



Swerve Robotic Platform

Mechanical Design and Manufacture

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Report Outline

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1. *Chassis Design / Manufacture*
2. *Wheel Assembly Design / Manufacture*

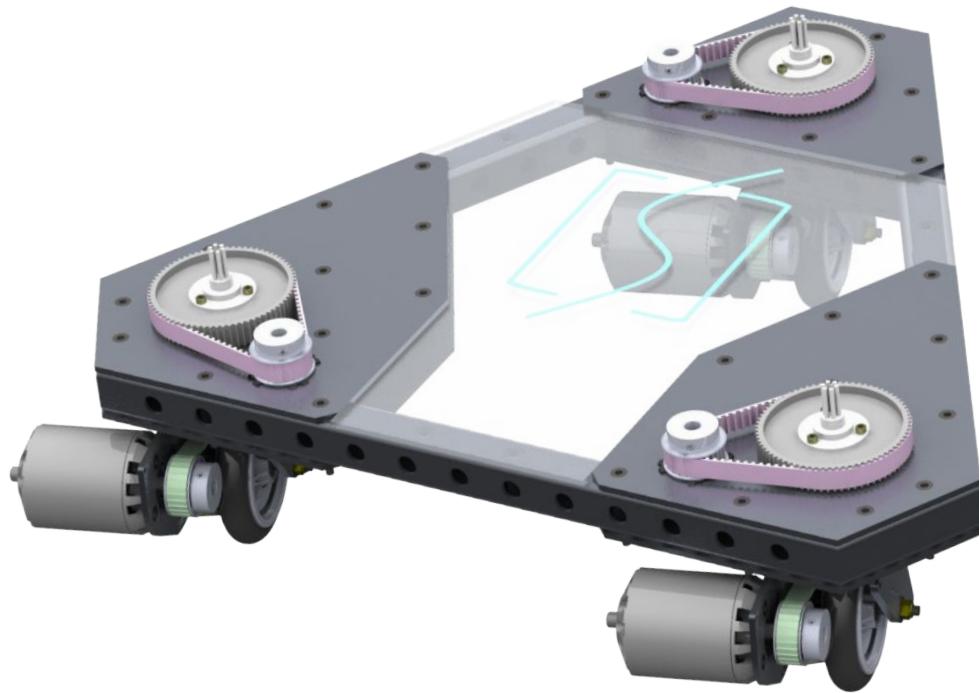


Chassis Design / Manufacture

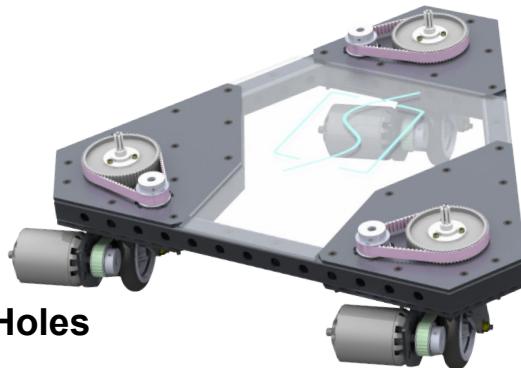
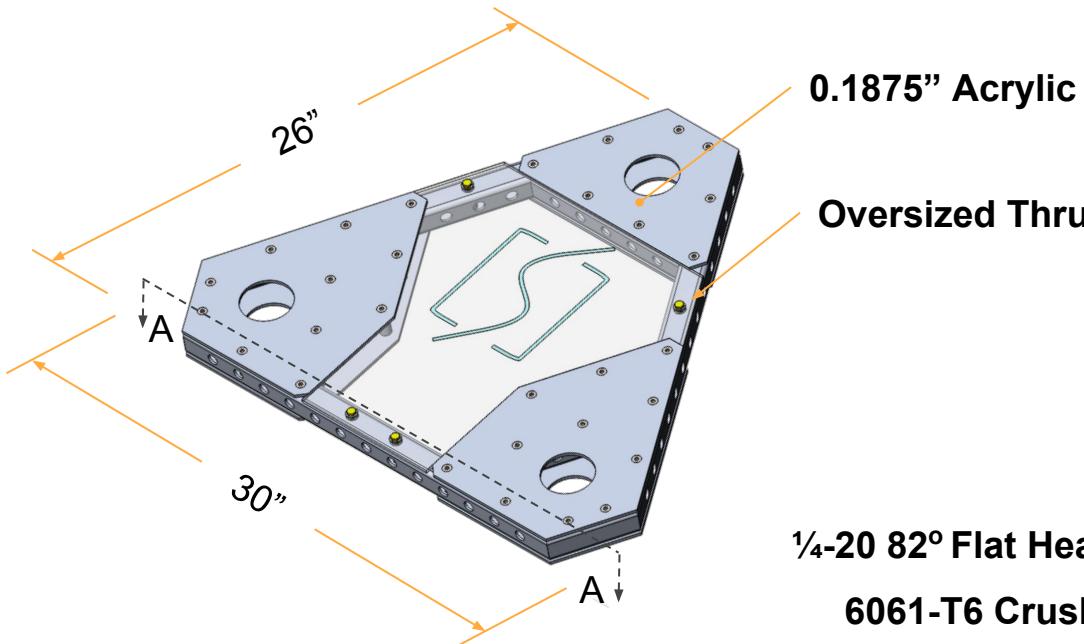
Mechanical and Structural Components, Manufacture, and Assembly

**Chassis Design /
Manufacture**

**Wheel Assembly
Design / Manufacture**



Chassis Assembly



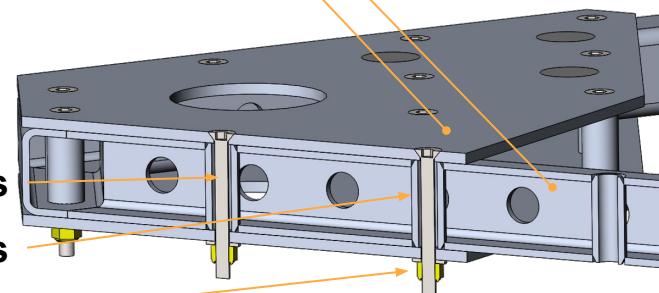
Oversized Thru Holes

6061-T6 Tube
6061-T6 Plate

1/4-20 82° Flat Head Bolts

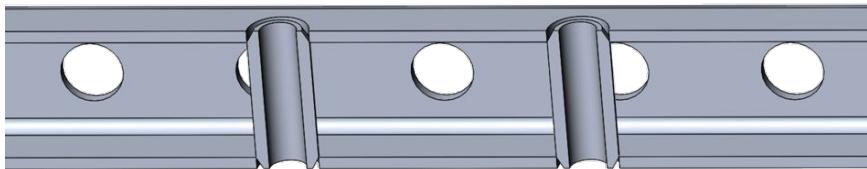
6061-T6 Crush Tubes

Nylon Locknut

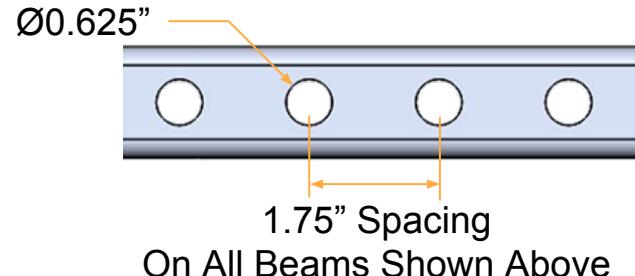
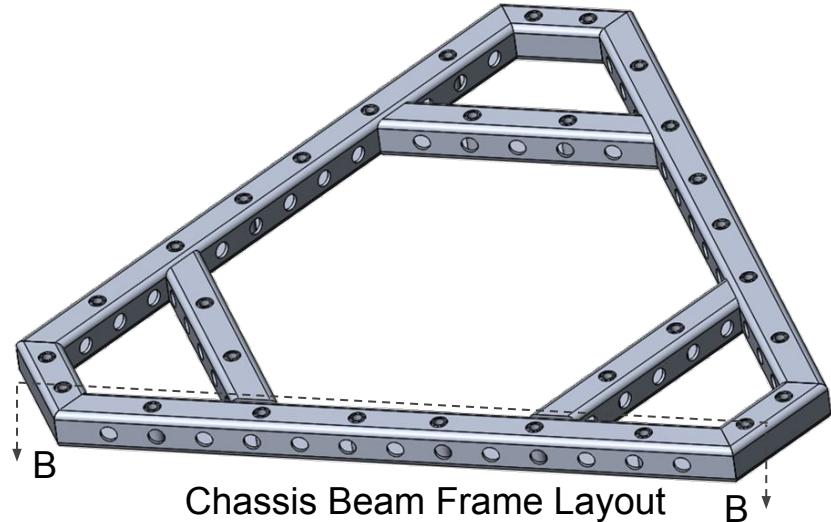
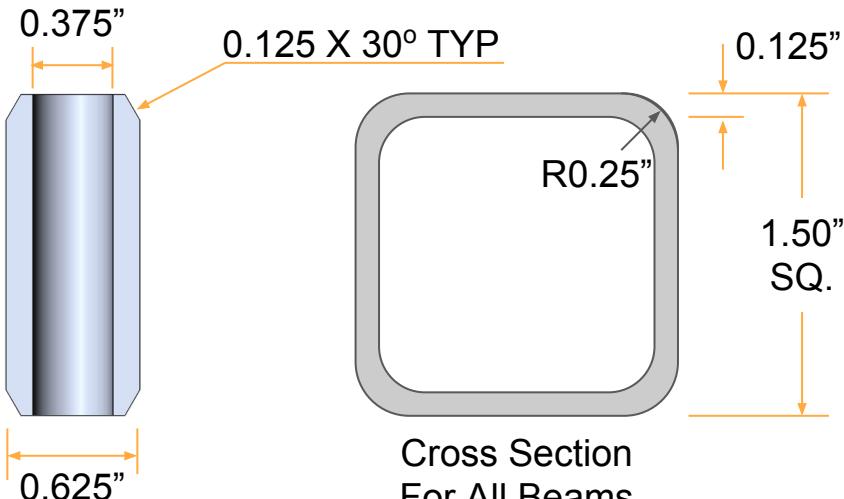


Section A-A
View Cut for Clarity

Chassis Frame Design

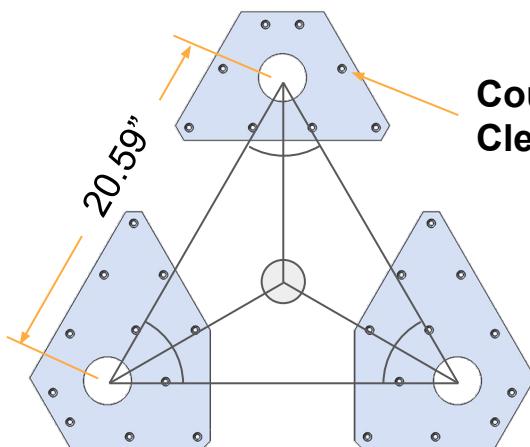


Section B-B



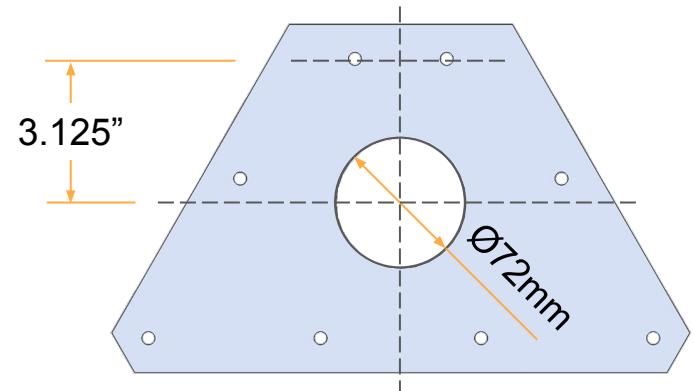
Gusset Plate Design

The gusset plates are used to connect the beams of the chassis together. The top and bottom gusset plates have identical shape and hole patterns. However, the top gusset plates have holes that are countersunk while the bottom plates have clearance holes.



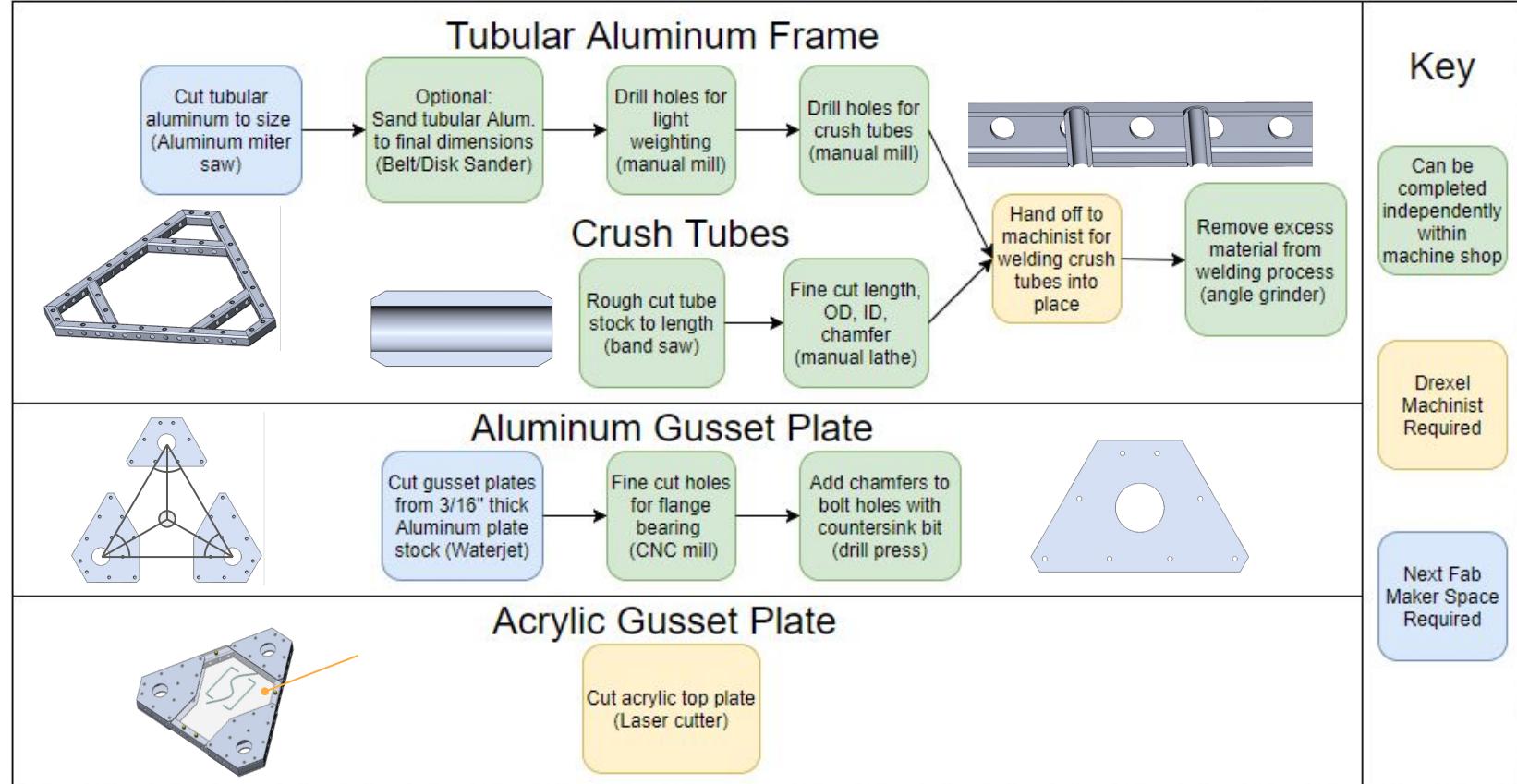
**Countersunk Holes (Top)
Clearance Holes (Bottom)**

Top Gusset Plates Shown (Countersink)



Identical Pattern for All Gusset Plates

Chassis Manufacturing Plan



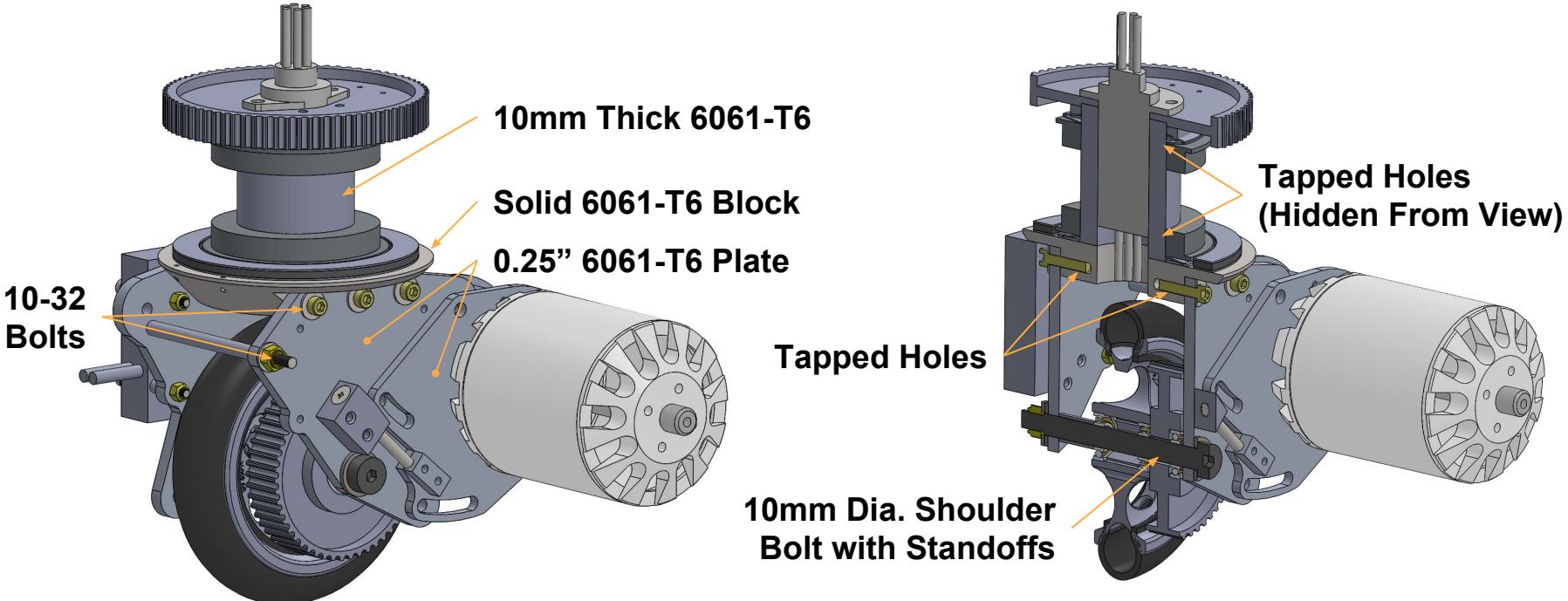
Wheel Assembly Design / Manufacture

Mechanical and Structural Components, Manufacture, and Assembly

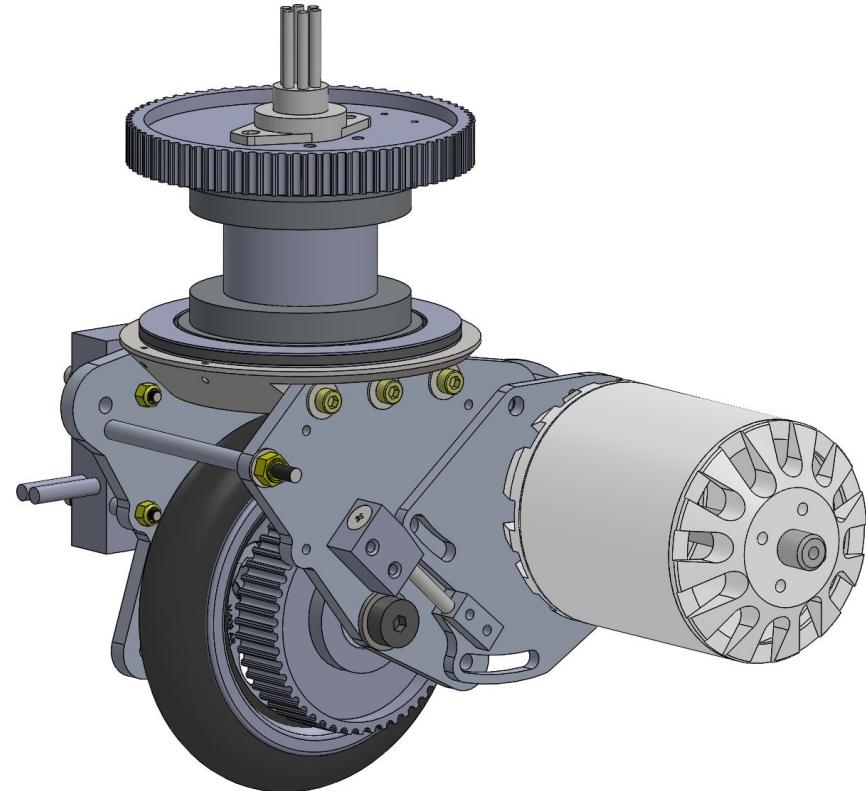
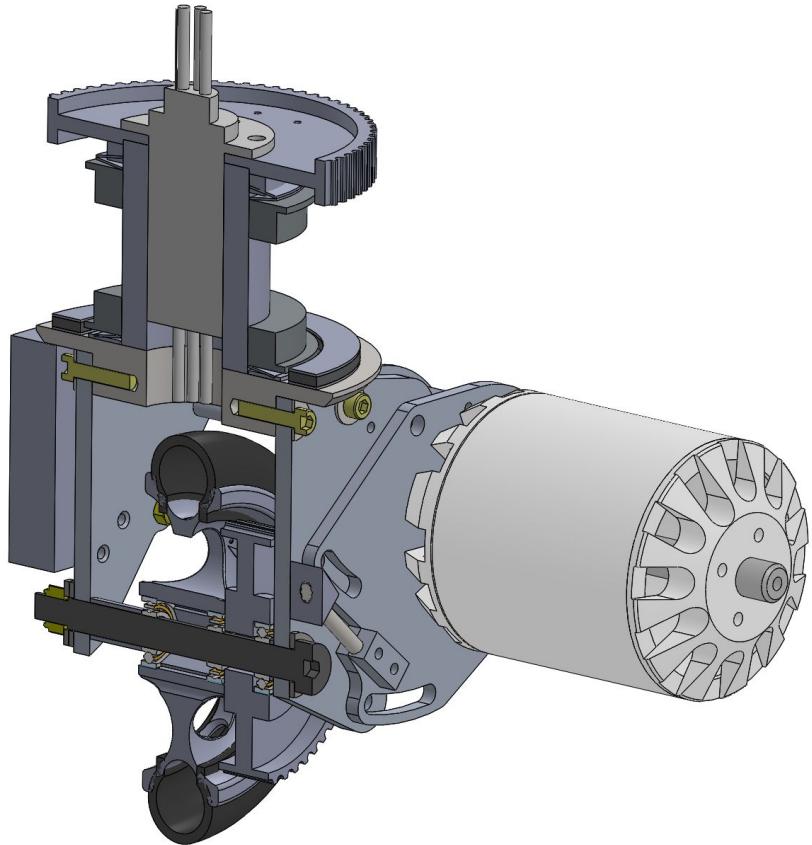
Chassis Design /
Manufacture

**Wheel Assembly
Design / Manufacture**

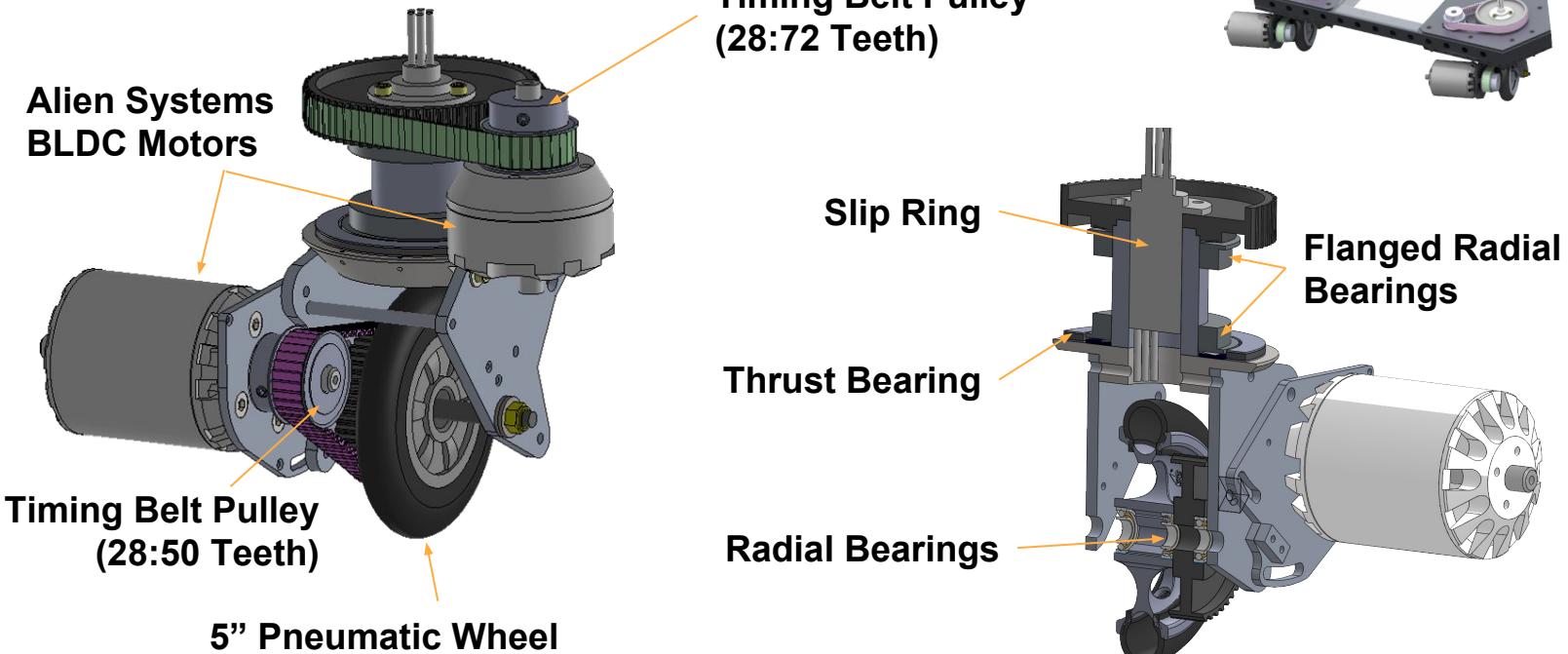
Swerve Assembly - Structural Components



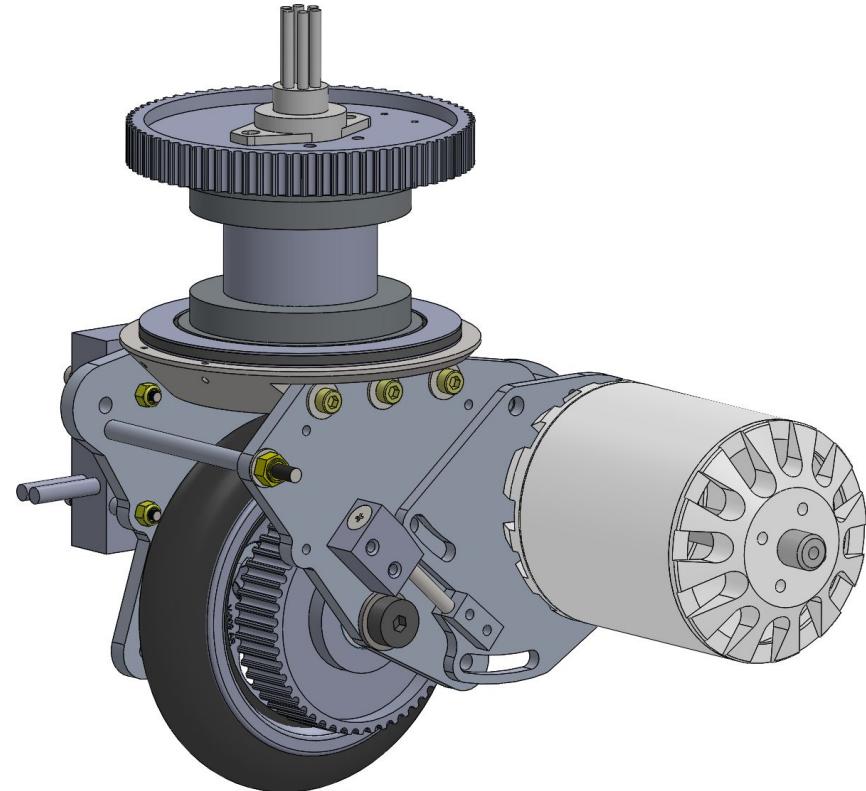
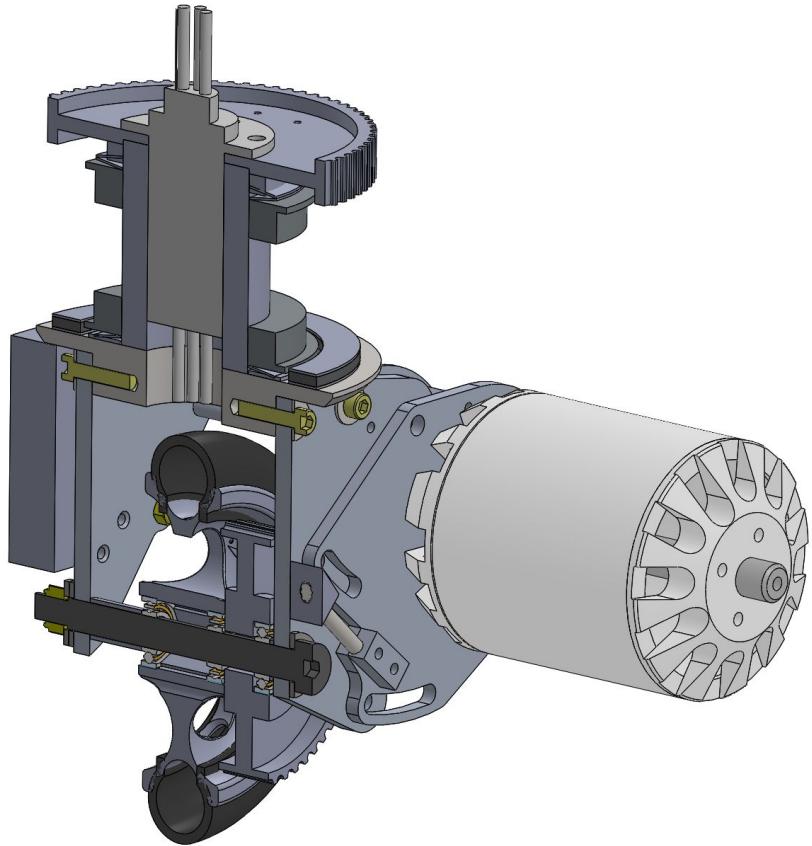
Swerve Assembly Manufacturing Plan



Swerve Assembly - Mechanical Components



Swerve Assembly Mechanical Design



Swerve Assembly Mechanical Design

Wheel Structure Design

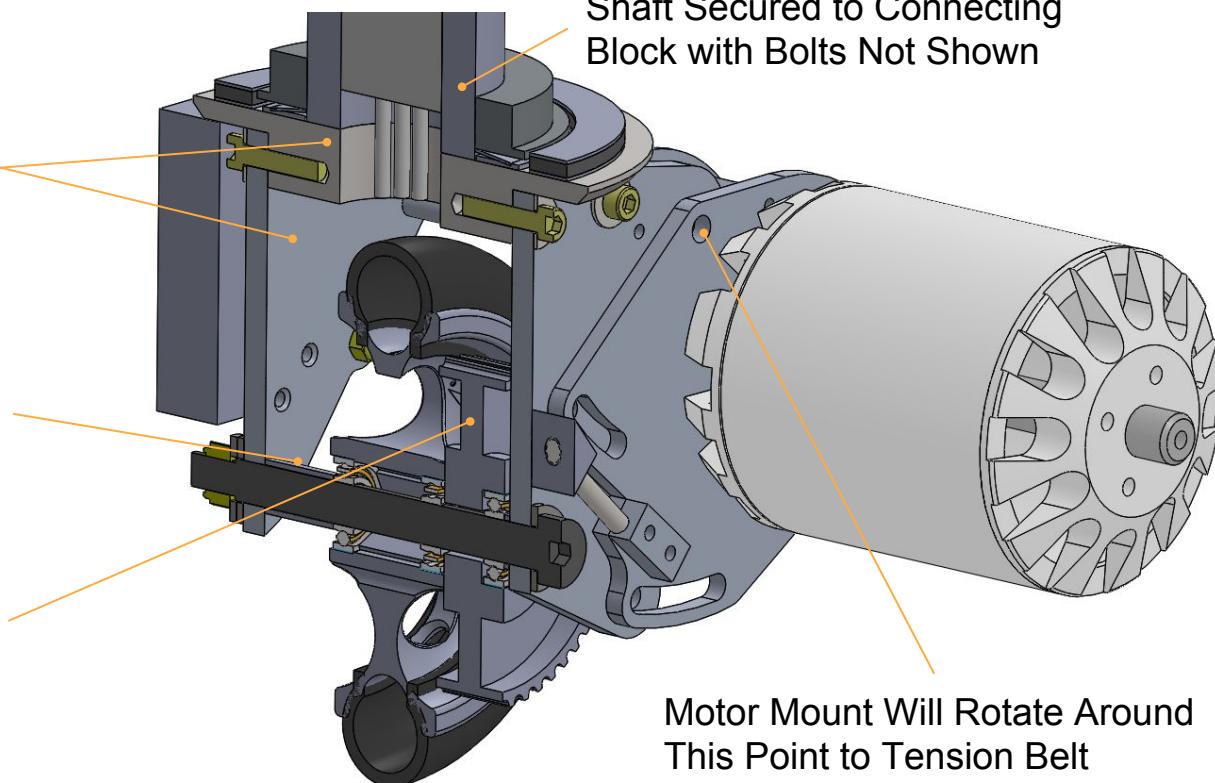
Connecting Block Secures Shaft to Side Plates of Wheel Structure

Tube Spacers Will Allow Preload in the Wheel Axle Bolt to Increase Rigidity

Drive Pulley Will Transfer Torque To Wheel through Bolts Connecting Pulley to Wheel Rim (Not Pictured)

Shaft Secured to Connecting Block with Bolts Not Shown

Motor Mount Will Rotate Around This Point to Tension Belt



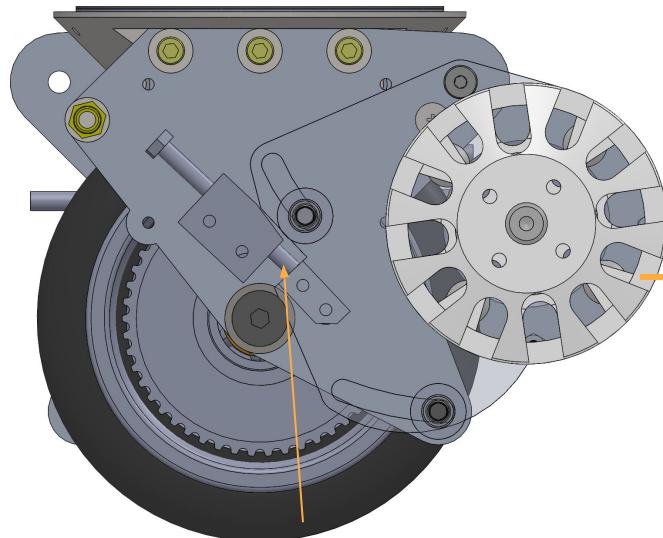
Swerve Assembly Mechanical Design

Belt Tensioning Design

Minimum Center to Center Distance: 3.14"

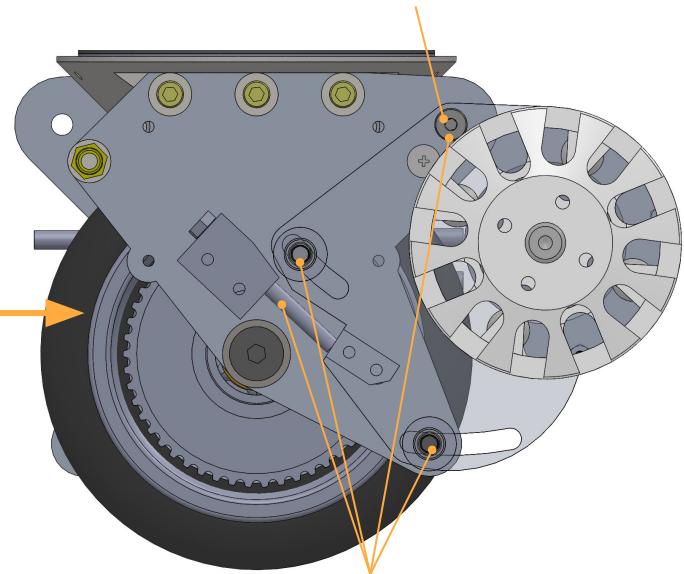
Maximum Center to Center Distance: 3.67"

Belt Full Tension Center to Center Distance: 3.47"



Tensioning Bolt Will Allow For Fine Tuning Belt Tension

Motor Mount Will Rotate Around This Point to Tension Belt



Belt Tension Will Be Held At 5 Points

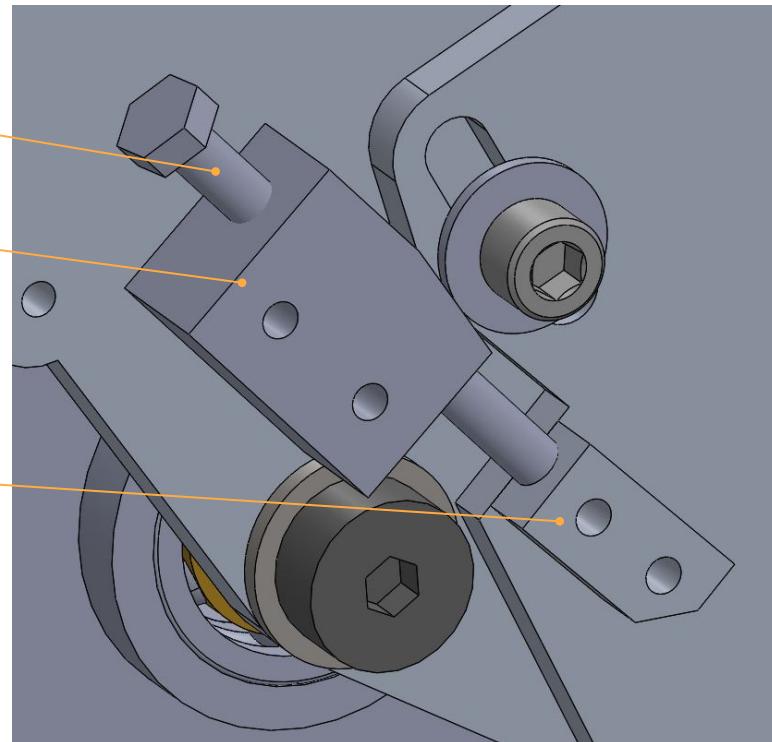
Swerve Assembly Mechanical Design

Belt Tensioning Design - Continued

Hex Bolt Threaded Into
Aluminum Block

Flat Head Bolts From
Wheel-Side Side Plate Thread
into Block And Permanently
Secure Block to Side Plate

Aluminum Block Provides Ample
Surface Area for Tensioning Bolt
to Create a Moment on Motor
Mount Plate



Swerve Assembly Mechanical Design

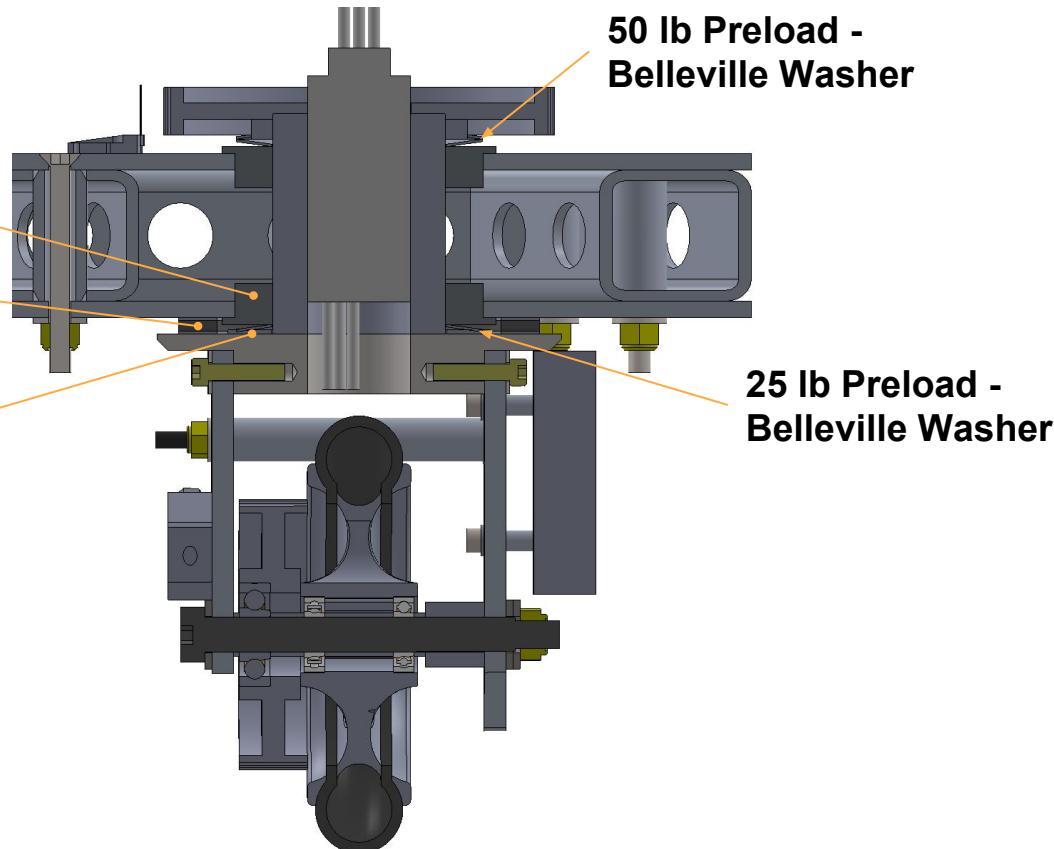
Swerve Bearing Design

Two Radial Bearings React Thrust Force Torque

Thrust Bearing Reacts Vertical Load

Belleville Washers Provide Preload to Radial Bearings

Higher Preload to Top Bearing Ensures Constant Thrust Bearing Contact Even if Vehicle is Lifted Into Air



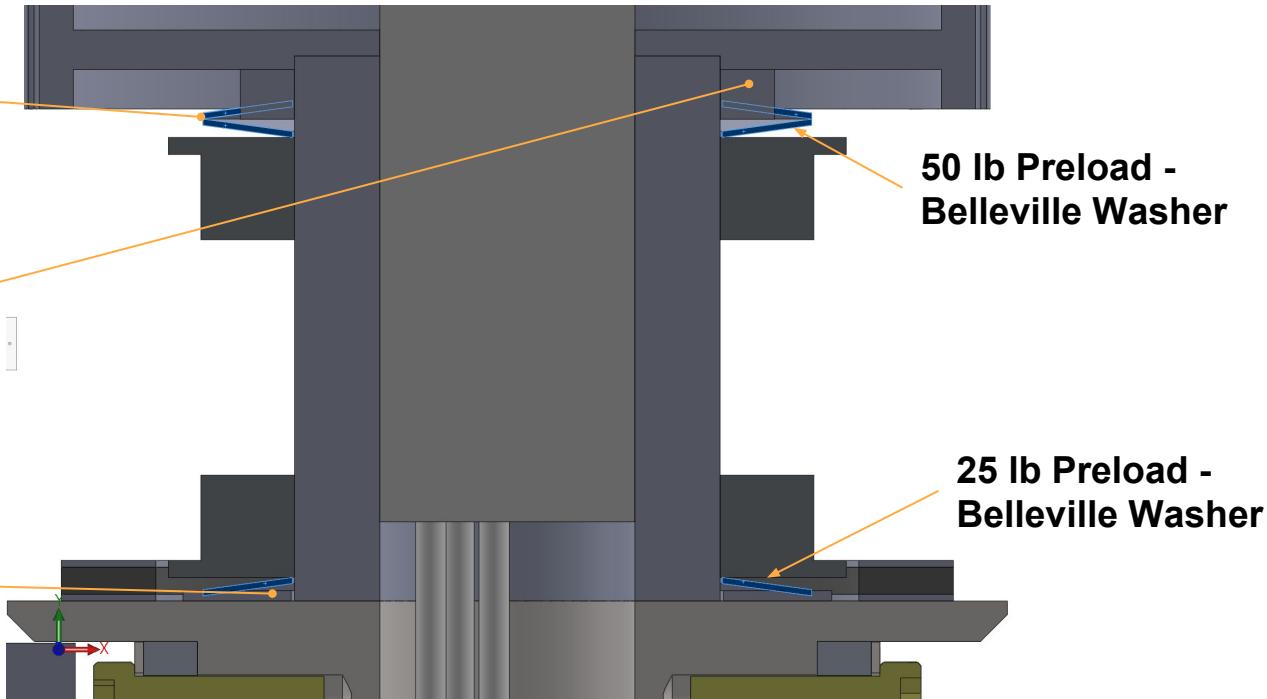
Swerve Assembly Mechanical Design

Swerve Bearing Design - Continued

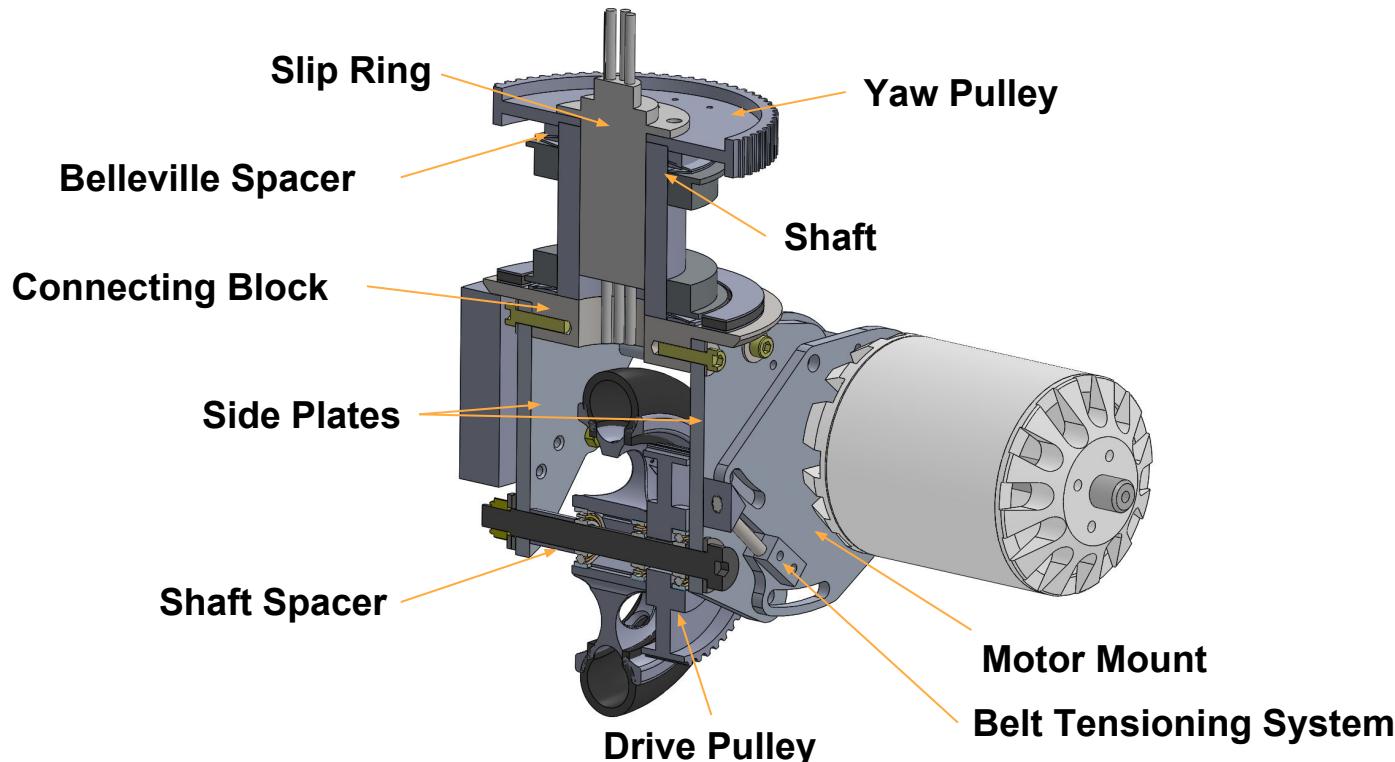
Two Belleville Washers in Series Provide the Same Force for Twice the Displacement

The Belleville Washers in Series Allows for Both Points of Contact to Be Close to the Shaft Thus a Smaller Spacer to Reduce Weight.

Large Shim (Machine Bushing) Will Allow for Fine Tuning of Bottom Belleville Washer, Thus Preload of Bottom Bearing

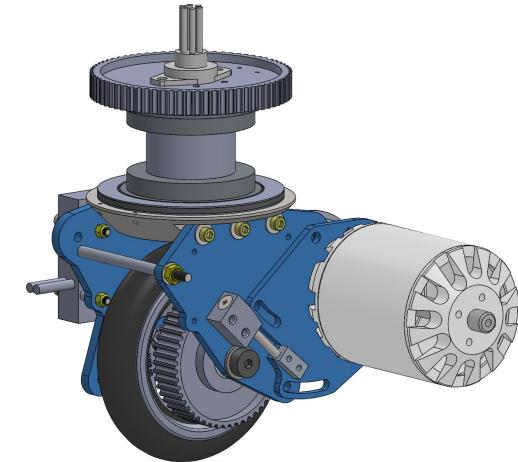
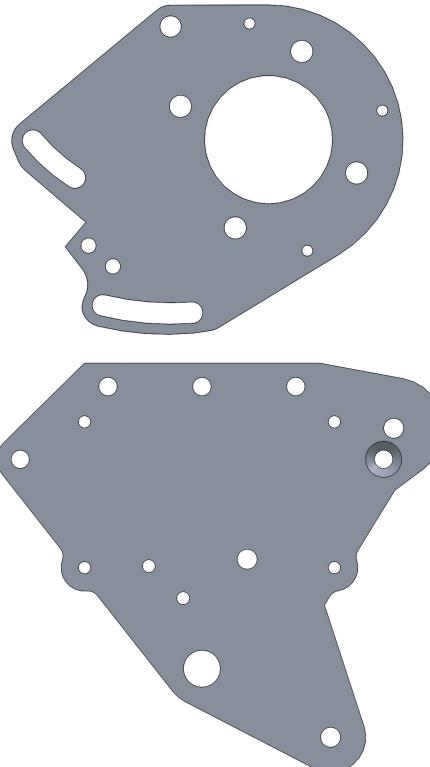
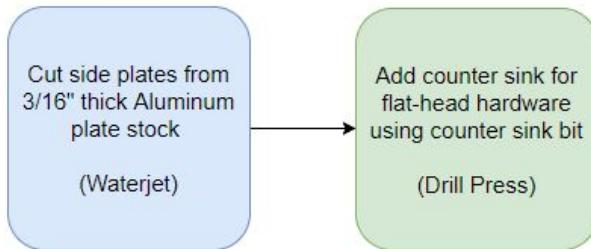


Swerve Assembly Manufactured/Modified Parts



Swerve Assembly Manufacturing Plan

Side Plates & Motor Mount



Next Fab
Maker Space
Required

Can be
completed
independently
within
machine shop

Drexel
Machinist
Required

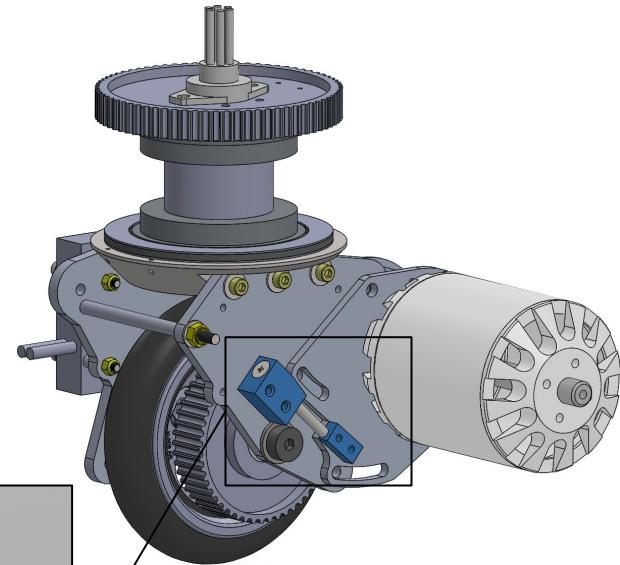
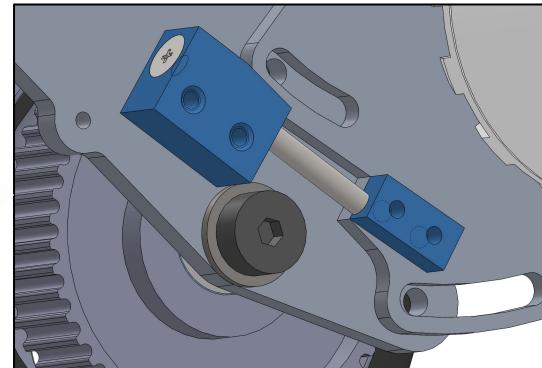
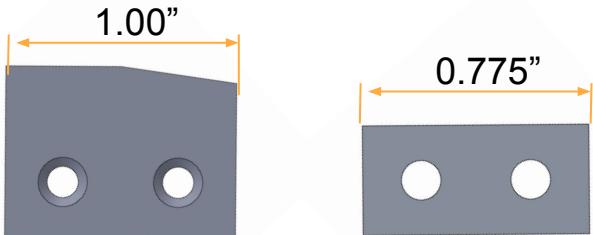
Swerve Assembly Manufacturing Plan

Belt Tensioning System

Cut blocks from Aluminum stock (Manual Mill)

Drill holes: mixture of clearance and tap drill (Manual Mill)

Create rounded corner on select parts to create clearance for the motor mount (belt/disk sander)



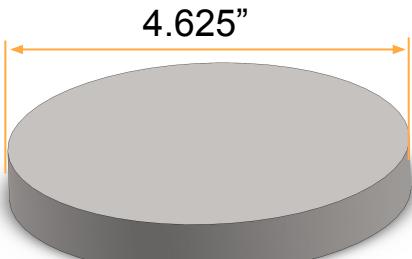
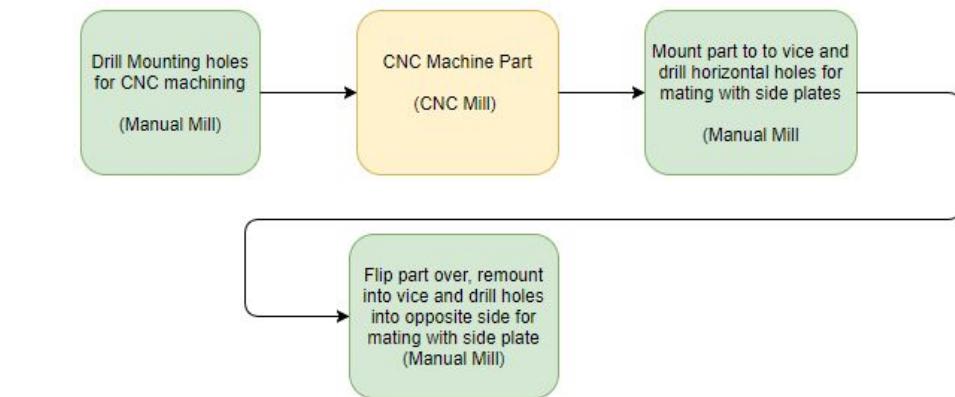
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Maker Space
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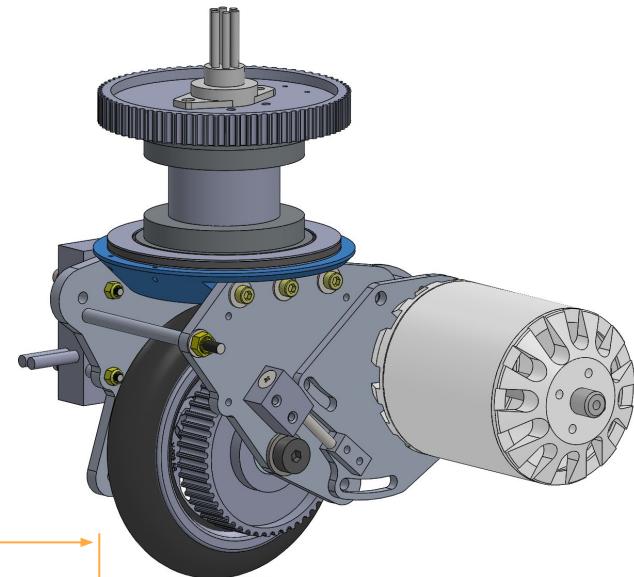
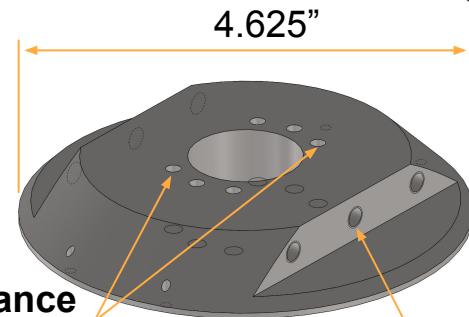
Drexel
Machinist
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Swerve Assembly Manufacturing Plan

Connecting Block



10-32 clearance mounting holes **Horizontal Holes**



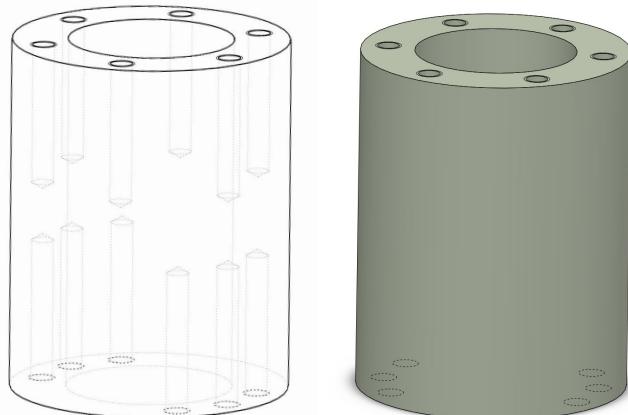
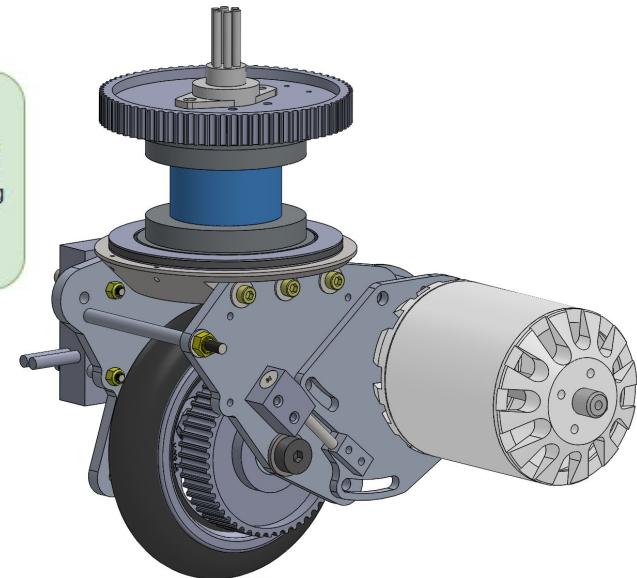
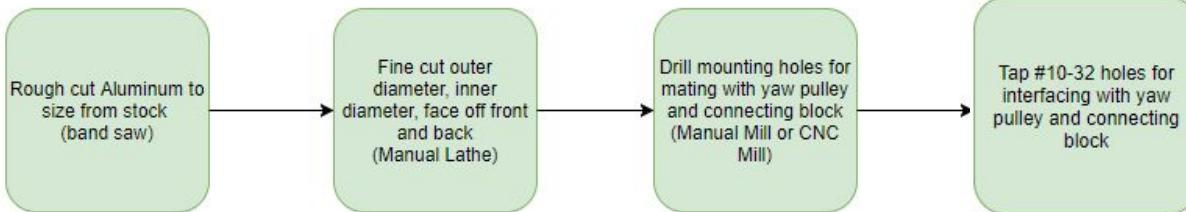
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Swerve Assembly Manufacturing Plan

Swerve Assembly Shaft



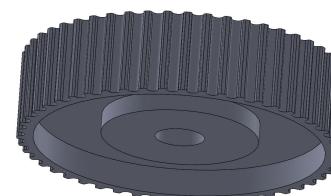
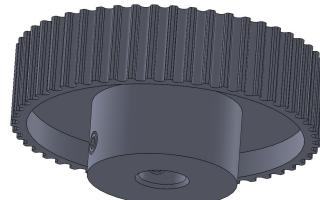
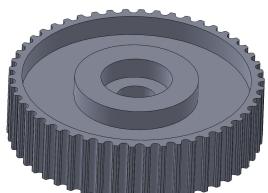
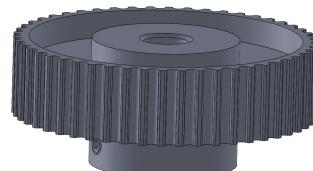
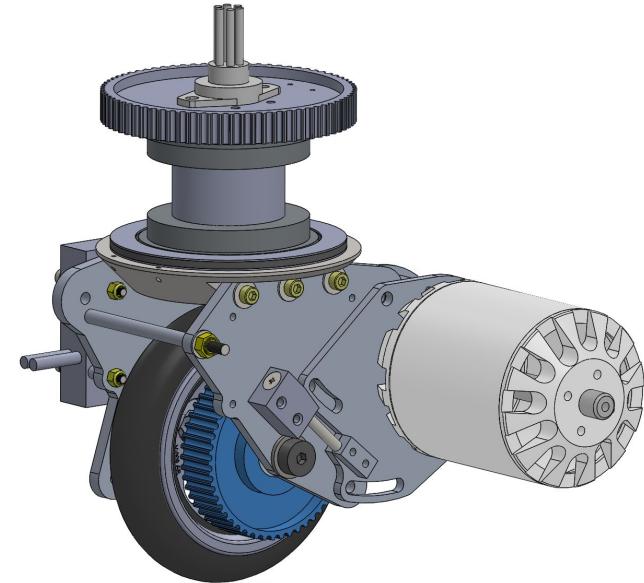
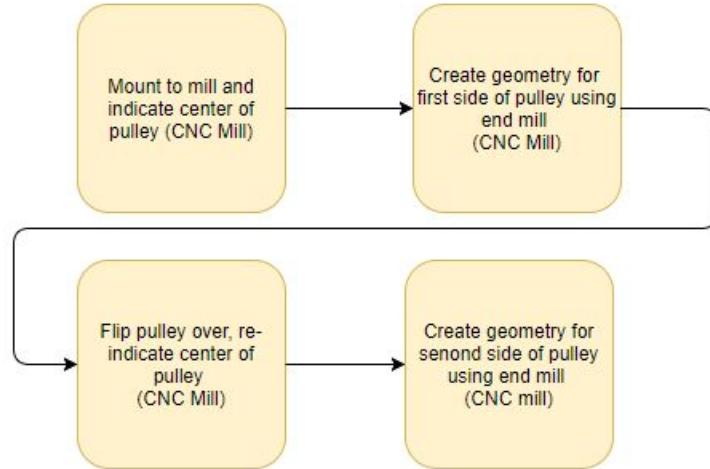
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Swerve Assembly Manufacturing Plan

Wheel Pulley



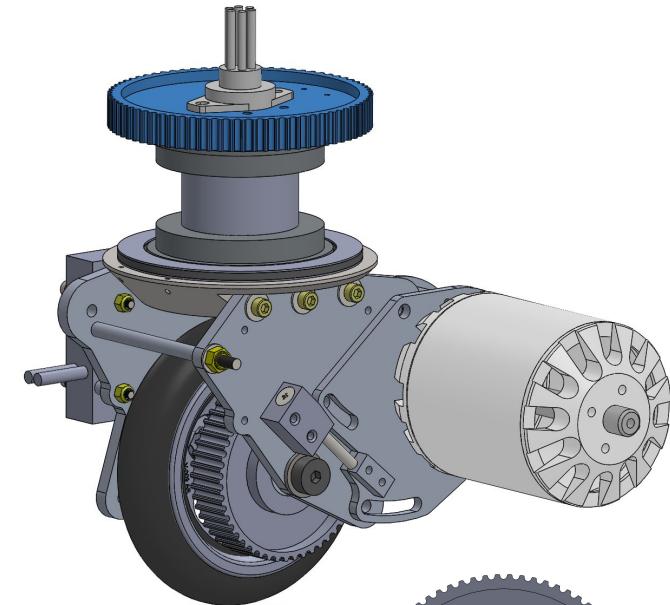
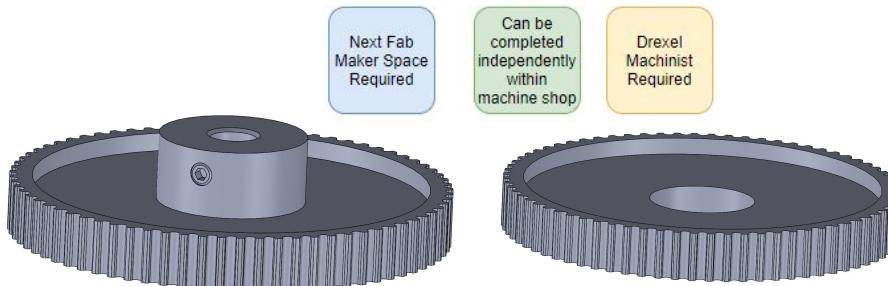
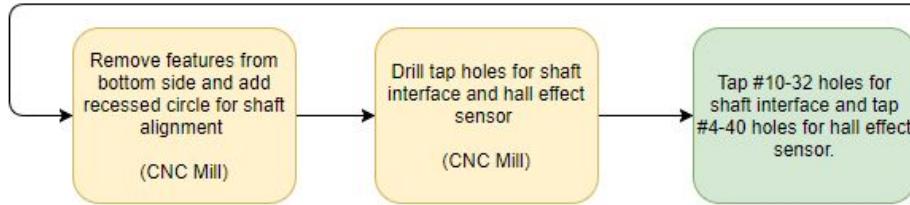
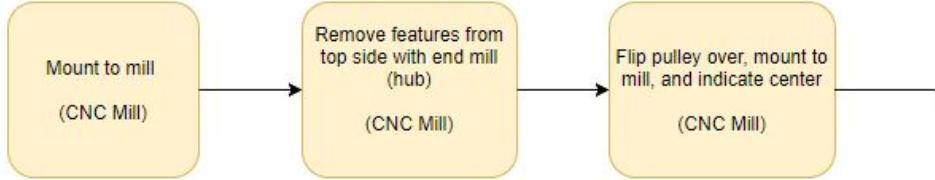
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Swerve Assembly Manufacturing Plan

Yaw Pulley



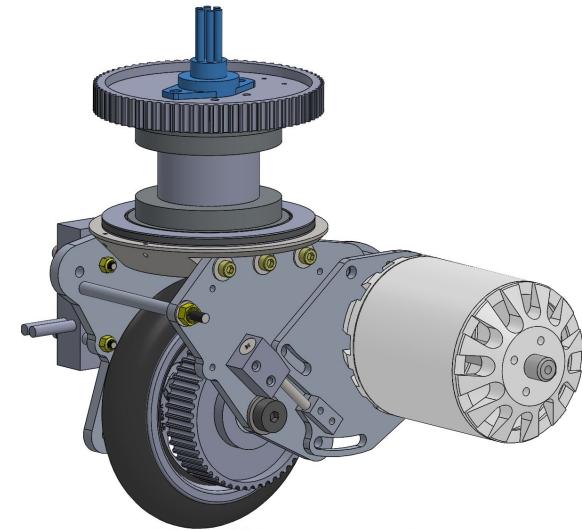
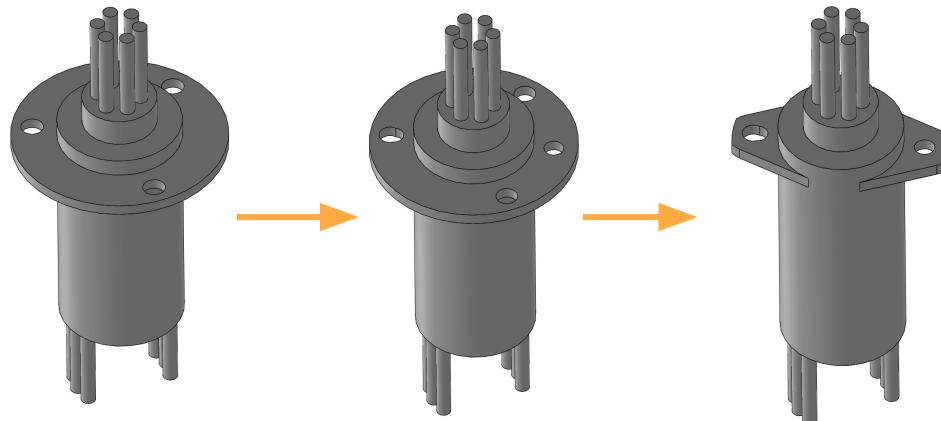
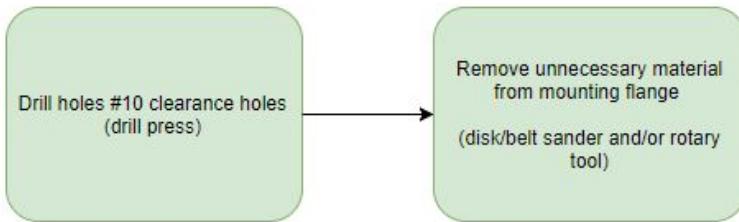
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Drexel
Machinist
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Swerve Assembly Manufacturing Plan

Slip Ring



Contact Us



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