Hingineers

Group 17
Evan Trainor - 300136249
Chayton Munro – 300304143
Andrew Stepanenko – 300362332
George Omoregie – 300325739
Mehdi Boudjemline – 300371792
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Abstract

This deliverable will show the reader our 2nd prototype and how we made it as well as why we made it. This deliverable will show how we plan to test our prototype and the components within this design. We will also include the client feedback from client meeting 2 which lead to the main parts of the current design but doing client meeting 3 we took what they said and perfected our design into what it is right now.

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Introduction

This deliverable discusses how changes to the first prototype of the are implemented to keep the proposed jig stable and secure enough to be able to undergo the second prototype test; ensuring the accurate measurement of different hinge sizes. Given these changes and the feedback provided from our clients, the second prototype test plan has been optimized to better simulate the competence of the jig. An updated bill of materials is shown to account for the cost of extra materials needed to implement the new changes from the previous prototype test.

Customer Feedback Client Meetings 2 and 3

Client Meeting 2

During the first functional solution the clients liked how we were attaching the jig to the door by using more of a mechanical aspect with rubber to hold it in place, they also liked the way we attached the jig in functional solution 3 as it was an easy slide on and off but they said we need to be careful when sliding it on and off as the door has a varnish on it at this stage. The advice they gave us is that we should find a way to combine the two with the mechanical part being on the side where the backset changes sizes between the doors. We took that and made that into our main final design.

The clients also said when we were showing how the holes are lined up and drilled to make sure to use a plate as it interchangeable but make sure to secure it properly and sturdy as using the drill can cause it to move. They did like our plate design based on the how easy it is to line up. Going with the plate design we had designs that had moveable holes and that also guided the drill and there would be one plate so we wouldn't have to switch it out but they said it would just be a lot easier to switch the plate for different sized hinges instead of trying to move the holes to a different spot as they could move out of that spot with the vibrations from the drill and the saw dust could clog up those holes after a long time if not cleaned.

The next piece of advice the clients gave us is that they wanted to make sure that we were sticking with the drilling/tapping they have now as its easy for the labourer to drill and tap. So, when we proposed the auto drilling and the multiple drill bits spinning at once they very quickly shut that down.

So, after all this the client said they wanted a jig that could be secured onto the door without leaving marks on the varnish and be secure to withstand the drills vibrations. The client wanted us to leave how to drill and how to tap just the way it is and to instead have a plate that can be easily slid into the jig for different sized hinges and is also thick enough to guide the drill so it can be a straight hole for the screws later.

Client Meeting 3

From client meeting two we introduced our new and improved final product which we showed the client in class in client meeting 3. The clients we impressed and liked that we took the designs they liked best and put the altogether to create something everyone liked. They liked the simplicity of our design, and it was very easy to use and replace parts. The one major piece of feedback the clients gave us was when we introduced the spring in the

towers that will help keep the jig in place. They said they liked the added measure of sturdiness but were unsure of how we were going to get the spring inside the tower and how to get it out if it broke. Other than that they liked everything about our design and didn't have any more critics as we said the what the materials were and the agreed with all of them.

Prototyping Test II Plan Old vs. New

Old

This prototype test plan is the original from 'Deliverable E'. In the next prototype, it is important that we verify that the jig is properly aligned relative to the door as well as the mold used to measure does not move in place. This means the frame of the jig that holds the mold remains perfectly parallel to the edge of the door that is being drilled/tapped. Additionally, the mold inserted into the jig must be secured in place so that it cannot be displaced by the drilling/tapping tools and inadvertently drill in the wrong place or damage the door. If all measurements made by the mold are consistently accurate and aligned properly throughout the measuring process, the jig should then be good for use.

New

The new test plan for prototype two is to test how our mechanism for holding our springs in the tower to help hold our jig to the door so it stays sturdy and adds an extra layer of sturdiness in addition to the suction cups. We will also be testing the ability of the towers and the mechanism the slides the jig for the different sized hinges as well as the different sized hinges and seeing if they all fit together and do the correct job. We will be doing this by 3D-printing the parts and seeing how well they fit together and if we need to adjust the sizes on any of the parts. For the part that holds the spring we will get a spring and see how it connects as well as getting pulled and see if we need to adjust the tower it sits within.

Prototype II

Disassembled Jig Pictures:

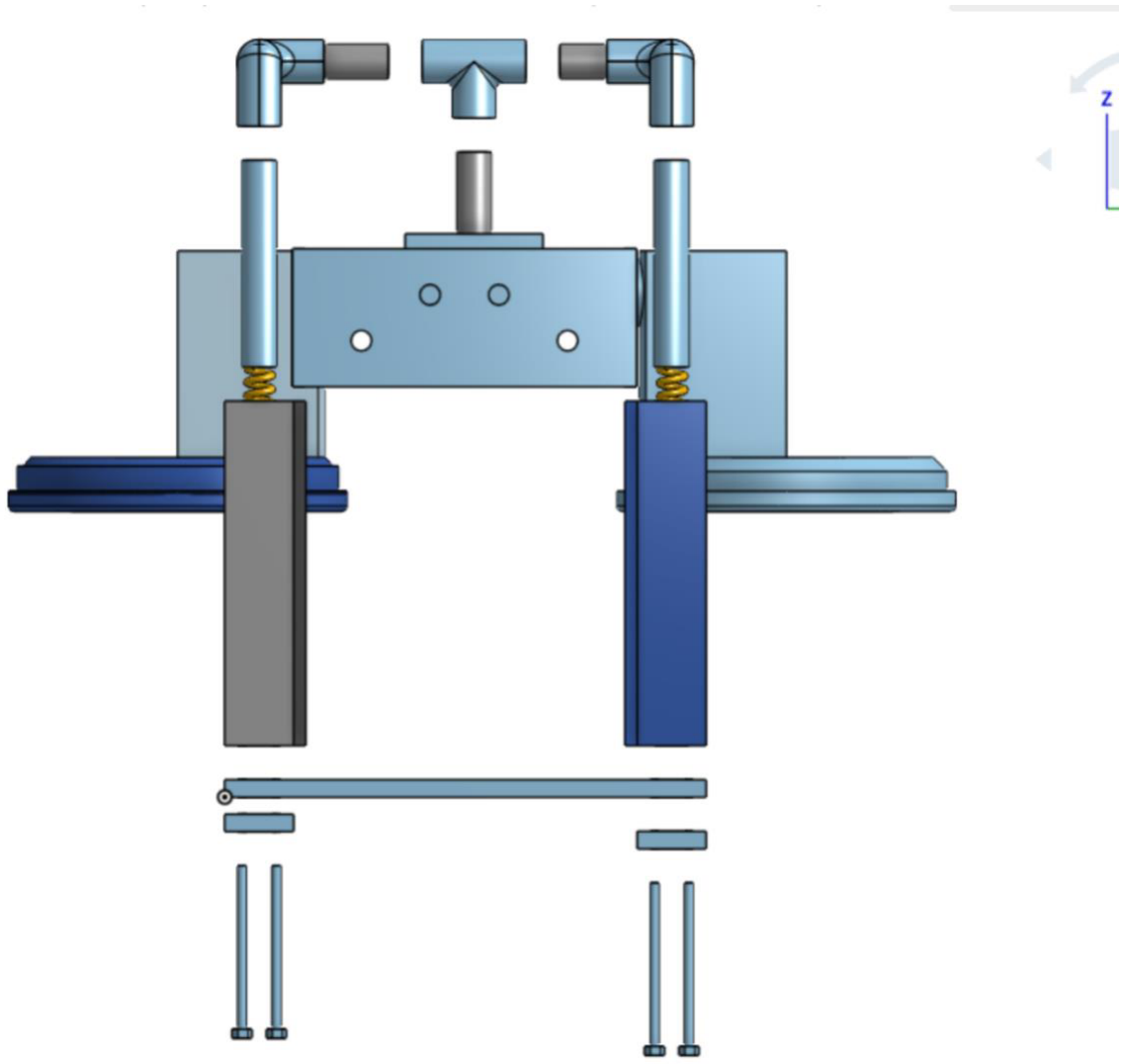

Figure 1: Full Jig Disassembled.

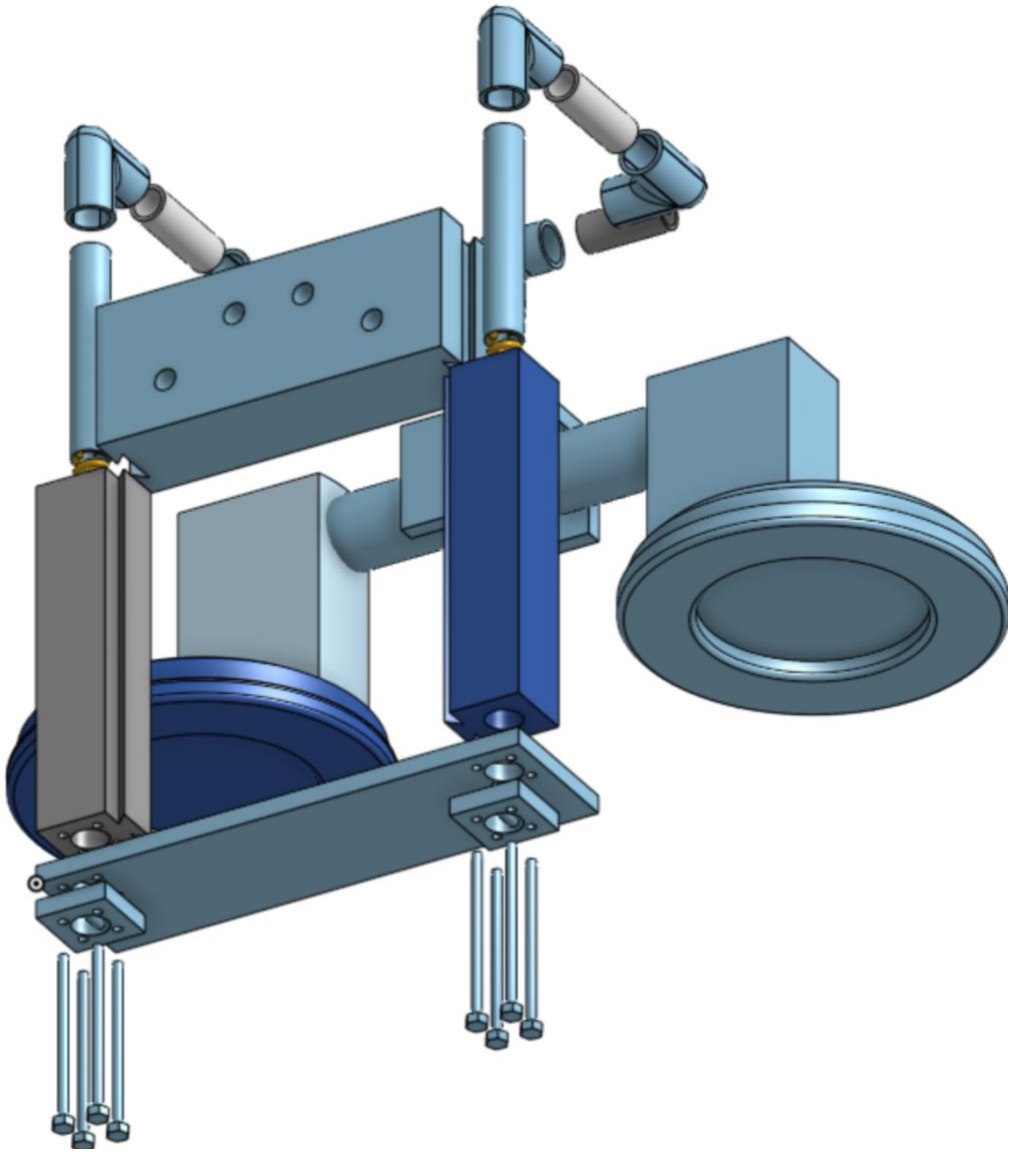

Figure 2: Full Jig Disassembled (Different View).

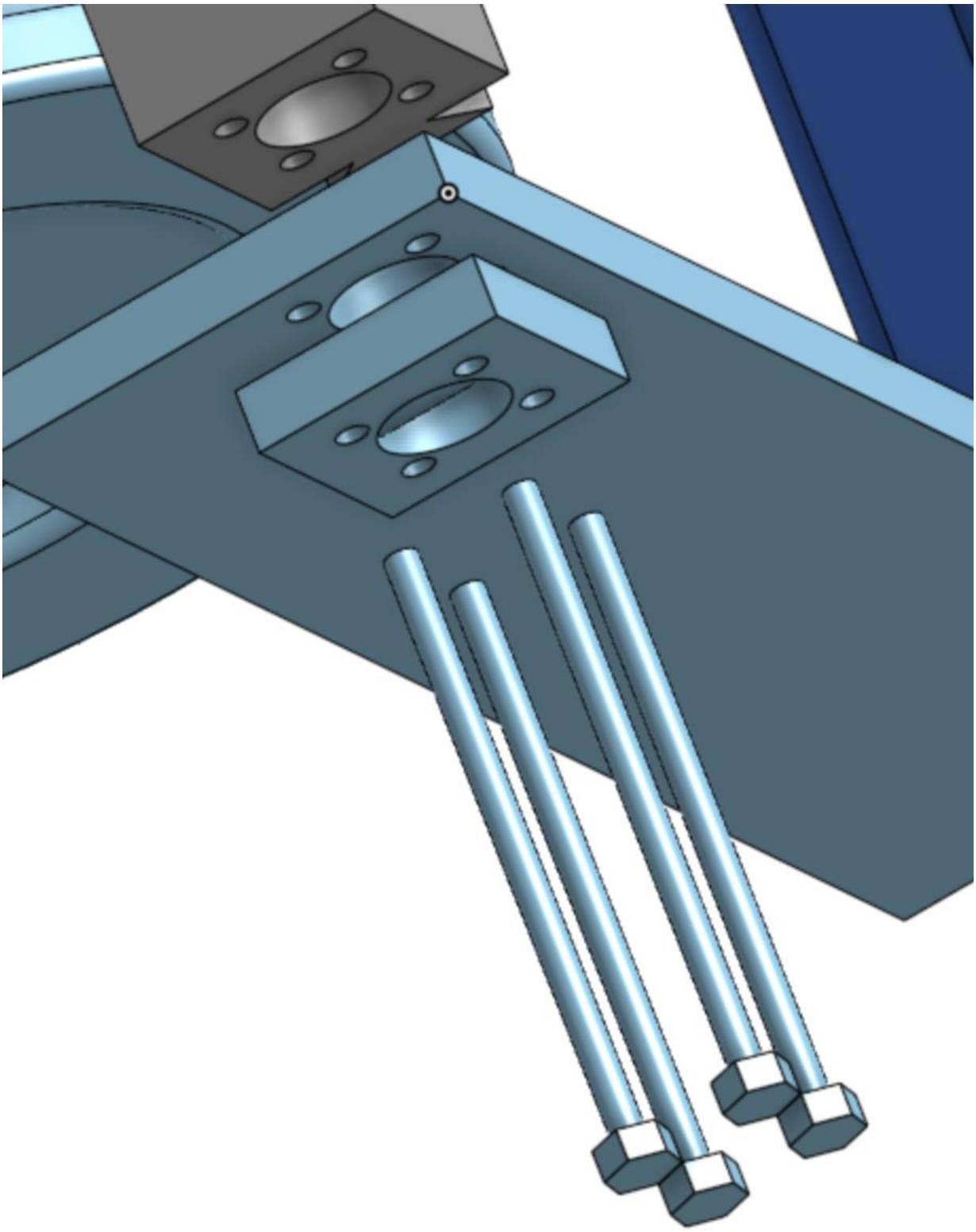

Figure 3: View of a Part of Prototype II.

Assembled:

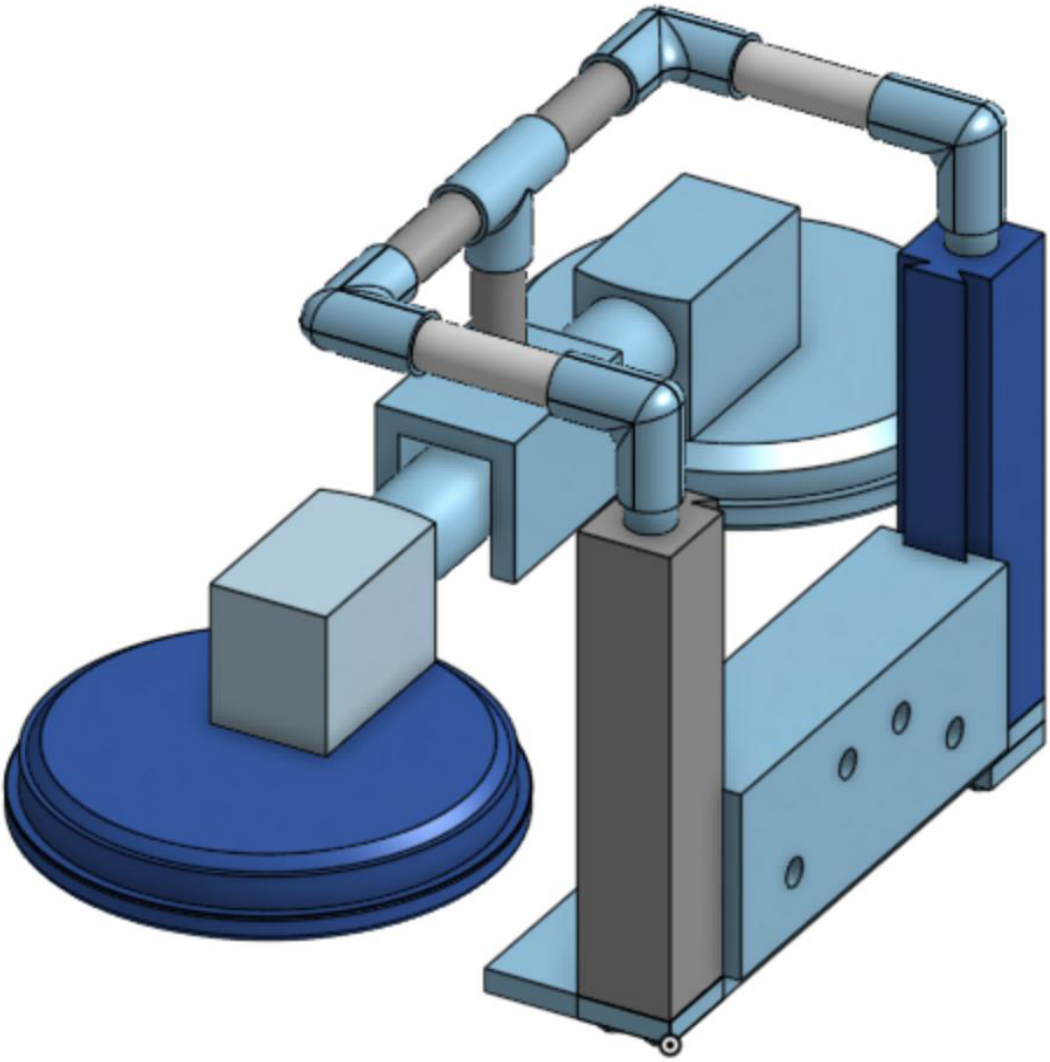

Figure 4: Final Product Fully Assembled.

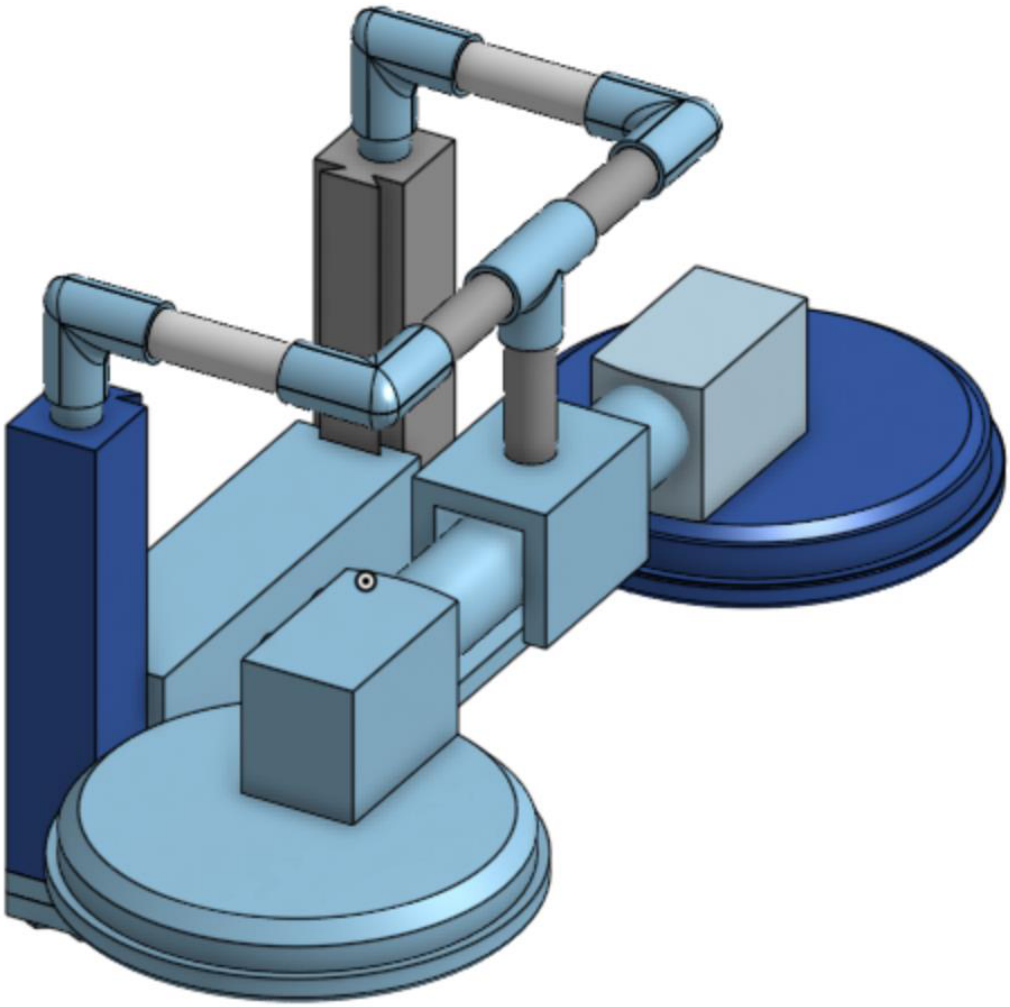

Figure 5: Different View of Final Product.

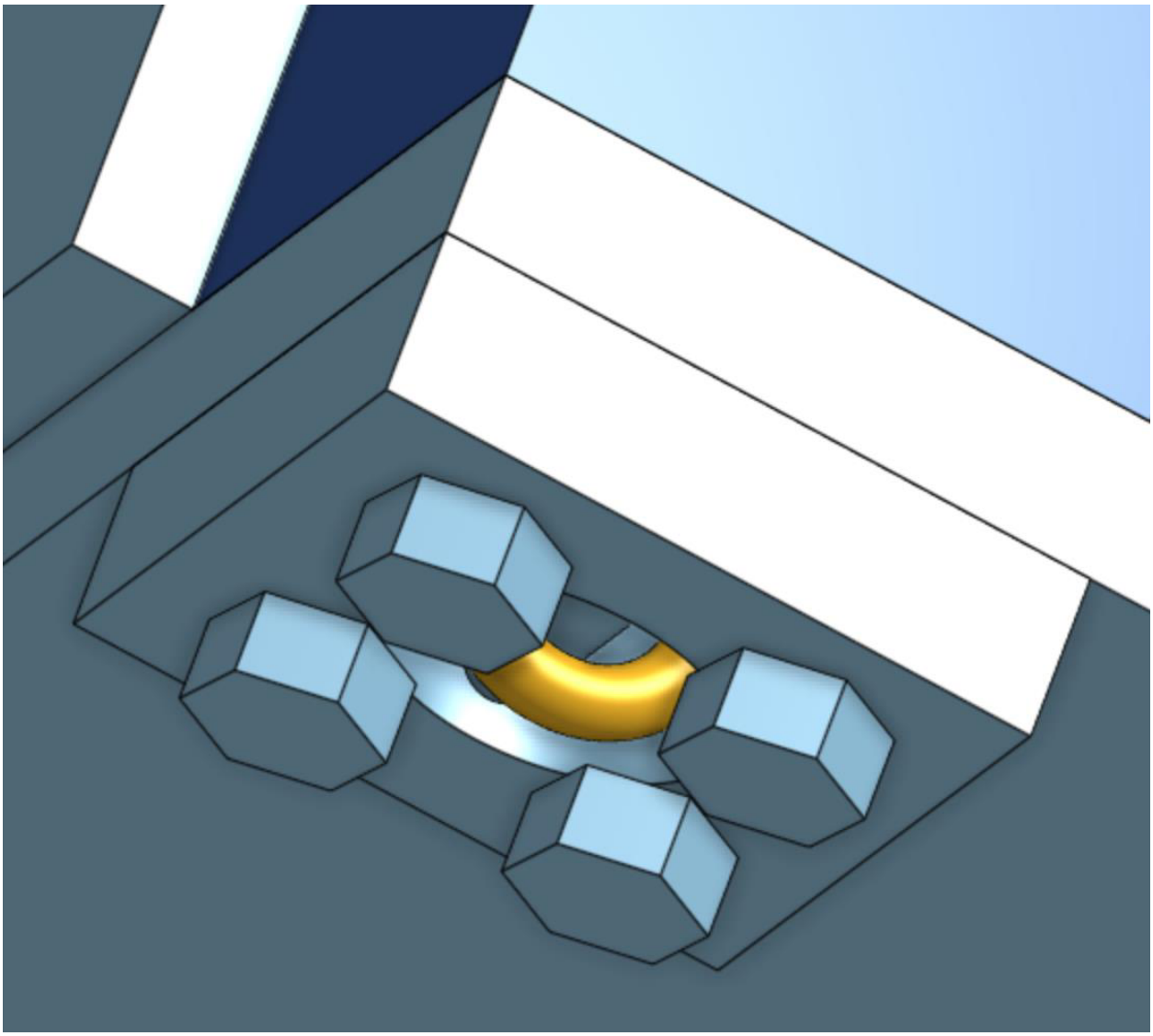

Figure 6: View of the Plate that holds the spring.

Mold:

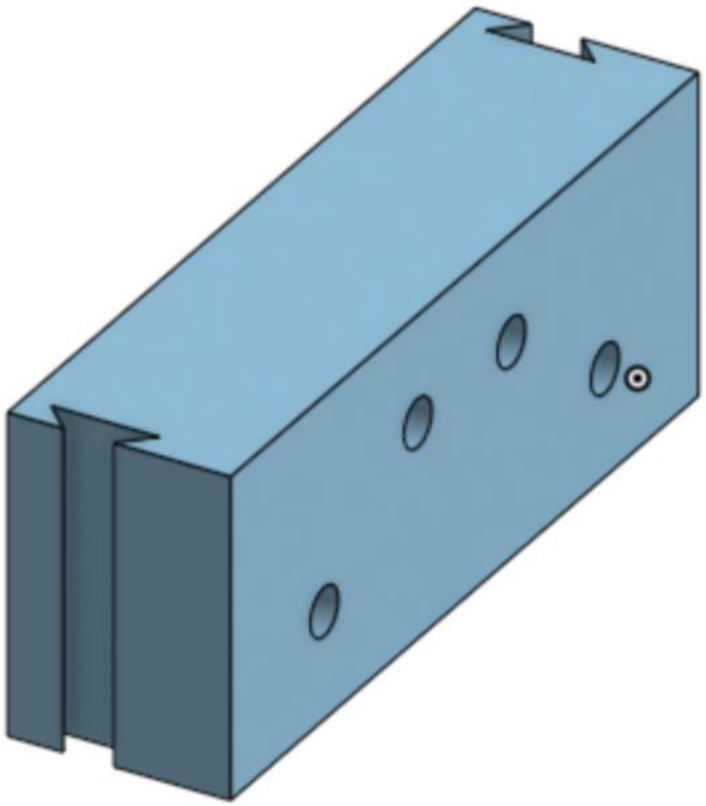

Figure 7: View of the Part that is interchanged for different sized hinges.

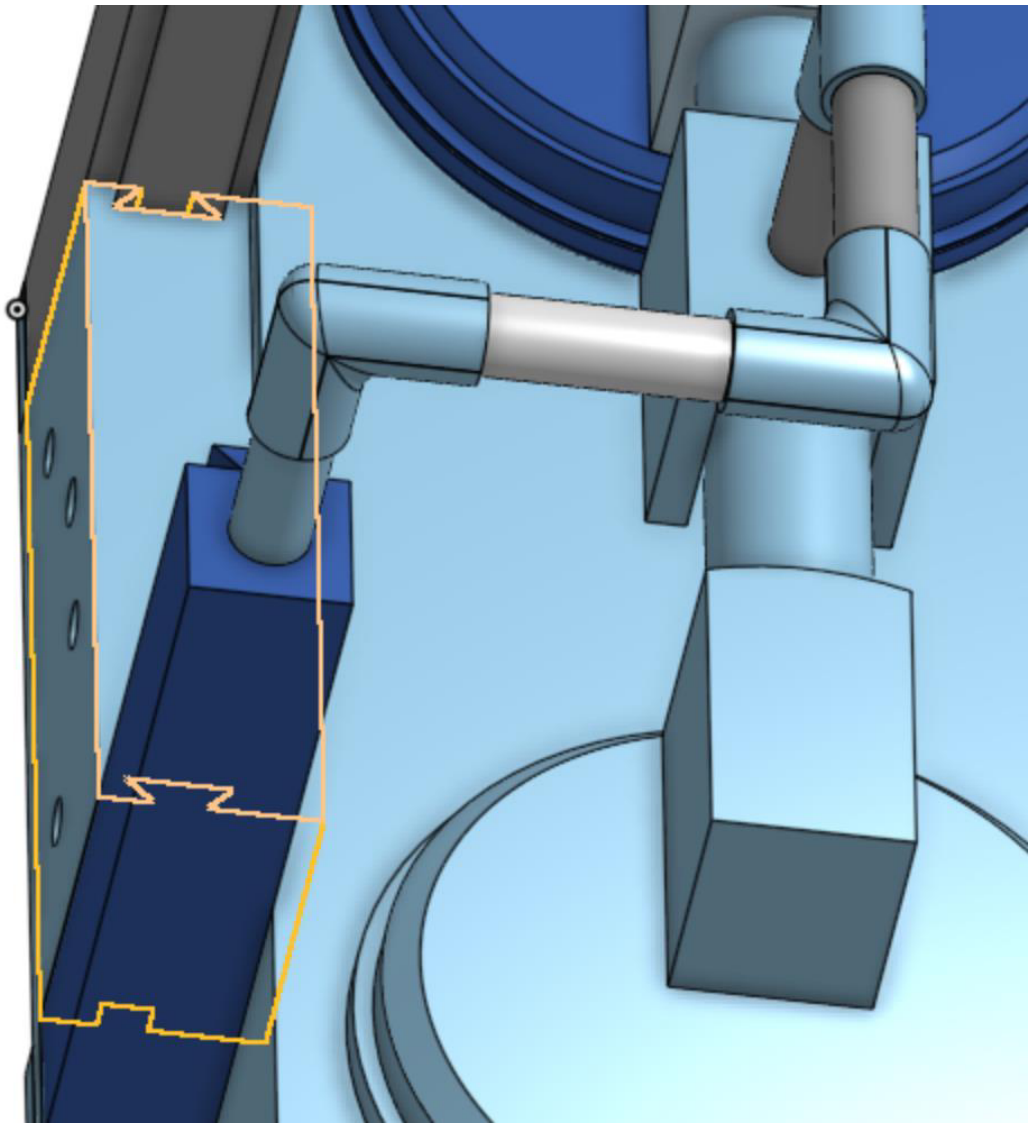

Figure 8: Where the Part from Figure 7 goes.

Prototype II Results

For prototype II our group said that we were prototyping how the part that slides in and out of the jig for different sized hinges and the part that holds in the springs that allow the jig to be adjusted for different sized backsets. During the prototype testing for the interchangeable hinge size part went smooth as how we have it designed will allow the part to slide correctly and smoothly and will also work to be slotted into the where the hinge is routered out to provide extra stability. Test 2 for prototype II hasn't gone so smoothly as we weren't able to find springs that were strong enough to provide extra strength in the correct size as they were all too thick to fit into the tower's predrilled hole so we have to keep looking or edit the towers and make a bigger hole for the spring. The prototype how we have the springs attached are the way we're going to keep it as it is easy to make and easy to see if the spring needs to be replaced and if cleaning is needed it is easy for that as well.

Figure 9: Prototype II (3D-Printing Error)

Figure 10: Side View of Prototype II

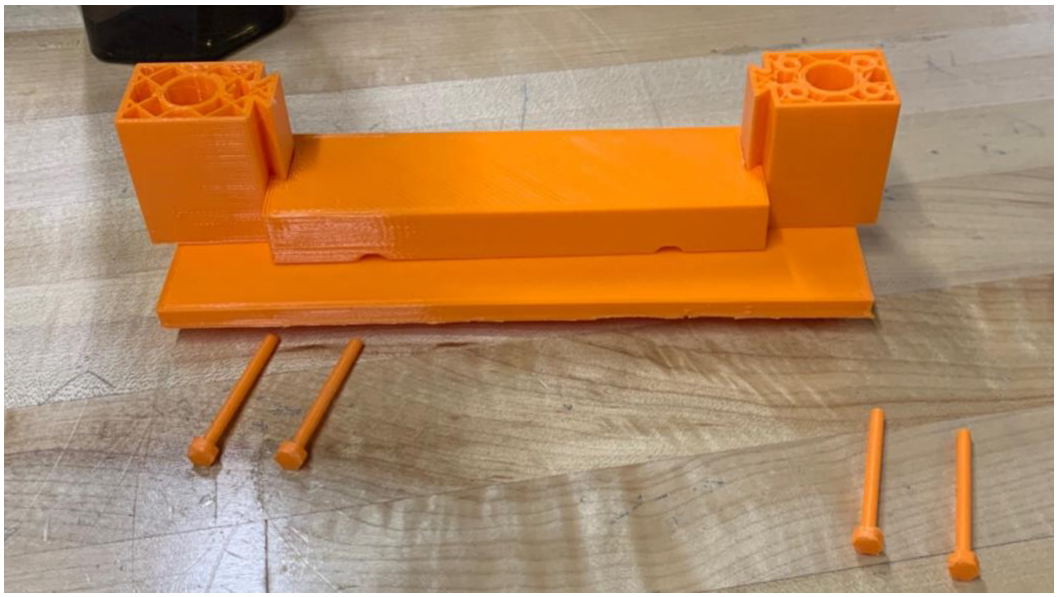

Figure 11: How Prototype II is supposed to look, but taller (3D-Printing Error)

Bill of Materials (Updated)

Table 1: Bill of Materials

Item Name	Description	Quantity	Cost (CAD)	Extended Cost (Tax)
Aluminum Vacuum Heavy Duty Suction Cup	Is a suction that is used for glass but in the reviews, we found one being used on a finish used on the doors at AMBICO. (2 Pack).	1	$32.99	$37.94
Steel	One of our group members has left over steel that we are able to use so that will be for the rods going to the suction cups as well as for the hinge jig that has the holes for different size hinges. Also be used for the locking mechanism of the steel hinge plate.	Depends on the size of pieces.	Free	Free
Wood	Wood can be scavenged from older furniture for free as many houses tend to throw out a lot of their old things away which can be reused for our jig.	Depends on the size of pieces.	Free	Free
Tee Connector Fitting	Will be used to let the rods that have the suction cups on them move accordingly to the different sized backsets on the door.	2	$2.30	$2.64
Copper Tubing	Copper tubing will be what allows us to house the retention spring in and connect the bottom of our jig to the top.	2 ft	$6.85 ($3.43 /ft.)	$7.74.
Copper Fittings	Copper fitting will be used to connect the copper rods together in order to connect the rods to the suction cups and the bottom of the jig	4	$0.93 (each)	$3.72
Springs	The springs in our jig will allow the user to pull apart the jig and attach it to the door such that it stays on the jig regardless of the backset size.	2	$2.82 (each)	$6.37
			Total after tax:	$56.05-58.41
			Budget:	$50

Conclusion

In conclusion, the adjustments made to our first prototype has proven to be beneficial in the second prototype test, as these changes promoted more rigidity by replacing the ball-and-socket joins with simple tension springs. The second prototype test – involving the verification of accurate measurements with the molds – has proven to be a success, with both mold sizes securely fitting into the jig with no problem. However, we have come across difficulties looking for springs to complete the design, meaning that this will have to be dealt with in the final prototype test.