Robotics Traveling Van – 3rd Hardware Status Update

100% Milestone Check-in

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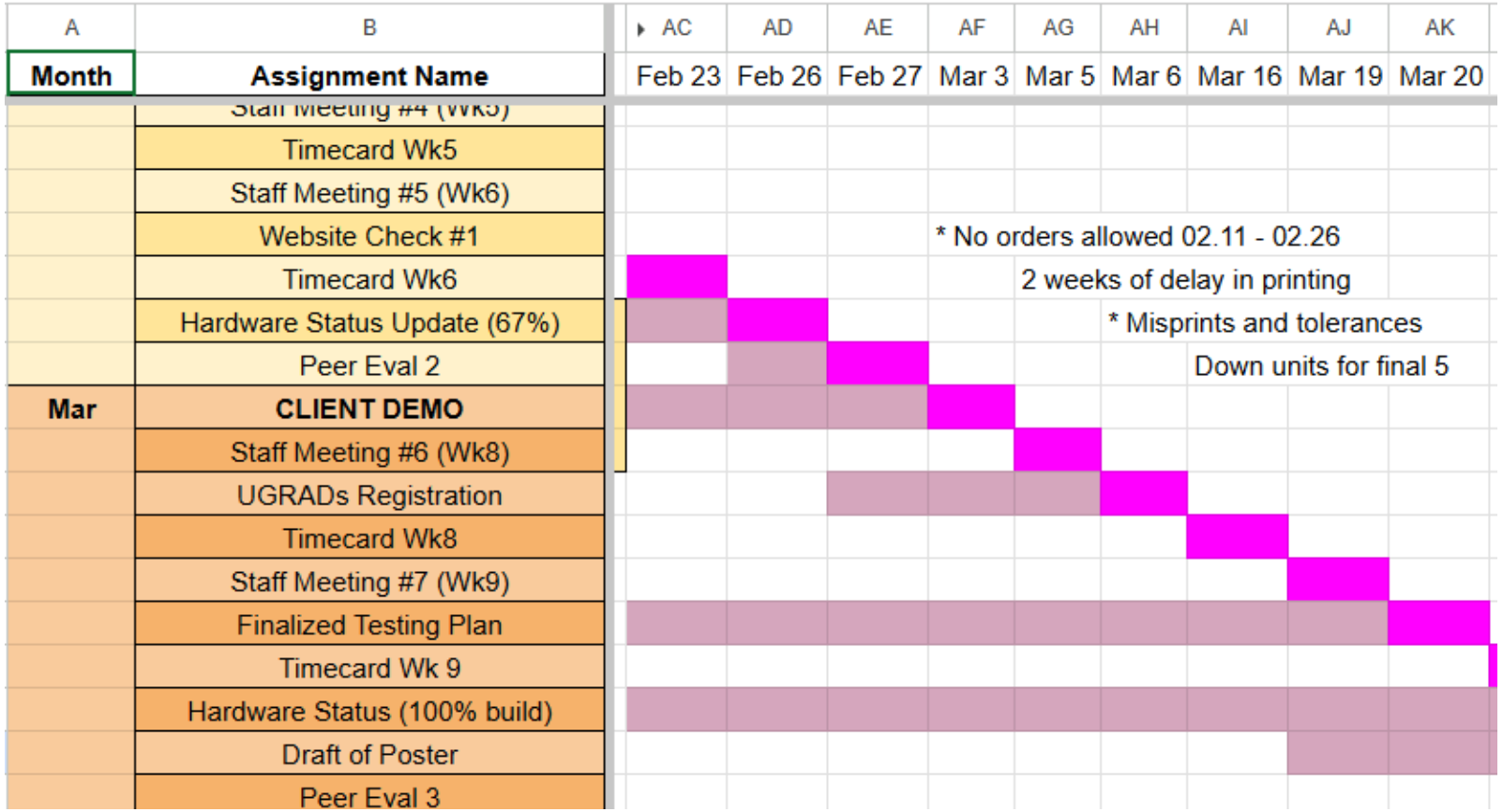
03/26/2026

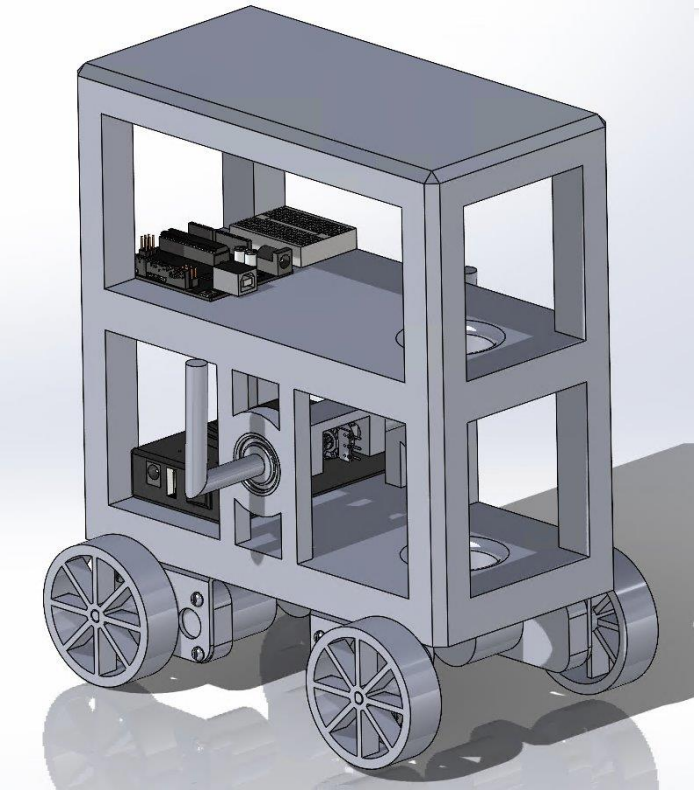
Gantt Chart & Schedule

1) Client demo April 1st
2) Final Poster
3) New robot quantity goal (one of each until mass production green light)

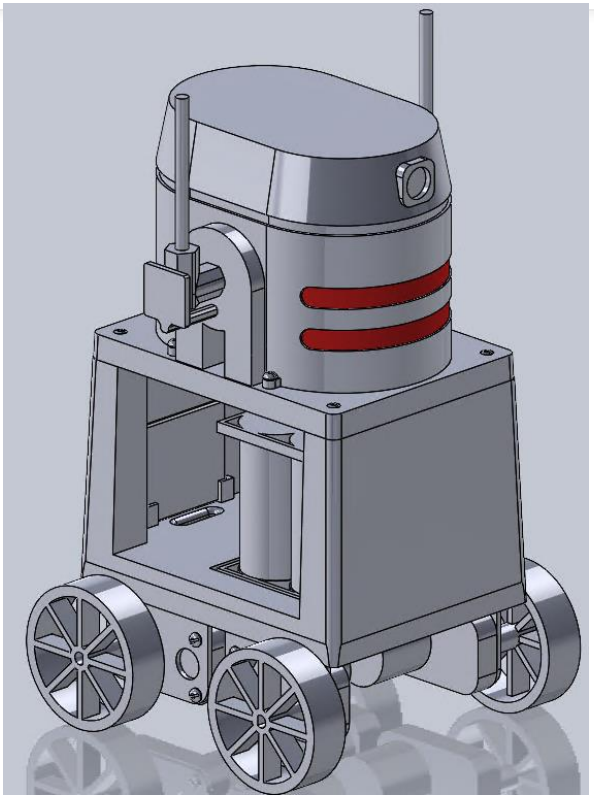


RTV – Andres

Design Efforts – Robot 1 (Inverted Pendulum)



February 202



February 2026

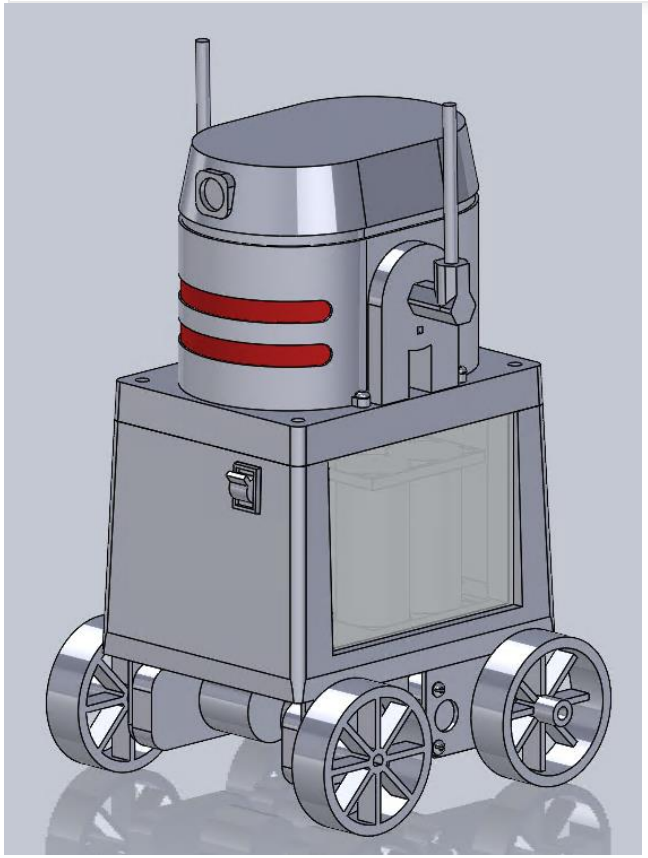
- Frame Completely Overhauled, Almost all electrical components now mounted on single level
- Switched from Arduino to Raspberry-Pi control system
- Battery system custom built.
- Switched to Magnetic Potentiometer
- Pendulum arm moved up, rebuilt to accommodate magnetic potentiometer
- Overall more aesthetically pleasing

Design Efforts – Robot 1 (Inverted Pendulum)

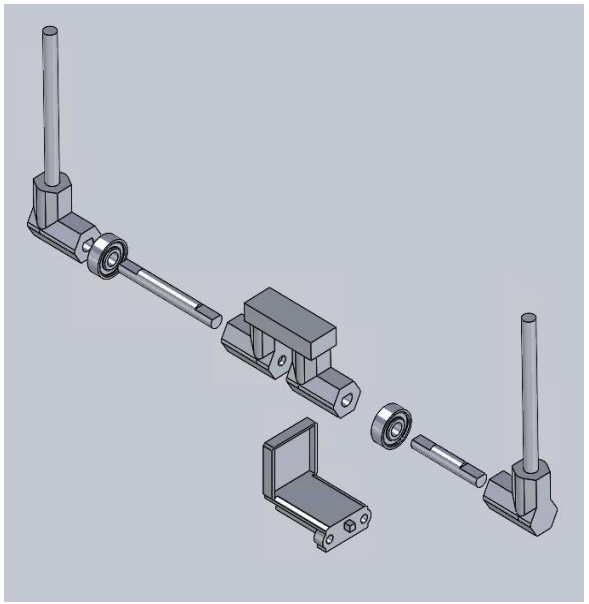
Design mistakes revealed in testing

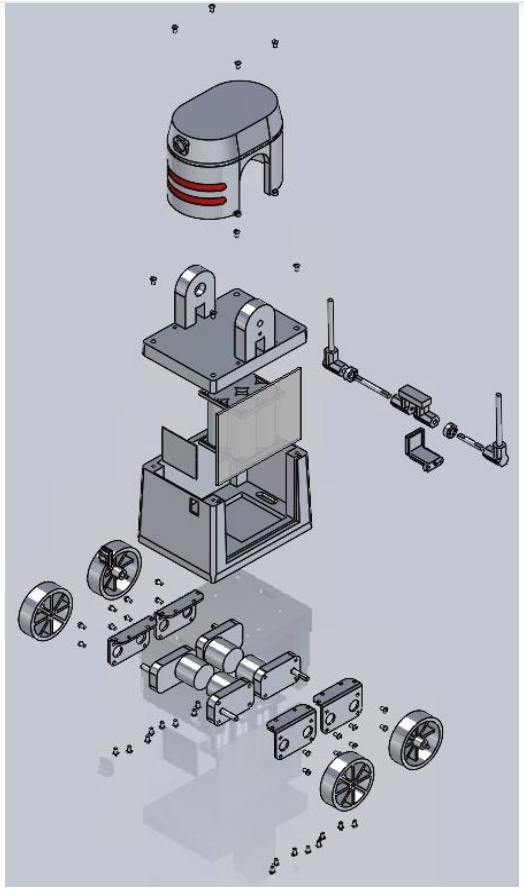
1) Aluminum Rods not exactly 6mm
2) Wires exposed, risk of catching on things

Robot 1 Updated CAD



RTV – Colin





- Both Bottom and Top frames modified with looser tolerances, added hole for power switch and slot for acrylic window
- Magnetic Potentiometer mount reinforced & moved to inside of shell
- Pendulum Arm separated into 4 pieces, printed center bracket to mount magnet and keep arms at same angle
- Fillets added to Bracket arms and aluminum rods

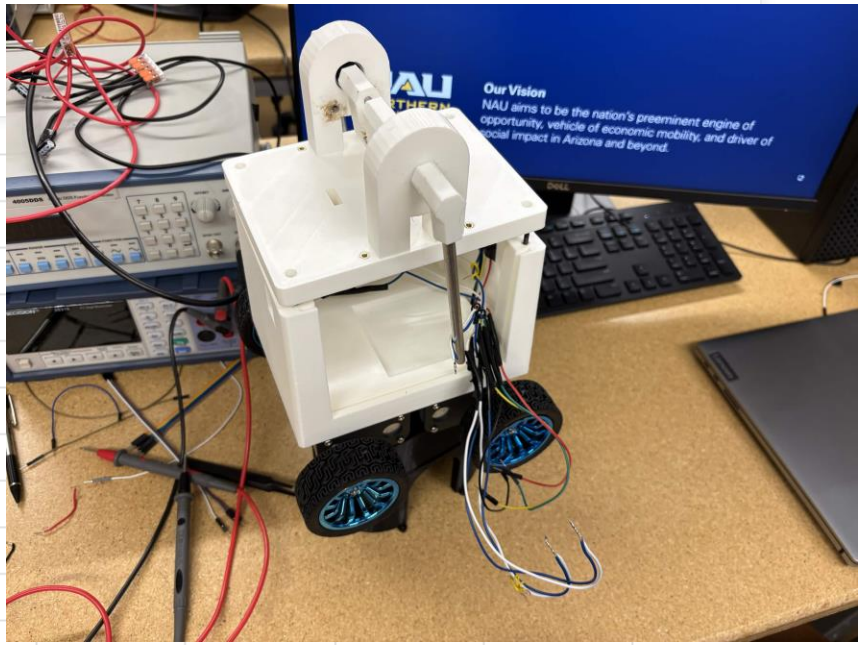
Purchasing Plan – Robot 1

	5 Unit BOM			Purchased		In Stock	Cost			
Mech	4	motors		100%		100%	49.95			
	4	wheels		100%		100%	-			
	2	bearings		100%		100%	8.49			
	5	Al rods		100%		100%	11.99			Total Budget
	3kg	filament		100%		100%	22.99			$5,000
	100	screws		100%		100%	21.99		Spent	$925.68
	100	M3 long		100%		100%	9.49		Remaining	$4,074
	100	M3 short		100%		100%	9.99			
Electrical	1	PicoPi		100%		100%	12.99			
	1	protoboard		100%		100%	5.99			
	1	buck converter		100%		100%	8.69			
	2	motor drivers		100%		100%	25.98			
	#	wire		100%		100%	9.99			
	4	batteries		100%		100%	159.95			
	1	chargers		100%		100%	72.95			
	1	mag. encoders		100%		100%	44.95			
	1	BMS		100%		100%	44.95			
	1	power cords		100%		100%	49.95			
UI	1	Touchscreen		100%		100%	104.95			
			% total	100%	% total	100%				

1) Project Scope has been severely dialed back
2) Now only producing 1 of each robot, if approved by Shaefer, might get the go-ahead for more

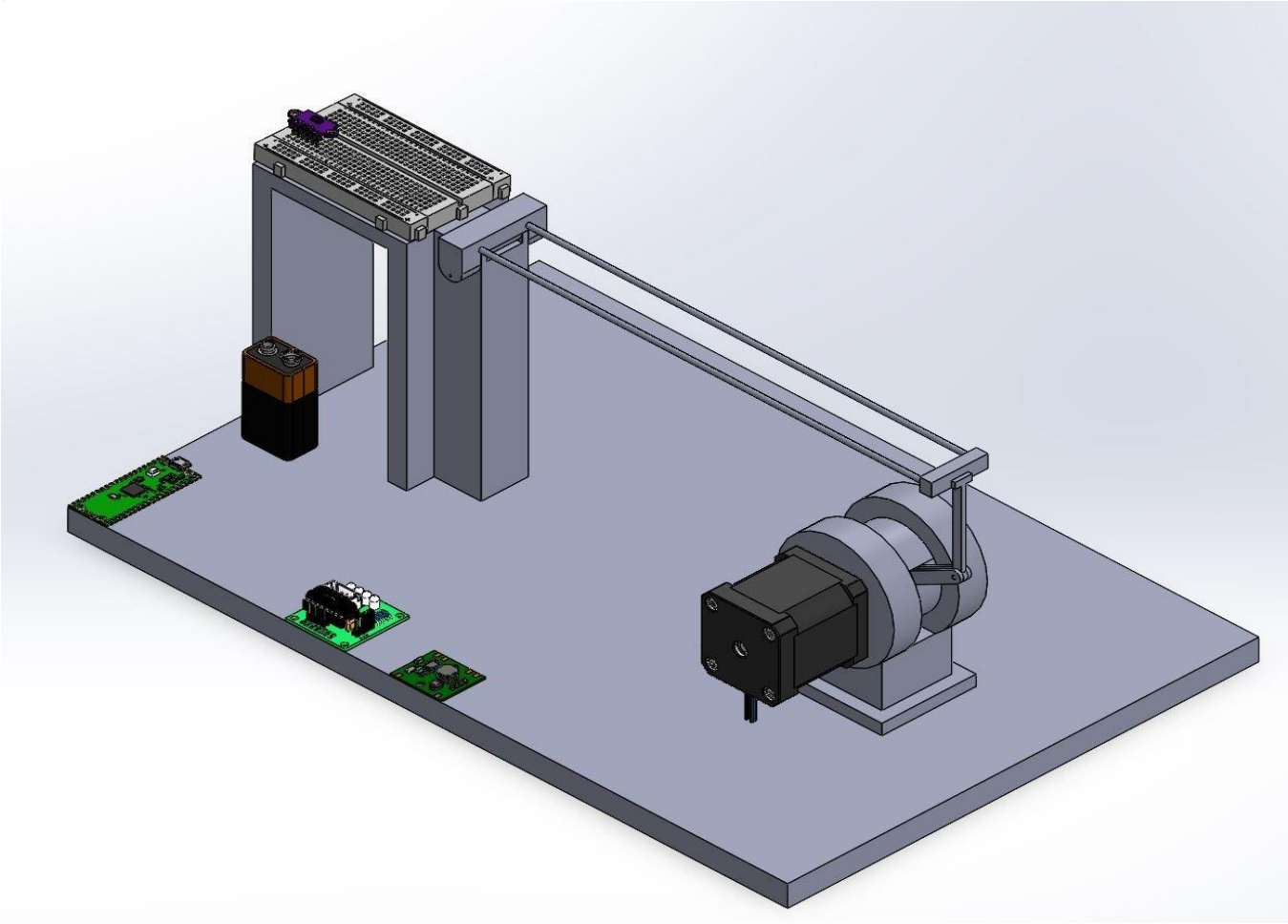
Manufacturing Plan – Robot 1

		Status	Unit Time	1 Units Time	TOTAL: 100%
Parts Printed					
Frame	top/bottom	100%	9 hrs/each	352 hrs	Note: 10 hrs of print from IDEALab for TPU shell
	arm bracket	100%	3 hrs/per 12	8 hrs	
	mag. holder	100%	2 hrs/per 8	9 hrs	
	shells	100%			
		Status			TOTAL: 100%
Parts Machined					
Pendulum		100%	1hr/each	7 hrs	(moved from bending to cutting)
		Status			TOTAL: 100%
Units Assembled					
Robot 1		100%	1.5 hrs/each	9 hrs	Note: Only includes mechanical assembly and circuit mounting, NOT circuit soldering (~3 hrs each)
		Status			If electrical included, total assembly time for 5 units is ~22.5 hrs
Soldering					
circuit	protoboard	100%	4 hrs/each	13.5 hrs	



Robot 2 Design Efforts (Sep. 2025-March 2026)

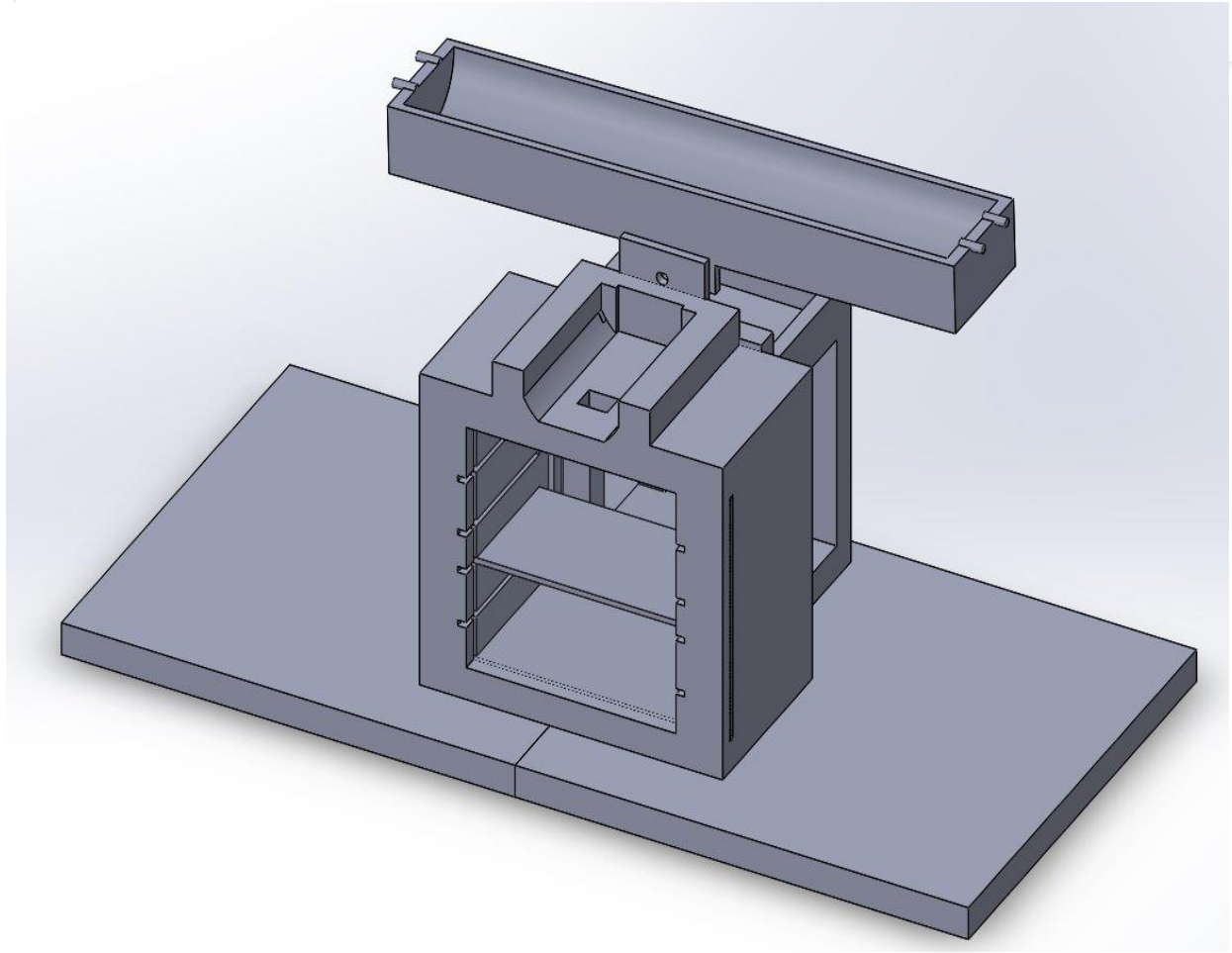
Design Efforts – Robot 2 (V1-V2)



September 2025 - December 2025

- Create a physical prototype
- Studying the physics of beam
- Analyzing stresses and motion of the components

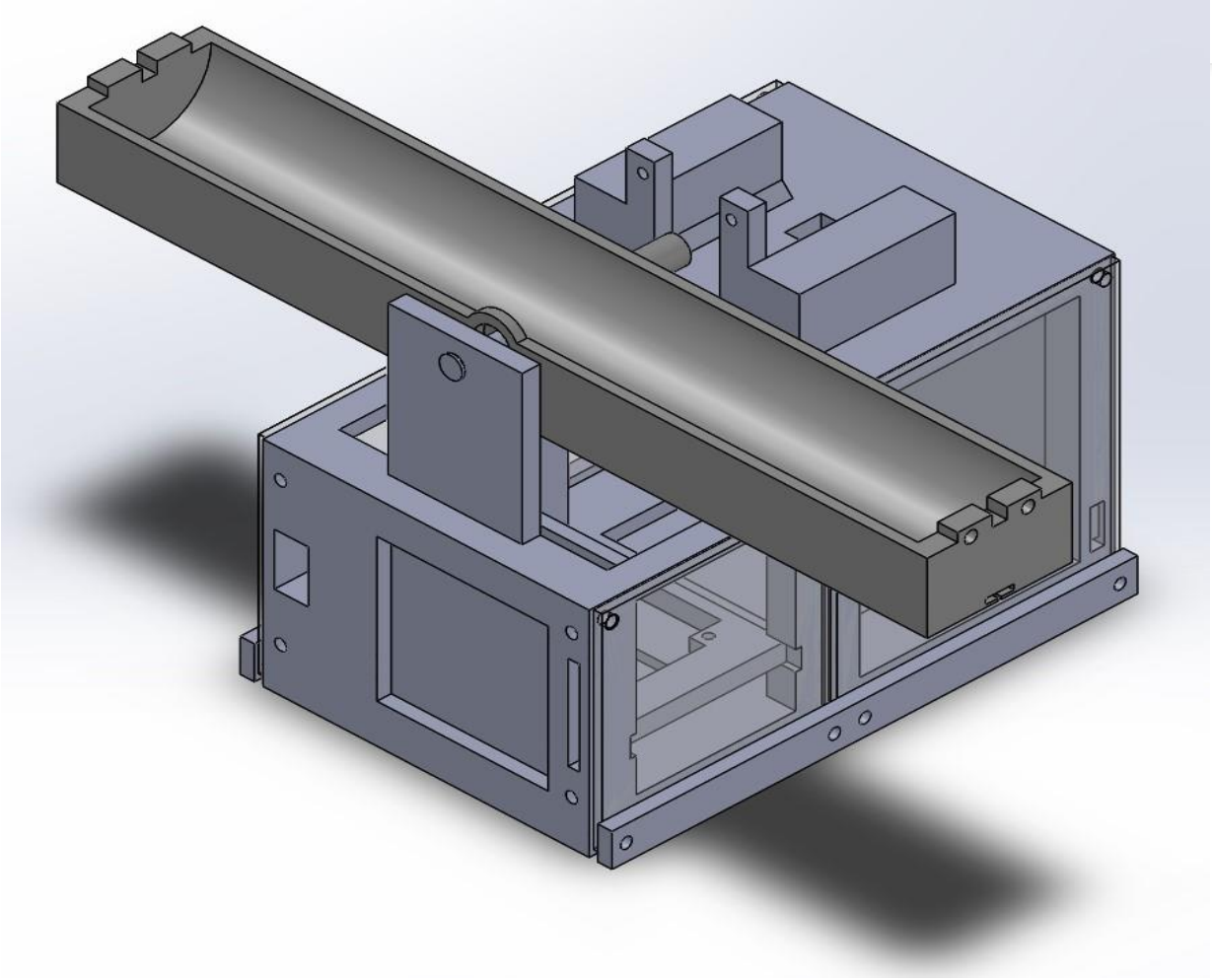
Design Efforts – Robot 2 (V3)



January 2026 - February 2026

- Less parts = Less material
- Stability
- Reduction size (14"x 7.5")
- Spacious for Electrical components
- Multiple functionality with each individual part
- Flows efficiently

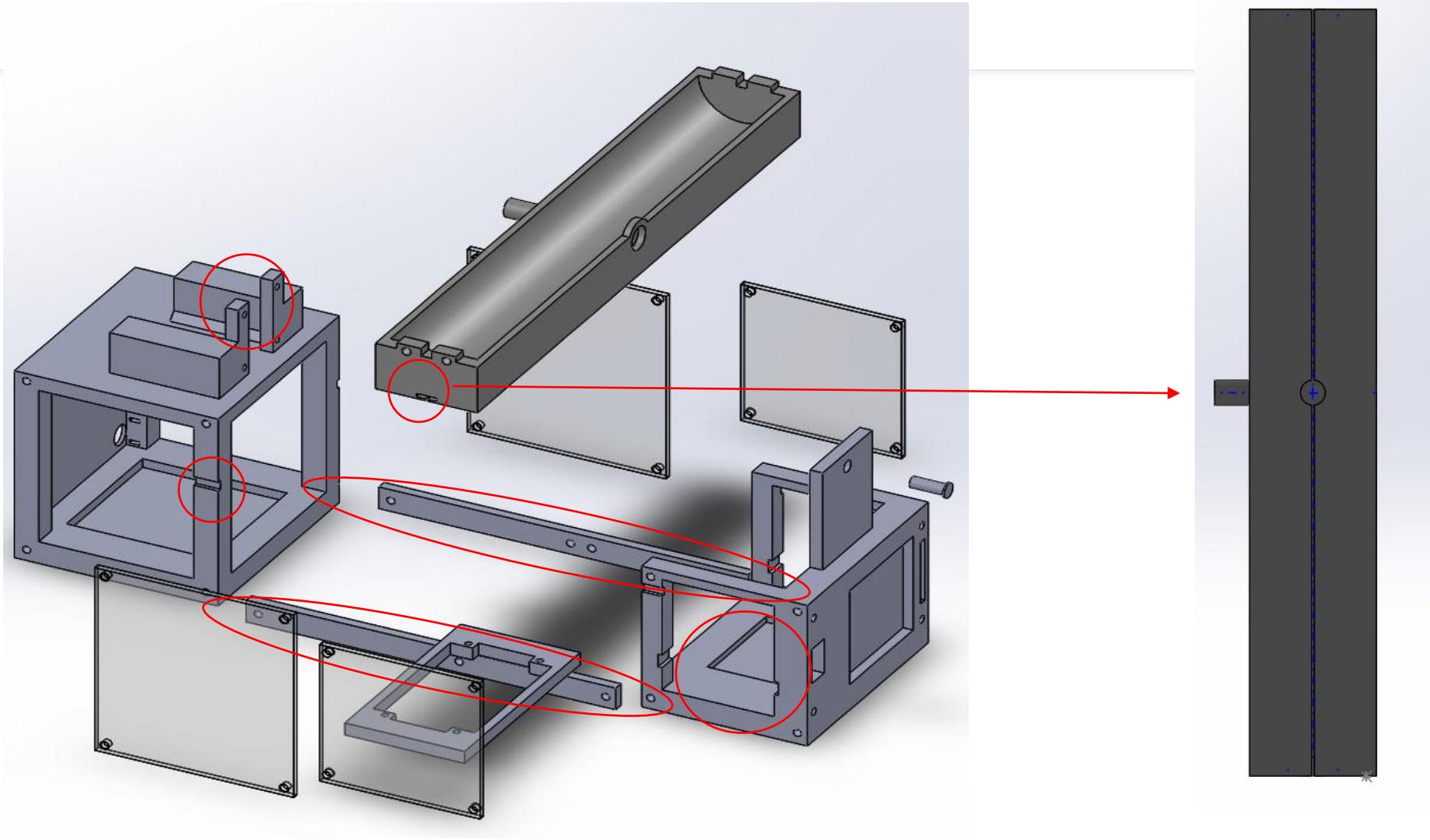
Design Efforts – Robot 2 (V4)



February 2026 – March 2026

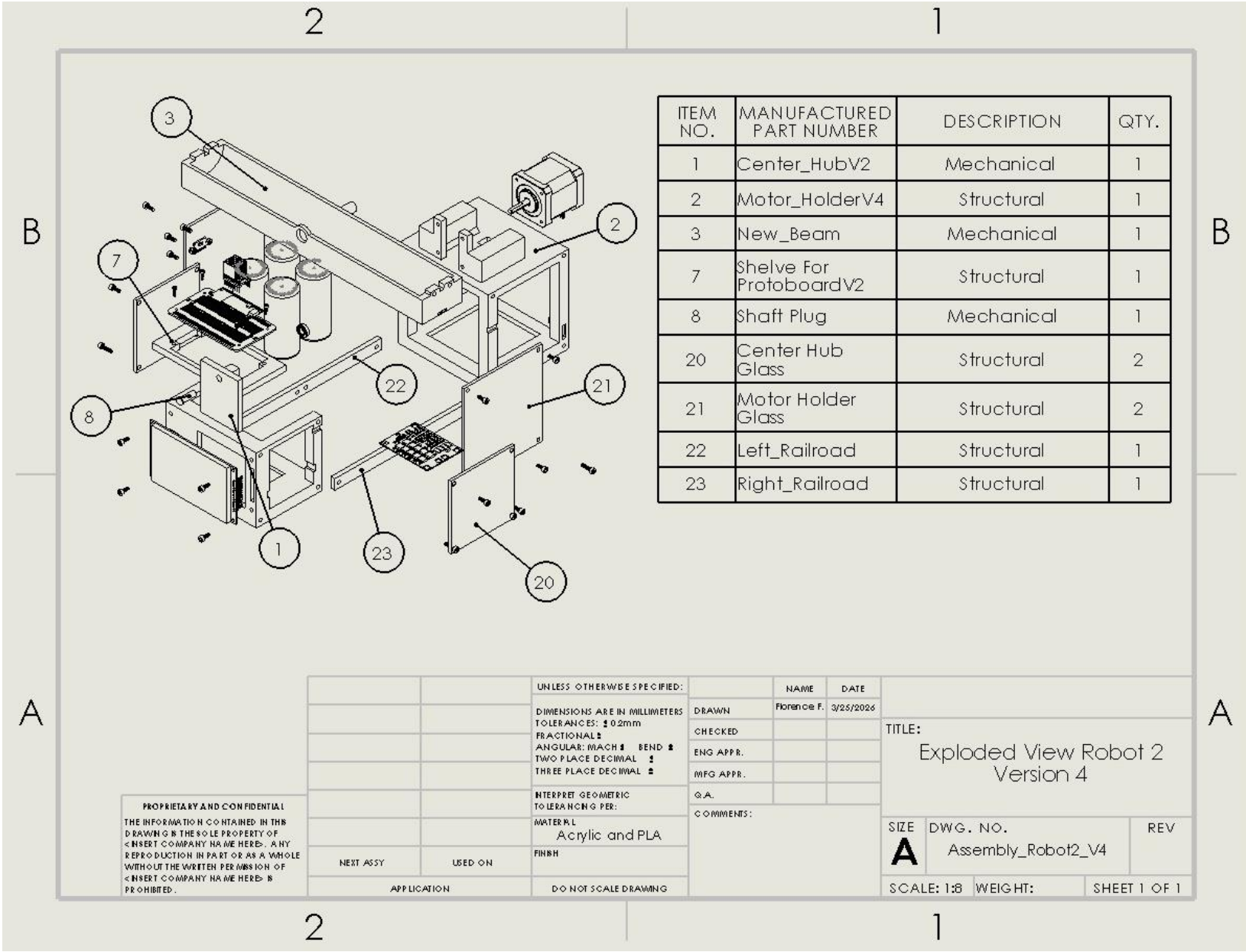
- Maximizing *internal* volume for wiring
- Increasing *central hub* vertically for clearance for components
- Minimized *backbone* with brackets
- *Cut out* for zip ties to hold hubs together
- Vertical extrusion for the *stepper motor* to reduce motion
- *Beam* cut-out underneath for easy wiring access

Robot 2 Updated CAD



Robot 2 Updated CAD

RTV – Florence



Purchasing Plan – Robot 2

Category	Item Description	Total Qty Ordered	Price Per Unit	Total Price	Status
Electronics & Power	Nema 17 Stepper Motor	5 Units	$14.99	$74.95	**RECEIVED**
Electronics & Power	ToF Sensor (VL53L0X)	3 Packs (1 Unit + 2 Packs)	$12.99	$38.97	**RECEIVED**
Electronics & Power	LiFePO4 Batteries	4 Boxes	$31.99	$127.96	**RECEIVED**
Electronics & Power	LCD Screen (4-inch)	5 Units	$20.99	$104.95	**RECEIVED**
Electronics & Power	Voltage Step-Down	2 Packs	$8.69	$17.38	**RECEIVED**
Electronics & Power	BMS Board (14.8V)	3 Packs	$8.99	$26.97	**RECEIVED**
Electronics & Power	Microcontroller (RP2040/Pico)	3 Units	$12.99	$38.97	**RECEIVED**
Electronics & Power	LiFePO4 Battery Charger	4 Units	$14.59	$58.36	**RECEIVED**
Electronics & Power	Protoboard Set	2 Packs	$13.59	$27.18	**RECEIVED**
Electronics & Power	Stepper Motor Driver TMC2208	1 Unit	$17.99	$17.99	**RECEIVED**
Electronics & Power	Rocker Switch (On/Off)	4 Units	$7.99	$31.96	**RECEIVED**
Hardware & Fasteners	686 Ball Bearings (10-pack)	2 Packs	$8.59	$17.18	**RECEIVED**
Hardware & Fasteners	Longer M3 Threaded Inserts	2 Packs	$9.99	$19.98	**RECEIVED**
Hardware & Fasteners	Shorter M3 Threaded Inserts	1 Pack	$9.99	$9.99	**RECEIVED**
Hardware & Fasteners	M2 Threaded Inserts	1 Pack	$9.99	$9.99	**RECEIVED**
Hardware & Fasteners	M3 x 12mm Socket Screws	1 Pack (100pcs)	$8.95	$8.95	**RECEIVED**
Hardware & Fasteners	M3 x 8mm Socket Screws	1 Pack (100pcs)	$8.95	$8.95	**RECEIVED**
Hardware & Fasteners	M2 Screw Assortment Box	1 Box	$14.99	$14.99	**RECEIVED**
Hardware & Fasteners	M3 Zinc Hex Nuts (5-piece)	2 Packs	$3.75	$7.50	**RECEIVED**
Wiring & Materials	22 AWG Hookup Wire	1 Pack	$15.29	$15.29	**RECEIVED**
Wiring & Materials	Dupont Jumper Wire Set	1 Pack	$6.98	$6.98	**RECEIVED**
Wiring & Materials	Header Pins	1 Pack	$7.39	$7.39	**RECEIVED**
Wiring & Materials	Hyper PLA Filament (Black)	3 Rolls	$17.99	$53.97	**ORDERED**
Wiring & Materials	KAITELA Clear Acrylic Sheets 4"x6"	2 Packs	$16.99	$33.98	**ORDERED**

Requirement	Target	Current Progress	Raw Numbers	Status
Total Items Ordered	100%	**100%**	26 / 26 Items	☑ Goal Met
Total Items On-Hand	100%	**100%**	26 / 26 Items	☑ Goal Met

Raw Estimates:	1 Unit:	All 5:
	$305.63	$780.78

RTV – Freddy

Manufacturing Plan – Robot 2

Part	Time [hours]	Manufacturing Method	Progress Percent
Center Hubs	5	3D Printed	100%
Backbones	3	3D Printed	100%
Protoboard Shelves	2	3D Printed	100%
Shaft Plugs	:06	3D Printed	100%
Motor Holders	6	3D Printed	100%
Beams	5	3D Printed	100%
Soldered Protoboards	5	Soldered	100%
Soldered Battery Packs	5	Soldered	100%
Acrylic Glass Covers (4x)	:30	Cut / Drilled	100%
Total	**31**		**100.00%**

File Part	Total PLA Filament (g)	Total Time (hrs:min)	Costs ($USD)
Motor Holder	188.69 g	6:03	$3.39
Center Hub	136.28 g	4:47	$2.45
Protoboard Shelf	11.60 g	1:01	$0.21
Inside Base Plate	38.90 g	2:11	$0.70
Shelve for BMS	21.80 g	2:27	$0.39
Shaft Plug	0.50 g	0:07	$0.01
Beam	115.00 g	*5:37*	$2.07
TOTAL PER ROBOT	**512.97 g**	**22:13**	**$9.23**

Physical Builds

Robot 2: Ball - on - Beam

Robot 1 Demo

Robot 1: Inverted Pendulum

Robot 2 Demo

Robot 2: Ball - on - Beam

Thank You