Project Title: Digital Traction with Finger Sleeves

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Advisor: Prof. Randolph Ashton (rashton2@wisc.edu)
Co-Team Leader: Amy Dang (adang9@wisc.edu)
Co-Team Leader: Sean Carey (srcarey@wisc.edu)
Communicator: Anshpreet Sohal (sohal2@wisc.edu)
BSAC: Patricia Prakasam (pprakasam@wisc.edu)
BWIG: Henna Razeq (razeq@wisc.edu)
BPAG: Anem Karthik (kanem@wisc.edu)

Date: 10/30/26 - 11/5/26

Problem Statement

The objective of this project is to create a digital traction device using finger traps that precisely pulls the patient's hand, wrist, and forearm into a comfortable, neutral position while holding a stable static load about 1/10th of the patient's weight. To be feasible for Idrissa Pouye Hospital, the device must be portable and usable in both the plaster casting room and the operating room. This requires a compact device that can be transported easily between spaces and provides unobstructed access to the forearm for casting and arthroscopy. It must tolerate routine sterilization without degradation and maintain its mechanical material properties. In addition, the design must be simple enough to fabricate, assemble, and repair using materials and processes available in or near Dakar so that the hospital can maintain a reliable inventory even as individual devices are lost or damaged over time.

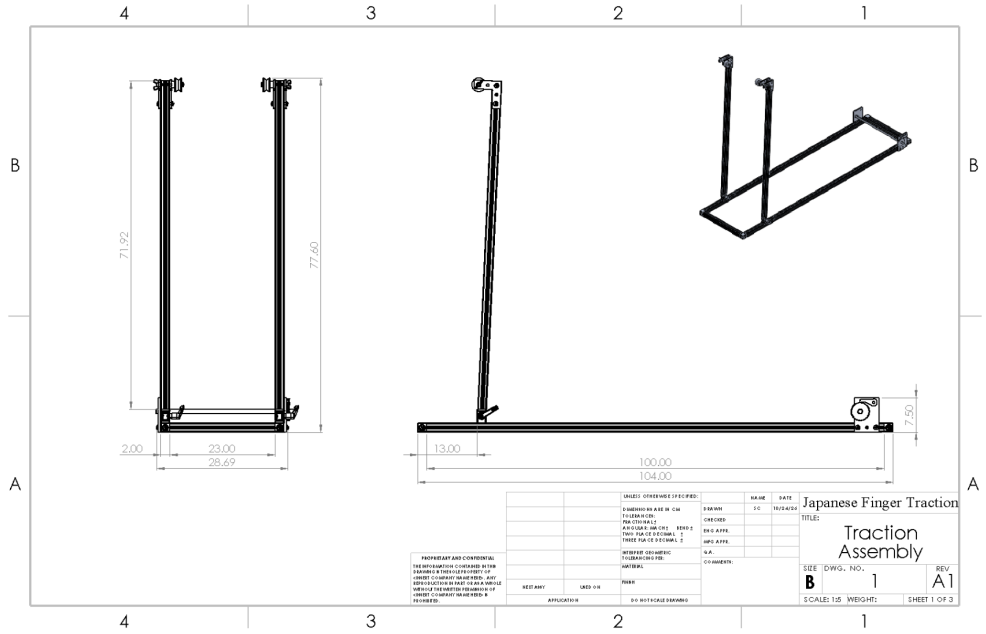
Brief Status Update:

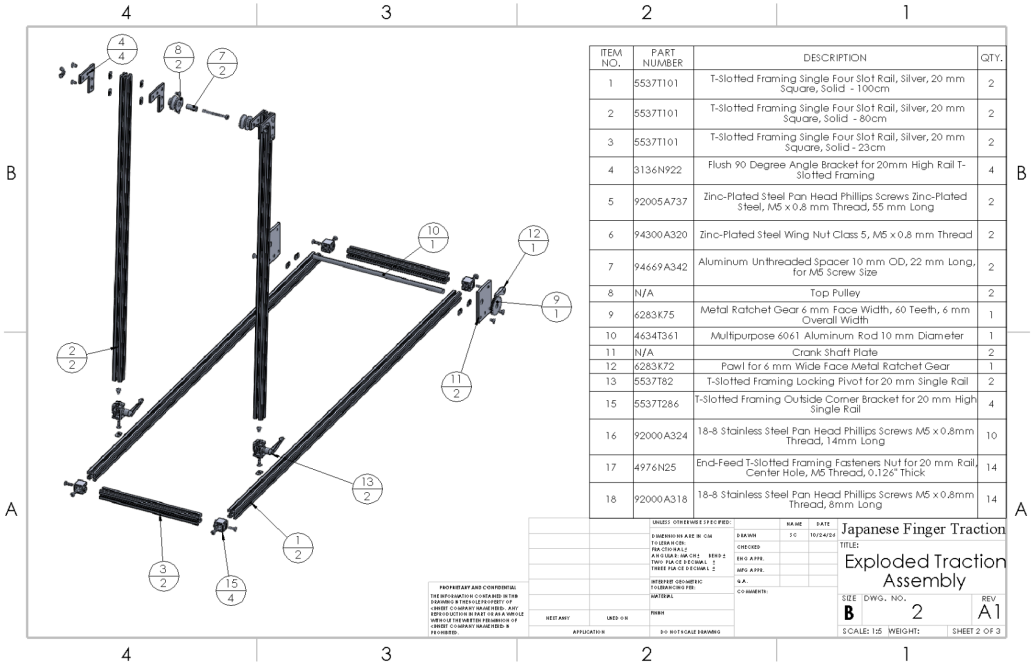
We were able to get a sample of the wrist rotation device made and have made changes based off of that and feedback from show and tell and hope to fabricate it next week. We are still currently waiting on materials to be ordered so that we can begin fabrication and testing. We were able to get good feedback and ideas from show and tell so we hope to start implementing those this week.

Weekly/Ongoing Difficulties:

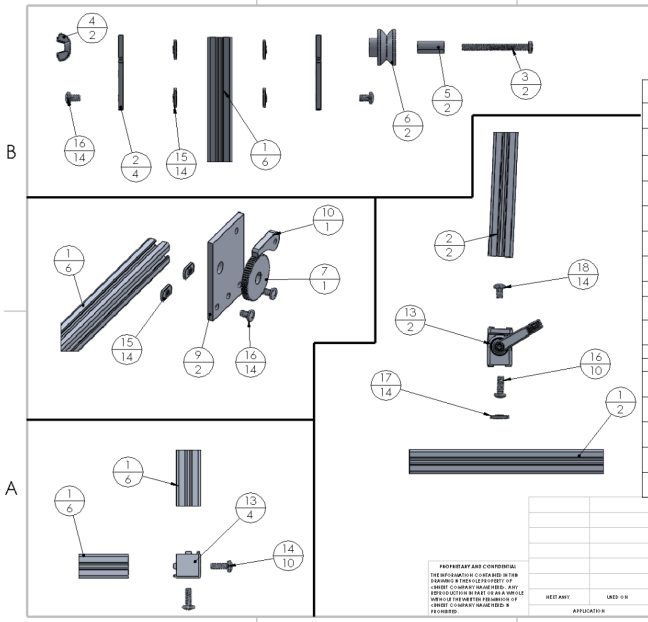
We are currently still waiting for materials to be ordered so there is only so much progress we can make right now. We did run into an issue with the mechanical staring gauge which we though was much shorter than it is, but we do have another option that we will be researching over the next few days.

Current Design





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 100cm	2
2	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 80cm	2
3	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 23cm	2
4	3136N922	Flush 90 Degree Angle Bracket for 20mm High Rail T-Slotted Framing	4
5	92005A737	Zinc-Plated Steel Pan Head Phillips Screws Zinc-Plated Steel, M5 x 0.8 mm Thread, 55 mm Long	2
6	94300A320	Zinc-Plated Steel Wing Nut Class 5, M5 x 0.8 mm Thread	2
7	94669A342	Aluminum Unthreaded Spacer 10 mm OD, 22 mm Long, for M5 Screw Size	2
8	N/A	Top Pulley	2
9	6283K75	Metal Ratchet Gear 6 mm Face Width, 60 Teeth, 6 mm Overall Width	1
10	4634T361	Multipurpose 6061 Aluminum Rod 10 mm Diameter	1
11	N/A	Crank Shaft Plate	2
12	6283K72	Pawl for 6 mm Wide Face Metal Ratchet Gear	1
13	5537T82	T-Slotted Framing Locking Pivot for 20 mm Single Rail	2
15	5537T286	T-Slotted Framing Outside Corner Bracket for 20 mm High Single Rail	4
16	92000A324	18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 14mm Long	10
17	4976N25	End-Feed T-Slotted Framing Fasteners Nut for 20 mm Rail, Center Hole, M5 Thread, 0.126" Thick	14
18	92000A318	18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 8mm Long	14



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1	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 100cm	2
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8	N/A	Top Pulley	2
9	6283K75	Metal Ratchet Gear 6 mm Face Width, 60 Teeth, 6 mm Overall Width	1
10	4634T361	Multipurpose 6061 Aluminum Rod 10 mm Diameter	1
11	N/A	Crank Shaft Plate	2
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18	92000A318	18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 8mm Long	14

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN mm
TOLERANCES:
FRACTIONAL
ANGULAR: MACH BEND
TWO PLACE DECIMAL
THREE PLACE DECIMAL
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
NEXT ASSY | USED ON
APPLICATION | DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	JC	10/24/24
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

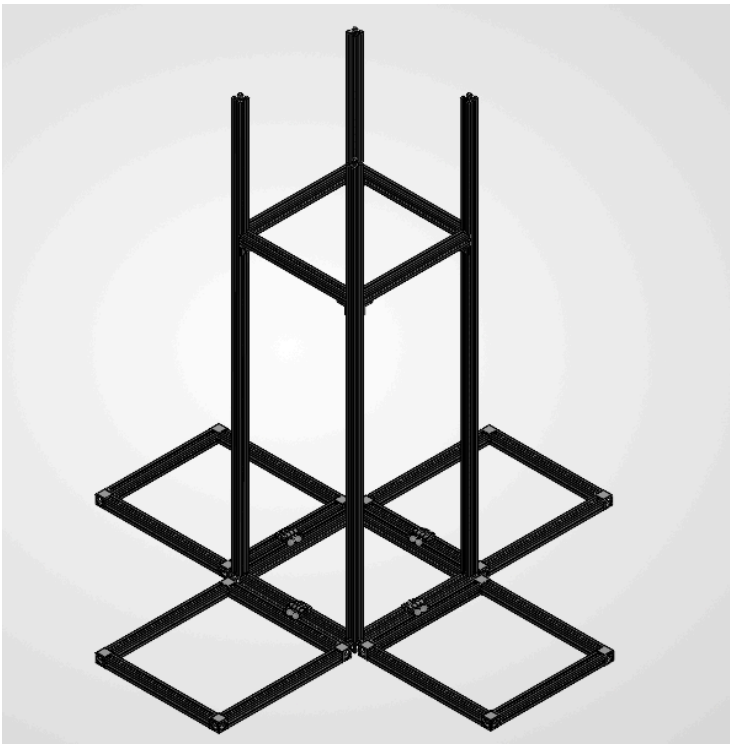
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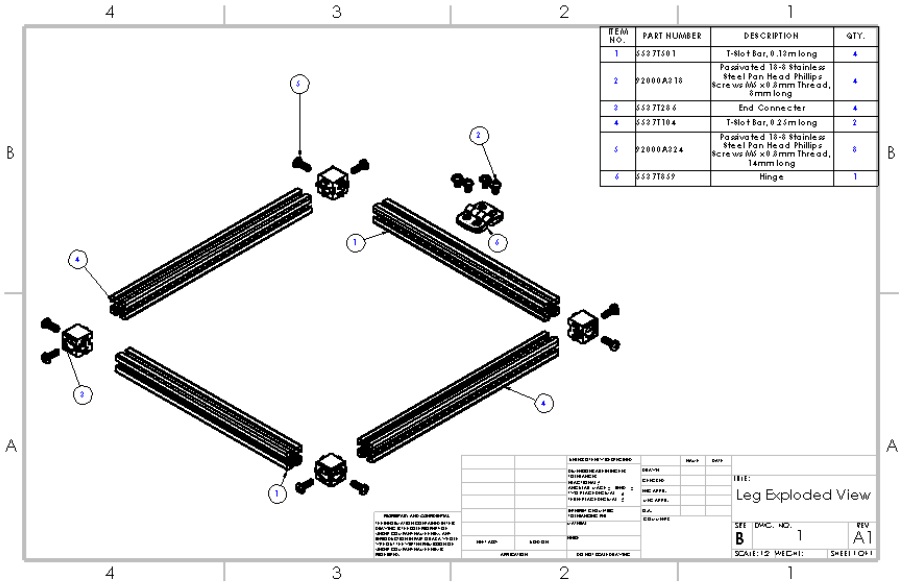
Japanese Finger Traction

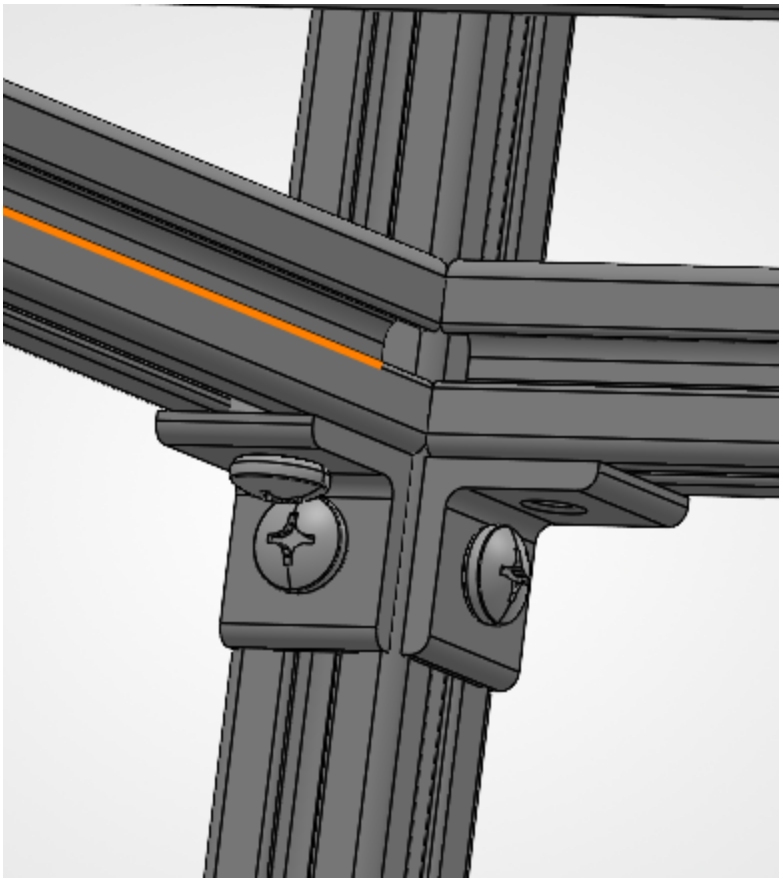
TITLE:
Traction Assembly Exploded Views

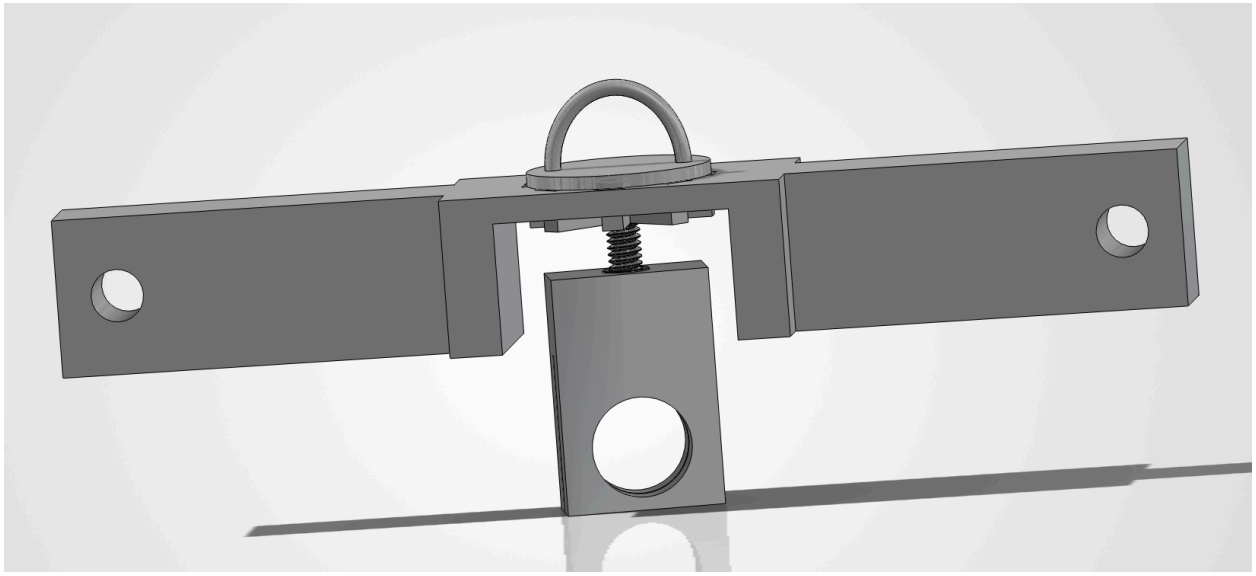
SIZE	DWG. NO.	REV
B	3	A1

SCALE: 1:2 WEIGHT: SHEET 3 OF 3




4
3
2
1
B
A
ITEM NO.
PART NUMBER
DESCRIPTION
QTY.
1
6607T501
T-Slot Bar, 0.12m long
4
2
92000A218
Passivated 18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 8mm long
4
3
6607T286
End Connecter
4
4
6607T104
T-Slot Bar, 0.25m long
2
5
92000A224
Passivated 18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 14mm long
8
6
6607T859
Hinge
1
Leg Exploded View
SIZE
B
DWG. NO.
1
REV
A1
SCALE: 1:5
WEIGHT:
SHEET 1 OF 1





New Final Design: Guillotine Pulley traction mechanism with new base design (top image) and wrist rotation mechanism (bottom image).

Summary of Weekly Team Member Design Accomplishments

Team: Continued to improve the current design while we are waiting to begin fabrication. We also did some materials research for both the traction system and wrist rotation device.

Individual:

- Amy Dang:
  - Revised wrist rotation design and researched new materials to use for it
- Sean Carey:
  - Looked for materials to use for project
  - Began experimenting with FEA analysis for the t-tubes
  - Researched spark-fun strain gauges
  - Brainstormed changes to make based off of show and tell feedback
- Anshpreet Sohal:
  - Exploded Leg View
- Patricia Prakasam:
  - Finished up Fabrication Protocol
  - Added Strain Gauge to Materials list
- Henna Razeq:
  - Researched ways to test tension in finger sleeves
  - Researched Materials
- Karthik Anem:
  - Did research on possible testing methods.
  - Worked on clamp design.

Upcoming Team and Individual Goals:

Team: Once we have the materials, we hope to fabricate the design as soon as possible. We would also like to finish the FEA Analysis of the different parts of our design. Also complete the rest of the test protocols.

Individual:

- Amy Dang:
  - 3D print new wrist traction design and purchase materials for it
  - Update wrist rotation solidwork design in solidworks
  - Fabricate traction device
- Sean Carey:
  - Create design for strain gauge
  - FEA Analysis Protocol/Testing
  - Fabricate Device
- Anshpreet Sohal:

- ➢ Troubleshoot Base Design Exploded View
- ➢ Fabricate Device

❖ Patricia Prakasam:
- ➢ Assist with any fabrication as needed
- ➢ Support other team members in any issues that may arise

❖ Henna Razeq:
- ➢ Fabricate device
- ➢ Research more ways to test, and how to go about testing

❖ Karthik Anem:
- ➢ Update clamp design with connector
- ➢ Begin fabricating if materials come in

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Product Design Specifications	09/18	All	Started	Yes
Design Matrix	09/25	All	Started	Yes
Preliminary Presentations	10/02	All	Started	Yes
Preliminary Deliverables	10/07	All	Started	Yes
Show and Tell	10/30	All	Started	Yes
Final Presentation	12/04	All	Not Started	No
Final Deliverables	12/09	All	Not Started	No

Timeline

Task	September				October					November				December		
	4	11	18	25	2	9	16	23	30	6	13	20	27	4		
Project R&D																
Research	X	X	X	X	X	X	X	X	X	X						
PDS	o	o	X	X	X	X	X	X	X	X						
Design Matrix	o	o	o	X	X	X	X	X	X	X						
Prototyping	o	o	o	o	o	o	o	X	X	X						
Testings	o	o	o	o	o	o	o	o	o	o						
Deliverables																
Progress Reports	na	X	X	X	X	X	X	X	X	X						
Prelim presentation	o	o	o	X	X	X	X	X	X	X						

Final Poster	o	o	o	o	o	o	o	o	o	o						
Meetings																
Client	na	o	X	o	X	o	X	o	X	X						
Advisor	X	X	X	X	o	X	X	X	X	o						
Website																
Update	X	X	X	X	X	X	X	X	X	X						

Filled boxes = projected timeline
X = task was worked on or completed – **o = Not completed**

Expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	QTY	Cost Each	Total	Link
Print										
Part 1	CF-PLA	DI Lab	X	X	X	10/19/2026	1	$2.61	$2.61	
Part 2	CF-PLA	DI Lab	X	X	X	10/19/2026	1	$0.11	$0.11	
Part 3	CF-PLA	DI Lab	X	X	X	10/19/2026	1	$0.35	$0.35	
Brackets Test	CF-PLA	DI Lab	X	X	X	10/21/2026	1	$0.55	$0.55	
Brackets, gears, paw, crank, pulley	CF-PLA. 1 top pulley. 4 3-way corner brackets. 7 2-way corner brackets. 1 surface corner bracket. 1 gear. 1 paw. 1 crank plate. 1 L bracket. 1 T bracket	DI Lab	X	X	X	10/28/3036	1	$3.07	$3.07	

Writ rotation	CF-PLA All 3 parts of the wrist rotation	DI Lab	X	X	X	10/28/2026	1	$3.20	$3.20	
Traction Device										
T-Tube	Single Four Slot Rail, Silver, 20 mm Square, Solid			McMaster Carr	5537T82		4	$35.73 / 10ft	$142.92	https://www.mcmaster.com/5537T101-5537T504/
T-tube rotating joint	Locking Pivot for 20 mm Single Rail			McMaster Carr	5537T82		2	$23.49	$46.98	https://www.mcmaster.com/5537T82/
Aluminum Unthreaded Spacer	10 mm OD, 22 mm Long, for M5 Screw Size			McMaster Carr	94669A342		2	$2.50	$5.00	https://www.mcmaster.com/94669A342/
Zinc-Plated Steel Pan Head Phillips Screws	Zinc-Plated Steel, M5 x 0.8 mm Thread, 55 mm Long			McMaster Carr	92005A737		1	$13.80 / 10	$13.80	https://www.mcmaster.com/92005A737/

Zinc-Plated Steel Wing Nut	Class 5, M5 x 0.8 mm Thread			McMaster Carr	94300A320		1	$4.61 / 25	$4.61	https://www.mcmaster.com/94300A320/
Multipurpose 6061 Aluminum Rod	10 mm Diameter, 1 ft.			McMaster Carr	4634T36		1	$3.87	$3.87	https://www.mcmaster.com/4634T36-4634T361/
Hinge	Rail-to-Rail Hinge for 20 mm High Rail, Silver			McMaster Carr	5537T859		4	$13.89	$55.56	https://www.mcmaster.com/5537T859/
18-8 Stainless Steel Pan Head Phillips Screws	M5 x 0.8mm Thread, 14mm Long			McMaster Carr	92000A324		1	$11.90 / 50	$11.90	https://www.mcmaster.com/92000A324/
End-Fed T-Slotted Framing Fasteners	Nut for 20 mm Rail, Center Hole, M5 Thread, 0.126" Thick			McMaster Carr	4976N25		6	$2.27 / 10	$13.62	https://www.mcmaster.com/4976N25/

18-8 Stainless Steel Pan Head Phillips Screws	M5 x 0.8mm Thread, 8mm Long			McMaster Carr	92000A318		$1.00	$8.50 / 50	$8.50	https://www.mcmaster.com/92000A318/
								TOTAL:	**$316.65**	

Activities Time

Team Member	Date	Activity	Time (h)	Weekly Total (h)	Semester Total (h)
Amy Dang	11/3	Solidworks+Material research	2.5 hr	2.5 hr	49 hr
Sean Carey	11/1 11/4 11/4 11/4	Materials Research Brainstorming FEA Analysis Testing Force Sensor Research	0.5 hr 1 hr 1 hr 1 hr	3.5 hr	65 hr
Anshpreet Sohal	11/5 11/5	Force Sensor Research SolidWorks	0.25 hr 1.25 hr	1.5 hr	50 hr
Patricia Prakasam	11/5	Materials List	0.5 hr	0.5 hr	39 hr
Henna Razeq	11/5	Research	1.5 hr	1.5 hr	41.5 hr
Karthik Anem	11/4 11/5	Solidworks Research	1 hr 2 hr	3 hr	45.5 hr