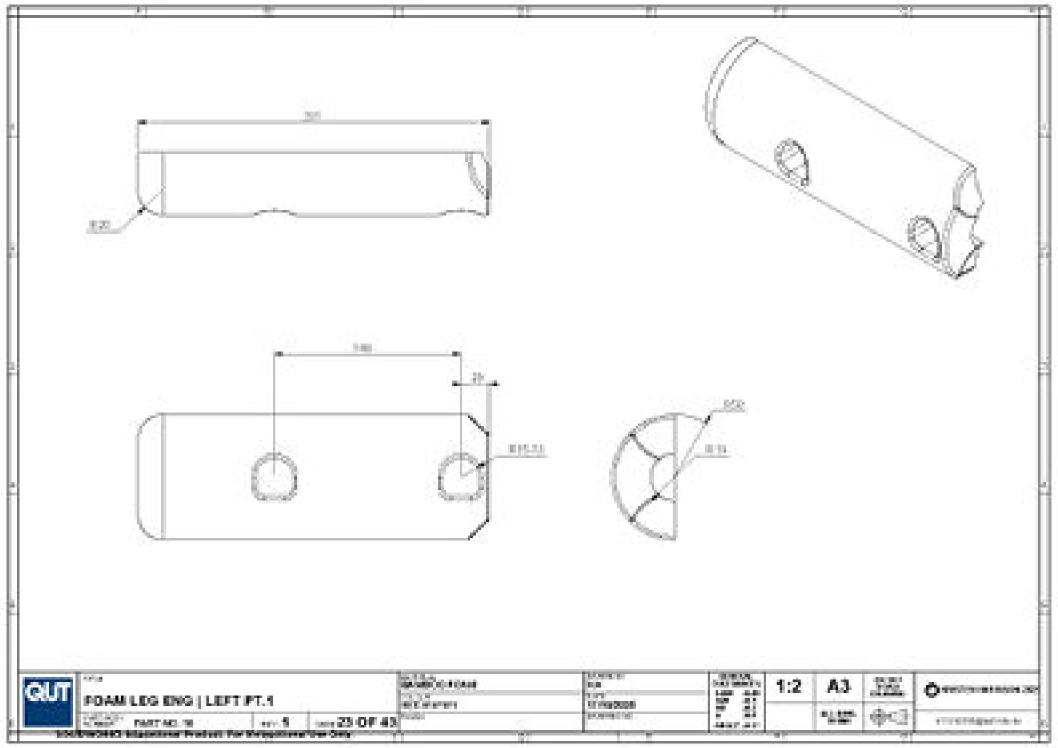
~14 can fit into the sample shapes.

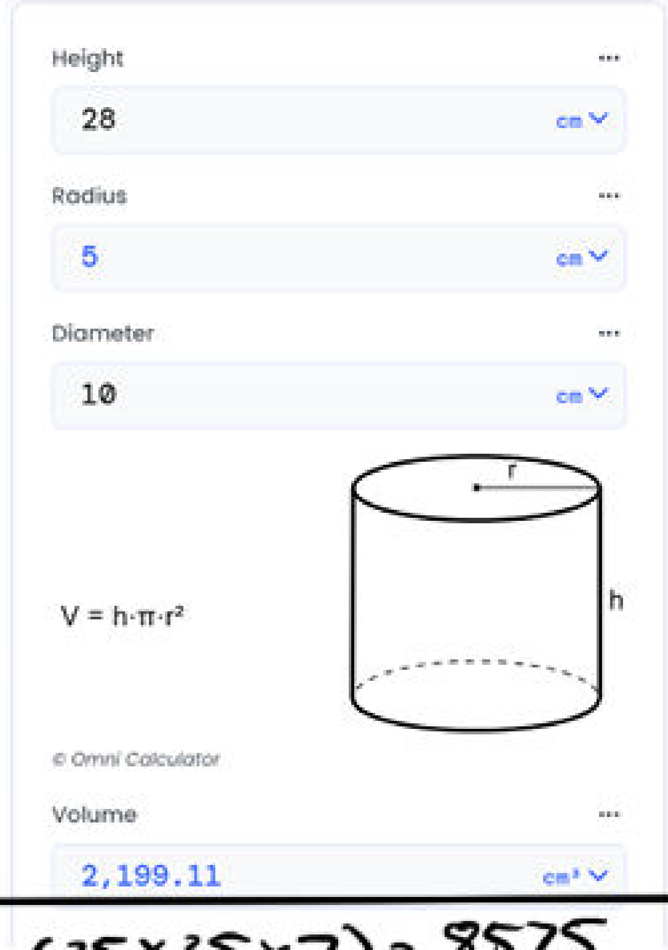
↓ (45 ÷ 14)

Price = ~$3.21 for the full assembled comps, ~$1.61 for each half.

Bill of materials calculations

Kristen Harrison - k_harrison16@hotmail.com





(21,205 ÷ 2,199)

~10 can fit into the sample shape.

(45 ÷ 10)

↓

Price = ~$4.5 for the full assembly comps., ~$2.25 for each half.

(35×35×7) = 8575

(21,205 ÷ 8,575)

~2 Full size shapes can fit into the sample shape.

(45 ÷ 2)

↓

Price = ~$ 22.5 for the seat shape.

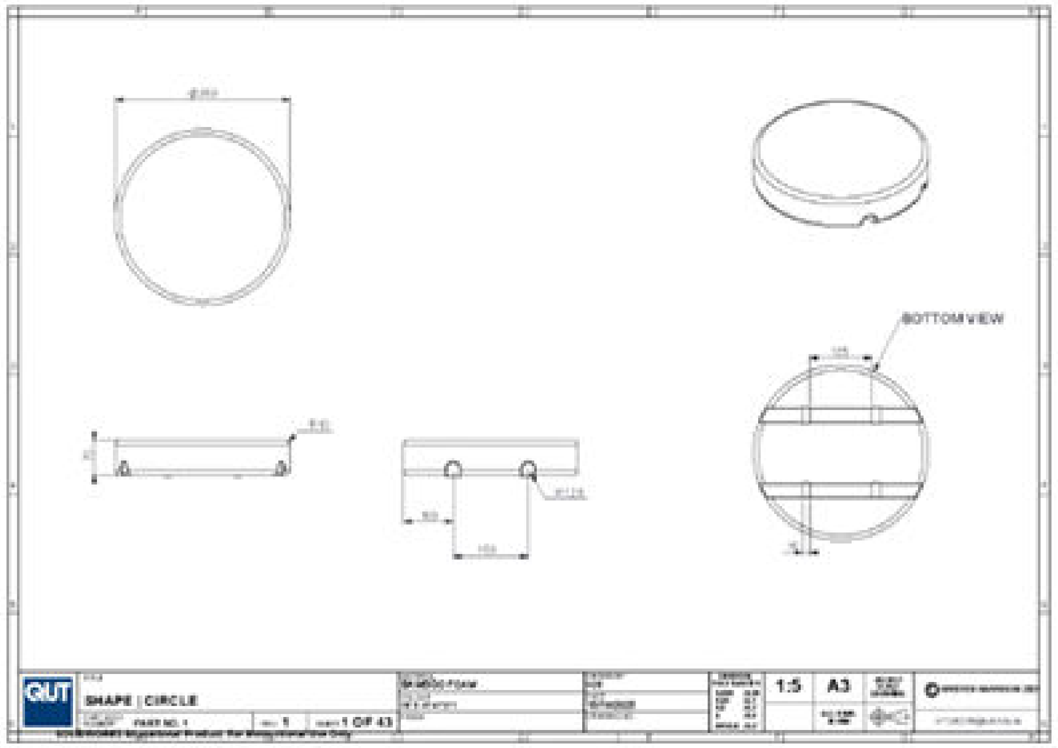
(35×20×7) = 4900cm³

(21205 ÷ 4900)

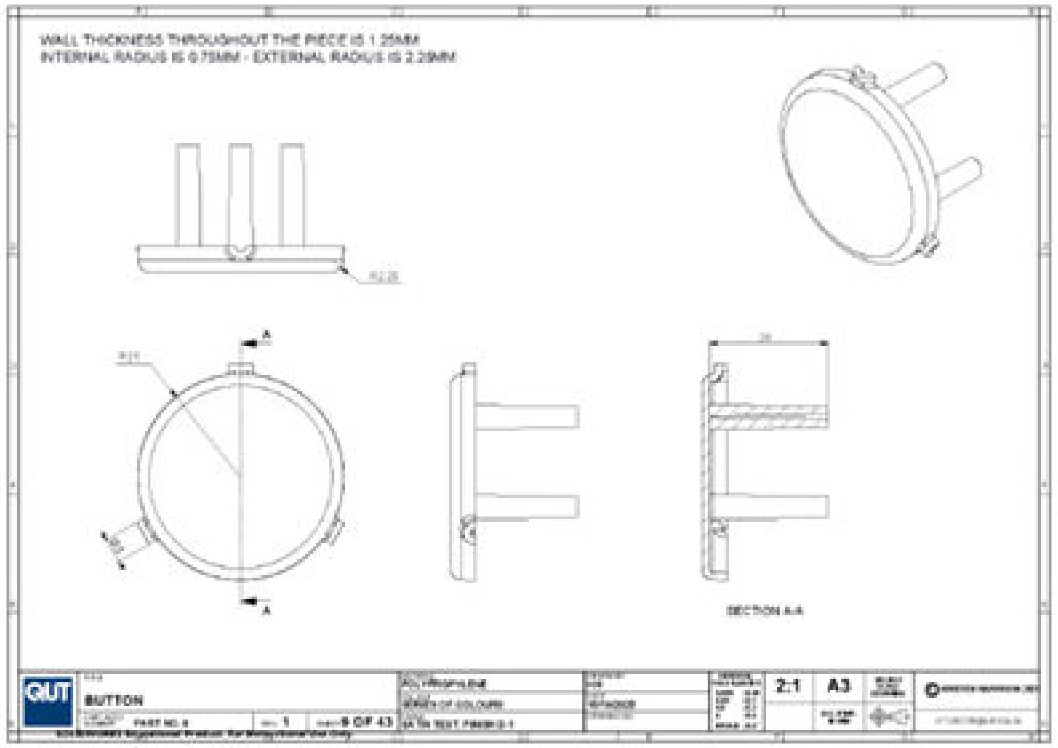
~4 half shapes can fit into the sample shapes.

↓ (45 ÷ 4)

Price = ~$ 11.25 For the seat shape.



Kristen Harrison - k_harrison16@hotmail.com



Material
Polypropylene, Molded

Material price ($/kg)
$ 2.20 /kg

Density (g/cm³)
0.0339 g/cm³

Part volume*
370 cm³

Runner volume
cm³

Regrind price
0 $/kg

Additives price
0 $/kg

Material Cost Summary

Material:	$2,765.230 ($27.652/part)
Regrind:	$0 ($0.000/part)
Additives:	$0 ($0.000/part)
Markup:	$0 ($0.000/part)
Material:	$2,765.230 ($27.652/part)

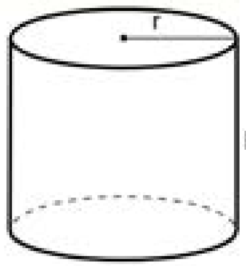
Solidworks reports that the volume for this part is 370 cm³.
This cost seems excessive...

Height
24 cm

Radius
0.25 cm

Diameter
0.5 cm

$V = h \cdot \pi \cdot r^2$



© Omni Calculator

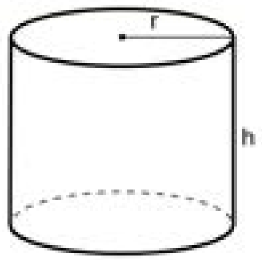
Volume
4.71 cm³

Height
0.5 cm

Radius
2 cm

Diameter
4 cm

$V = h \cdot \pi \cdot r^2$



© Omni Calculator

Volume
6.28 cm³

Volume

Bosses.

Main body

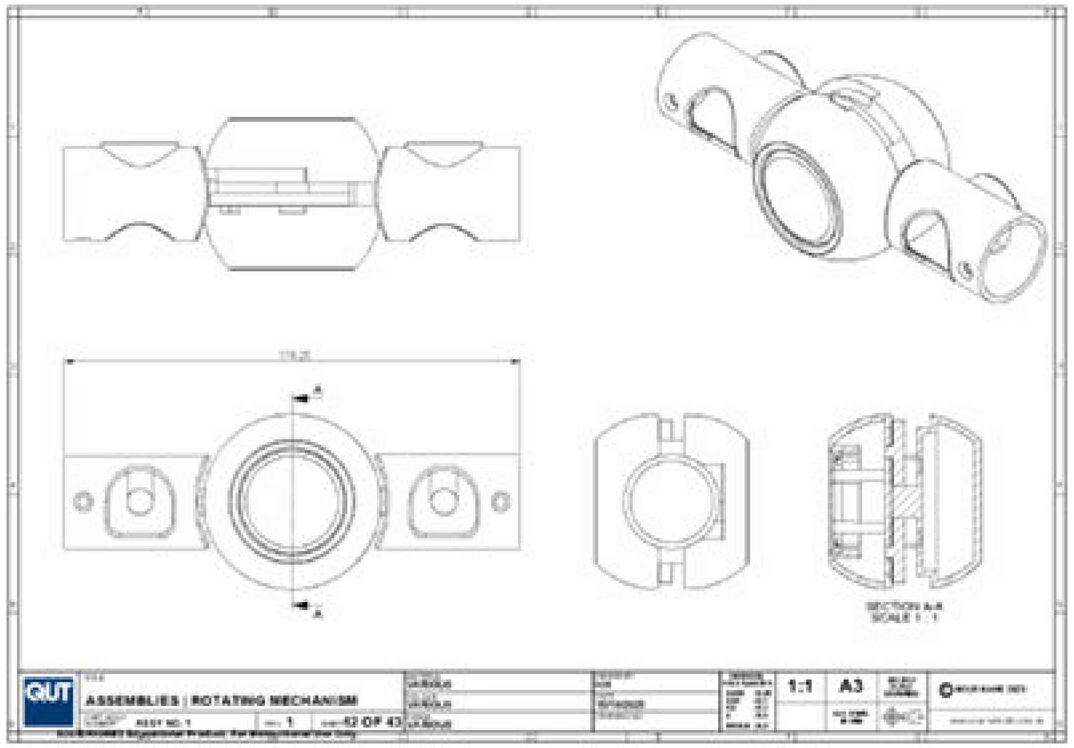
4.7 x3 = 14.1

+ 6.28

20.38 cm³

$1.52 seems more realistic.

Kristen Harrison - k_harrison16@hotmail.com



D&D Technologies
KwikFit Plain Pivoting General Purpose Gate Hinges

$9.36 -10% = $8.4

Add to Cart

How to purchase

Select store

Click & Collect

Select a store for availability

In-store

Select a store for availability

The mechanism is difficult to cost because there isn't anything to base it on...

This hinge is the closest thing I can find based on function.

Goliath
Goliath Straight Tongue Lock Barrel
★★★★★ 5 (2) I/N: 4230209

$11.86 -10% = $10.67

Add to Cart

How to purchase

End to end, the aluminium tubes attached to the arms is ~179 mm

3000 ÷ 179 = ~16

24.49 ÷ 16 = 1.53

1.53 + 10.67 + 8.4 = $20.60

∴ The overall cost for the custom components is ~$20.60.

Metal Mate
Metal Mate 25 x 1mm 3m Aluminium Round Tube
★★★★★ 5 (1) I/N: 1079454

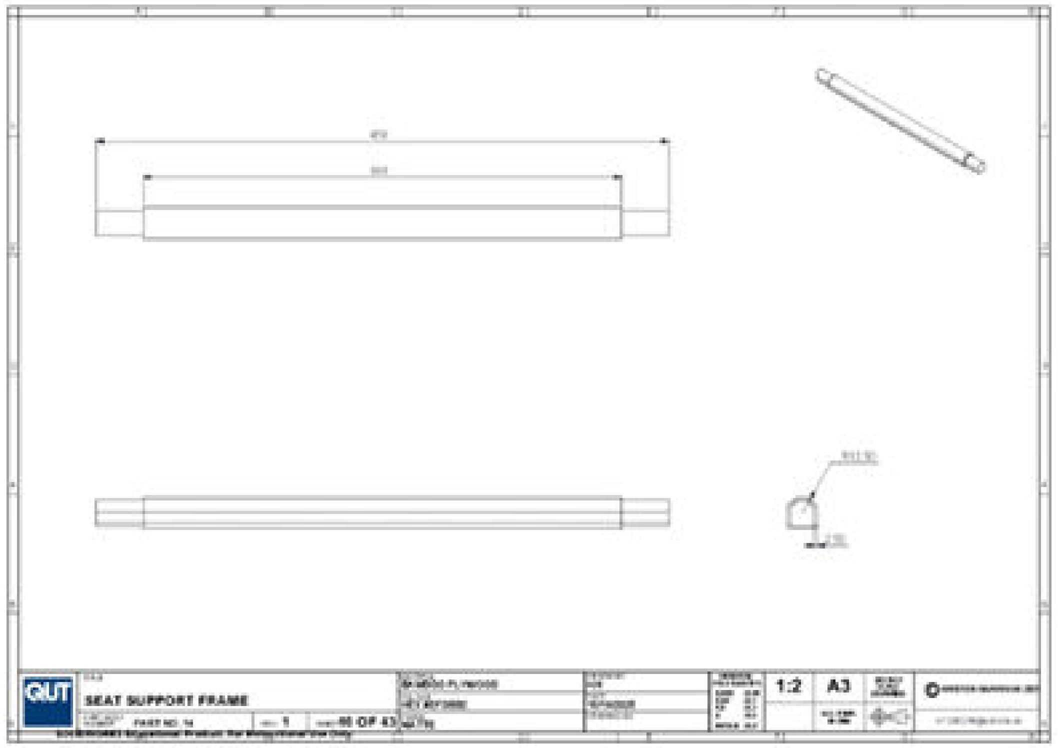
$27.21 -10% = $24.49

Add to Cart

Size: 3m

1m 3m

Bill of materials calculations

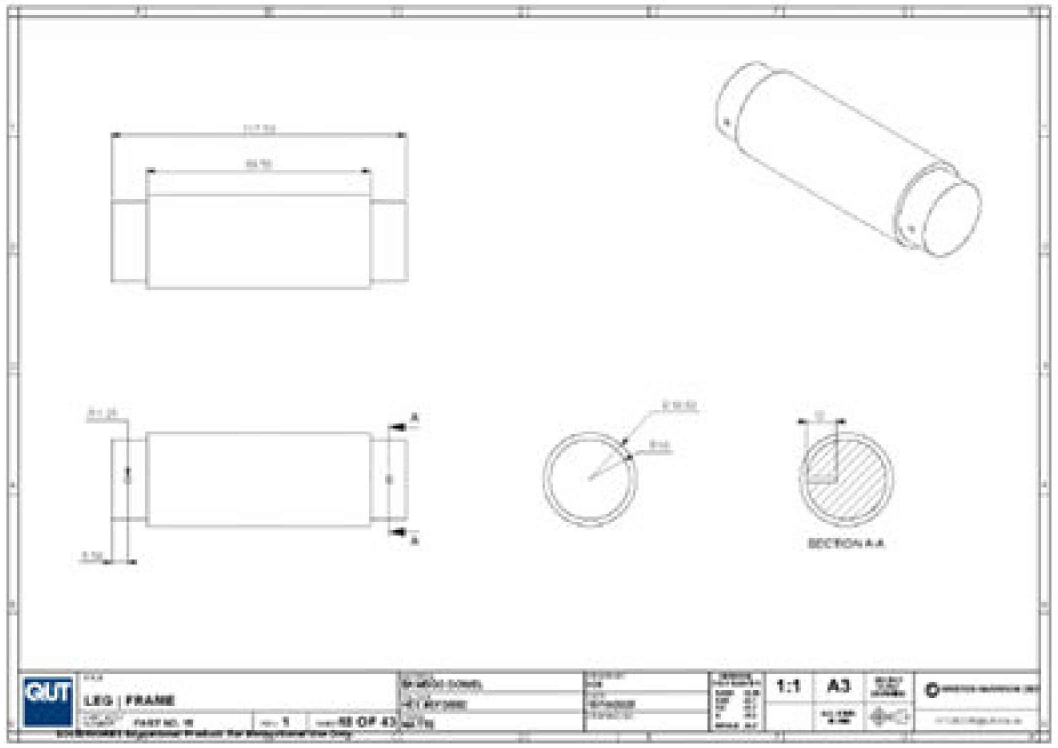


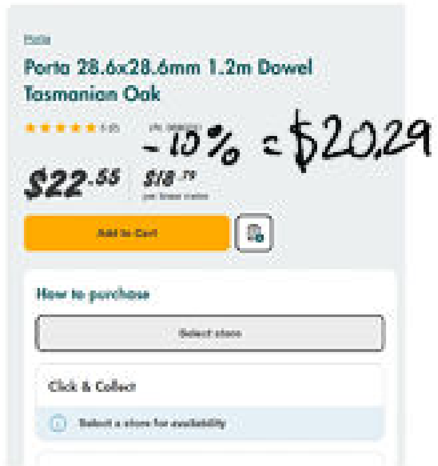
−10% =$29.97

2400 ÷ 460 = ~5.

5 can fit in 2.4mm.

29.97 ÷ 5 = $5.99





−10% = $20.29

1200 ÷ 10 = 120 mm (length)

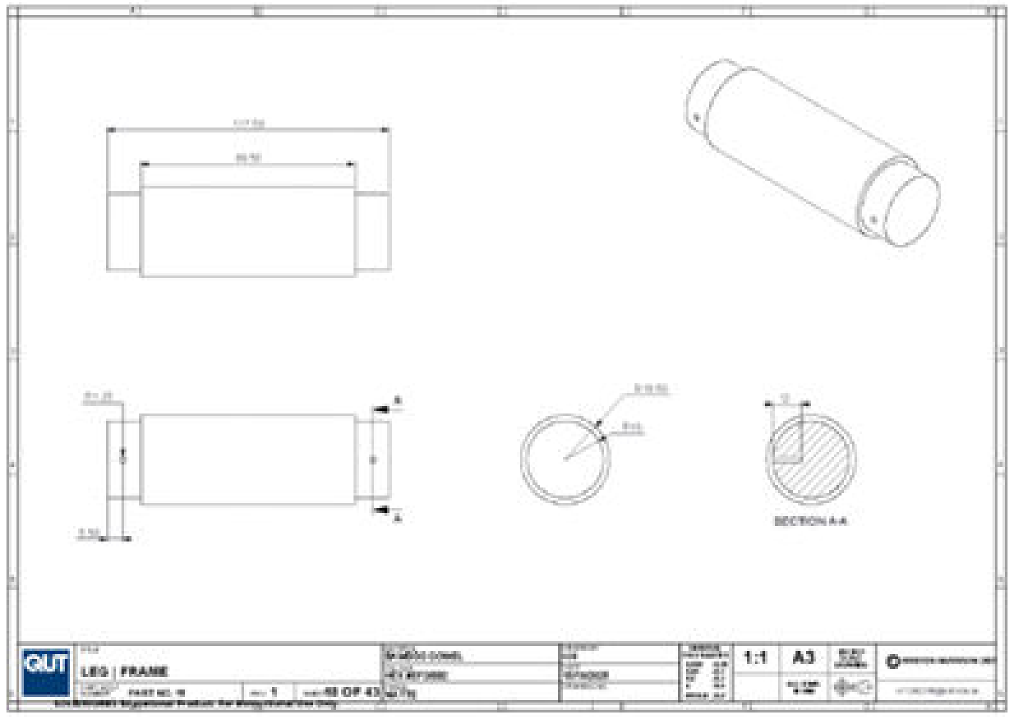
meaning 10 frames can be cut from 1 dowel.

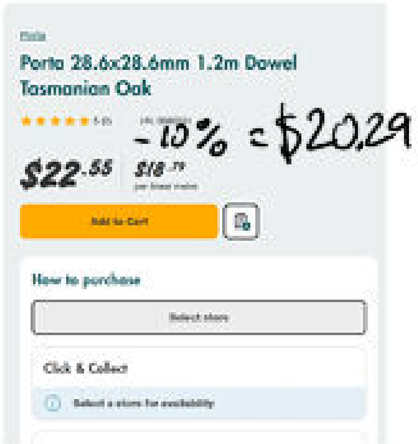
Price = 20.29 ÷ 10

= $2.03.

For 1 leg the total cost is $12.17.

Bill of materials calculations



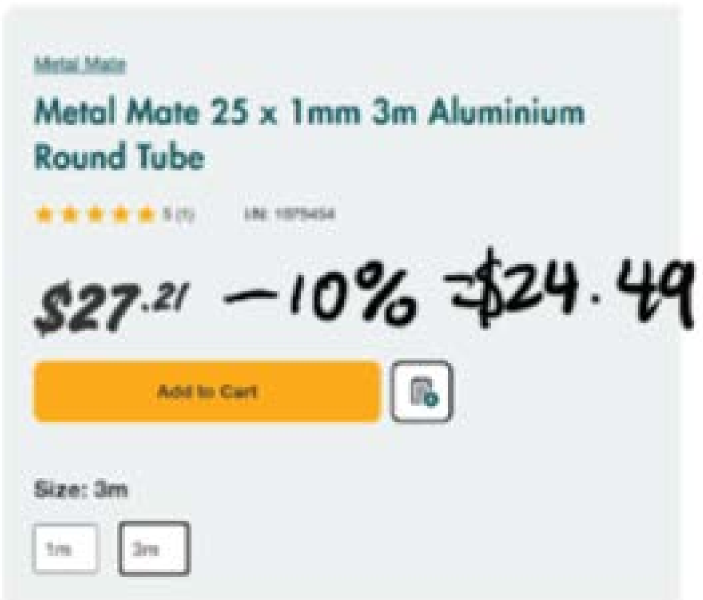


$-10\% = \$20.29$

$1200 \div 10 = 120$ mm (length)
meaning 10 Frames can be cut from 1 dowel.

Price $= 20.29 \div 10$
$= \$2.03$.

For 1 leg the total cost is \$12.17.



$-10\% = \$24.49$

$3000 \div 108 = \sim 28$

$\$24.49 \div 28 = \$0.90$

For 1 leg the total cost is \$1.80.

Kristen Harrison - k_harrison16@hotmail.com

PART NUMBER	PART NAME	MATERIAL	MATERIAL FEATURES	OFF-THE-SHELF OR CUSTOM	PRICE
1	SHAPE | CIRCLE	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$22.50
2	SHAPE | SQUARE	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$22.50
3	SHAPE | RECTANGLE	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$11.25
4	SHAPE | WAVE	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$11.25
5	SHAPE | CROSS	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$22.50
6	SHAPE | SEMI CIRCLE	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$11.25
7	SHAPE | SEMI SPHERE	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$22.50
8, 10-13	CASE, ROTATING AND FIXED ARMS, CAM LOCK, CAM LOCK CASE	ALUMINIUM 6061	SATIN TEXTURE FINISH D-1, ANODISED	CUSTOM	$20.60
9	BUTTON	POLYPROPYLENE	SATIN TEXTURE FINISH D-1	CUSTOM	$1.52
14	SEAT SUPPORT FRAME	BAMBOO PLYWOOD	MATTE	CUSTOM	$5.99
15	LEG FRAME	BAMBOO PLYWOOD	MATTE	CUSTOM	$2.03
16	LEG FRAME END CAP | LEFT	ALUMINIUM 6061	SATIN TEXTURE FINISH D-1, ANODISED	CUSTOM	$0.90
17	LEG FRAME END CAP | RIGHT	ALUMINIUM 6061	SATIN TEXTURE FINISH D-1, ANODISED	CUSTOM	$0.90
18	FOAM LEG END | LEFT PT. 1	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$2.25
19	FOAM LEG END | LEFT PT. 2	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$2.25
20	FOAM MECH. COVER | BASE PT. 1	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$0.70
21	FOAM MECH. COVER | BASE PT. 2	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$0.70
22	FOAM MECH. COVER | RIGHT ANGLE PT. 1	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$0.70
23	FOAM MECH. COVER | RIGHT ANGLE PT. 2	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$0.70
24	FOAM MECH. COVER | MID ANGLE PT. 1	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$0.70
25	FOAM MECH. COVER | MID ANGLE PT. 2	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$0.70
26	FOAM LEG BODY PT. 1	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$1.61
27	FOAM LEG BODY PT. 2	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$1.61
28	FOAM RIGHT END | LEFT PT. 1	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$2.25
29	FOAM RIGHT END | LEFT PT. 2	BAMBOO FOAM	FIRMNESS - 24-30	CUSTOM	$2.25
30	CAM TOOL	BAMBOO PLYWOOD	MATTE	CUSTOM	$2.03
31	MAGNET	-	-	OFF-THE-SHELF	$0.05
32	CAM SPRING	STAINLESS STEEL	-	OFF-THE-SHELF	$0.08
33	BUTTON SPRING	STAINLESS STEEL	-	OFF-THE-SHELF	$0.08
34	ROTATING ARM SPRING	STAINLESS STEEL	-	OFF-THE-SHELF	$0.08
35	SCREW	STAINLESS STEEL	-	OFF-THE-SHELF	$0.0075
				TOTAL	$174.49

Bill of materials

PART NUMBER	PART NAME	QUANTITY	OFF-THE-SHELF OR CUSTOM	PRICE
1	SHAPE | CIRCLE	1	CUSTOM	$22.50
2	SHAPE | SQUARE	1	CUSTOM	$22.50
3	SHAPE | RECTANGLE	1	CUSTOM	$11.25
4	SHAPE | WAVE	1	CUSTOM	$11.25
5	SHAPE | CROSS	1	CUSTOM	$22.50
6	SHAPE | SEMI CIRCLE	1	CUSTOM	$11.25
7	SHAPE | SEMI SPHERE	1	CUSTOM	$22.50
8, 10-13	CASE, ROTATING AND FIXED ARMS, CAM LOCK, CAM LOCK CASE	10	CUSTOM	$206
9	BUTTON	10	CUSTOM	$15.20
14	SEAT SUPPORT FRAME	4	CUSTOM	$23.96
15	LEG FRAME	12	CUSTOM	$24.36
16	LEG FRAME END CAP | LEFT	2	CUSTOM	$1.80
17	LEG FRAME END CAP | RIGHT	2	CUSTOM	$1.80
18	FOAM LEG END | LEFT PT. 1	2	CUSTOM	$4.50
19	FOAM LEG END | LEFT PT. 2	2	CUSTOM	$4.50
20	FOAM MECH. COVER | BASE PT. 1	10	CUSTOM	$7
21	FOAM MECH. COVER | BASE PT. 2	10	CUSTOM	$7
22	FOAM MECH. COVER | RIGHT ANGLE PT. 1	10	CUSTOM	$7
23	FOAM MECH. COVER | RIGHT ANGLE PT. 2	10	CUSTOM	$7
24	FOAM MECH. COVER | MID ANGLE PT. 1	10	CUSTOM	$7
25	FOAM MECH. COVER | MID ANGLE PT. 2	10	CUSTOM	$7
26	FOAM LEG BODY PT. 1	8	CUSTOM	$12.88
27	FOAM LEG BODY PT. 2	8	CUSTOM	$12.88
28	FOAM RIGHT END | LEFT PT. 1	2	CUSTOM	$4.50
29	FOAM RIGHT END | LEFT PT. 2	2	CUSTOM	$4.50
30	CAM TOOL	1	CUSTOM	$2.03
31	MAGNET	120	OFF-THE-SHELF	$6
32	CAM SPRING	24	OFF-THE-SHELF	$1.92
33	BUTTON SPRING	30	OFF-THE-SHELF	$2.40
34	ROTATING ARM SPRING	30	OFF-THE-SHELF	$2.40
35	SCREW	24	OFF-THE-SHELF	$0.22
			TOTAL	$497.60

Kristen Harrison - k_harrison16@hotmail.com