

Robotic Arm



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Project Description

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- Goal: develop a **waist-mounted robotic arm** that
 - Offers **active gravity compensation**
 - Remains **lightweight, low-profile, and energy efficient**
 - Enables the arm to rest naturally by the user's side.
- **Client:** Dr. Zach Lerner, Associate Professor of Mechanical Engineering, NAU.
- **Sponsorship:** W.L Gore

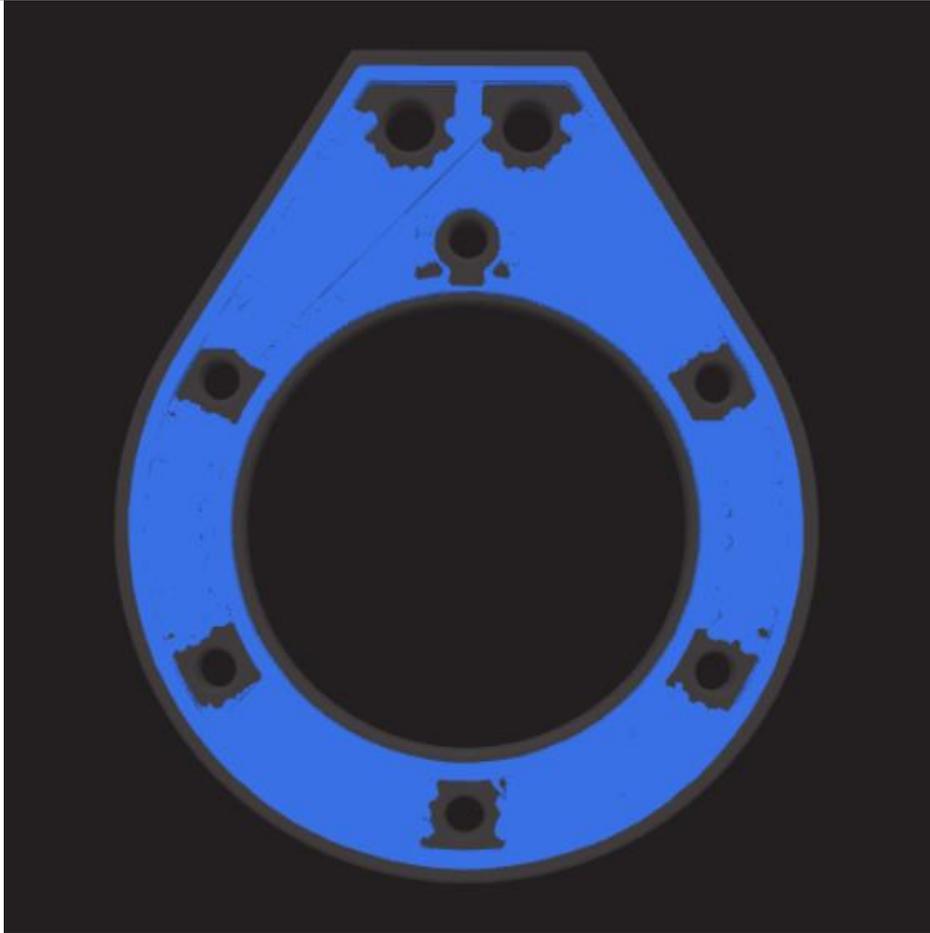
Purchase Plan

Type	Including	Percentage bought	Percentage on Hand
Fasteners	Screws, bolts, washers, heat set inserts, etc.	100	90
Printing Material	PLA, Onyx, and Carbon	100	100
Electronic Components	Batteries, Motor, control boards, etc.	100	100
Overall		100	97

Manufacturing plan

Manufacturing Plan							
Completion	Part No.	Material	Quantity	Manufacturing Hours / Part	Total Hours	Quantity Completed	Completed Time
	DET001	Carbon Fiber	3	1	3	3	3
	DET002	ONYX + C	1	11	11	1	11
	DET003	ONYX	1	2	2	1	2
	DET004	ONYX	1	1.66	1.66	1	1.66
	DET005	ONYX + C	2	1.33	2.66	2	2.66
	DET006	ONYX + C	2	5.5	11	2	11
	SUB01-DET001	ONYX + C	1	4	4	0	0
	SUB01-DET002	ONYX + C	1	3	3	0	0
	SUB03-DET001	ONYX	1	2.15	2.15	1	2.15
	SUB03-DET002	ONYX	1	2	2	1	2
	SUB03-DET003	ONYX	1	2	2	0	0
	Control Board	-	1	1	1	0	0
	Battery Connections	-	1	1	1	0	0
	Control Board Housing	ONYX	1	2	2	0	0
		Totals:	18	39.64	48.47	12	35.47
						Completed Manufacturing (%)	66.67%
						Manufacturing Time (%)	73.18%

Design Efforts (Spring Semester)

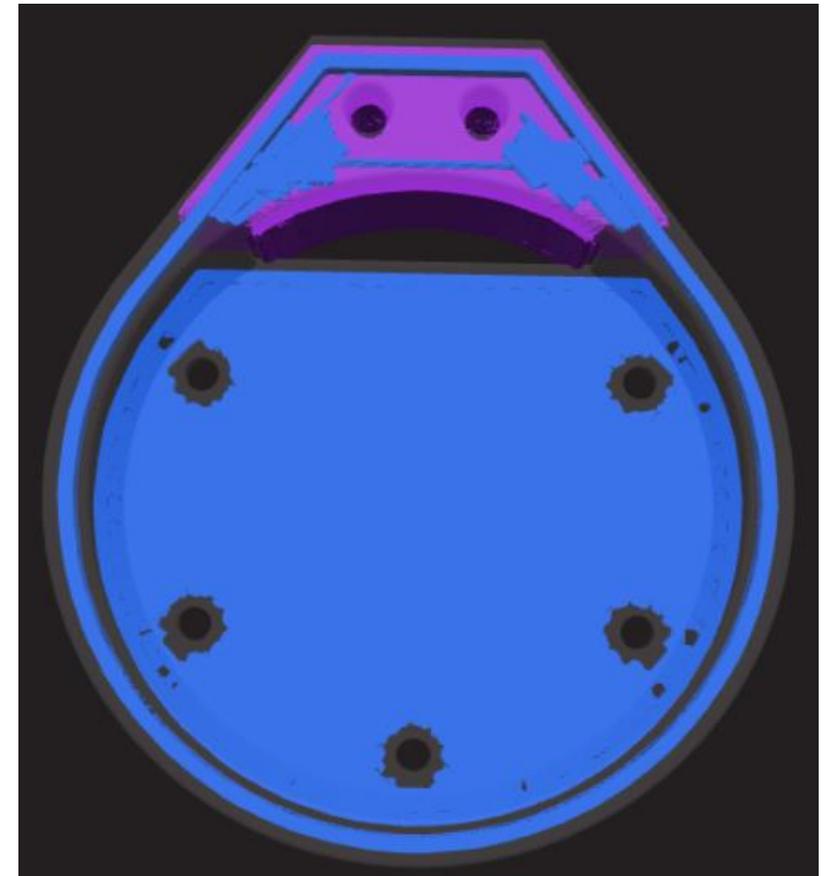
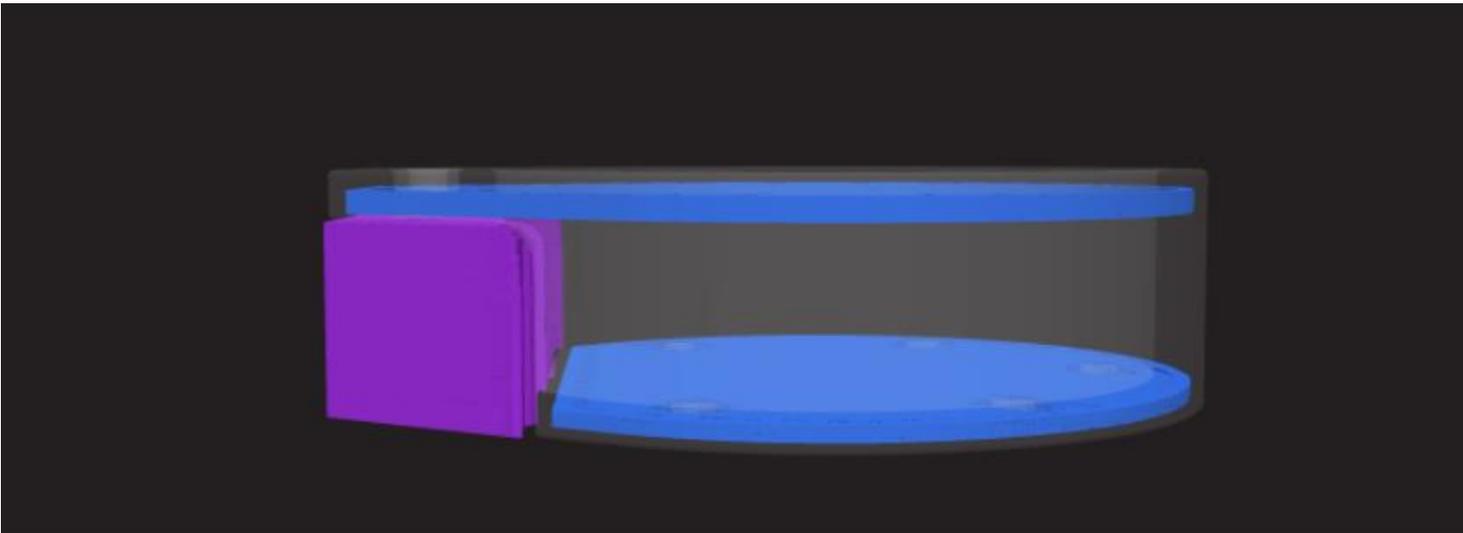


**Carbon Fiber inlay is represented in Blue.
3D Print supports are represented in Purple.
The rest of the part is represented by an opaque gray.

Parts Optimized for 3D Printing, DFM

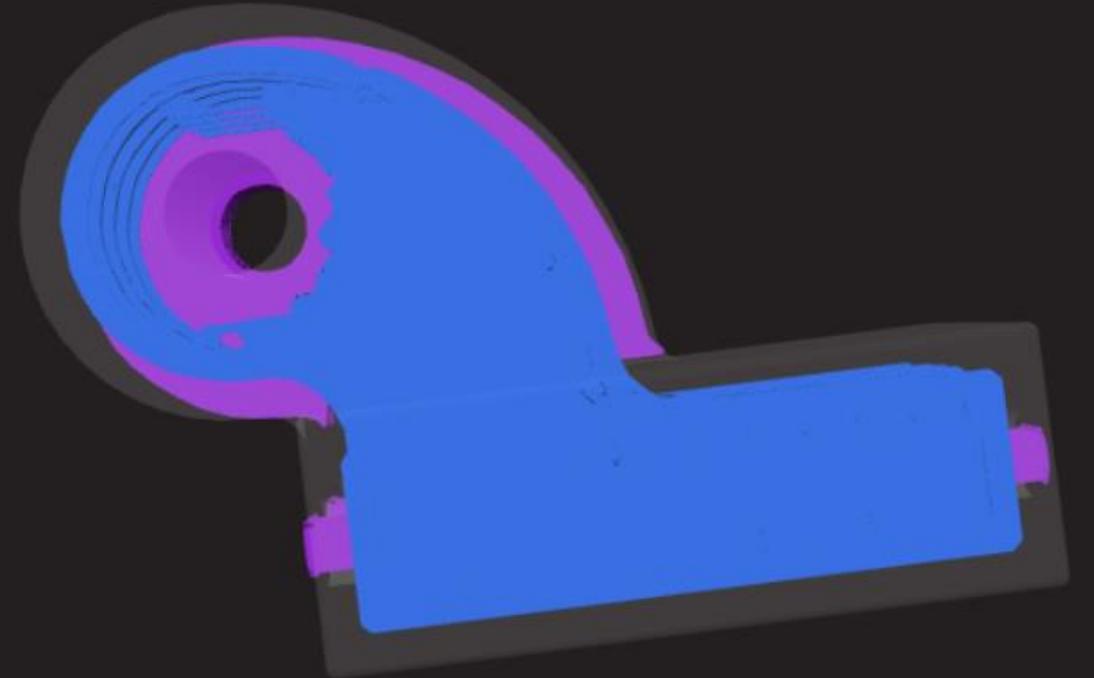
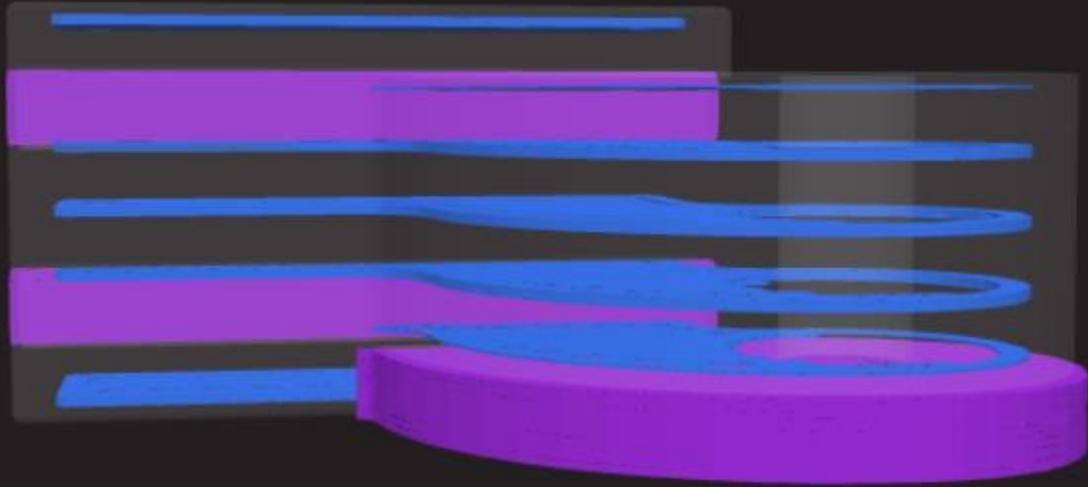
- The location of carbon inlay heavily influenced the design of the parts
- Orientation on the build plate
- Carbon striping for rigidity and waste reduction
- Increased distances between side walls and other critical geometries
- Increased thicknesses to counter deformation
- Rounded corners for safety, fit, and handling

Design Efforts (Spring Semester)



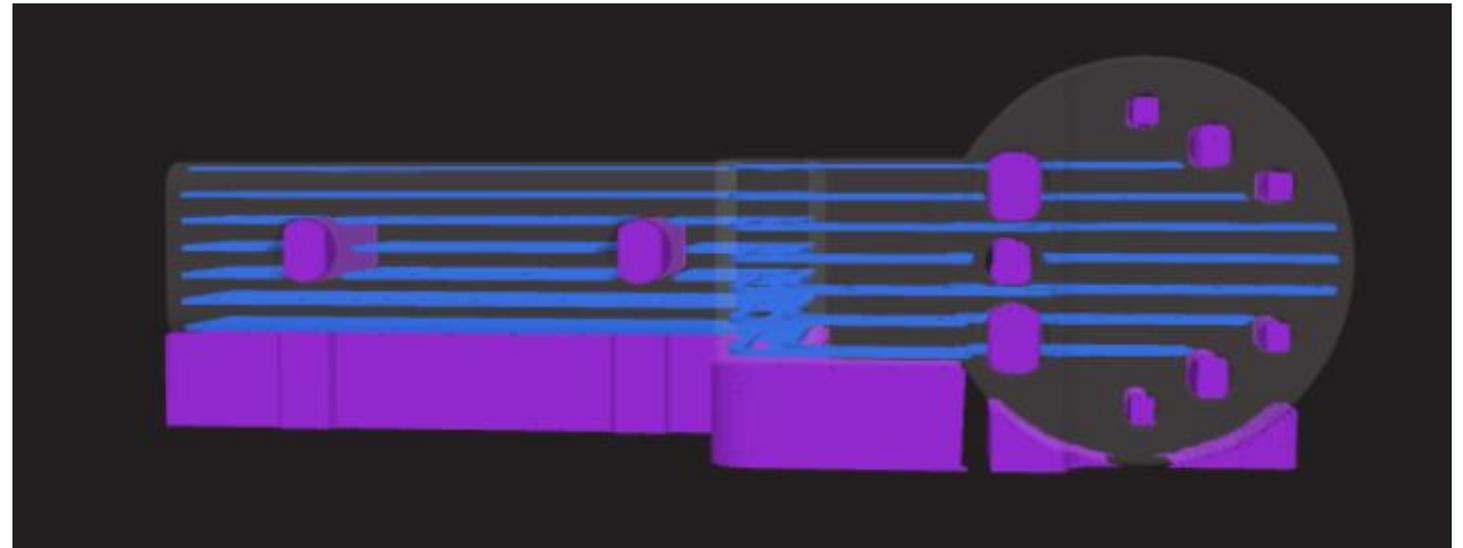
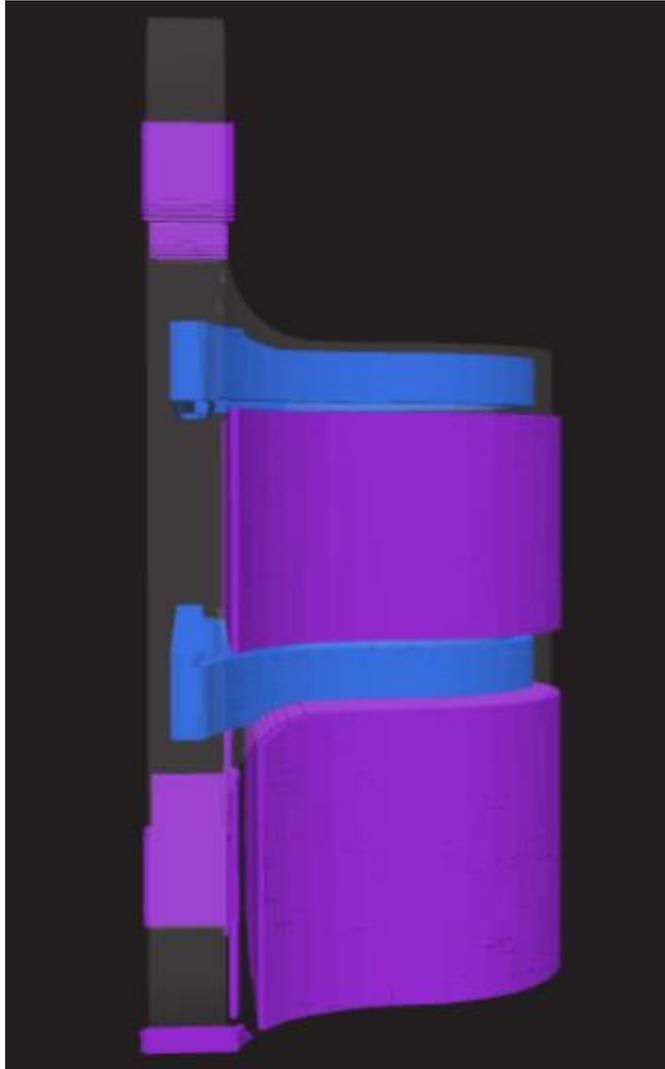
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Design Efforts - Continued



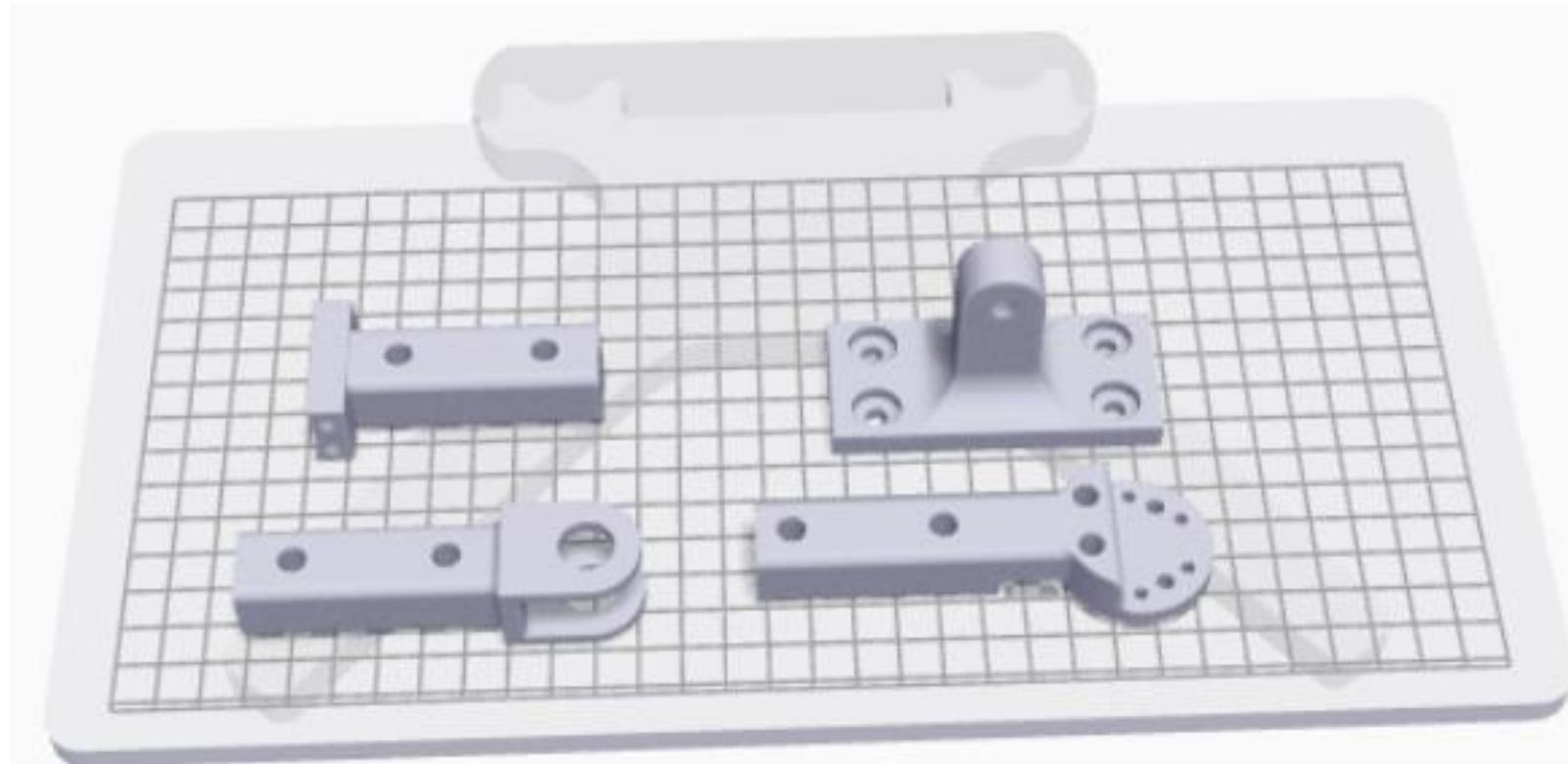
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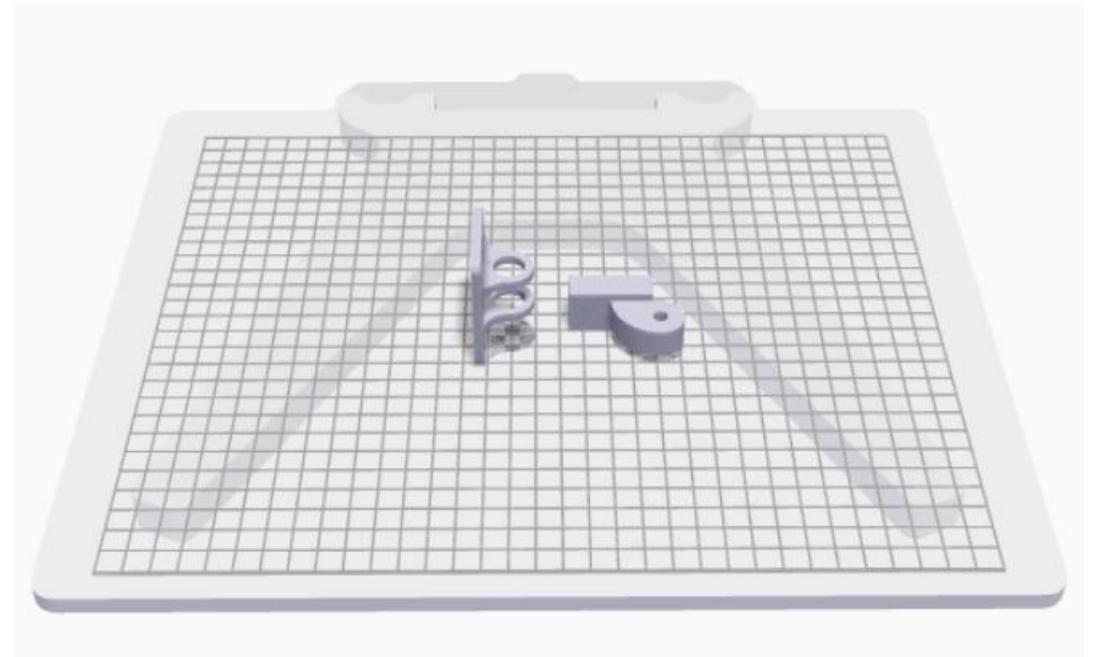
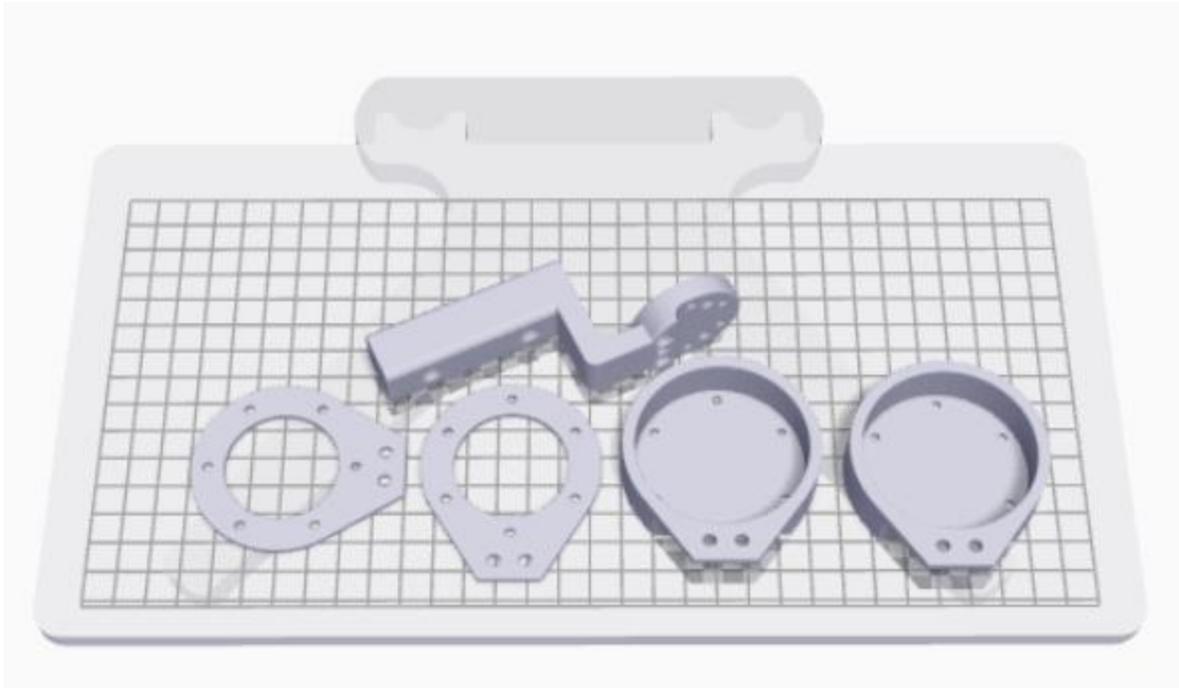


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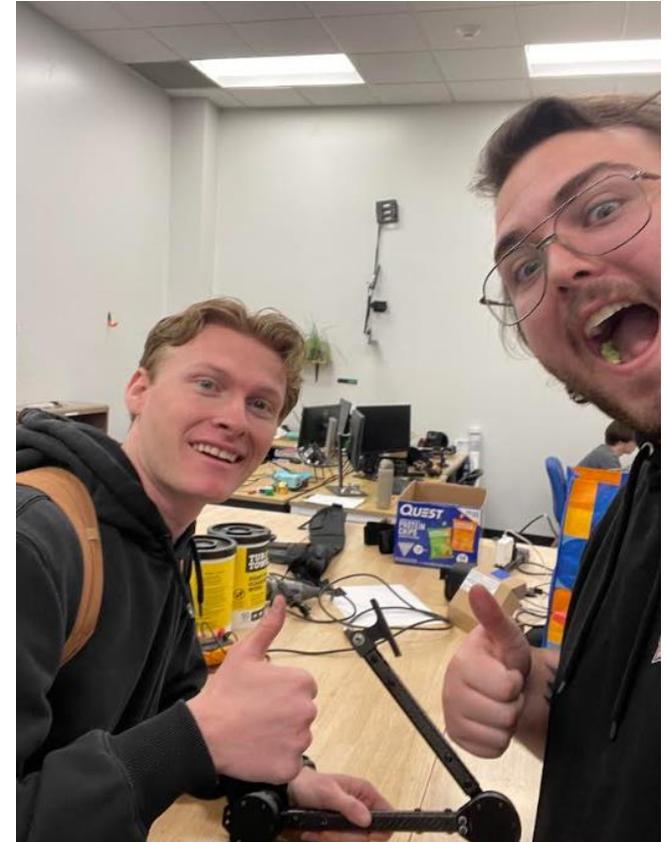
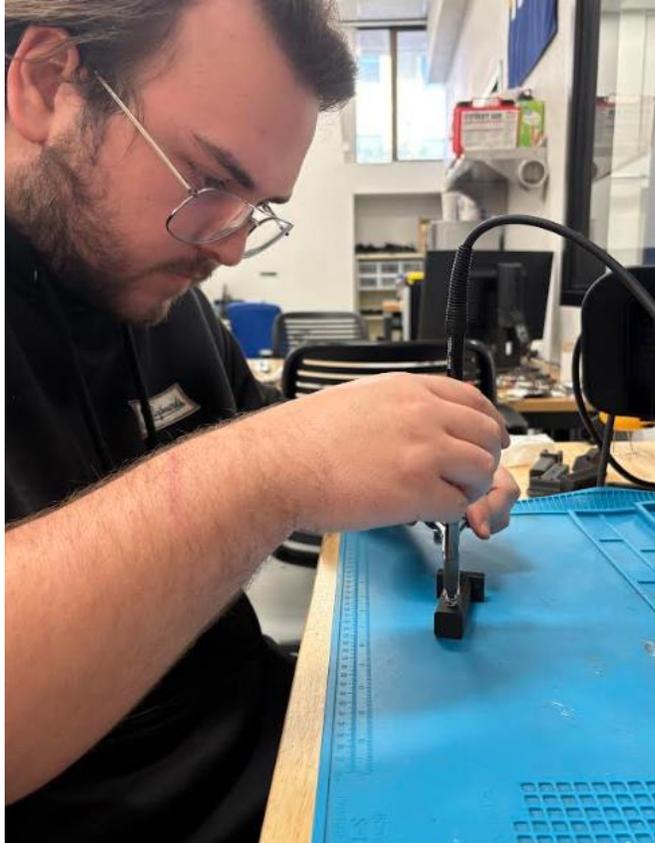
Onyx Only Build Plate



Carbon Fiber Inlay Build Plates



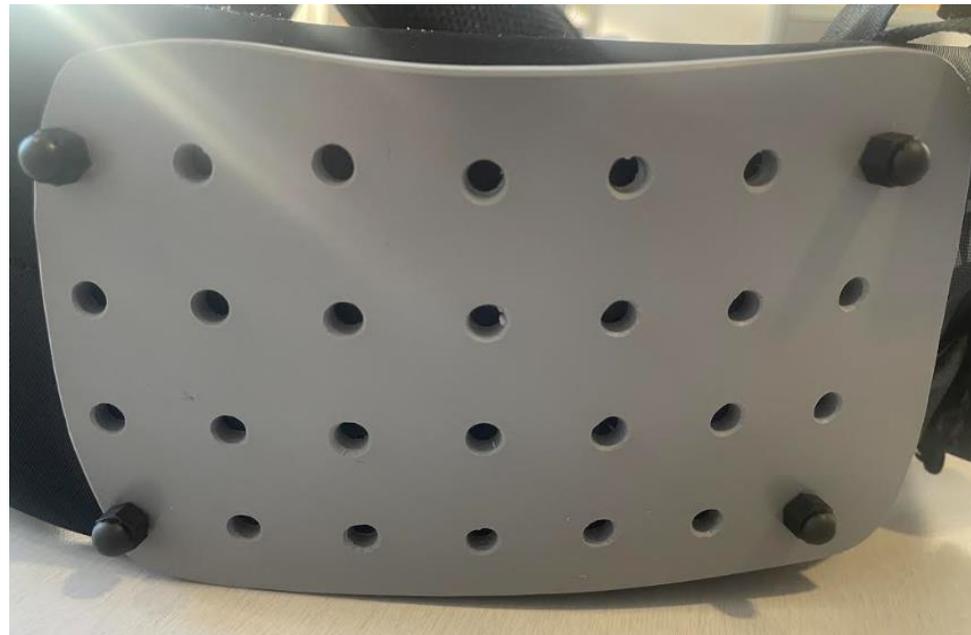
Manufacturing Process



Demonstration



Demonstration



**Thank you
And
Any Questions?**