

## PROJECT FOUR: MILESTONE 4 – COVER PAGE

Team Number: **Thurs-18**

Please list full names and MacID's of all *present* Team Members

Full Name:	MacID:
Vaisnavi Shanthamoorthy	shanthav
Sarah Youssef	yousss6
Jianhao Wei	weij50
Chengyao Liu	liuc169

## MILESTONE 4.1 – REFINED PROTOTYPE + PROTOTYPING TEST PLAN

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1. Take picture(s) of your refined prototype.
  - Insert your photo(s) as a Picture (Insert > Picture > This Device)
  - **Do not include more than two pictures per page**

*Insert picture(s) of your previous prototype(s) below.*

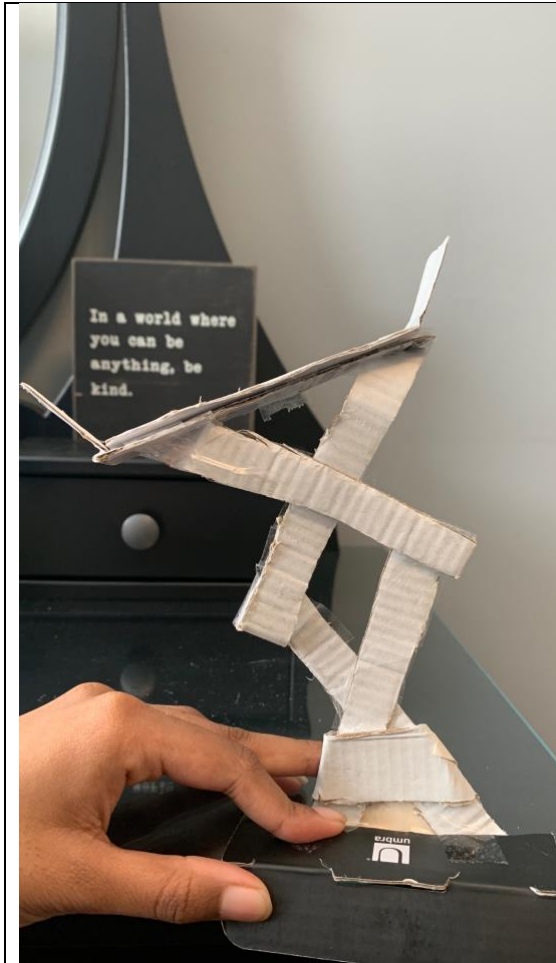




\*Limit screenshots to no more than 2 per page. For additional screenshots, please copy and paste the above on a new page.

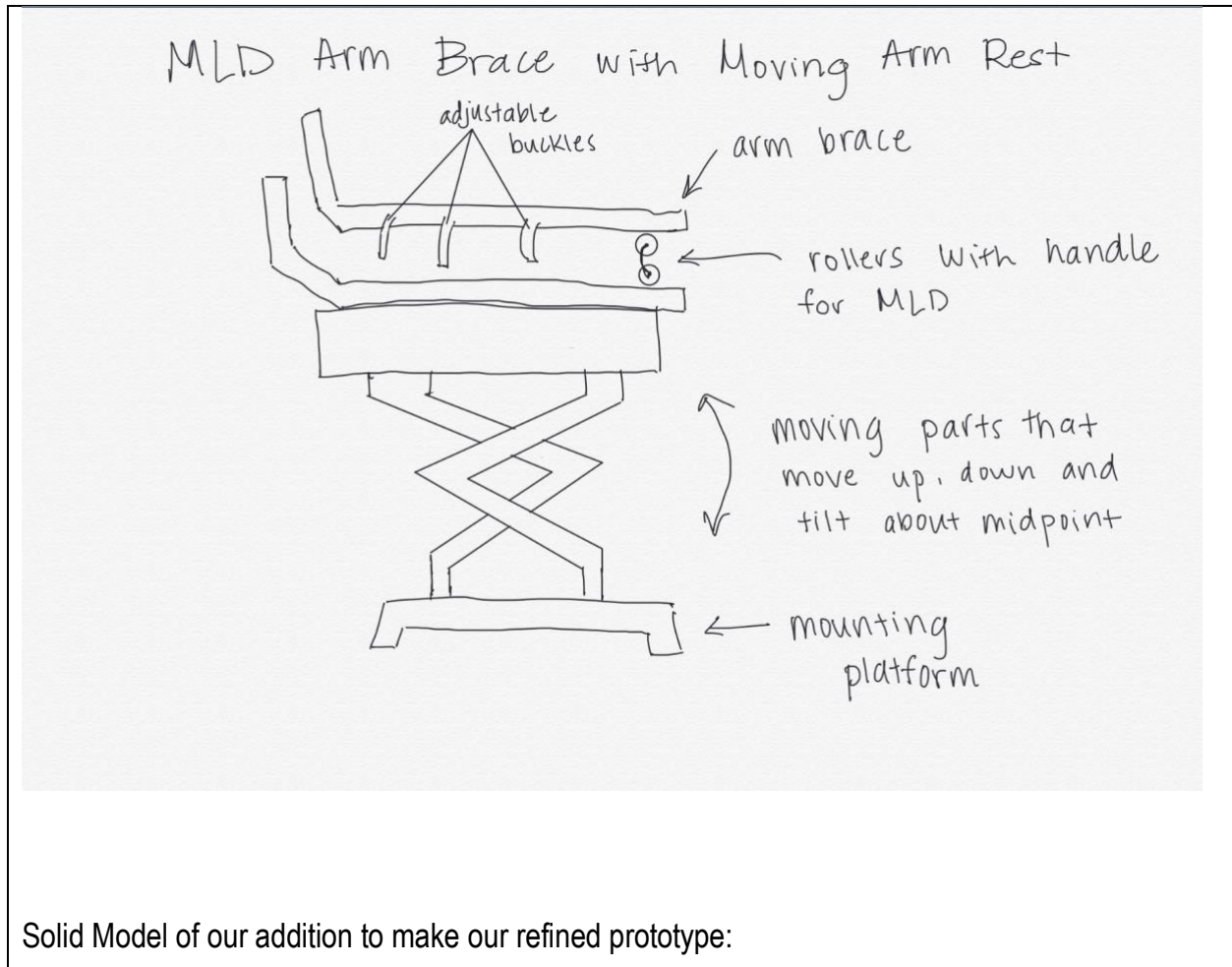
*Insert picture(s) of your refined prototype below.*

*Refined Prototype Addition:*

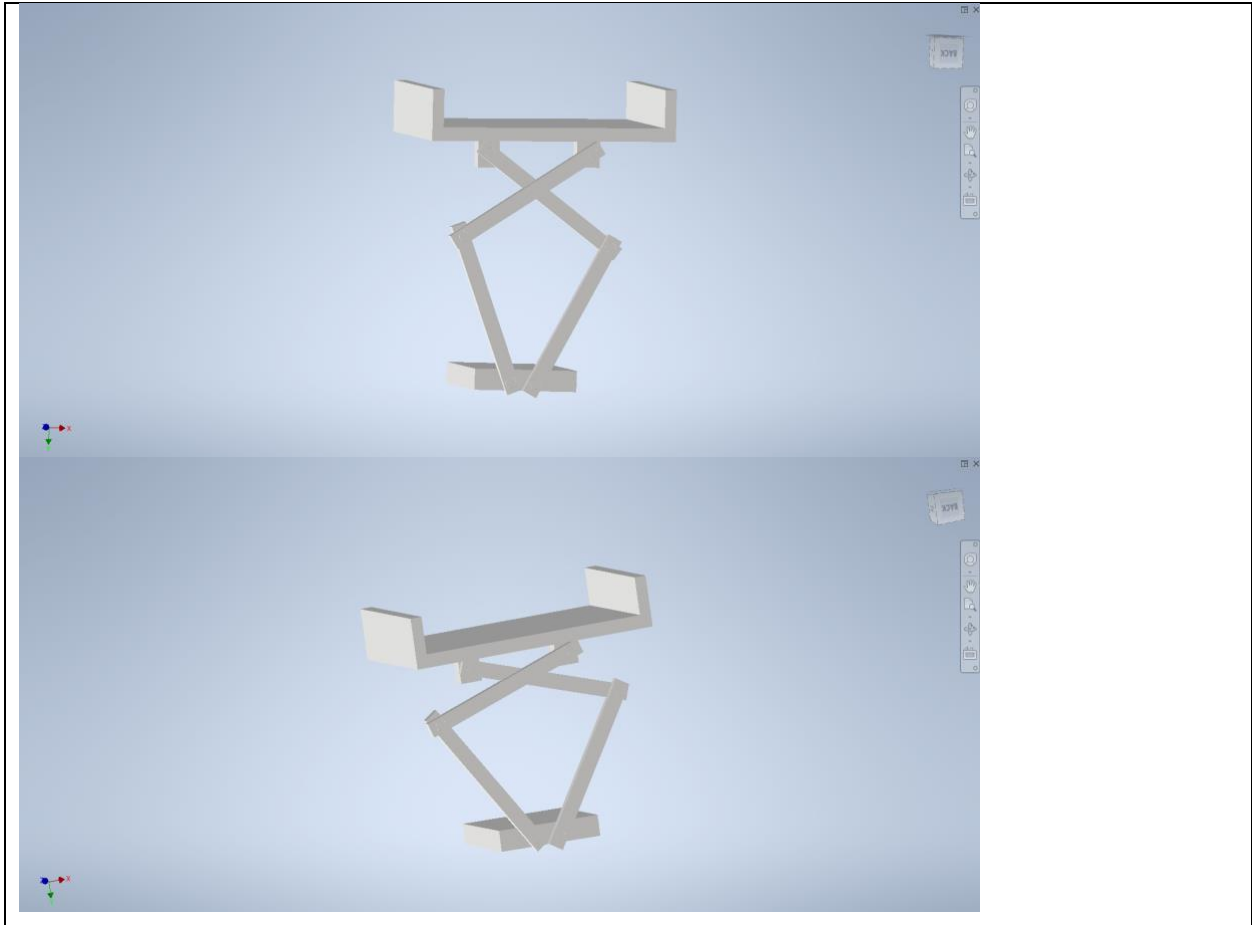




Sketch of our Refined Prototype for Clarity:



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\*Limit screenshots to no more than 2 per page. For additional screenshots, please copy and paste the above on a new page.

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2. Include details on how design concept was refined (what feedback was incorporated, what features are different than previous refined concept (initial prototype), etc.).

*Include details on your thought process and how the concept was refined below, with notes on relevant feedback that was incorporated (**max. 200 words**).*

The refined concept for this project was designed based on the feedback from the science students on the concepts presented last week. They mentioned that the rollers for manual lymph drainage would be a good idea to incorporate but it would be better to see it paired with a load bearing aspect, so that some of the load is taken off of Alanna's arm and she is able to bear higher stress on that arm. Because of this, we decided to include one of our older ideas (a mounted dynamic platform) with the arm brace and rollers so that the new solution could have both the pain management and load bearing aspects.



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3. Create a detailed prototype testing plan. (Max 500 words)
  - Consider what is feasible with the resources you have
  - “Testing” can include analytic solutions such as hand calculations, motion simulations in Inventor
  - Explore what you might do if you had more time, money, tools, etc.
  - Use IEEE referencing if any research is done

*Insert your **Present Testing Plan** (how you would test your prototype with the resources that you have available).*

To test our prototype, we are going to have a test plan that tests for three main objectives: safety, easy to use / adaptable, and lightweight.

Safety was considered as a major objective from the start of the initial prototype stages and was heavily incorporated into our design. To test for the safety of our design for the client, this can be done through observation and experimentation with pieces of thin cardboard. Any corners and edges present on our revised prototype will be rubbed back and forth against thin pieces of cardboard, and if the cardboard has any sharp bends or creases due to the rubbing, it will be considered a failed test. Any sharp / potentially harmful points on the device could also be felt over to see if they cause pain to any of the members. Different materials will also be tested for resistance to shattering through stress simulations on AutoCAD (Inventor). If the simulated material does not break / fracture under ~100 N of force, then the test will be considered successful.

To test for ease of use to the client, a physical prototype will be made by one of the members and will be tested for how efficient and effective it is to fully set up and place the mechanism around the body using only one hand. The prototype will be developed enough that it is able to effectively represent the concept we are trying to present. Because the client will need to be able to set up and secure the device using her non-dominant hand, the member carrying out the test will also need to be able to set up and secure the device around their dominant arm using their non-dominant hand. It will be considered a successful test if it is able to be set up and secured (in the manner mentioned) enough that the member can move their arm around without the mechanism falling off / unbuckling.

To test our design in terms of how lightweight it is, we noticed that the client mentioned that she would be able to carry a load no more than 8 lbs. Thus, a way in which we could test for this

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objective would be to scale the developed prototype and see if the weight of our design is within this range mentioned. With that being said, the design being lightweight was an objective from early in the engineering design process, we knew immediately that this would be an integral objective for our design and with our numerous refinements, this objective still is one of our top and main priorities.

*Insert your **Future Testing Plan** (how you would test your prototype with the resources that you do not currently have available but may have in the future).*

With more materials and time, each member would be able to build the same finalized device and be able to test its ease of use by trying to secure it around their dominant arms using their non-dominant hands. A larger testing pool (of people) would effectively increase the feedback and more clearly highlight the effectiveness of the device.

With access to more materials and money, the stress simulations on the materials can be taken out of the “simulation” environment and the materials can be tested for resistance to shattering in person. More time and research could also help the materials be tested for which material the client feels the safest using; as well as expanding the testing to more people and letting them give feedback on which material feels the safest to use.

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4. Fill out the table below, detailing each team member's contribution to this stage

Team Member's Full Name:	Contribution:
Vaisnavi Shanthamoorthy	Refined Prototype (Made a prototype for the addition to our initial porotype), Test Plan
Sarah Youssef	Aspect of Refined Prototype, How design concept was refined, Test Plan
Jianhao Wei	Inventor Model of Refined Prototype Addition
Chengyao Liu	Inventor Model of Refined Prototype Addition

## MILESTONE 4.2 – DESIGN REVIEW

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*Include feedback from peers in this row.*

N/A

*Include feedback from science students in this row.*

- *Possibly consider the possibility of making the device multifunctional, and if it could be used solely as an arm stand as well.*
- *Ensure that there no room for bacteria buildup, possibly could create holes to increase air flow in arm brace.*
- *Ensure no sharp edges as it could lead to flares for the client since the client suffers from several autoimmune diseases.*
- *Ensure device is portable (not too large)*

*If applicable, include feedback from the client in this row.*

N/A