

Multi Purpose Resistance Machine

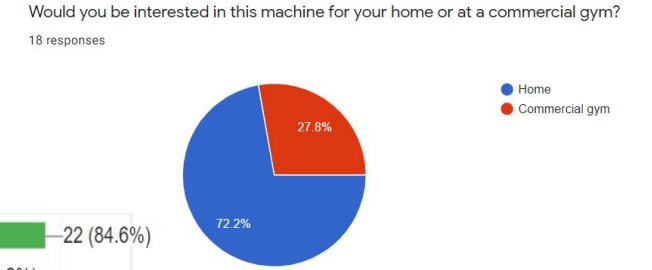
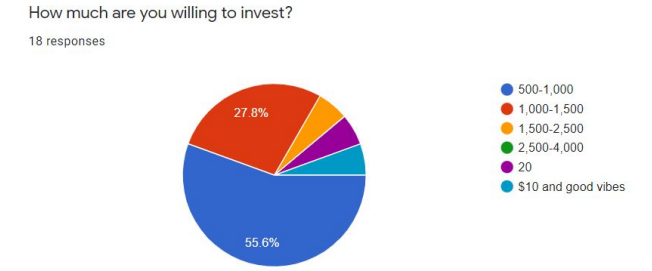
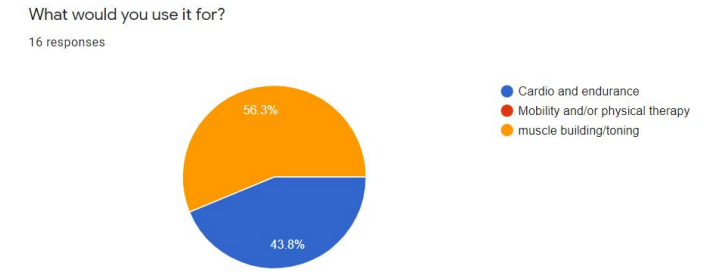
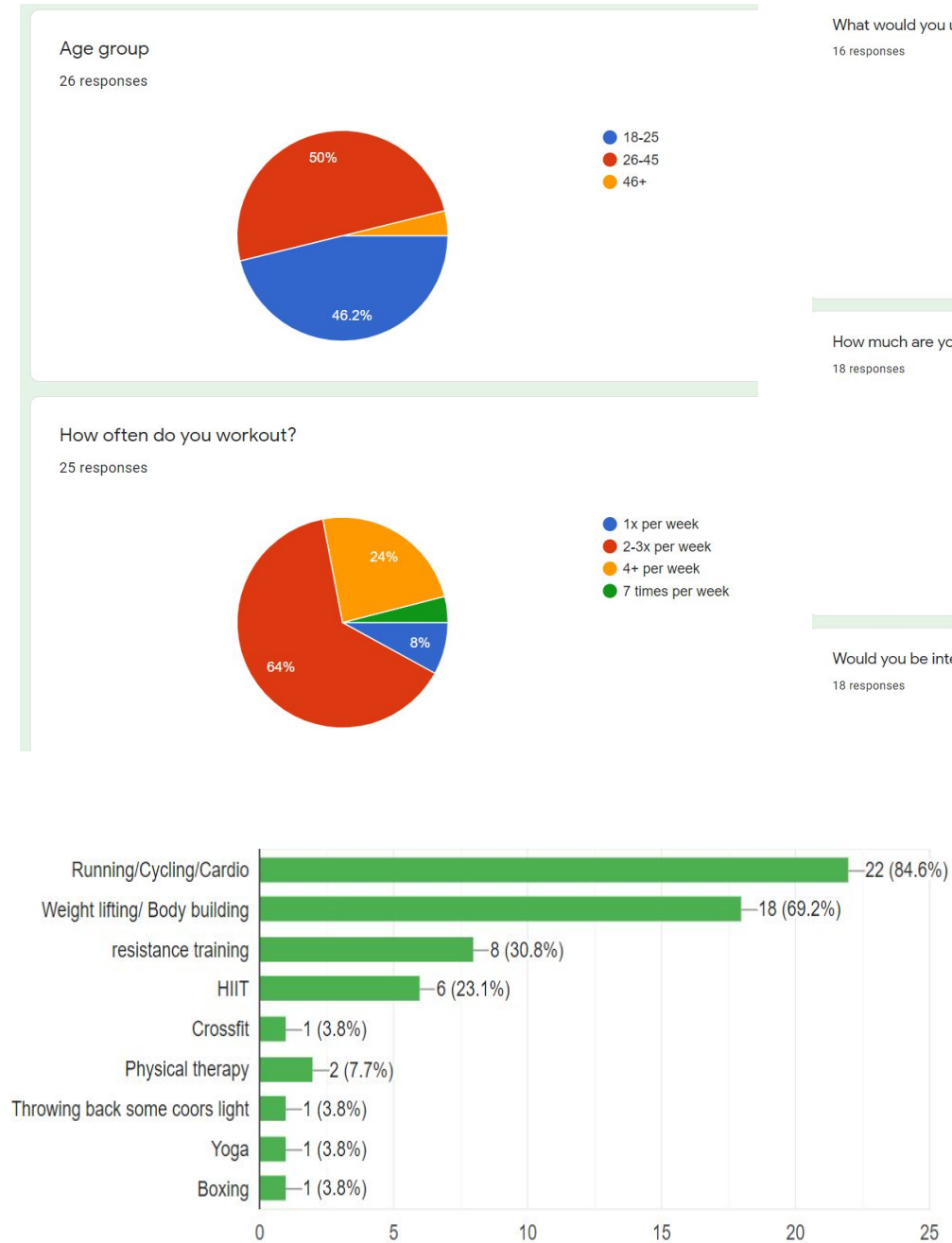


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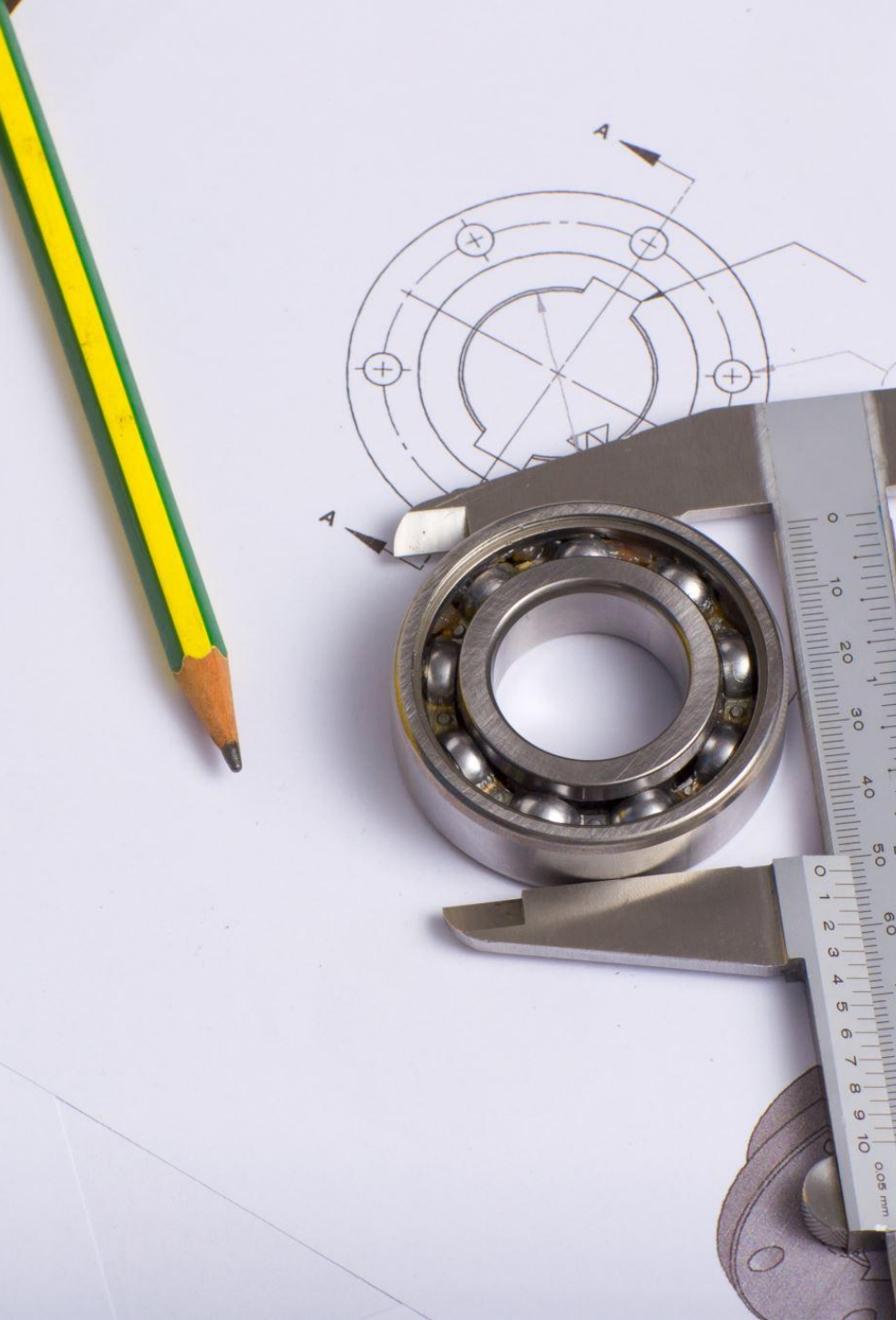
Customer Base

- All genders
- Ages 18-45
- 5'5" - 6'2"
- Home use
- Moderate to heavy activity
- Cardio/Toning
- \$500-\$1,000
- Performance tracking
- Seated
- Easy storage
- *Virtual coaching (not yet)

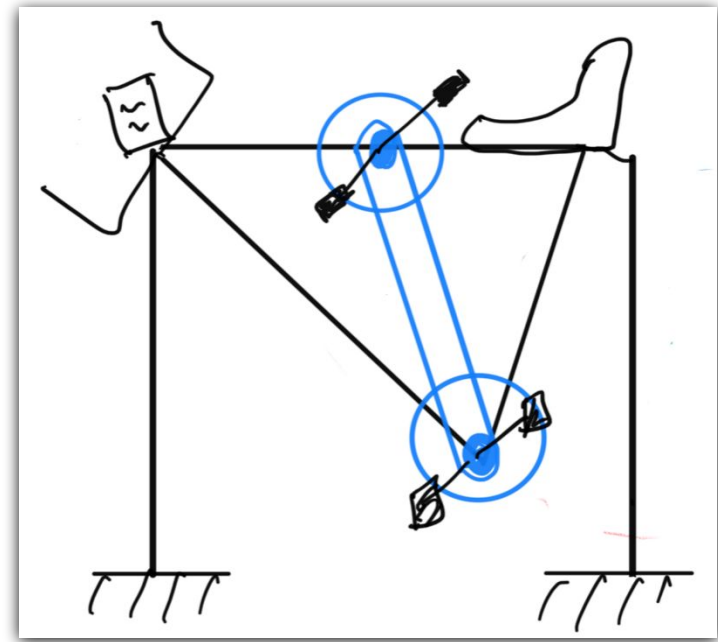
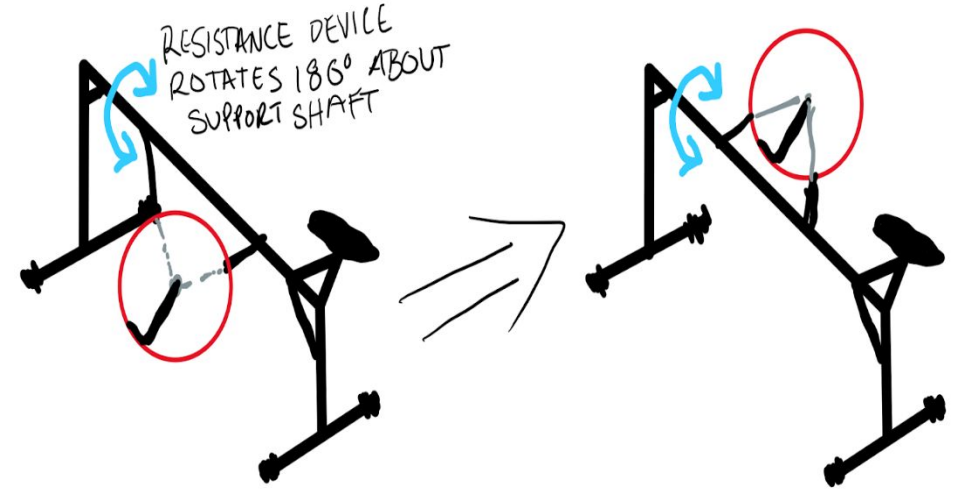
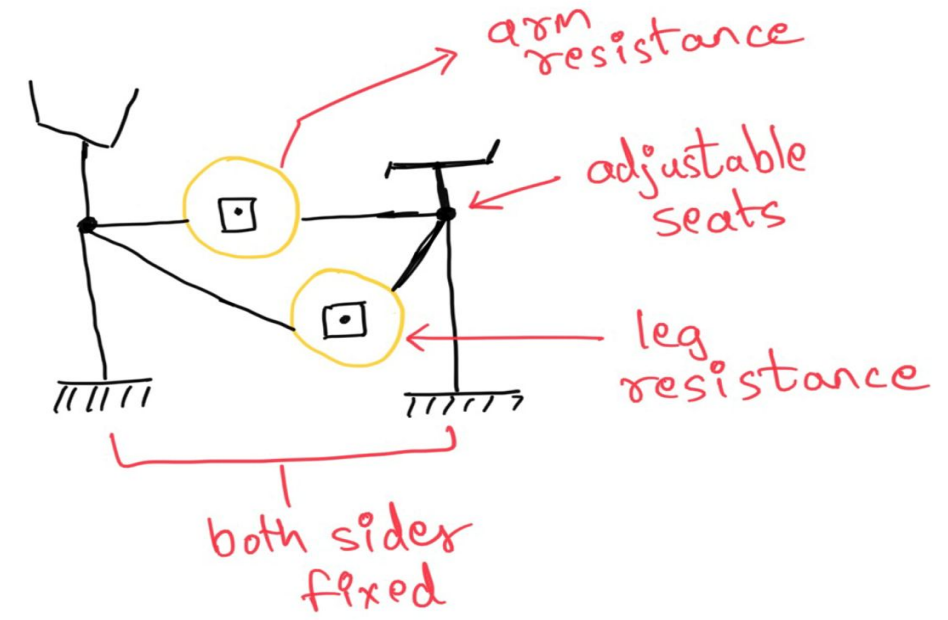
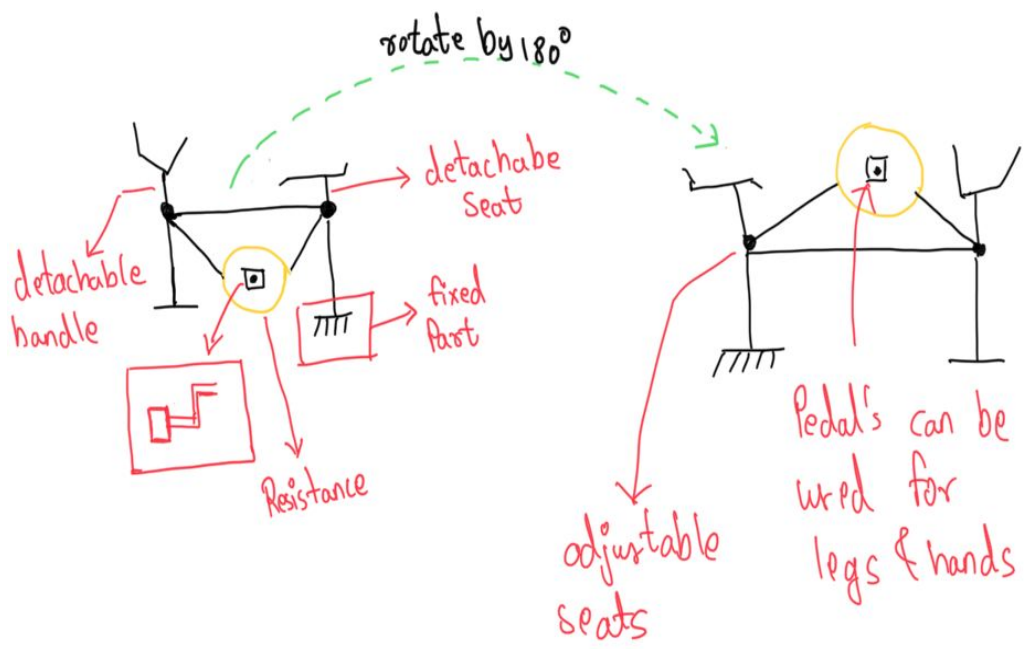


Study of Competitors

Company	Product	Drawbacks
HCI PhysioTrainer Bi-Directional (Low End ~\$500)	 A compact, dark grey exercise bike with a large flywheel and a seat. It has a simple design with a single pedal and a handlebar.	<ul style="list-style-type: none">• Lacks performance tracking.• Built for physiotherapy and cannot perform high intensity workouts.
First Degree Fitness E650 Arm Cycle (Medium End ~\$2500)	 A large, silver and black arm cycle with a circular flywheel and a seat. It has a complex design with multiple adjustment points and a large flywheel.	<ul style="list-style-type: none">• User needs to be standing to workout.• Not easily portable.
SciFit PRO1 Upper Body (High End ~\$5000)	 A large, black and silver exercise bike with a seat and a large flywheel. It has a complex design with multiple adjustment points and a large flywheel.	<ul style="list-style-type: none">• Very expensive for at home users.



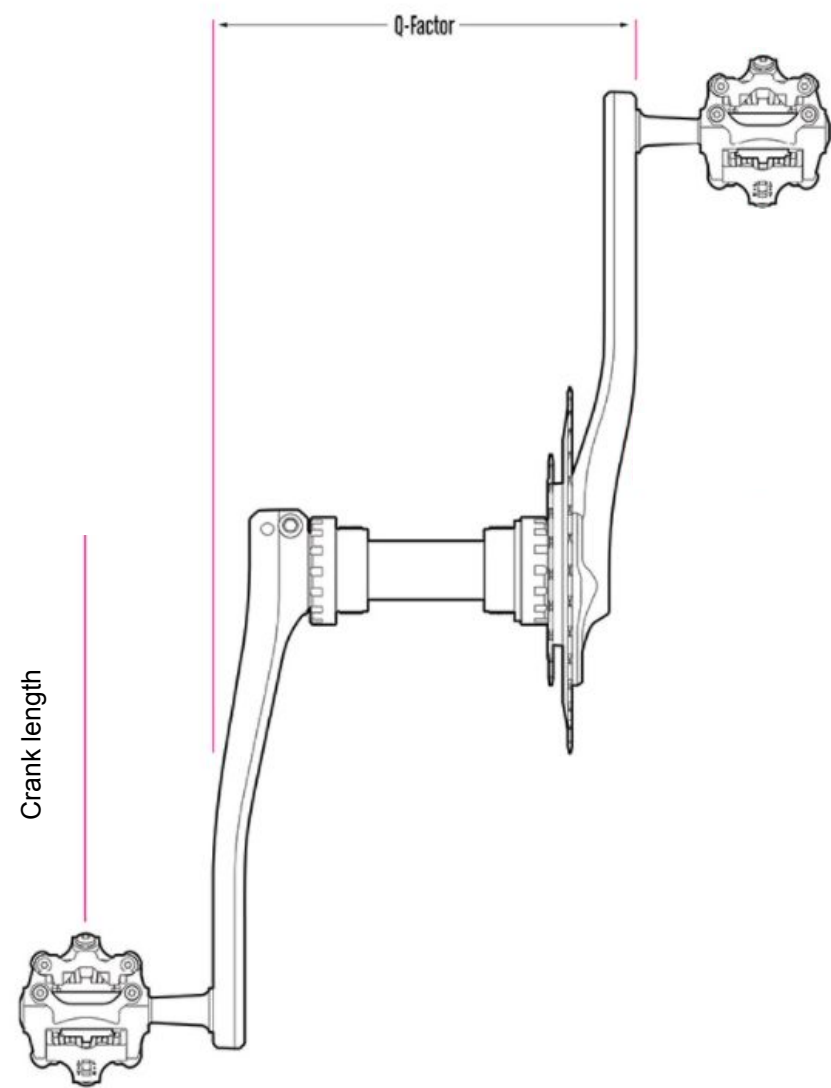
Concept Designs



Resistance Selection - Pugh Chart

Criteria	Weight	Concept 1- Water	Concept 2- Magnetic	Concept 3- Sand	Concept 4- Electric
Maintenance	1	0	1	0	1
Manufacturability	2	0	0	0	-1
Cost	2	0	-1	0	-1
Weight	2	0	1	0	1
Ease of Use	1	0	1	-1	1
Aesthetics	1	0	0	0	0
Safety	1	0	0	0	0
	Weighted Total	0	2	-1	0

- Q-Factor of 172.5mm
- Crank length of 145mm
- To be tested for commonality with upper body

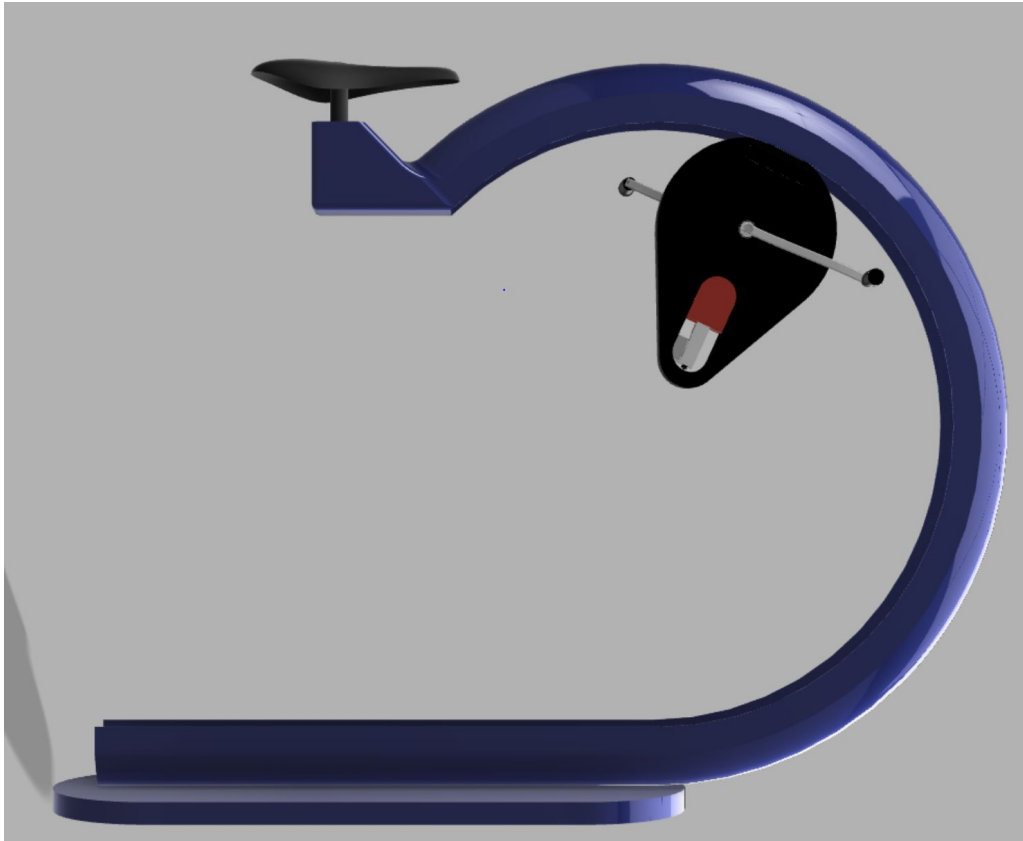


Functionality

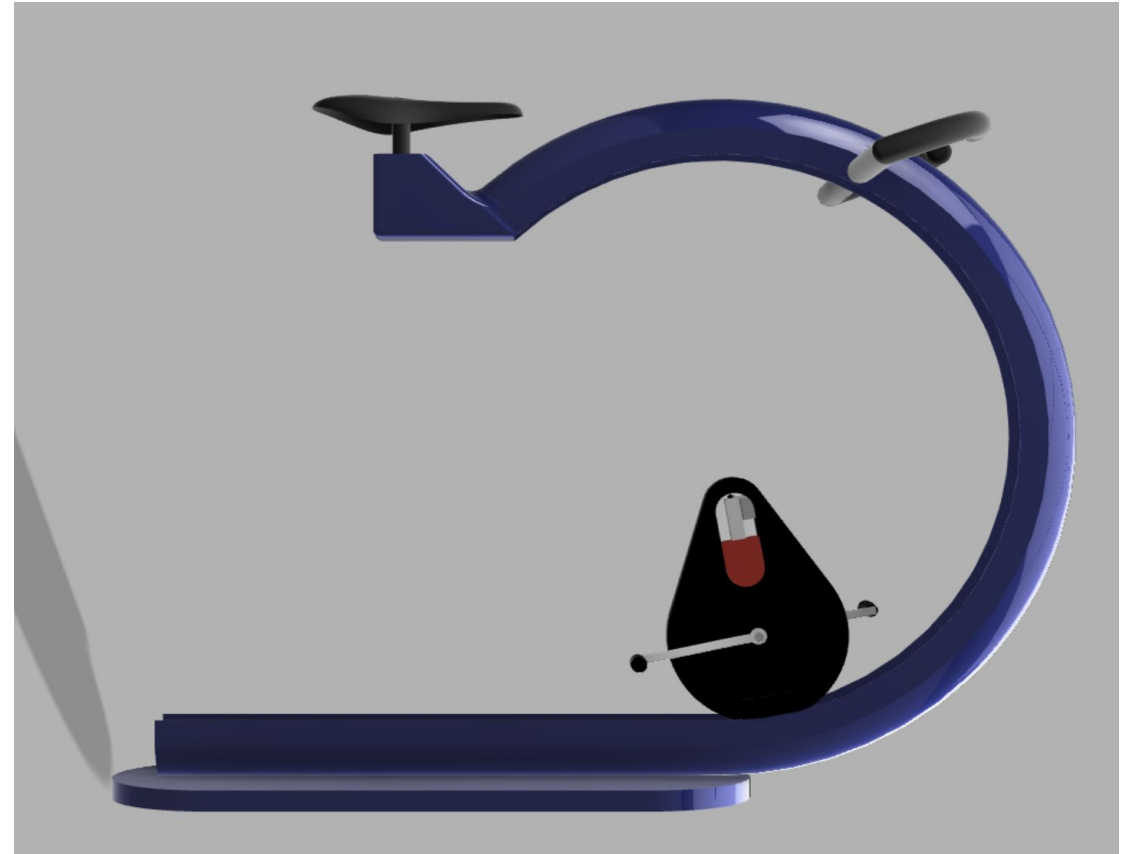
Resistance Levels	Must have a resistance level capable of providing workouts for both arms and legs. Long cardio runs and short intensity intervals. Resistance is electronically controlled
Multi-functional	The machine should serve a dual purpose to workout the upper and lower body in the seated position. Modularity of the frame to include our target body size range
Ease of Storage	The machine should be able to be assembled or disassembled easily at home without occupying too much space.
Performance Tracking	A mobile application needs to be developed which is compatible with Android and iOS platforms to track Calories burnt, Heart Rate, Speed, and RPM.
Seat Height	The seat must be adjustable for the user's height from 5.5 feet to 6.2 feet.

Functionality

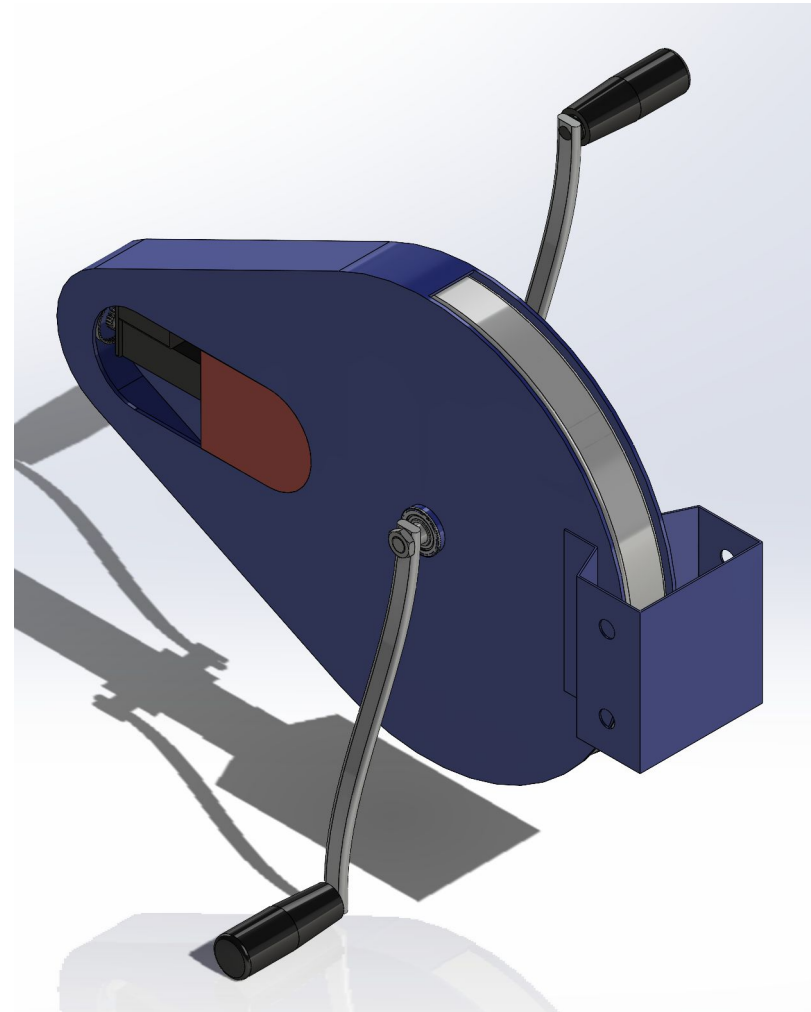
Hand crank position



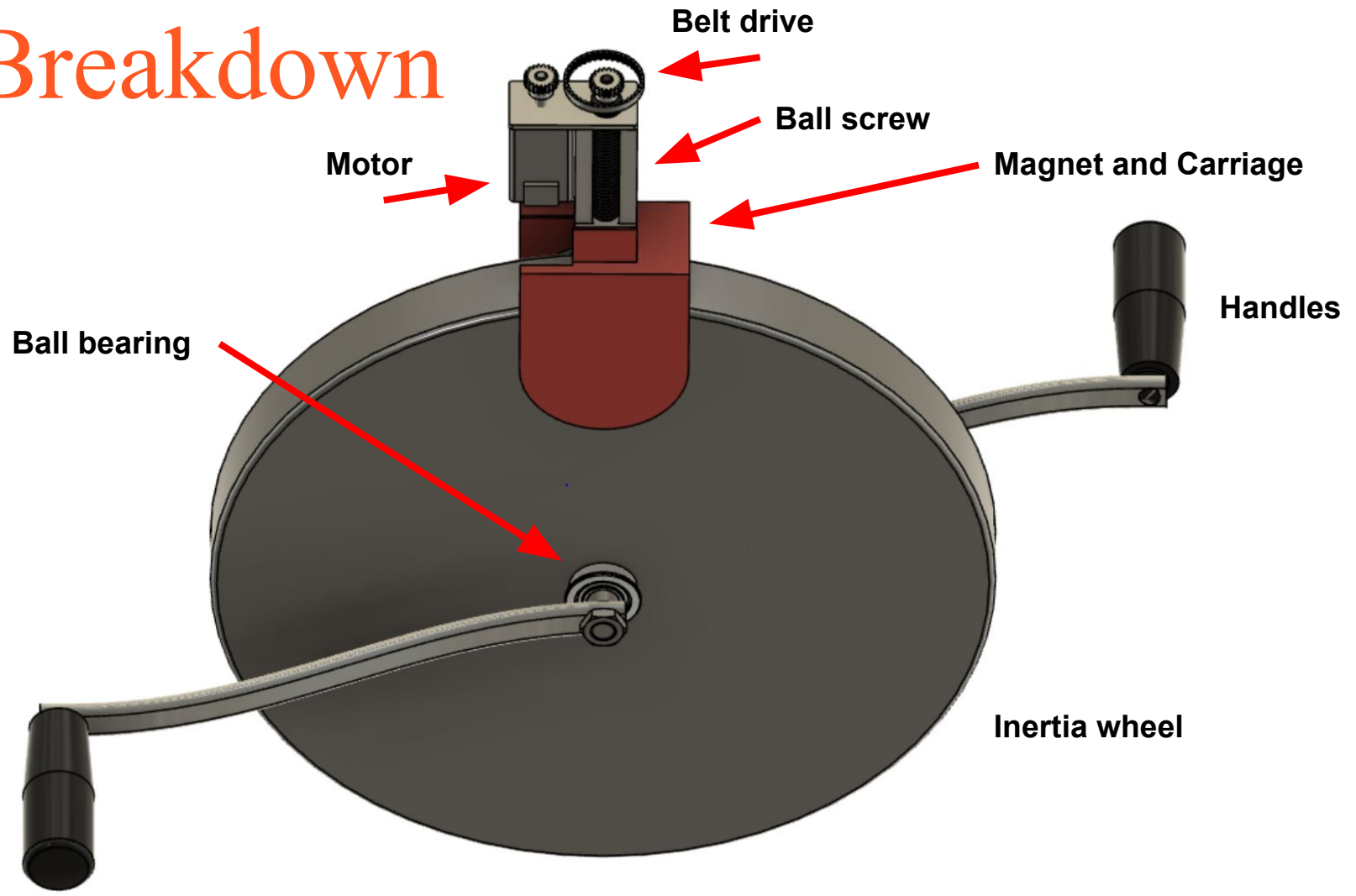
Pedalling position



Modeling

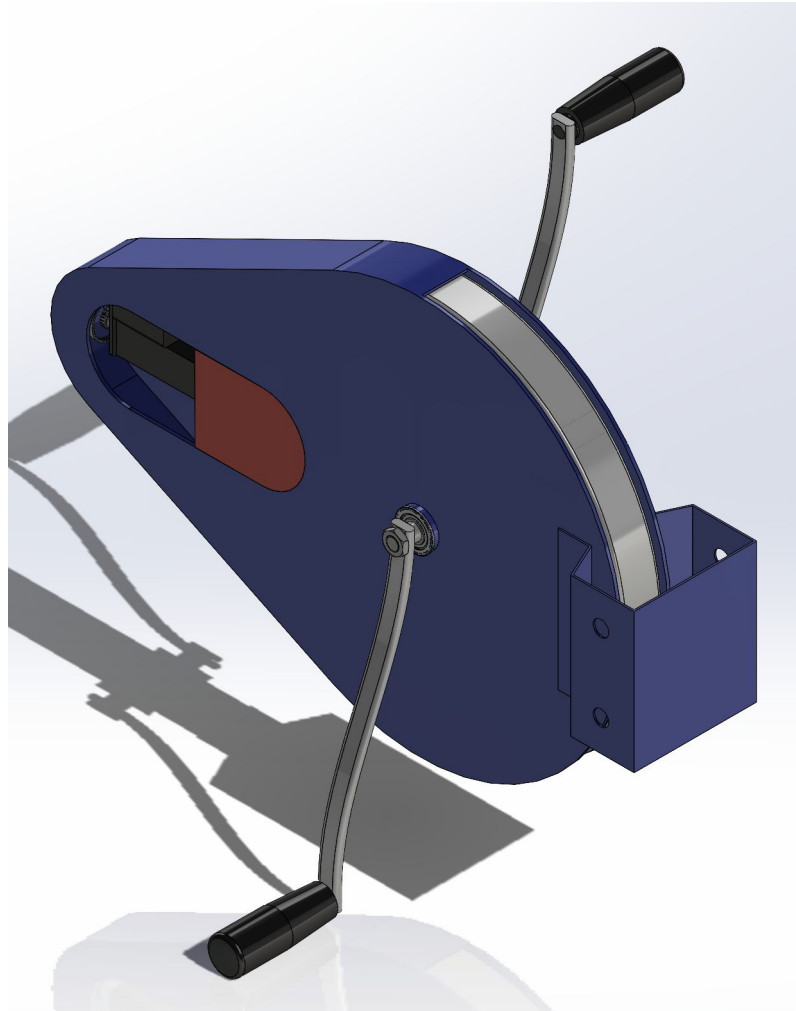


Resistance Breakdown



Resistance Mechanism Key Features

- Dual Purpose
- Easy to use
- Affordable
- Portable
- Aesthetic

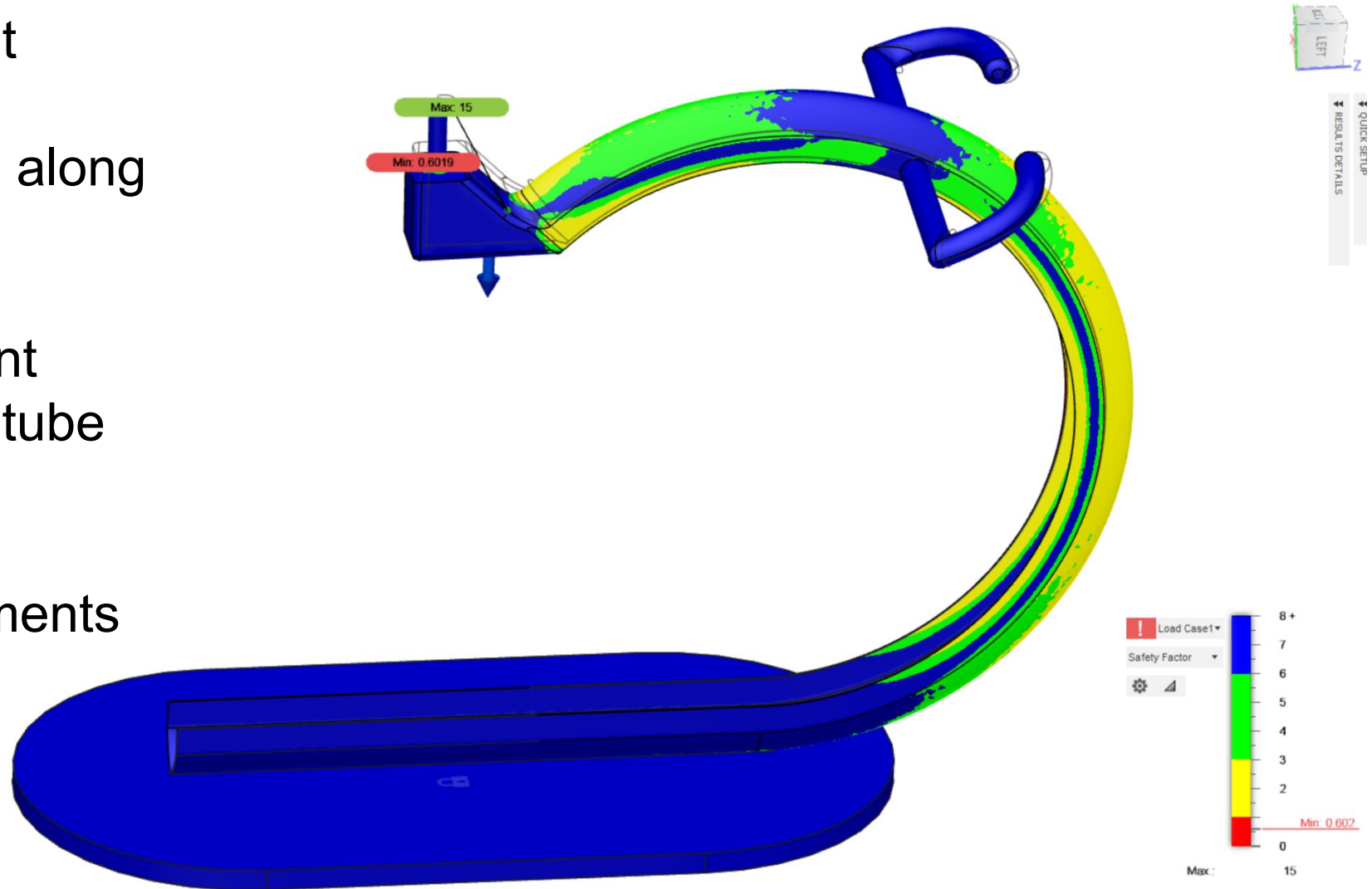


Safety and Reliability

- Wide and strong base capable of supporting up to 350lbs
- All components should have rounded corners.
- Resistance device should be enclosed to prevent pinch points and other moving-parts related accidents
- 10 year life cycle

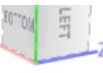
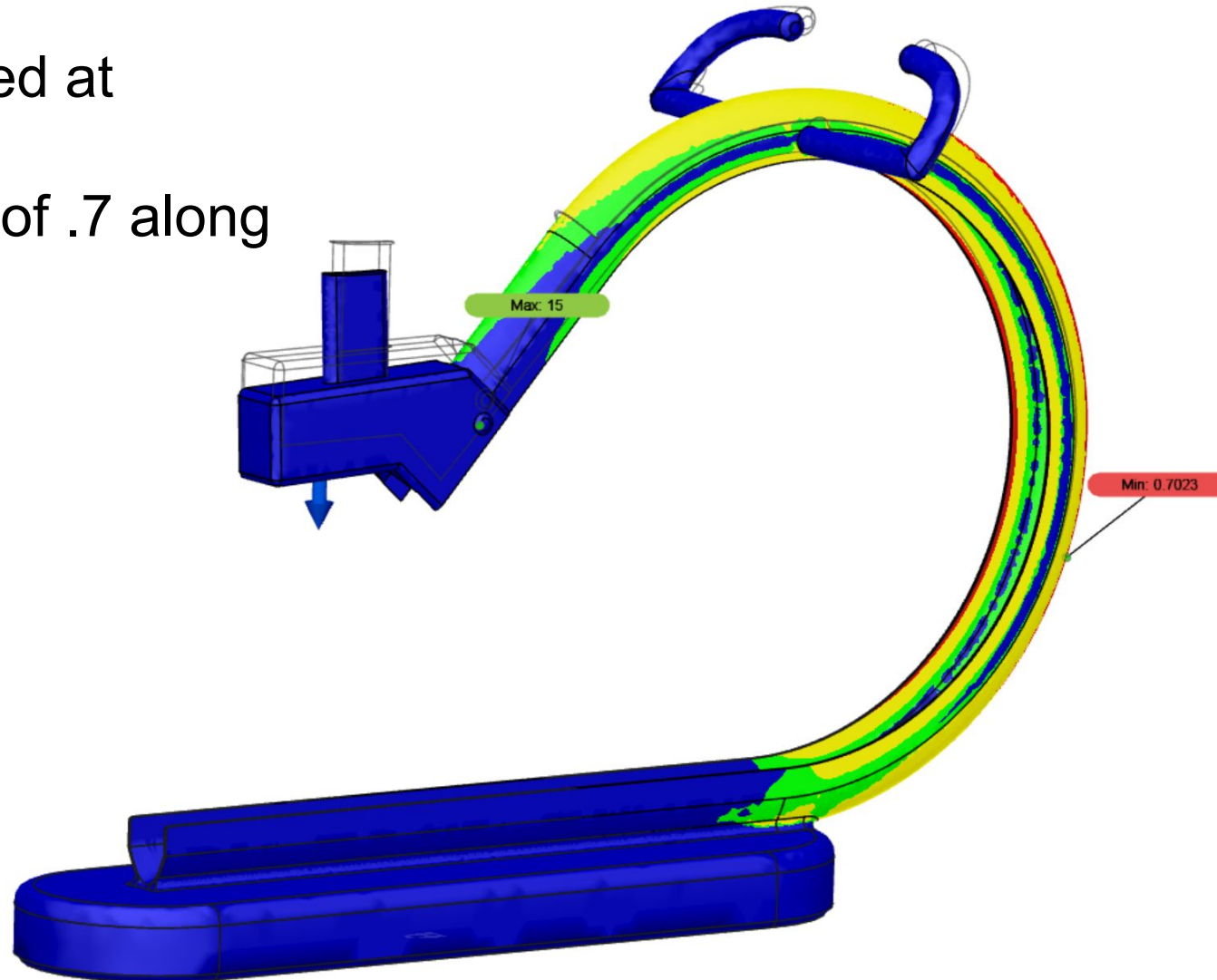
Modeling- Iteration 1

- Static load conducted at ~360lbs (1600N)
- Min factor of safety of 2 along main frame
- 2.5mm frame
- Failure at the seat mount
 - Team to revisit seat tube dimensions
 - Change design to accomodate adjustments

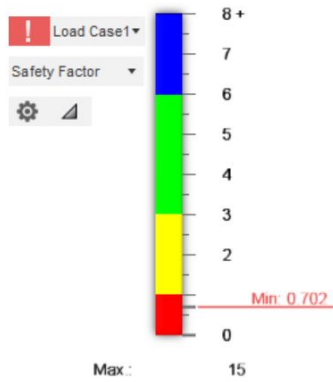


Modeling- Iteration 2

- Static load conducted at ~360lbs (1600N)
- Min factor of safety of .7 along main frame
- 4mm frame
- Failure at frame

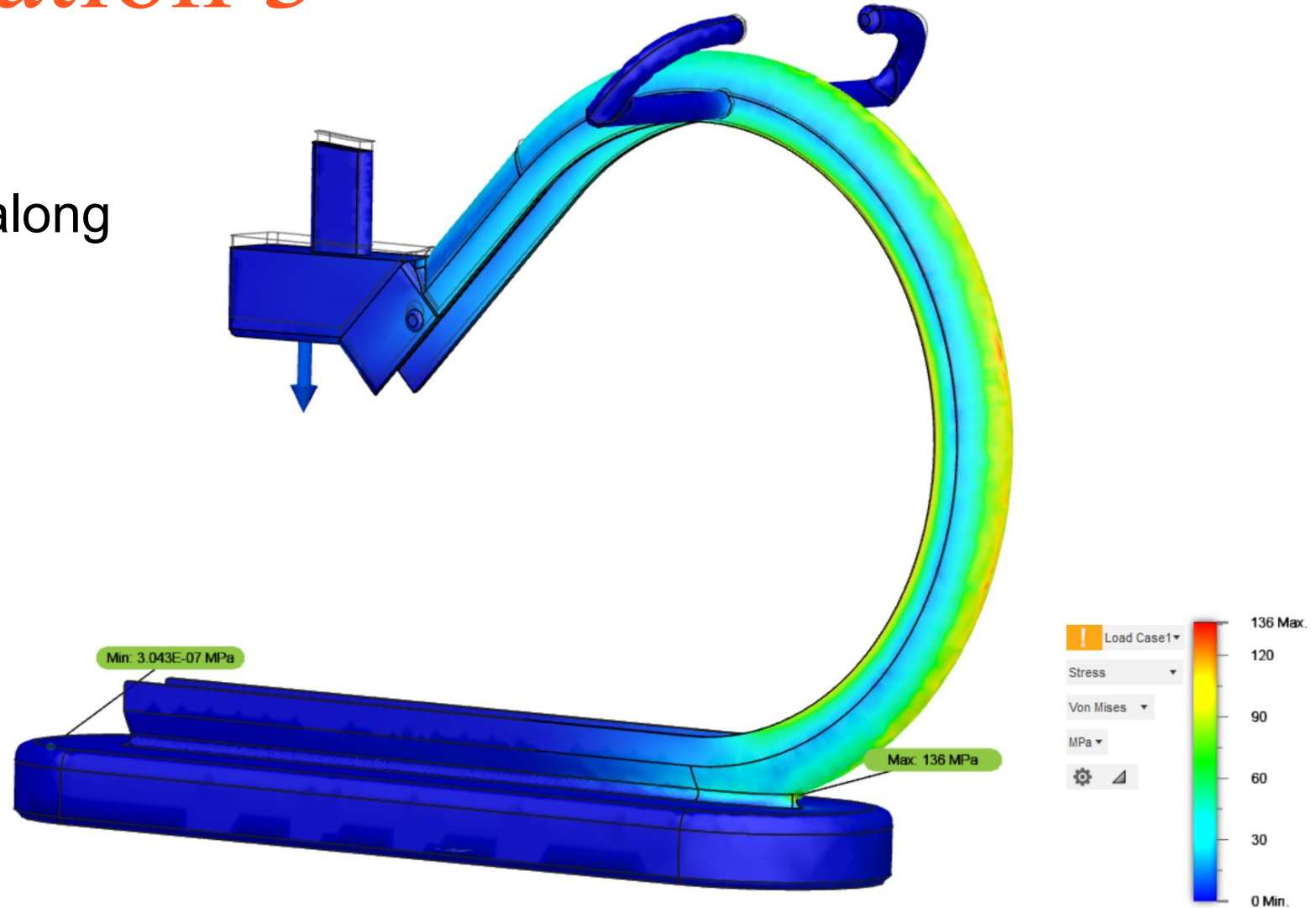


QUICK SETUP



Modeling- Iteration 3

- Static load conducted at ~360lbs (1600N)
- Min factor of safety of 1.5 along main frame
- 6mm flats/8mm curve



Materials and Components

1. Carbon Steel, Flat Stock, Thickness (Decimal) 0.032 in, Alloy Type - Carbon Steel 1008, 24 in Wide x 4 ft Long
2. Low-Carbon Steel Rod, 1/2" Diameter, 24 in Long
3. Low-Carbon Steel Disc, 1" Long, 10" Diameter
4. Rare Earth Magnet Material: Neodymium Iron Boron, Sintered, 102 lb Max. Pull, 2 in Dia
5. Miniature Ball Bearing: Sealed, Steel, 10 mm Bore Dia., 22 mm Outside Dia., 7 mm Wd
6. Super-Corrosion-Resistant 316 Stainless Steel Thin Hex Nut M8 x 0.75 mm Thread, 4 mm High
7. Position-Control DC Motor, NEMA 8, 3000 Maximum rpm, 1.6 Inch oz Torque
8. MXL Series Timing Belt Pulley, 3 mm Maximum Belt Width, 16.1 mm OD, 2 Flanges
9. MXL Series Timing Belt, 3 mm Wide, Trade Number 60mxi003M