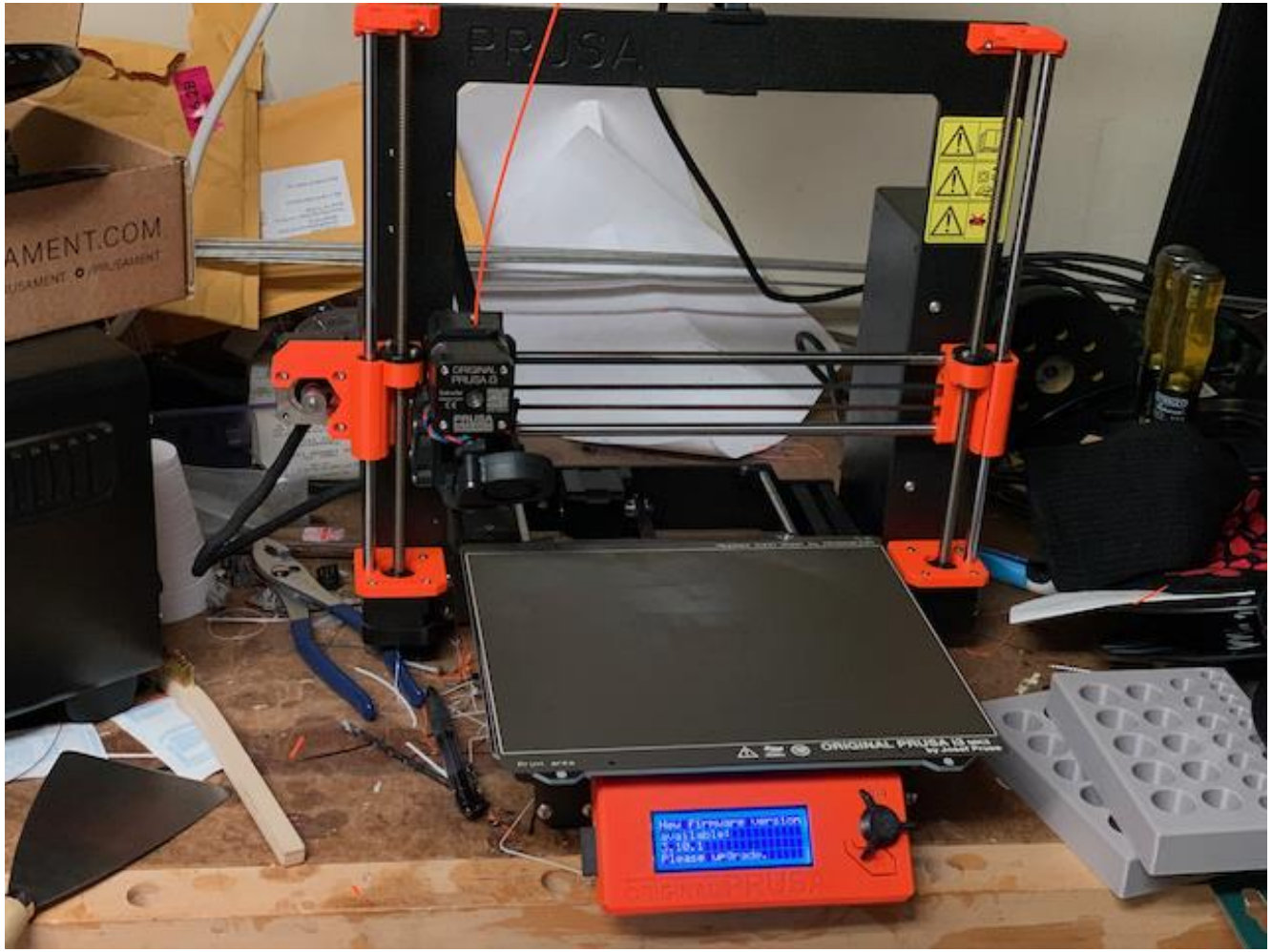
Be lazy, Have fun

PNWVHFS Conference
Salem, Oregon.
October 8 2022
Dave Miller VE7HR

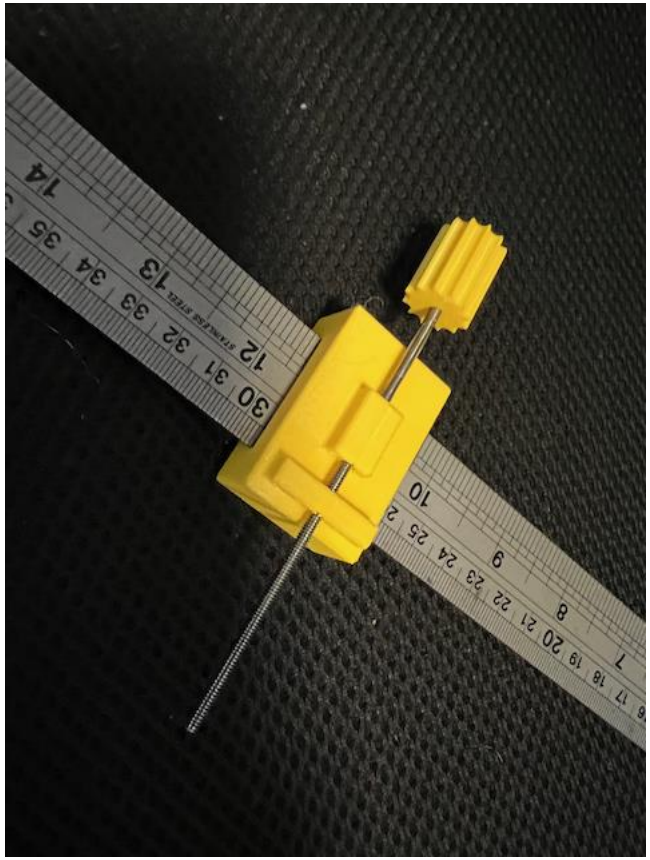
Let your 3D printer do all the work



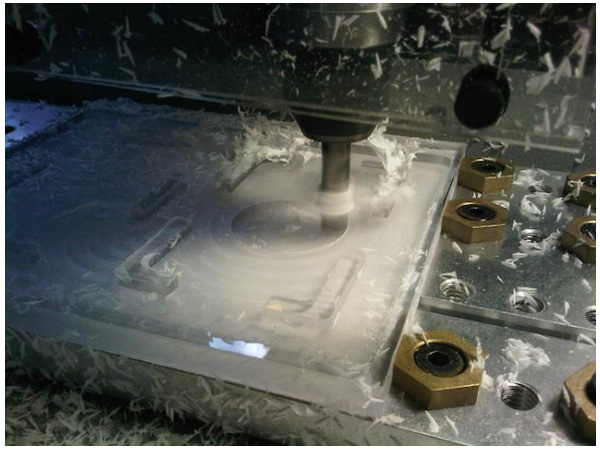
3D Printing applications in Ham Radio

Conical horns

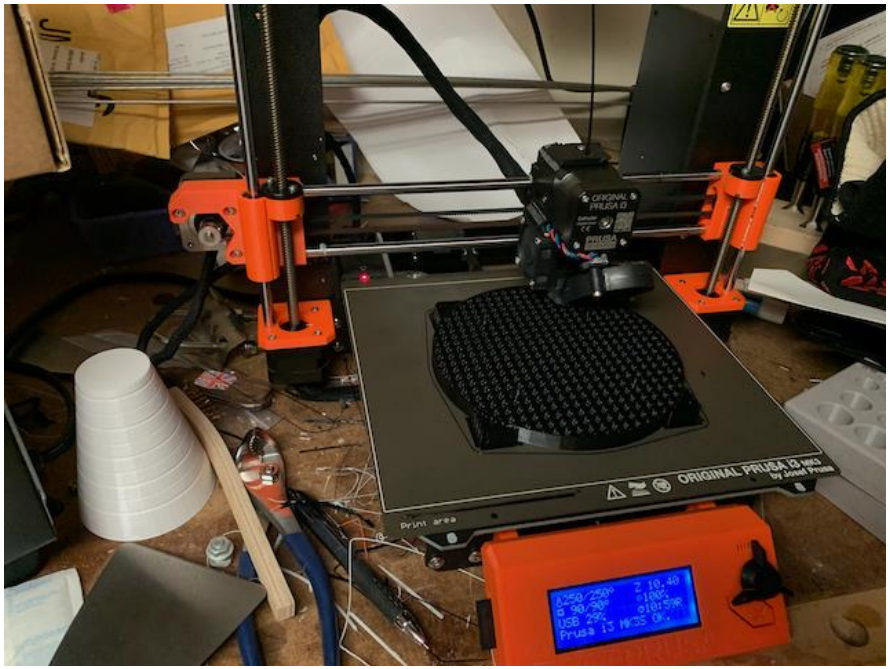
Pieces for 10 GHz Station



What is
3D printing



Subtractive Manufacturing



Additive Manufacturing

Why would you consider using 3D printing for Ham radio applications

- Reproducible
- Decent tolerances
- Decent Surface finish
- Useful sized objects
- Somewhat affordable
- Does not require much room

Steps involved

- Create 3D geometry
- Select material
- Slice
- Print
- Assemble
- Enjoy

A Case Study

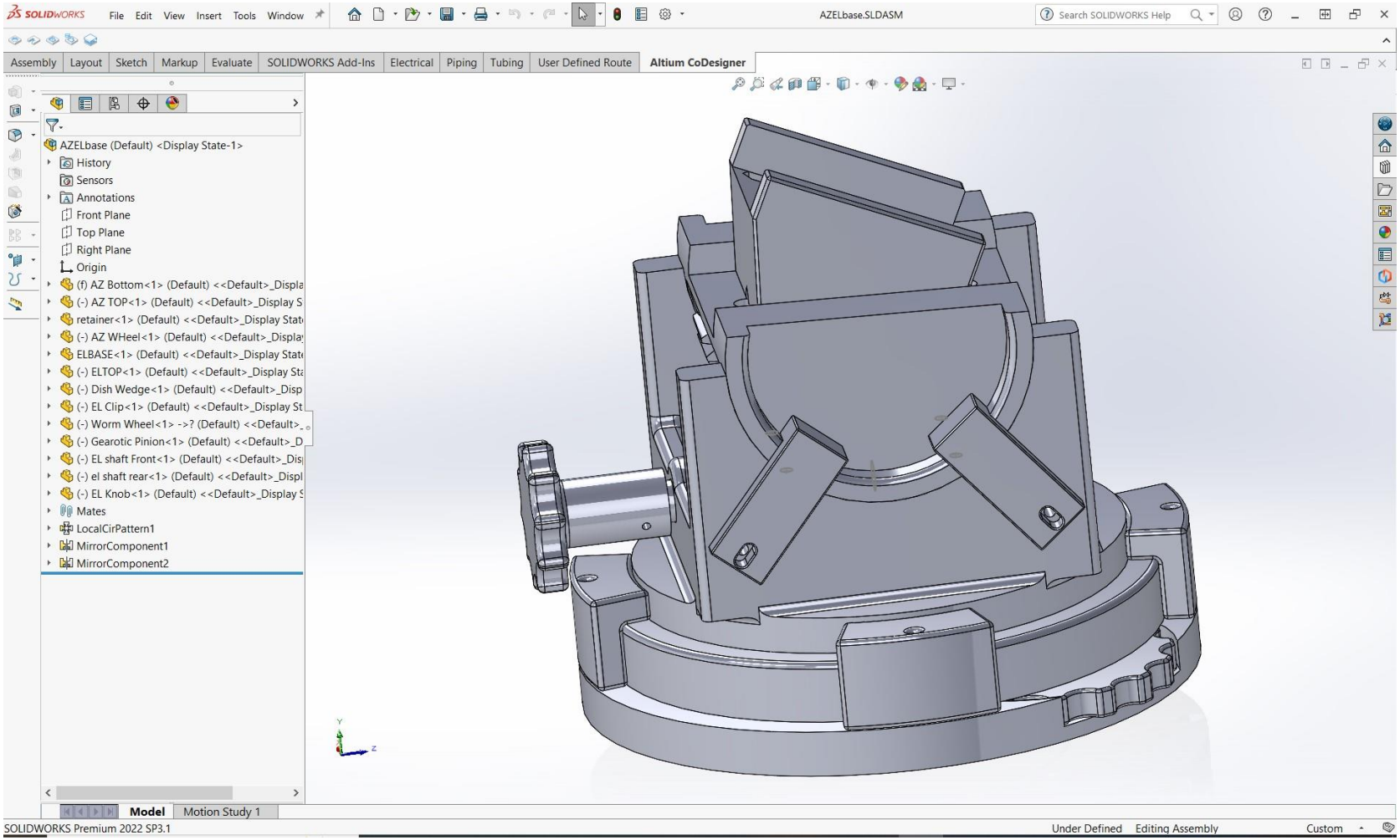
- Needed a Azimuth Elevation mount for my 10 GHz dish
- Was not able to find anything off the shelf
- Wanted to do something that others could reproduce
- Wanted to be modular and allow for improvements and enhancements

Requirements

Inexpensive Tripod

Easy to disassemble

Design


SOLIDWORKS
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Search SOLIDWORKS Help
Assembly Layout Sketch Markup Evaluate SOLIDWORKS Add-Ins Electrical Piping Tubing User Defined Route Altium CoDesigner
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History
Sensors
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Front Plane
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MirrorComponent1
MirrorComponent2
Model
Motion Study 1
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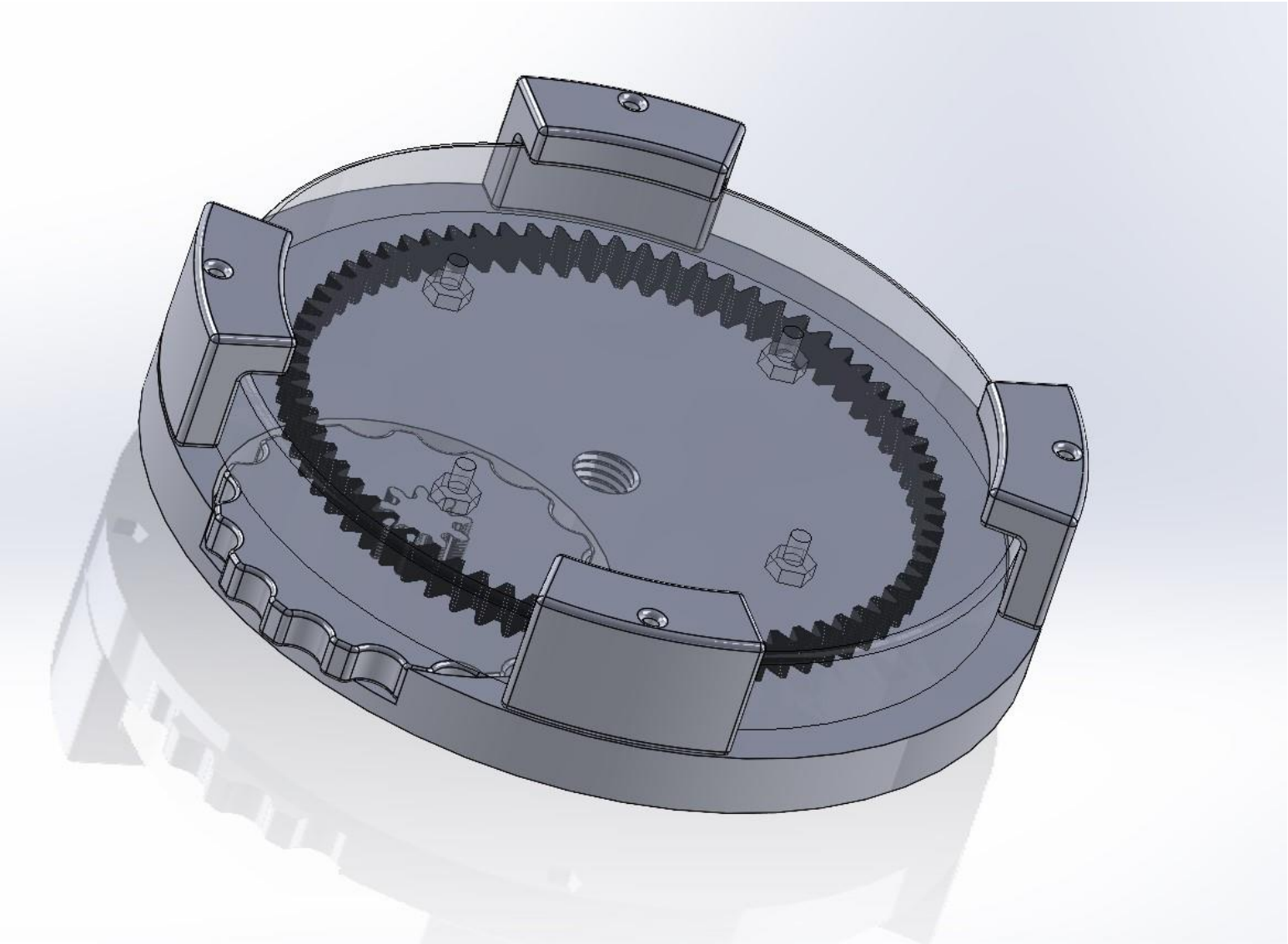
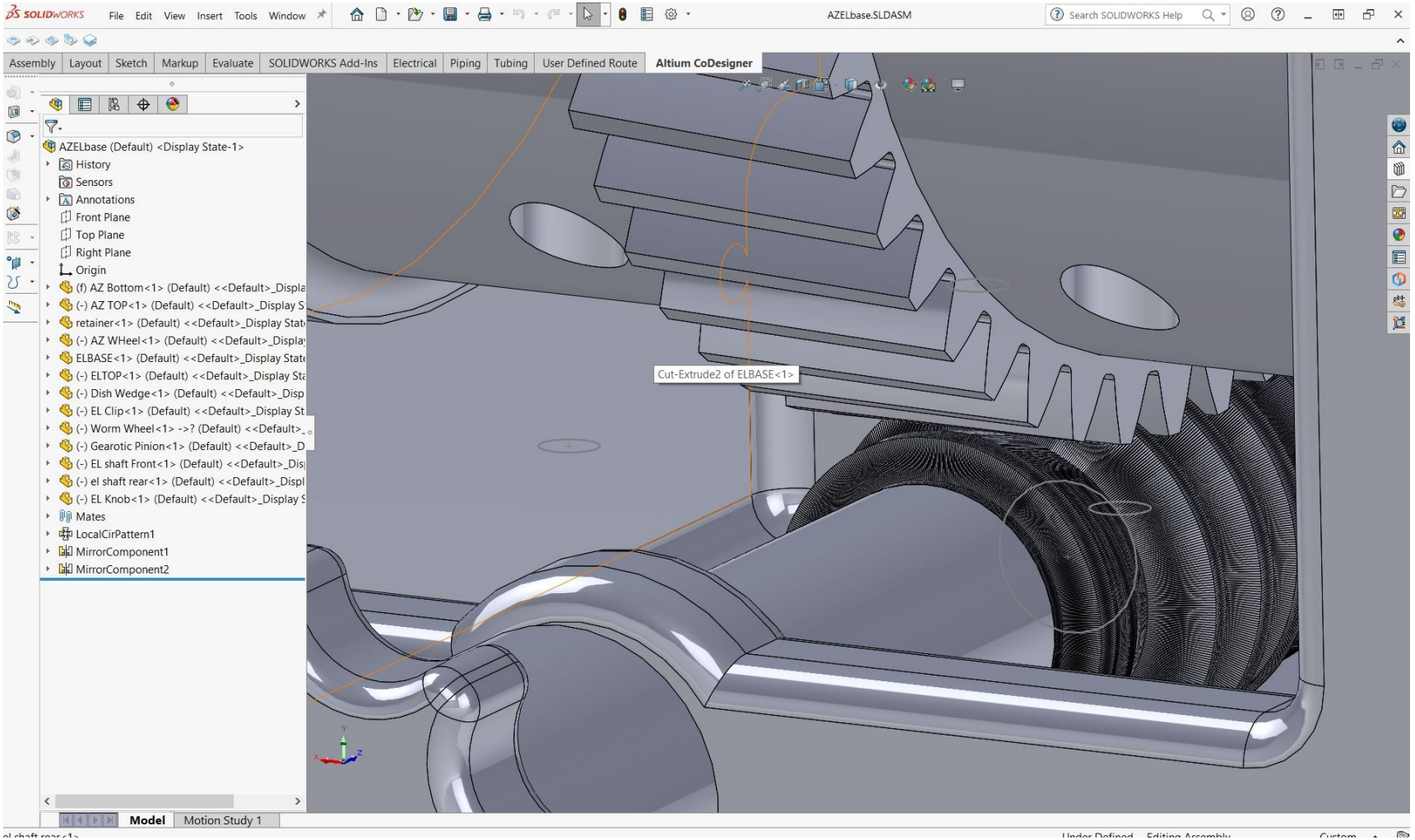
Under Defined
Editing Assembly
Custom

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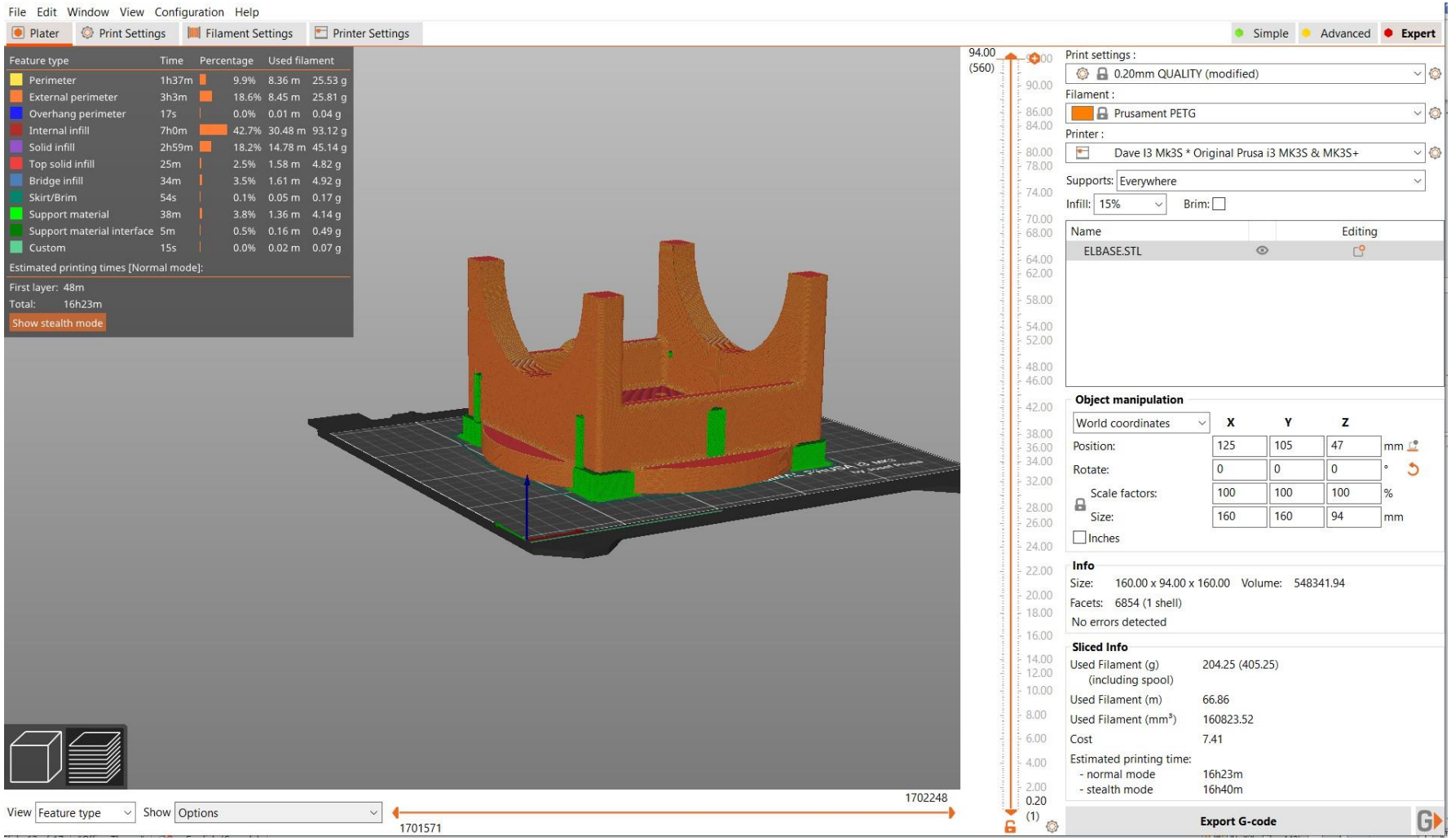
LocalCirPattern1
MirrorComponent1
MirrorComponent2
Cut-Extrude2 of ELBASE<1>
Model
Motion Study 1

Material Selection

- Three major materials
  - PLA
  - ABS
  - PETG

- PETG is the Winner in my opinion

Slicing

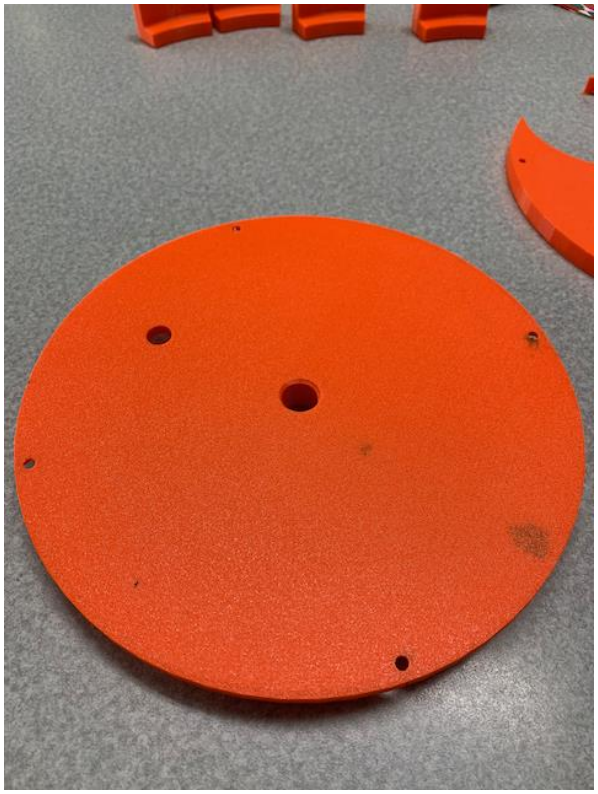

File Edit Window View Configuration Help
Plater
Print Settings
Filament Settings
Printer Settings
Simple
Advanced
Expert
Feature type Time Percentage Used filament
Perimeter 1h37m 9.9% 8.36 m 25.53 g
External perimeter 3h3m 18.6% 8.45 m 25.81 g
Overhang perimeter 17s 0.0% 0.01 m 0.04 g
Internal infill 7h0m 42.7% 30.48 m 93.12 g
Solid infill 2h59m 18.2% 14.78 m 45.14 g
Top solid infill 25m 2.5% 1.58 m 4.82 g
Bridge infill 34m 3.5% 1.61 m 4.92 g
Skirt/Brim 54s 0.1% 0.05 m 0.17 g
Support material 38m 3.8% 1.36 m 4.14 g
Support material interface 5m 0.5% 0.16 m 0.49 g
Custom 15s 0.0% 0.02 m 0.07 g
Estimated printing times [Normal mode]:
First layer: 48m
Total: 16h23m
Show stealth mode
94.00
(560)
Print settings :
0.20mm QUALITY (modified)
Filament :
Prusament PETG
Printer :
Dave I3 Mk3S * Original Prusa i3 MK3S & MK3S+
Supports: Everywhere
Infill: 15%
Brim:
Name
Editing
ELBASE.STL
Object manipulation
World coordinates
X
Y
Z
Position: 125 105 47 mm
Rotate: 0 0 0 °
Scale factors: 100 100 100 %
Size: 160 160 94 mm
Inches
Info
Size: 160.00 x 94.00 x 160.00 Volume: 548341.94
Facets: 6854 (1 shell)
No errors detected
Sliced Info
Used Filament (g) (including spool) 204.25 (405.25)
Used Filament (m) 66.86
Used Filament (mm³) 160823.52
Cost 7.41
Estimated printing time:
- normal mode 16h23m
- stealth mode 16h40m
Export G-code
1702248
1701571
View Feature type
Show Options

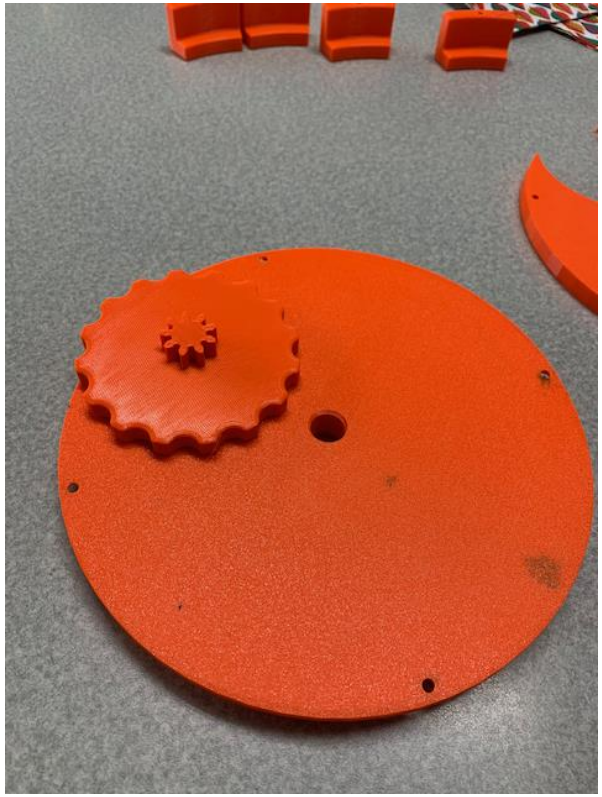
Printing

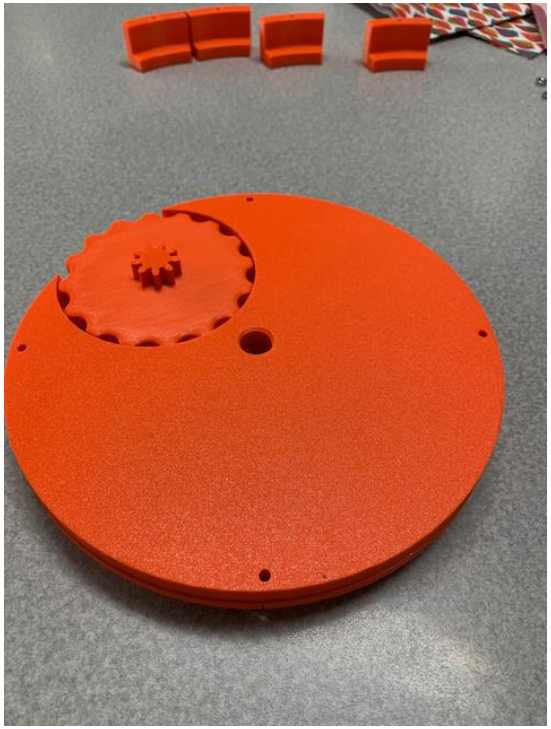
- Challenges on big parts
- How long it takes
- Redesign as you go
- Second time is sometimes better

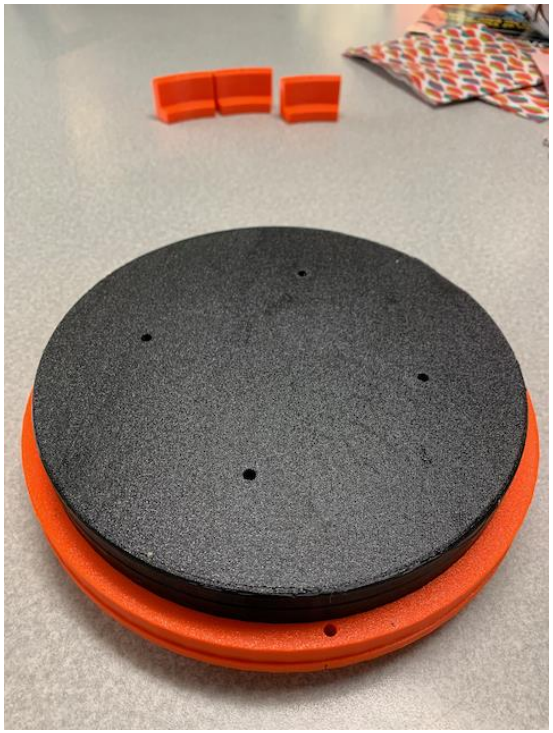
Assembling

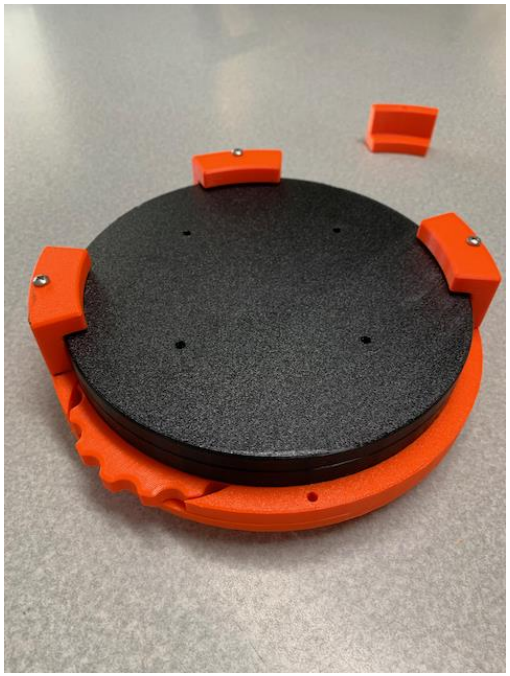
- Bolting together
- Sub assemblies
- Hardware
- Design enhancements

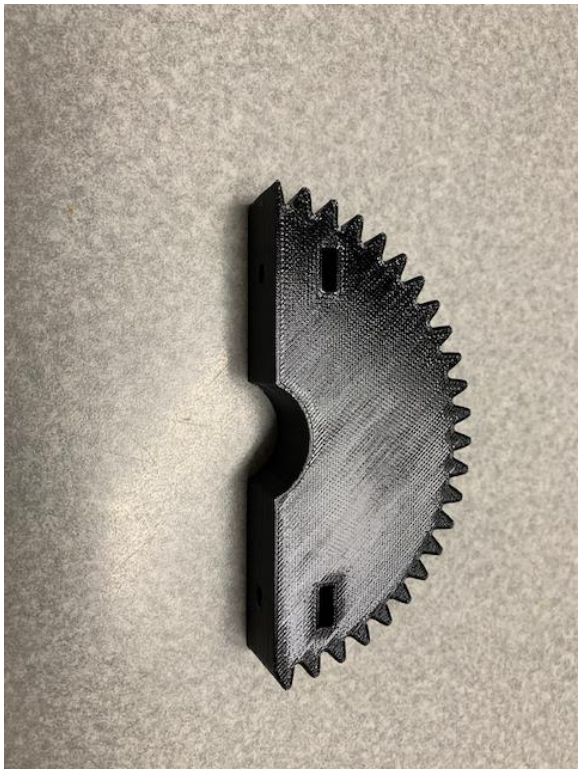


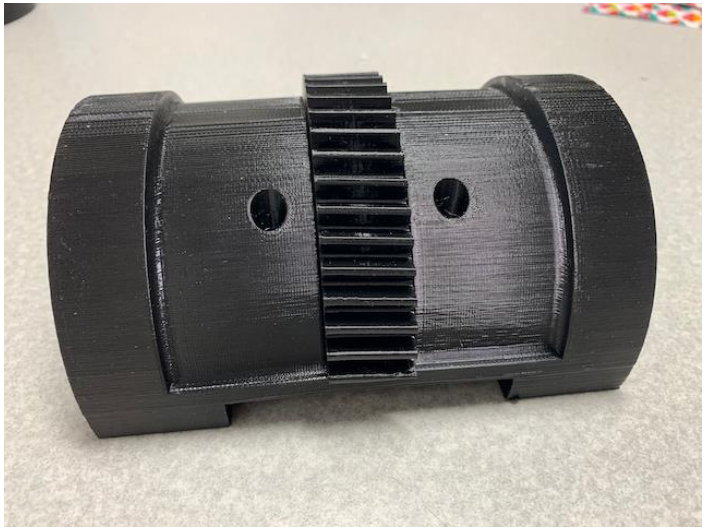


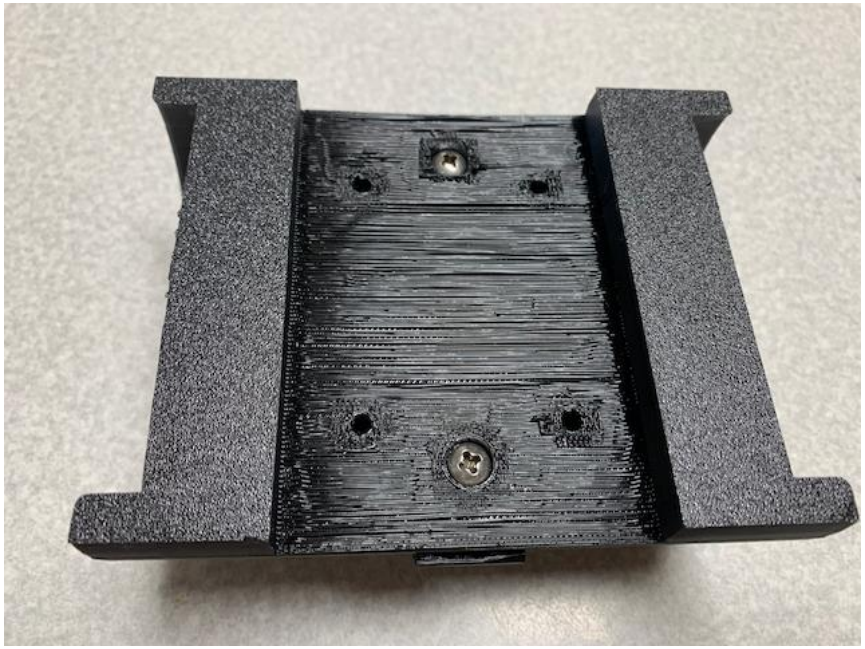


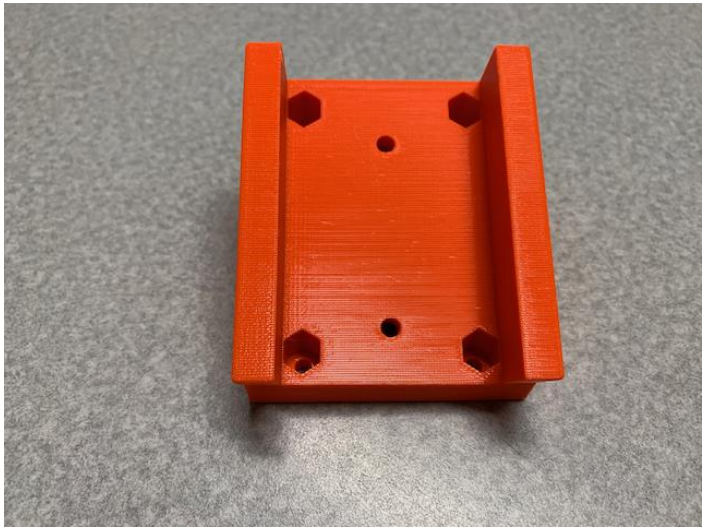


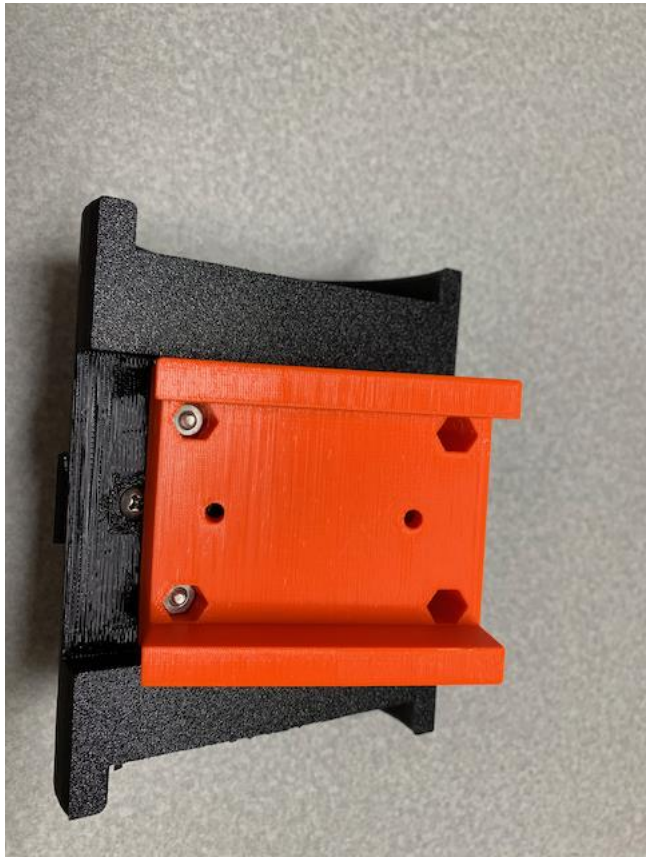


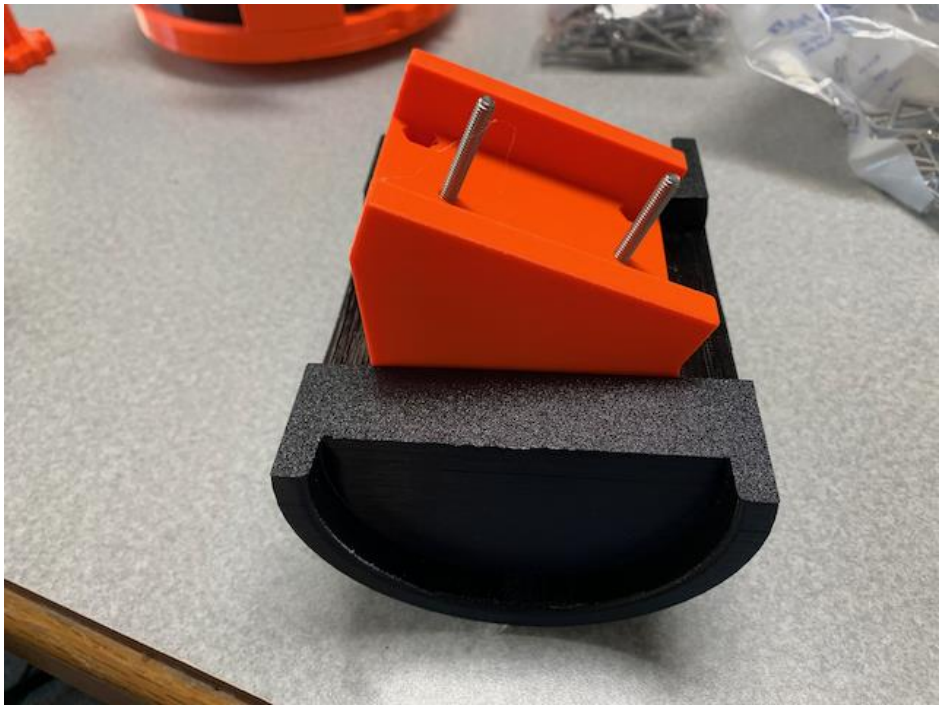












Using

Conclusions

- Seems fit for purpose
- Good prototype
- Enhancements
- Might make one in metal

Questions

- Any Questions

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- ve7hr@ve7hr.ca

- Thanks for listening