

Handheld Sewing Machine

Team Cross Stitch

Adrian Bergdal
Selina Brendle
Shawn Rogers
Jordan Satoski
Michael Woodworth

Problem Definition

A sewing device is needed, which is portable, small, durable, and handheld.

Customers

- Beginners
- Small residence occupants like students
- People interested in fixing their clothes instead of replacing them
- Travelers
- Campers and people doing outdoor activities
- Hostel and motel business
- Crafters

Engineering Requirements

- Performance: Can produce a lockstitch
- Weight: Less than 1.0 lb
- Operating Rate: 2 stitches per second
- Ergonomics: Comfortable to hold
- Control: Can sew in reverse

Analysis

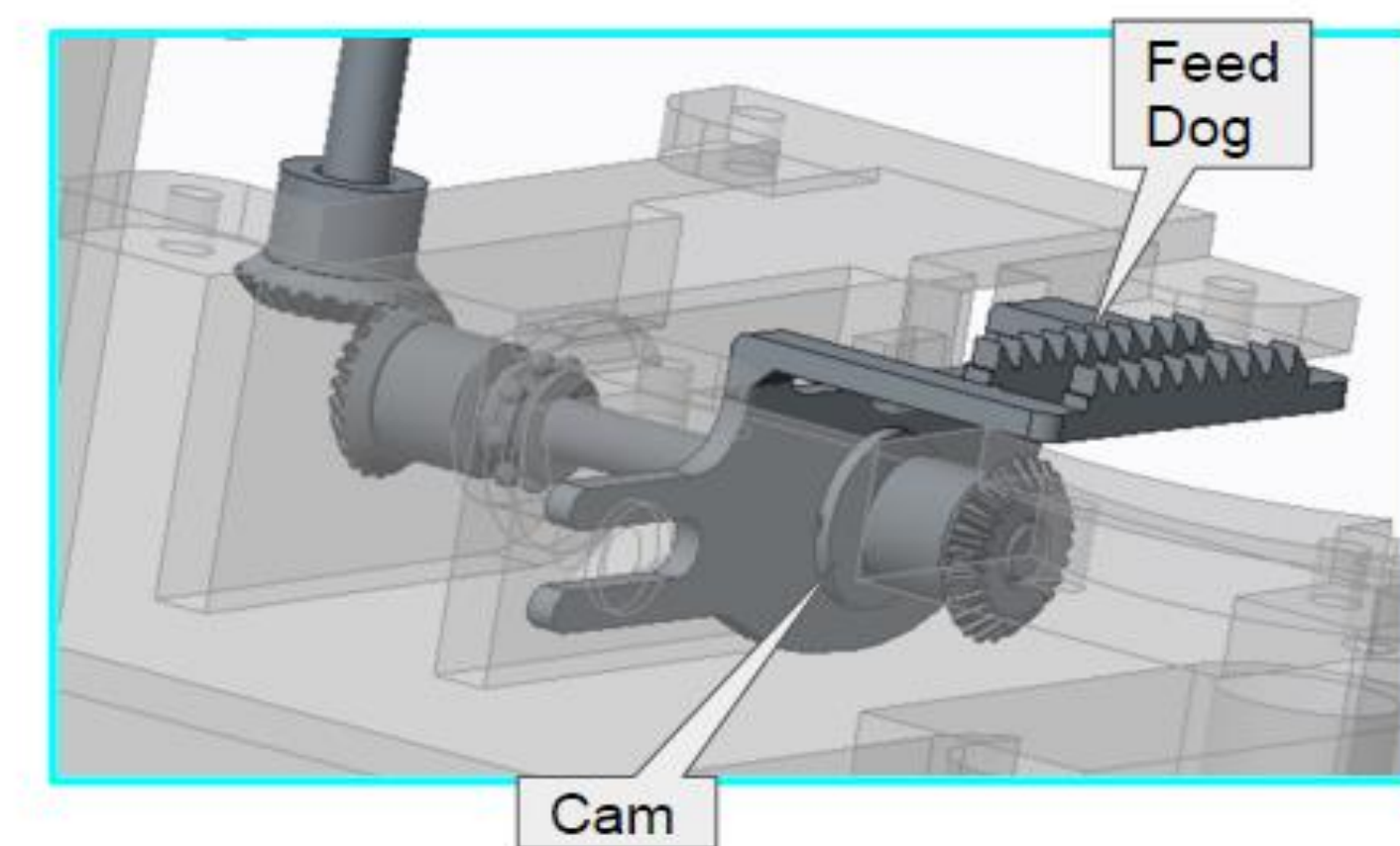
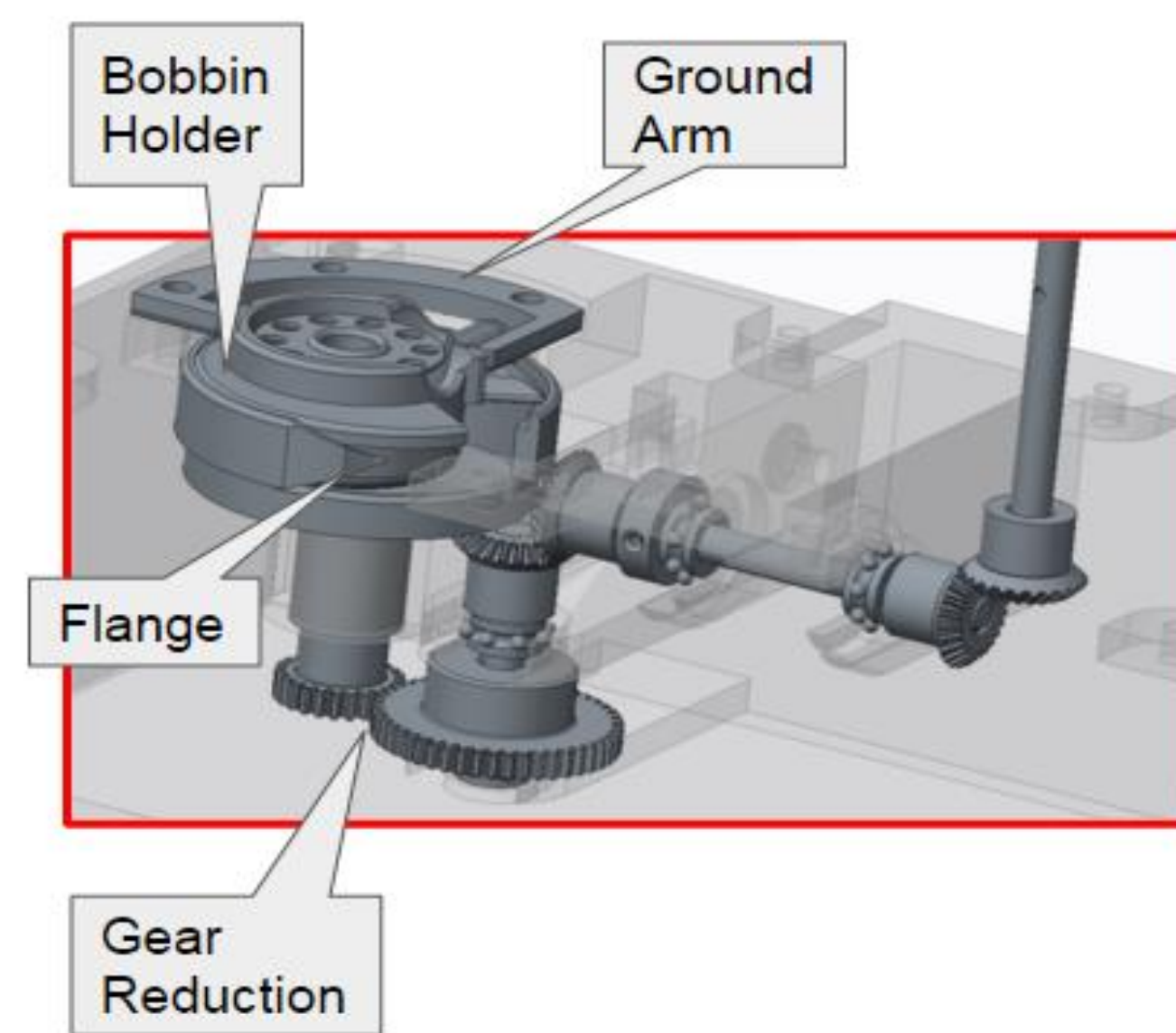
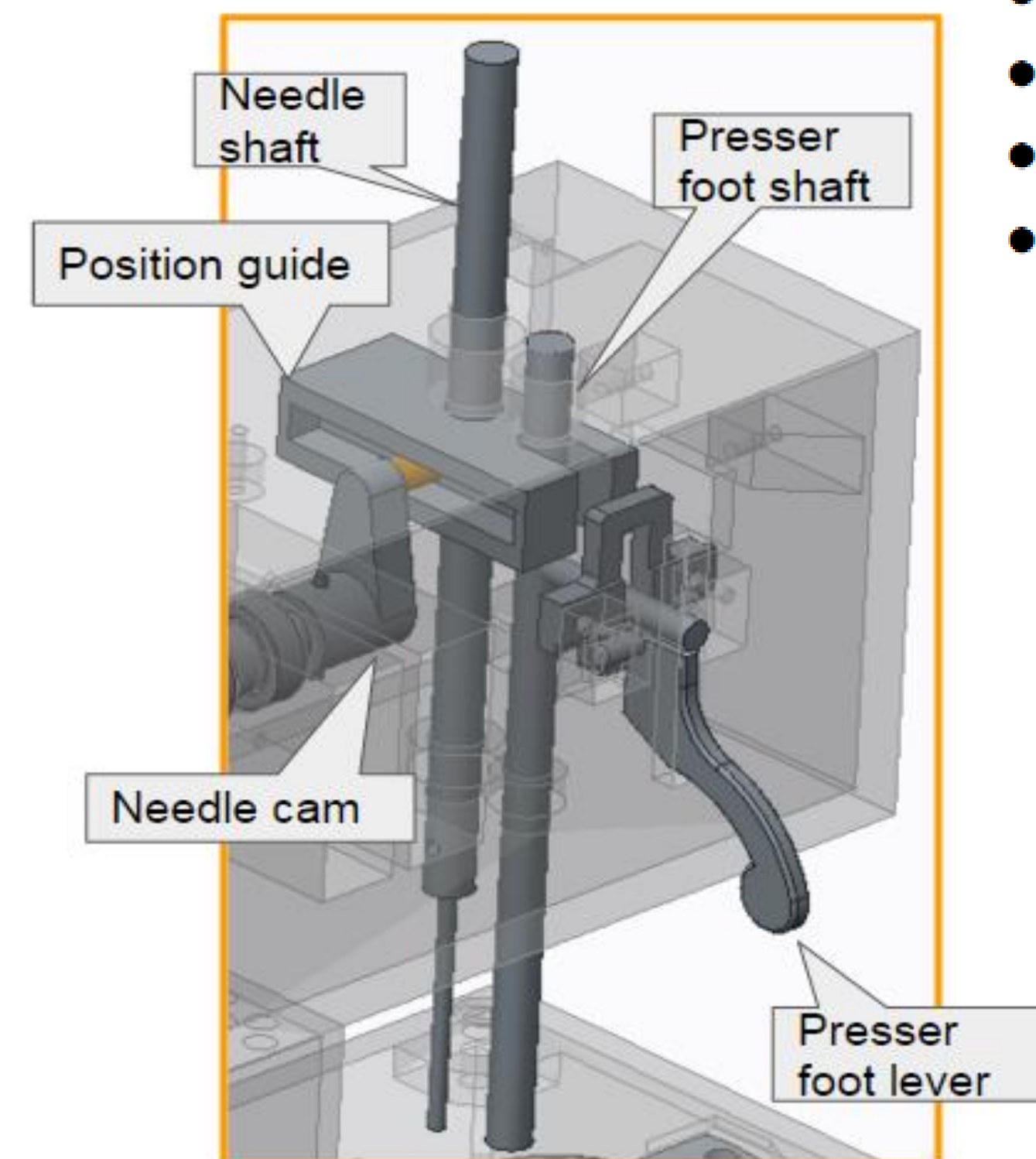
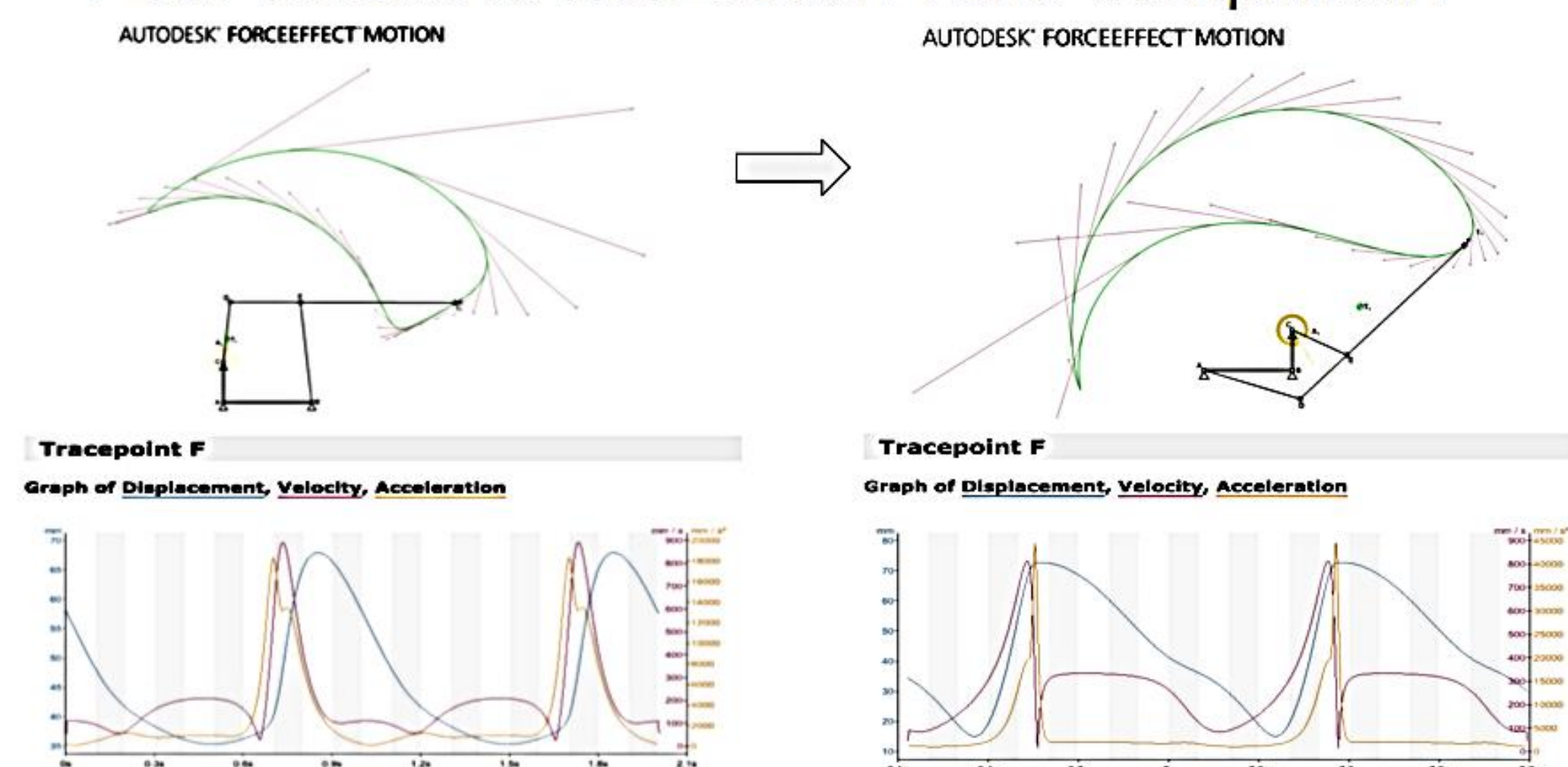
Motor Testing and Selection

Peak Torque Test for Motor



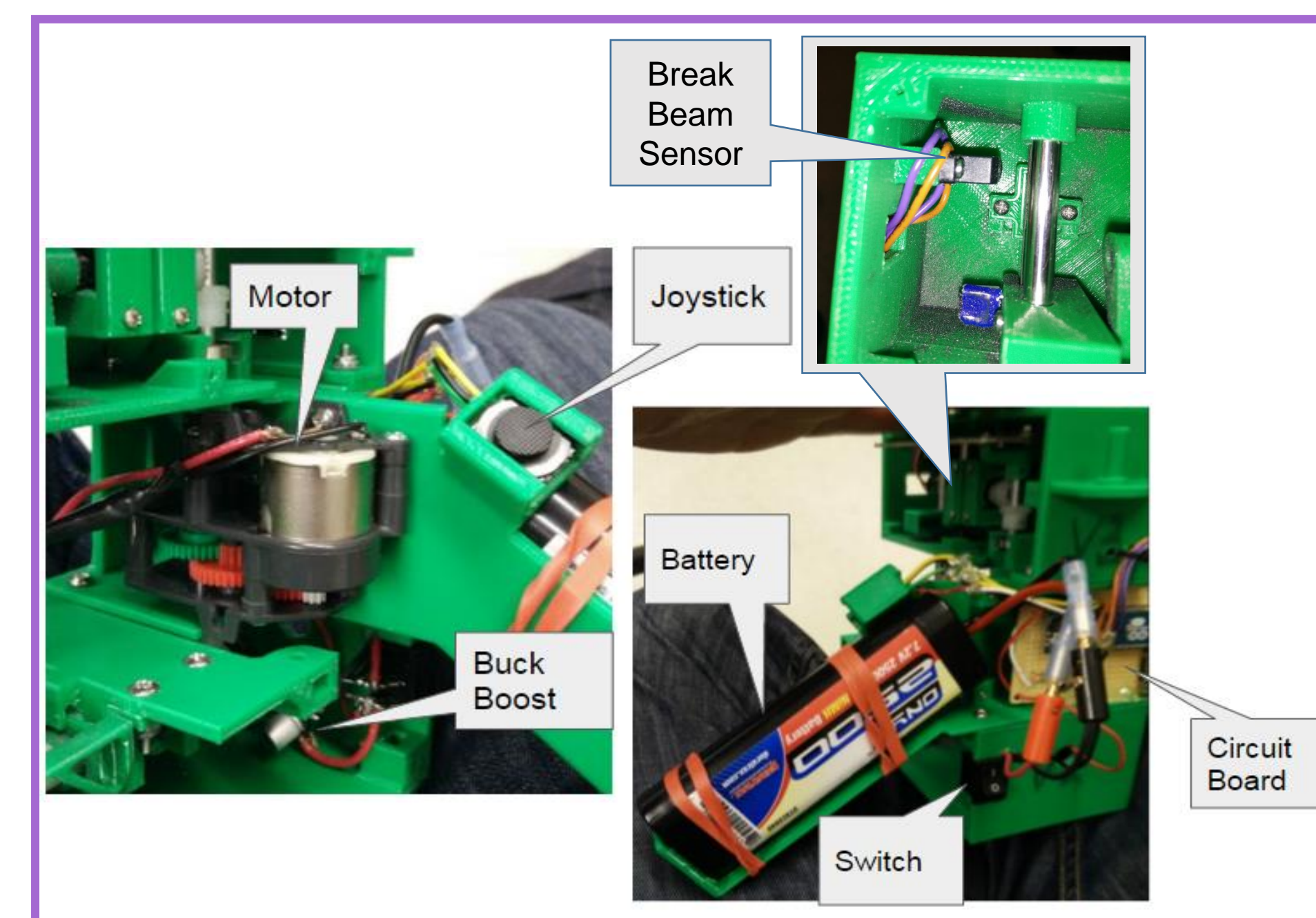
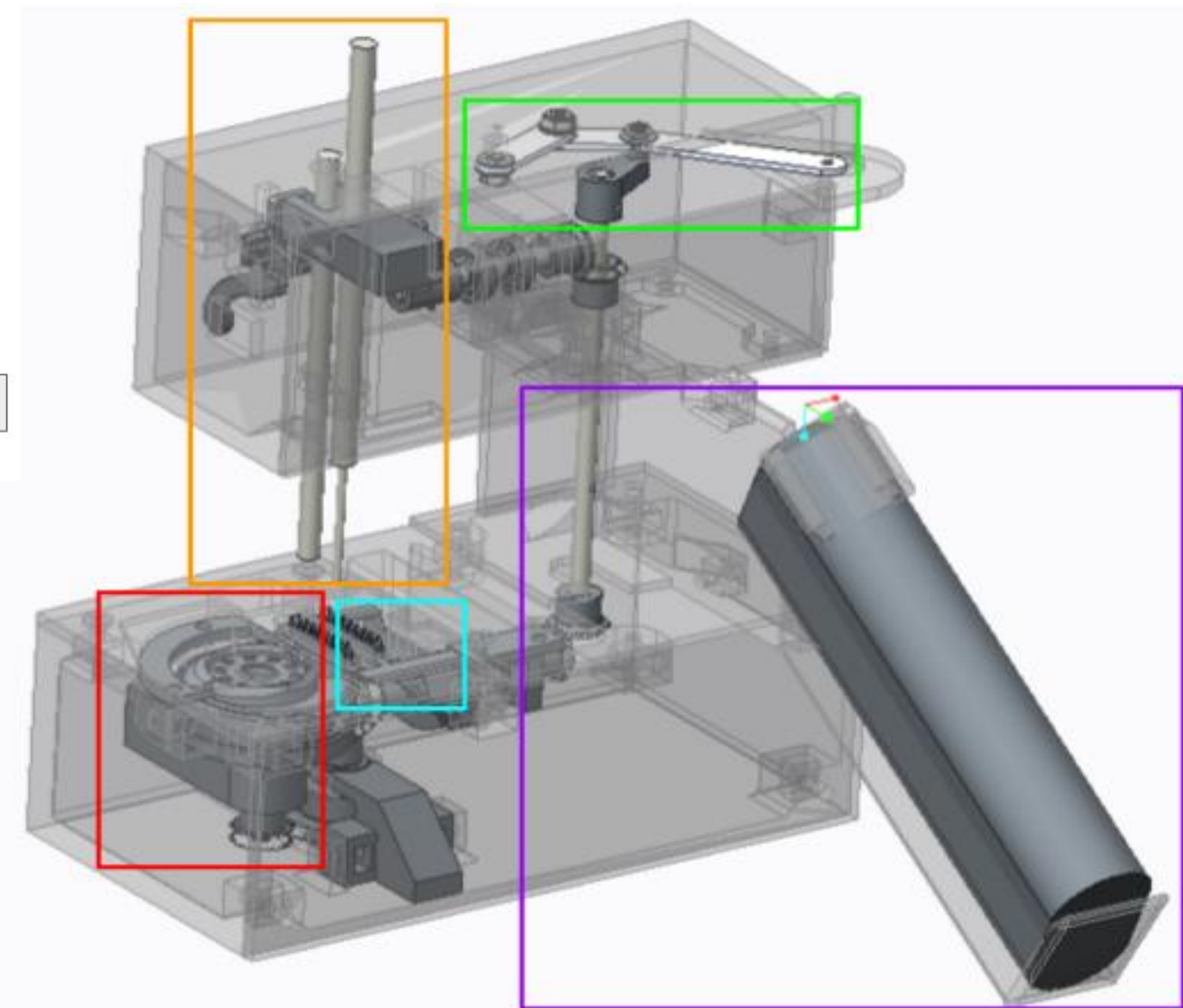
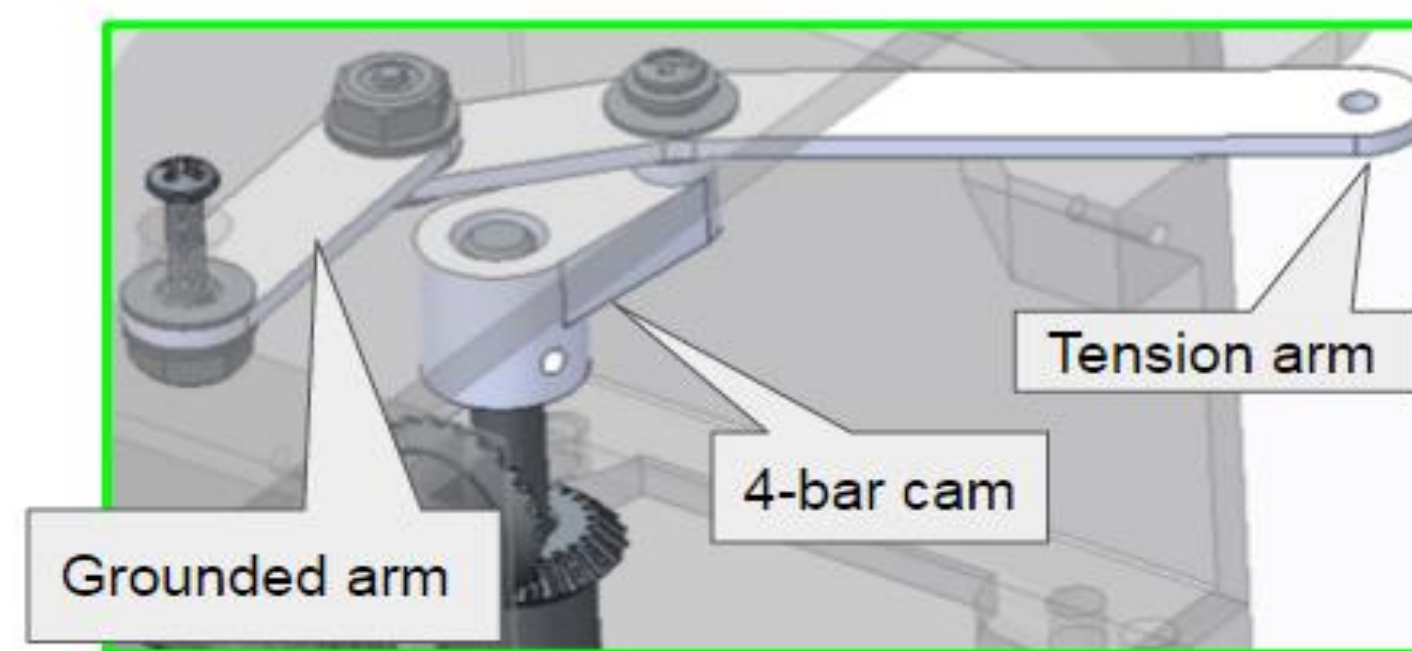
	Frequency of Rotation at Needle Driving Shaft [RPM]	Torque at Needle Driving Shaft [Nm]	Size [cm ³]
Benchmark	270	0.750	NA
Tamiya 72003 High-Power Gearbox Kit	145	0.444	88.6

4-Bar Vertical to Horizontal Profile Comparison

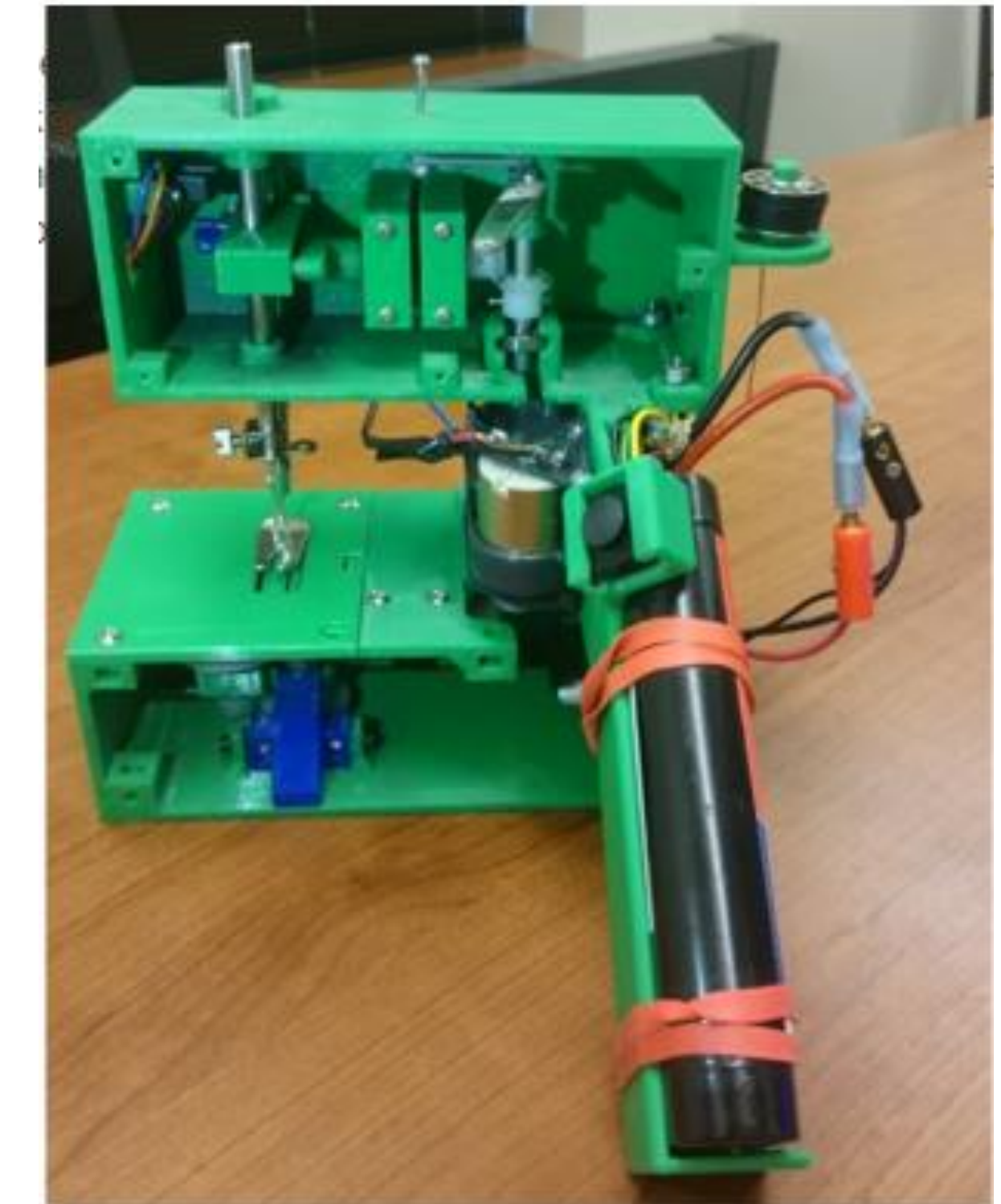


Design Systems

- Needle arm and Pressure Foot System
- Tension Arm System
- Bobbin System
- Feed Dog System
- Electrical Control System



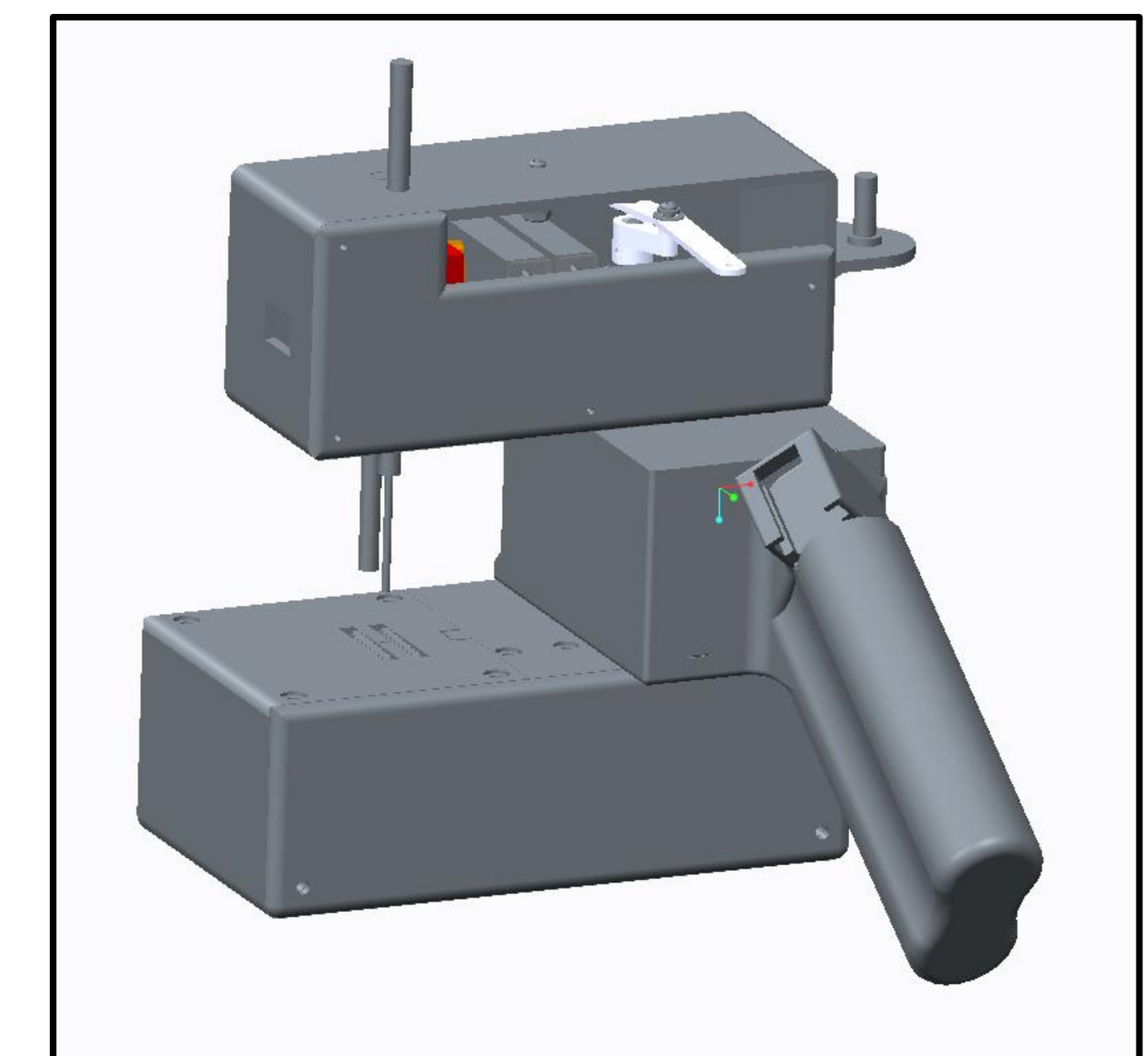
Prototype Design



Differences between Prototype and Final Design

- Final Design has enclosed electronics
- Final design uses smaller lithium ion batteries instead of the larger Volt Nickel-Metal Hydride (NiMH) battery

Final Design



Benchmark Comparison

Type	Handheld	Miniature	Handheld
Retailer	Singer	Michley	Team Cross Stitch
Name	Stitch Sew Quick	Michley LSS-202 Lil' Sew & Sew Mini 2-Speed Sewing Machine	Sew and Go
Picture			
Cost	12.92	15.87	~100
Size	8.3x2.7x1.3 inches 29.13 in ³	7.9 x3.7x7.4 inches 216.3 in ³	Body 3.2 x 6.1 x 6.7 Handle 1.1 x 5.14 x 2.0 142.092 in ³
Weight	13.3 ounces	28.8 ounces	33.4 oz
Power Source	Batteries or AC adapter	Wall Plug	Rechargeable Battery
Lock or Chain Stitch	Chain Stitch	Lock Stitch	Lock Stitch
MultiSpeed (Y/N)	N	Y	Y
Avg. Rating	2.6/5	3.1/5	N/A
Number of Ratings	412	1151	N/A
Noise Level	High	High	High