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# Team Cavatappi

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# Purchasing Plan



**Figure 1:** Male Luer Connector



**Figure 2:** Female Luer Connector

Item	Cost	Supplier	On Hand	Order By	Part No.	Notes
M3 Bolts	In Lab	Copper State	Yes			
M3 Set Screws	\$ 8.77	Copper State	No	8-Feb		
M3 Nuts	In Lab	Copper State	Yes			
Sous Vide	Team Member Owned	Anova	Yes			
Vacuum Sealer	Team Member Owned	Guttale	Yes			
Vacuum Bags	Team Member Owned	Guttale	Yes			
3ML Syringes	\$ 3.82	Qosina	Yes		C3303	Price Assumes 20ct
1ML Syringes	\$ 10.47	Qosina	Yes		C3301	Price Assumes 20ct
Injection Syringe	In Lab	Amazon	Yes			
Male Luer Connector	\$ 7.14	Qosina	No	8-Feb	11590	Price Assumes 30ct
Female Luer Connector	\$ 12.45	Qosina	No	8-Feb	11765	Price Assumes 30ct
Tygon	In Lab	St. Goblain	Yes			3/32" OD 1/32" ID
Hydraulic Tubing	\$ 12.03	Amazon	No	7-Feb		
Monofilament	In Lab	Trilene	Yes			20Lb Test .018" OD
Mandrel Material	In Lab		Yes			16ga Wire
Mineral Oil	In Lab		Yes			
Print Resin	Donated		Yes			
Print Filament	Donated		Yes			
Thread	\$ 1.35	Michaels	Yes			
Epoxy	\$ 6.17	Walmart	Yes			
UV Set Glue	\$ 18.30	Amazon	Yes			
UV Flashlight	Included with Glue	Amazon	Yes			
Eyelet Connector	In Lab		Yes			0.25" ID
T_Slot Rail	1.96/in	Home Depot	Yes			400 & 600
T_Slot Bracket	0.89/item	Home Depot	Yes			401 & 600

**Figure 3:** Manufacturing Plan

# Manufacturing Plan

Item	Material	Method	On Hand	Make By	Quantity
Tower_Spool	Resin	3D Print	Yes		1
Spool	Resin	3D Print	Yes		1
Tower_Mandrel	Resin	3D Print	Yes		5
Clamp	Onyx	3D Print	Yes		6
Clamp Jaw	Onyx	3D Print	Yes		6
Clamp (Machined)	Aluminum	Turn/Mill	No	18-Feb	10
Manifold Slice (Test)	Onyx	3D Print	Yes		9
Manifold (Test)	Onyx	3D Print	Yes		2
Arm	Onyx	3D Print	No		2
Wrist	Onyx	3D Print	No		2
Elbow	Onyx	3D Print	No		2
Gimble	Onyx	3D Print	No		2
Control Housing	Onyx	3D Print	No		2
Manifold Slice (Prod)	Onyx	3D Print	No		32
Manifold (Prod)	Onyx	3D Print	No		8
Manifold Mounting Plate	Onyx	3D Print	No		8
Muslces	Onyx	3D Print	No		100
End Effector	Onyx	3D Print	No		2

Figure 4: Manufacturing Plan

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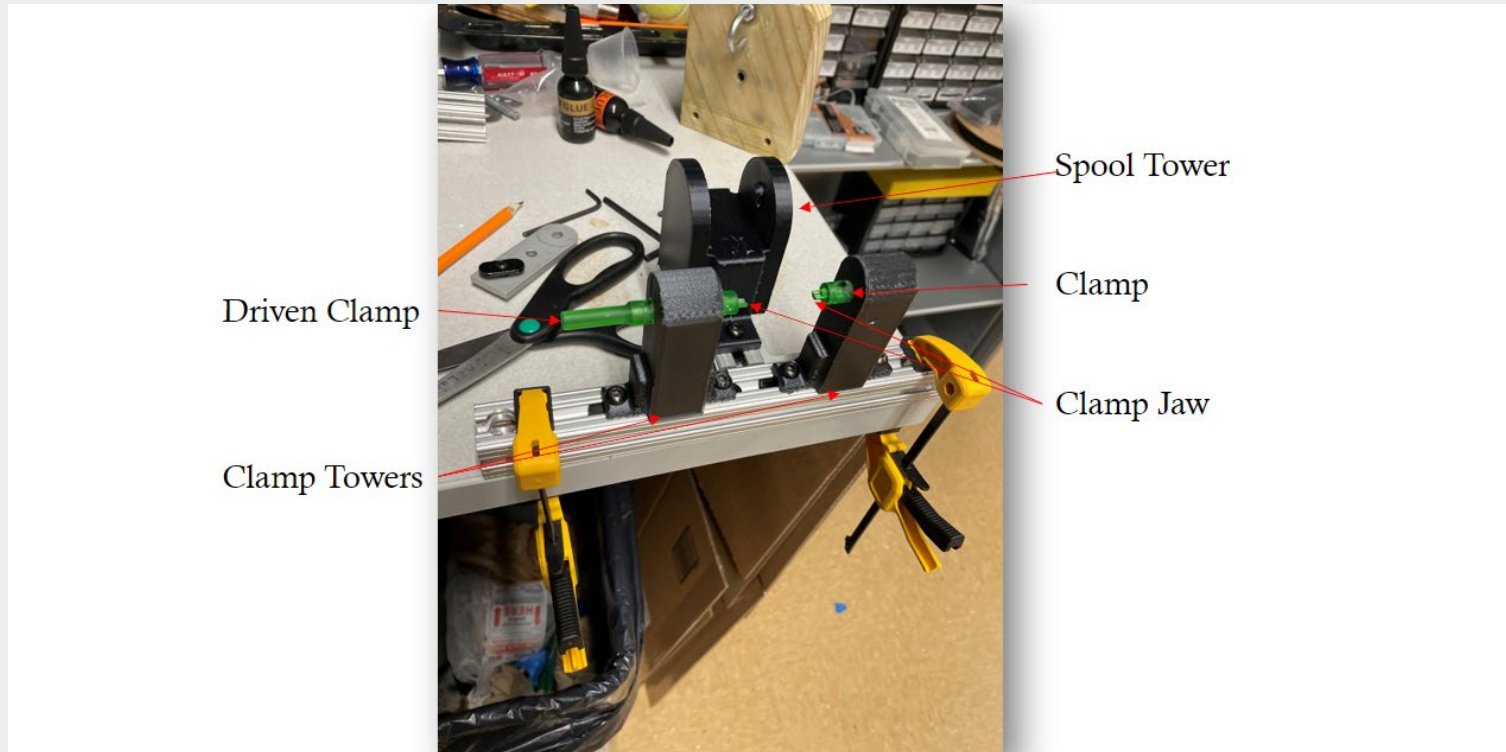
# Manufacturing Plan- Previous Setup



**Figure 5:** Previous Manufacturing Setup



# Manufacturing Plan- Updated Setup



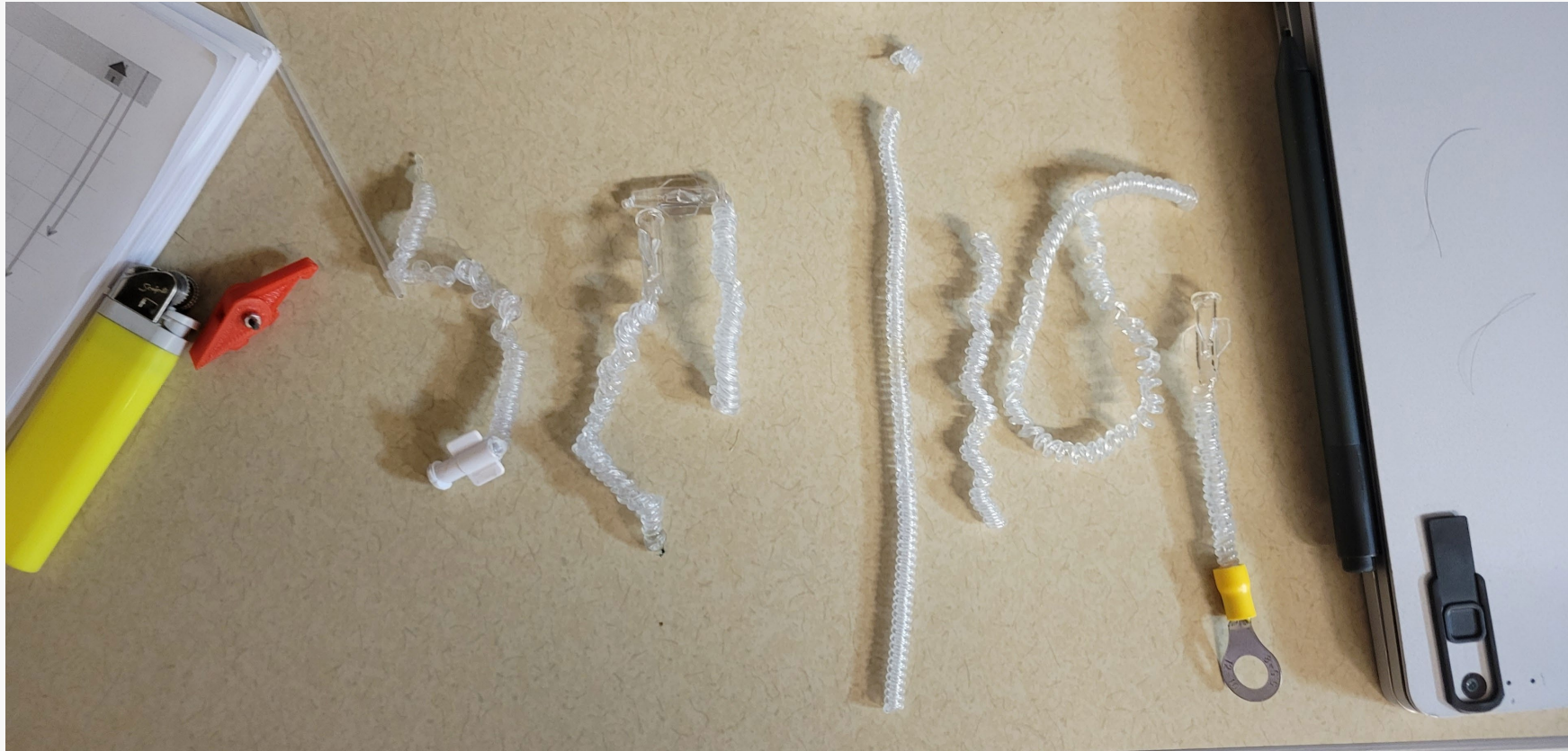
**Figure 6:** Spooling Method Setup



**Figure 7:** Current Heating Method

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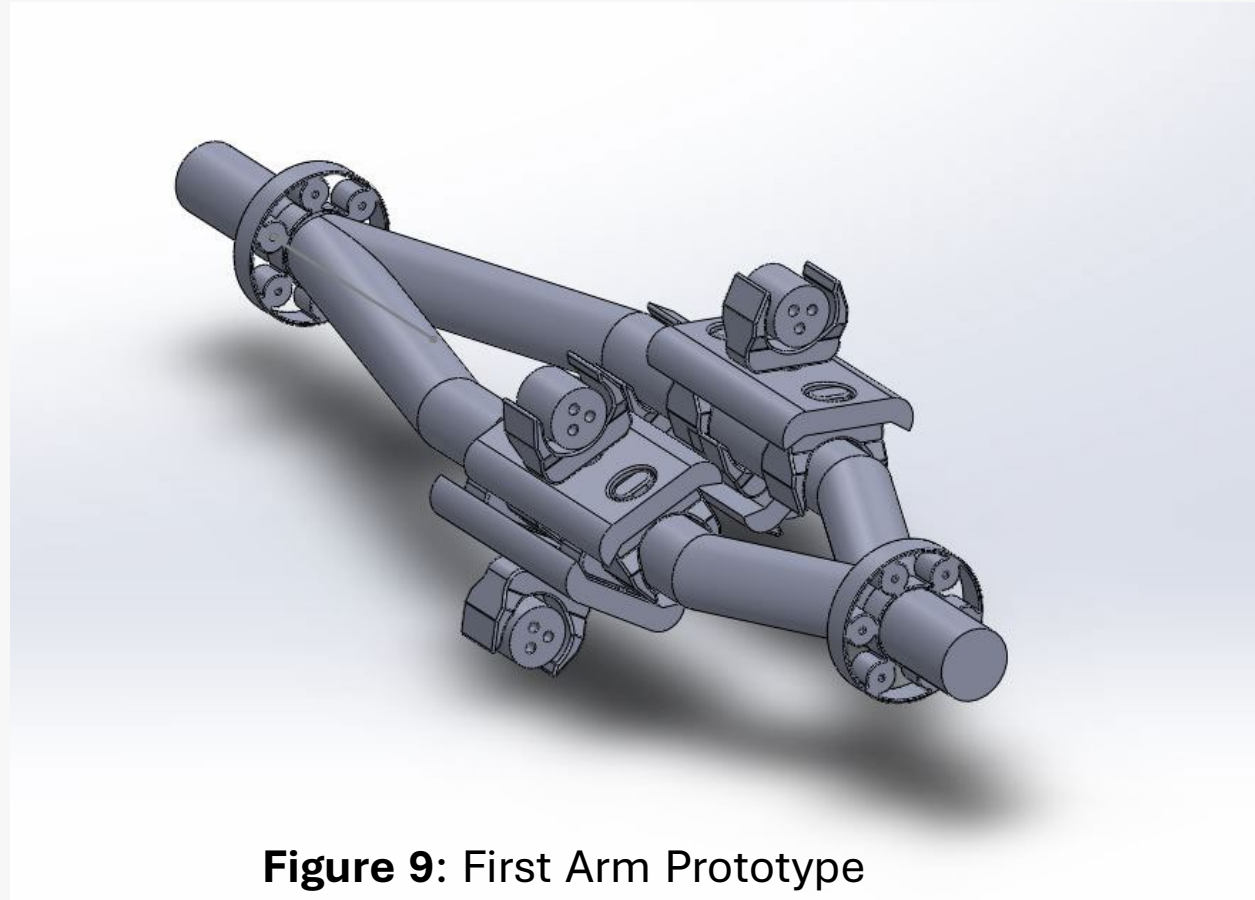
# Manufacturing



**Figure 8:** Previous Muscle Fibers

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# Design Efforts-Arm



**Figure 9:** First Arm Prototype

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# Design Efforts-Iteration on Manifold

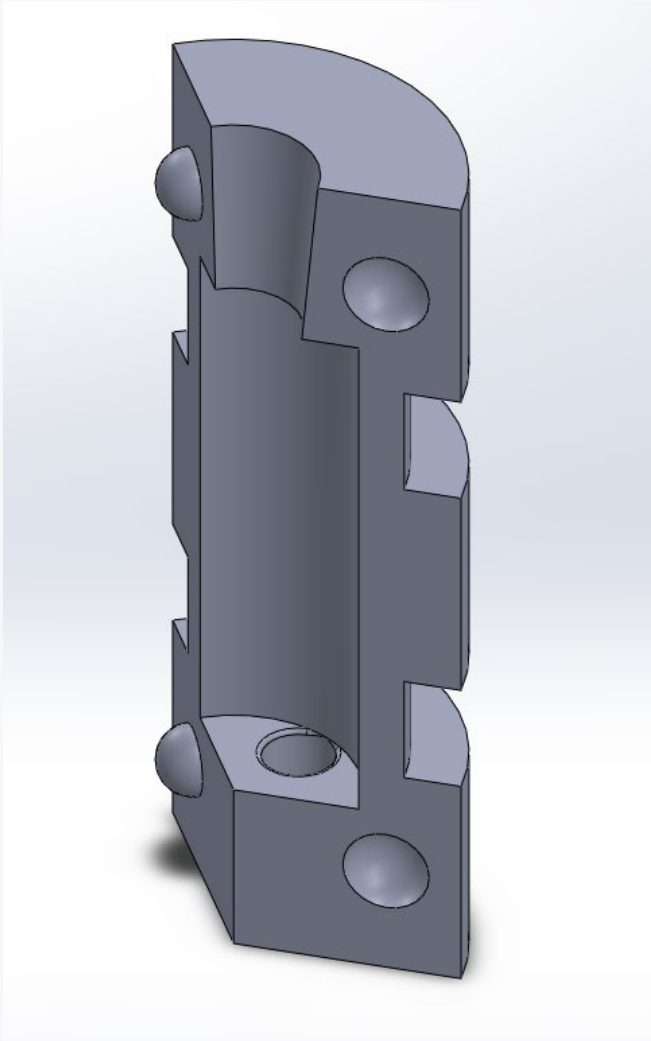
## What we learned:

- Steps for adhesion need to be precise with multi-piece manifold
- First test failed

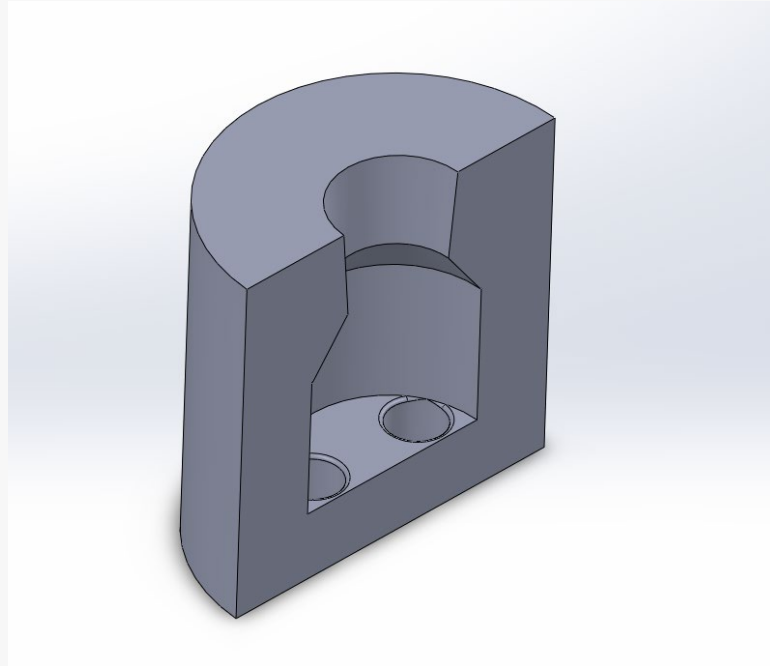
## What needs to be changed:

- Single piece manifold
- Shorter to conserve space

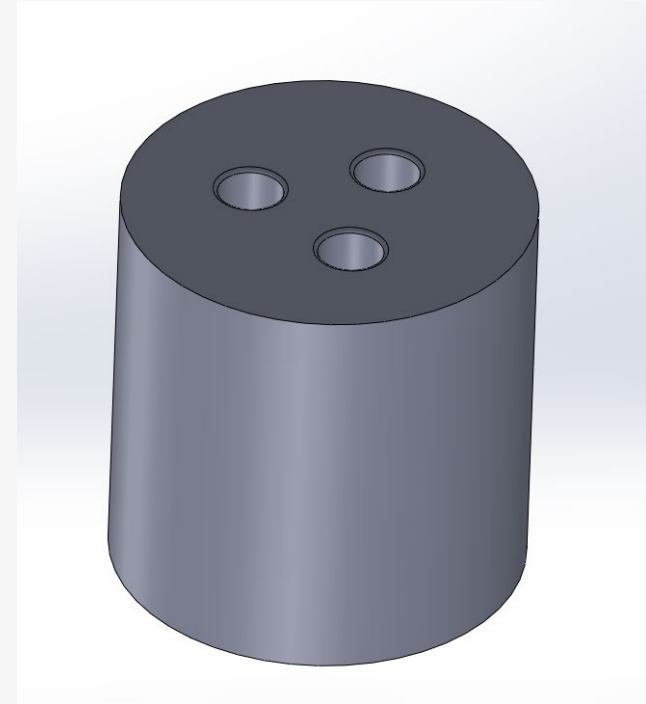




**Figure 10:** A manifold “slice”



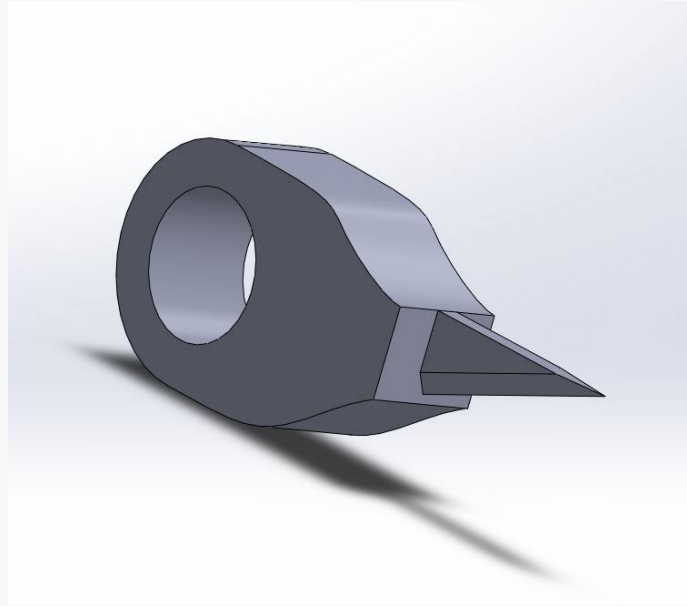
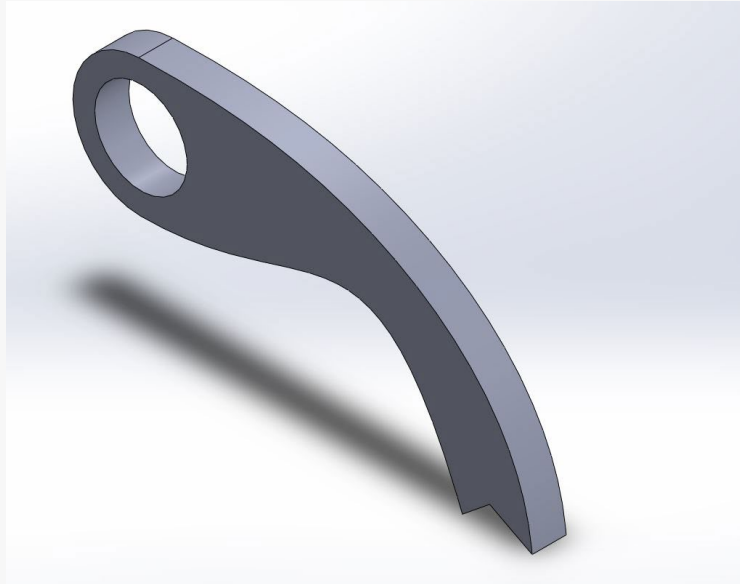
**Figure 11:** Single Manifold Cx



**Figure 12:** Single Manifold

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# Design Efforts: End Effector



**Figure 13:** Concept Grasping “finger” **Figure 14:** Concept Slicing Finger

- End Effector
  - Based on a 1–3-minute demo
  - Something that a 12 y/o – grown adult can do
  - Designs should be biomimetic

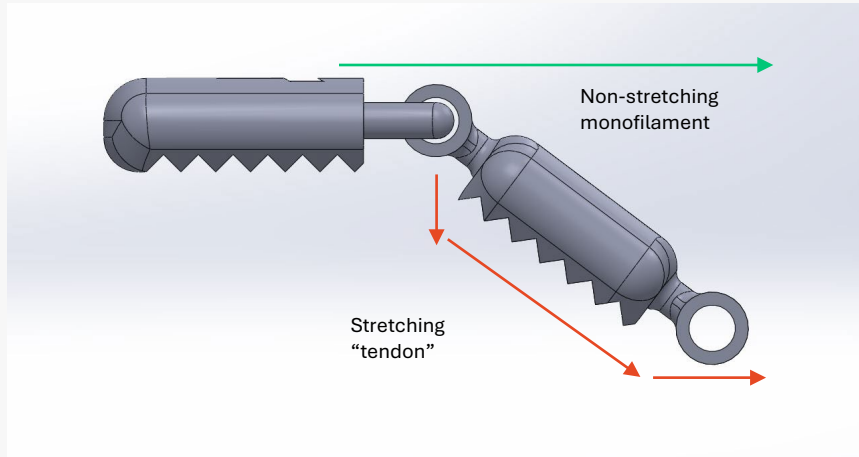


**Figure 15:** 3D Printed Joint

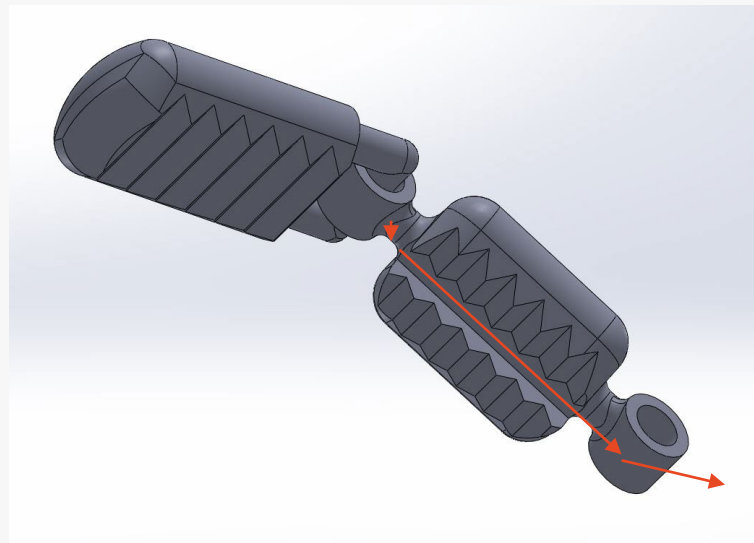
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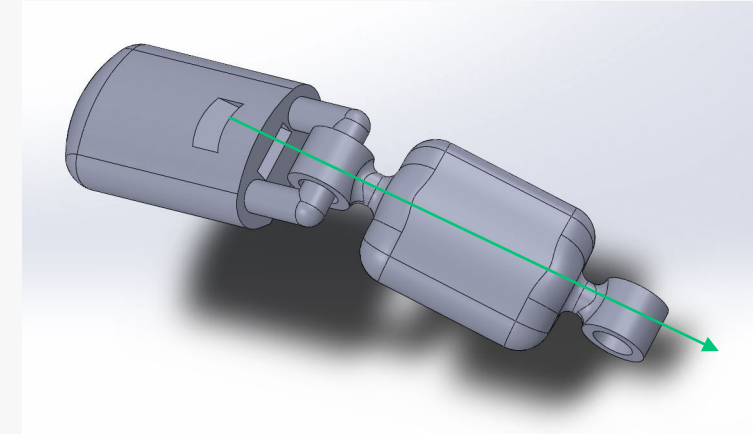
# Design Efforts: End Effector



**Figure 16:** Two Knuckle Finger



**Figure 17:** Bottom View

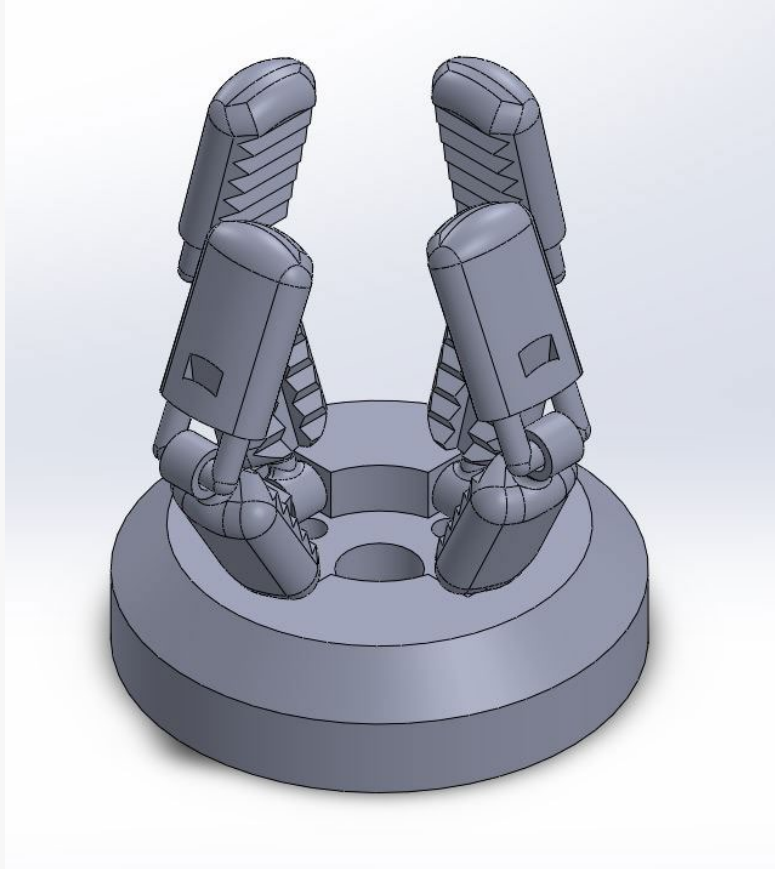


**Figure 18:** Top View

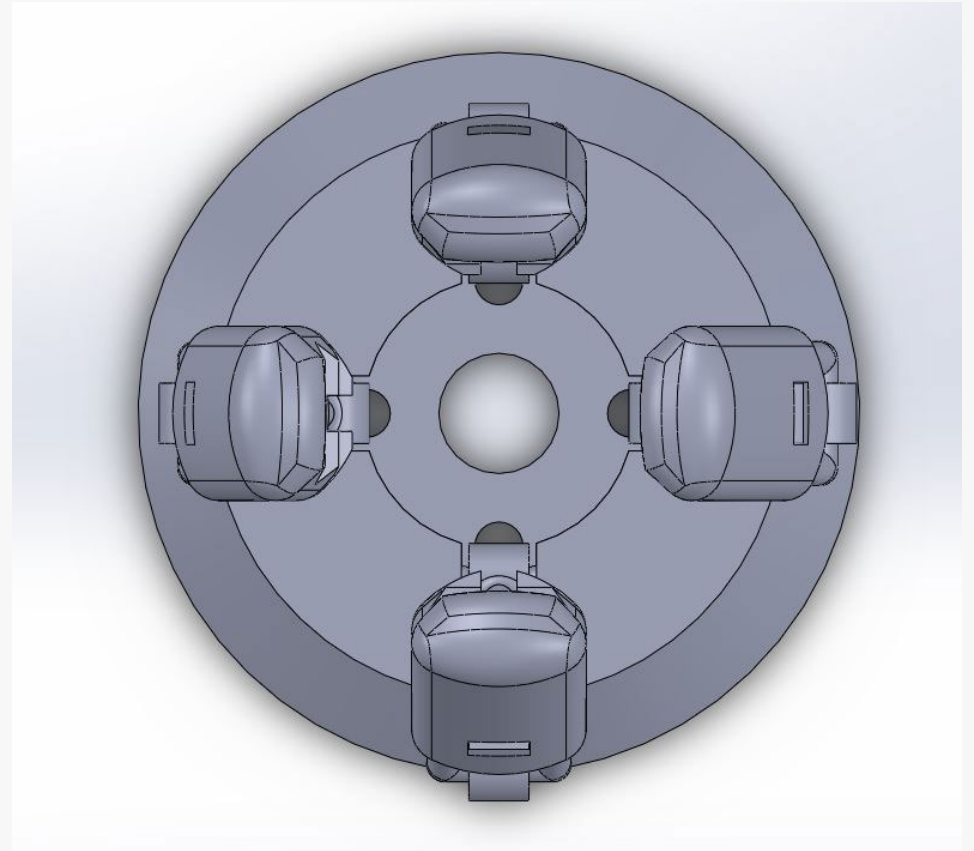
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# Design Efforts: End Effector



**Figure 19:** End Effector Isometric view



**Figure 20:** Top View

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# Updated Gantt

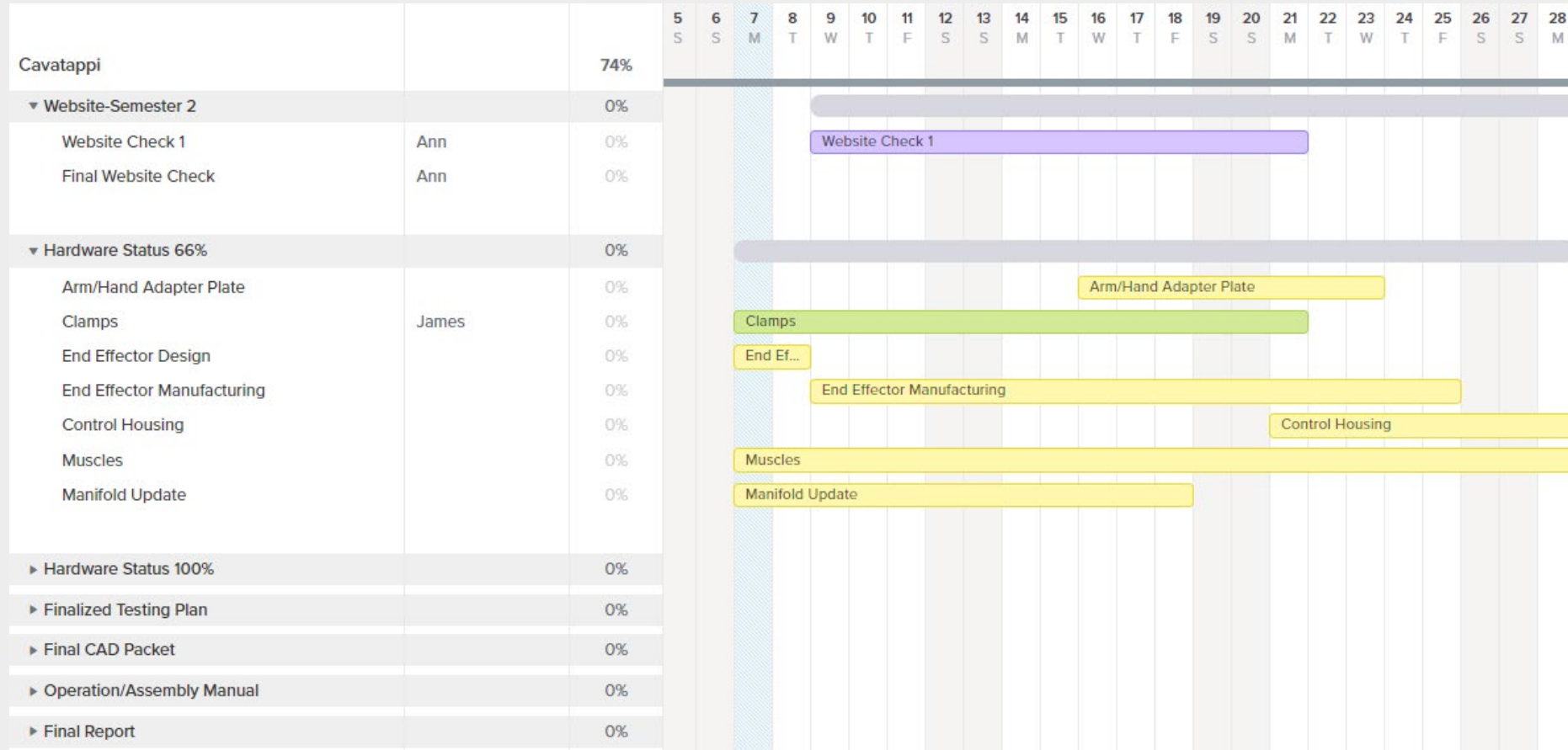


Figure 21: Updated Gantt Chart