



Swerve Robotic Platform

Mechanical Design and Manufacture

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Report Outline

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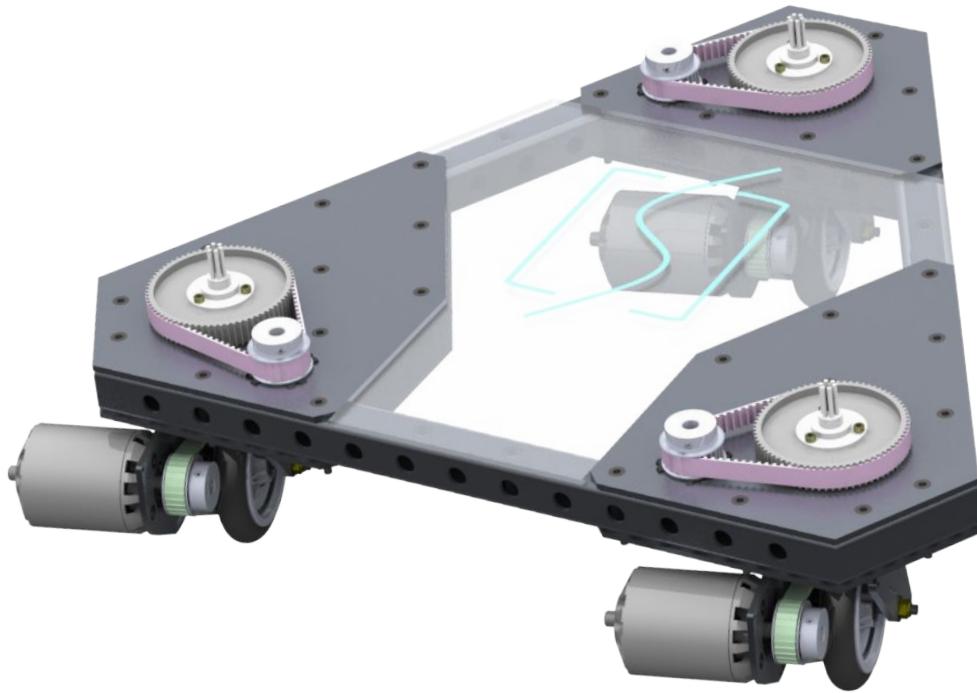
1. *Chassis Design / Manufacture*
2. *Wheel Assembly Design / Manufacture*

Chassis Design / Manufacture

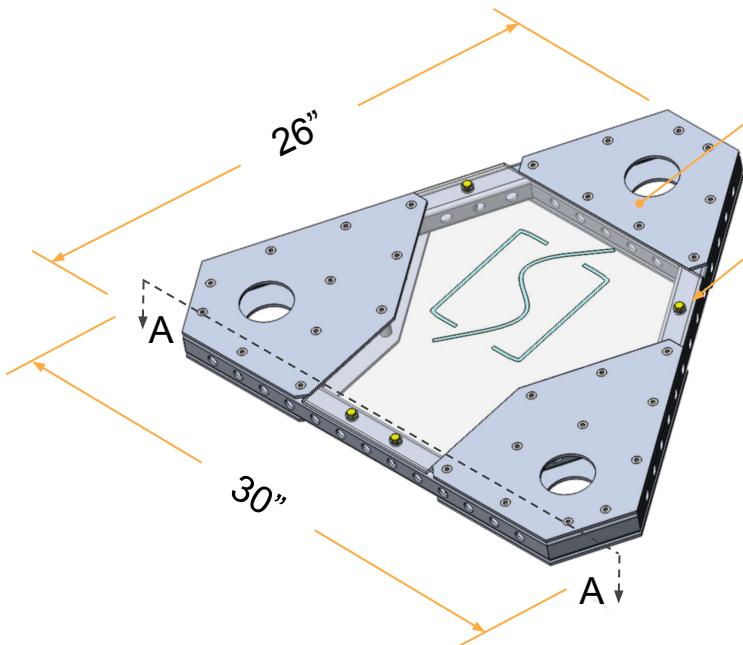
Mechanical and Structural Components, Manufacture, and Assembly

**Chassis Design /
Manufacture**

**Wheel Assembly
Design / Manufacture**



Chassis Assembly



0.1875" Acrylic

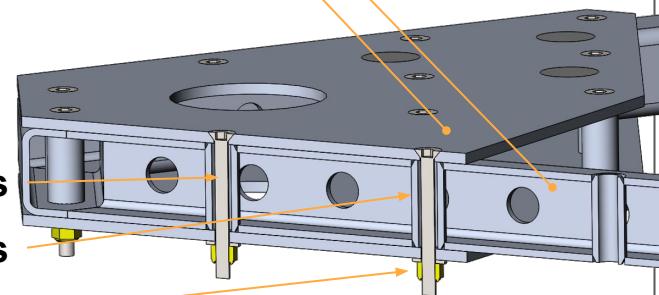
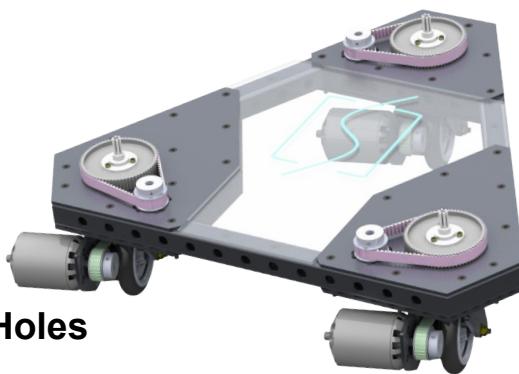
Oversized Thru Holes

6061-T6 Tube
6061-T6 Plate

1/4-20 82° Flat Head Bolts

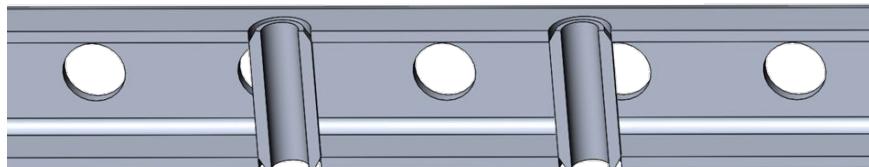
6061-T6 Crush Tubes

Nylon Locknut

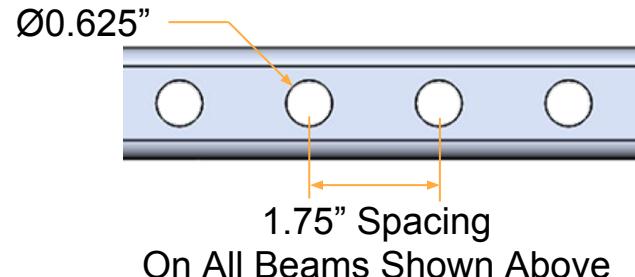
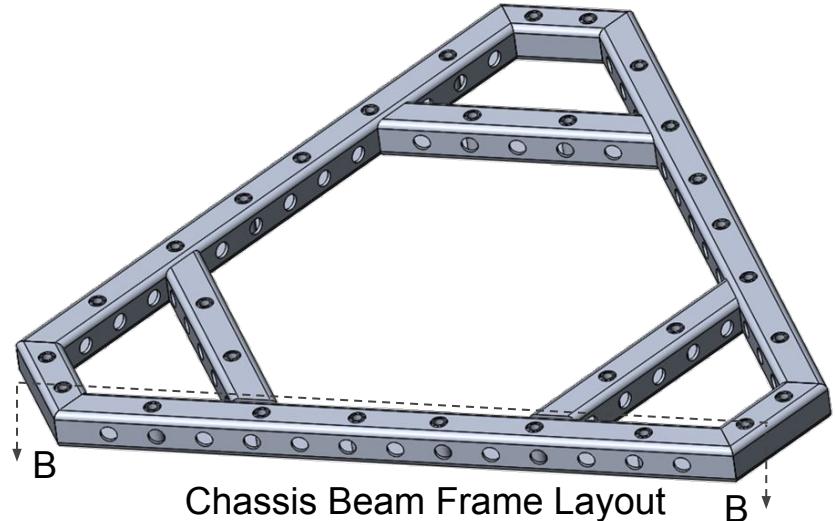
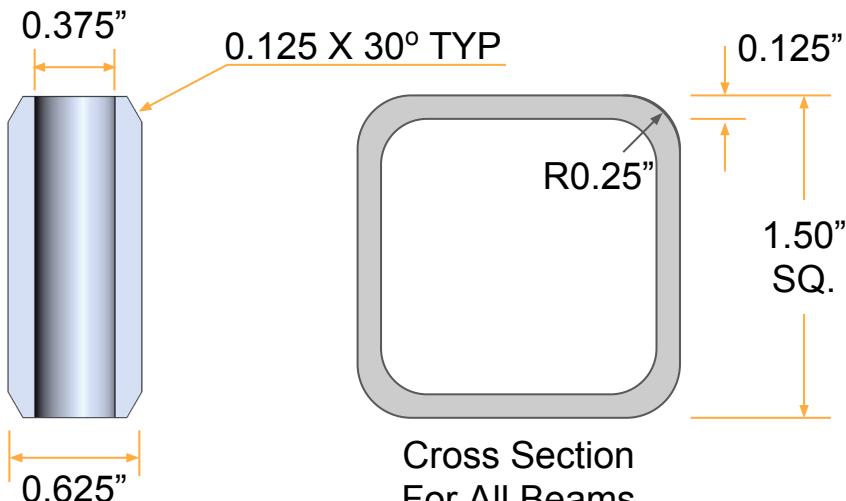


Section A-A
View Cut for Clarity

Chassis Frame Design

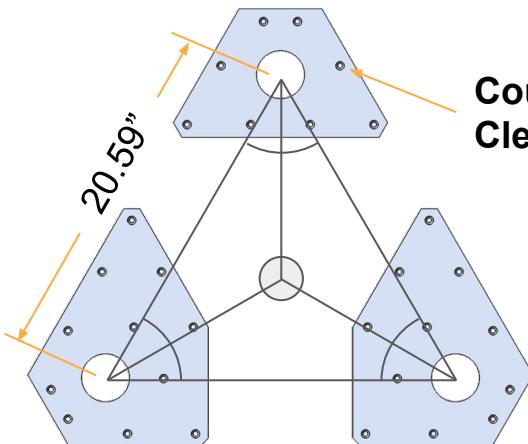


Section B-B

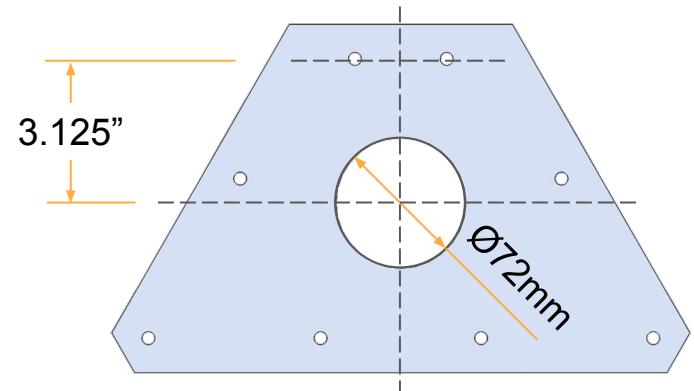


Gusset Plate Design

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.

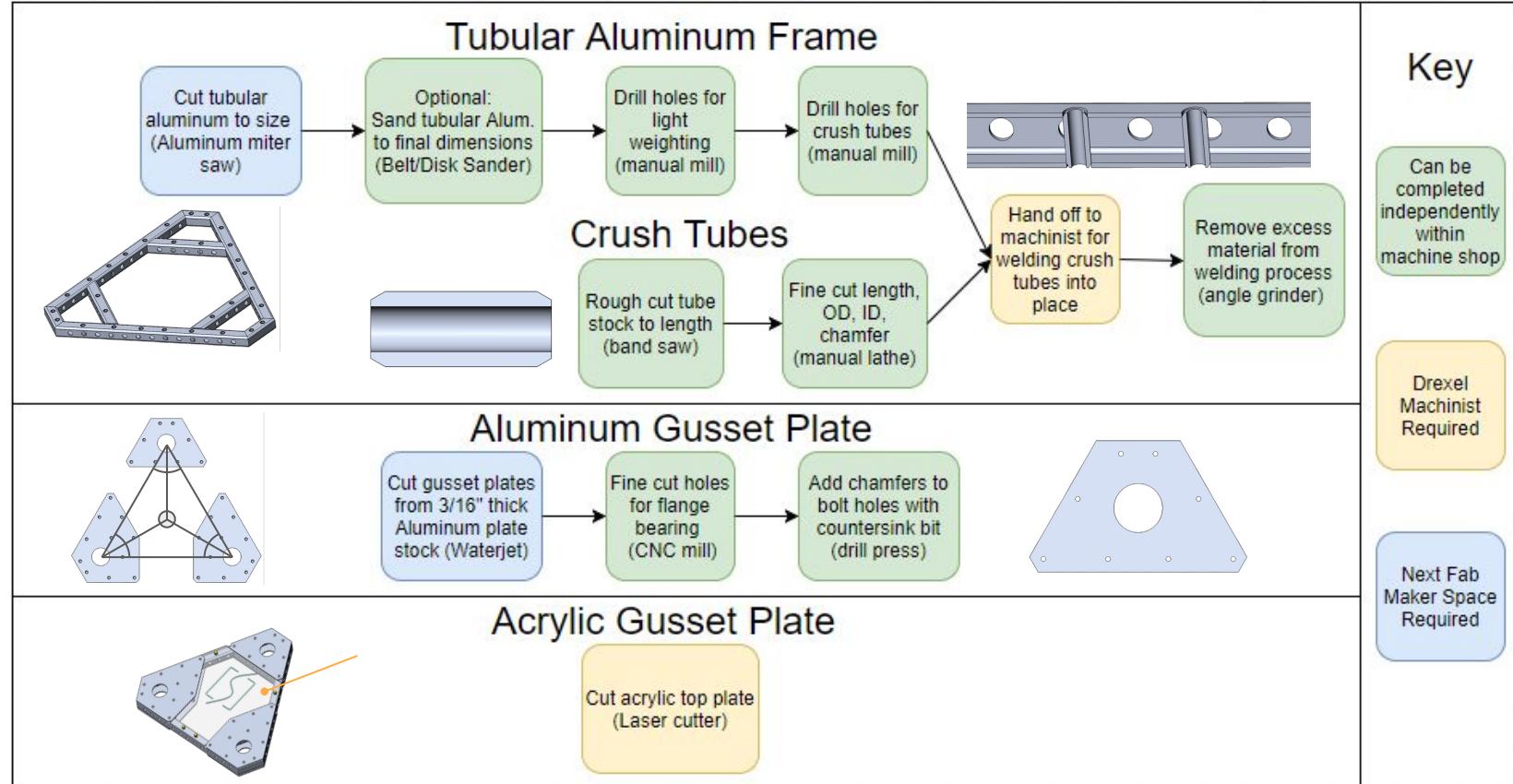


Top Gusset Plates Shown (Countersink)



Identical Pattern for All Gusset Plates

Chassis Manufacturing Plan



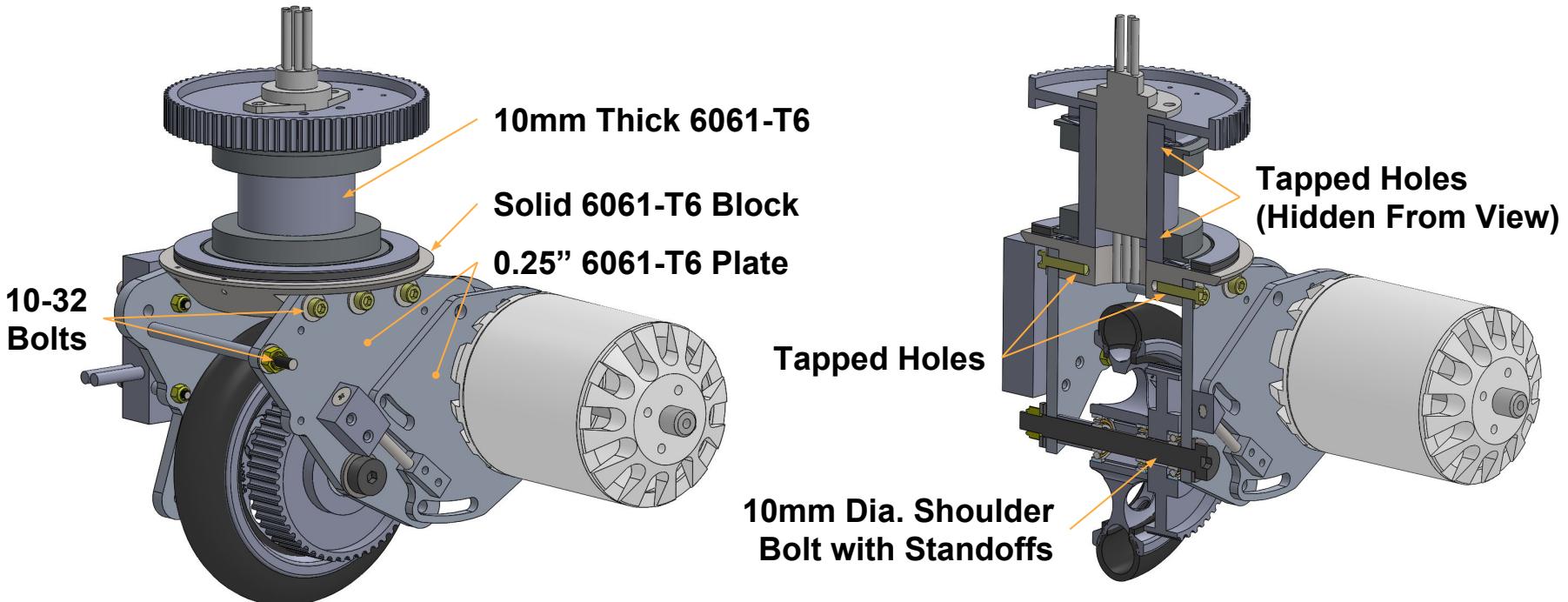
Wheel Assembly Design / Manufacture

Mechanical and Structural Components, Manufacture, and Assembly

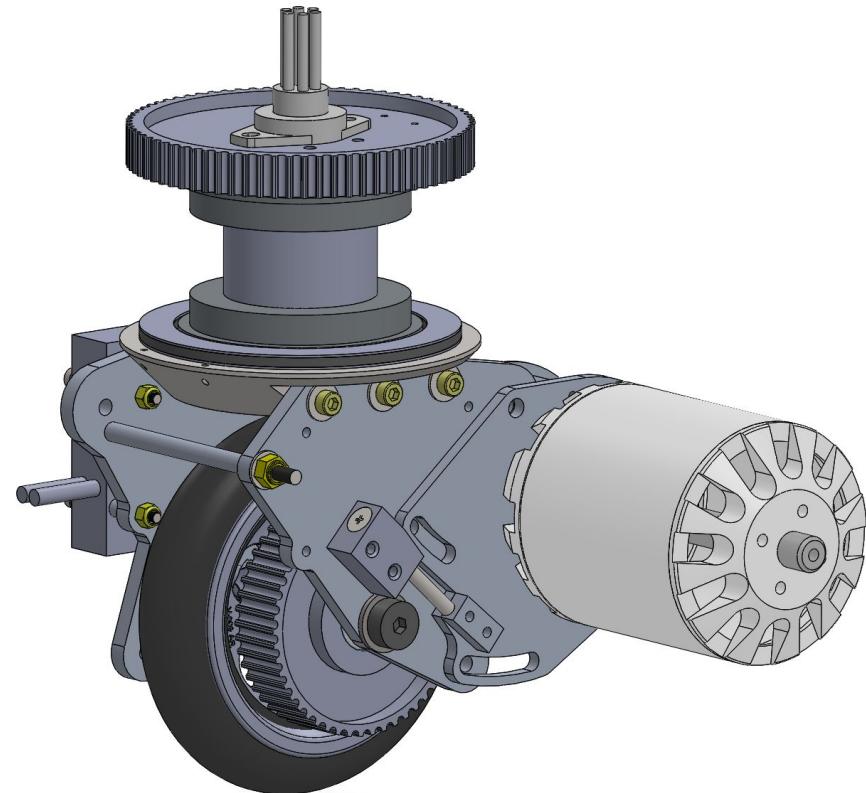
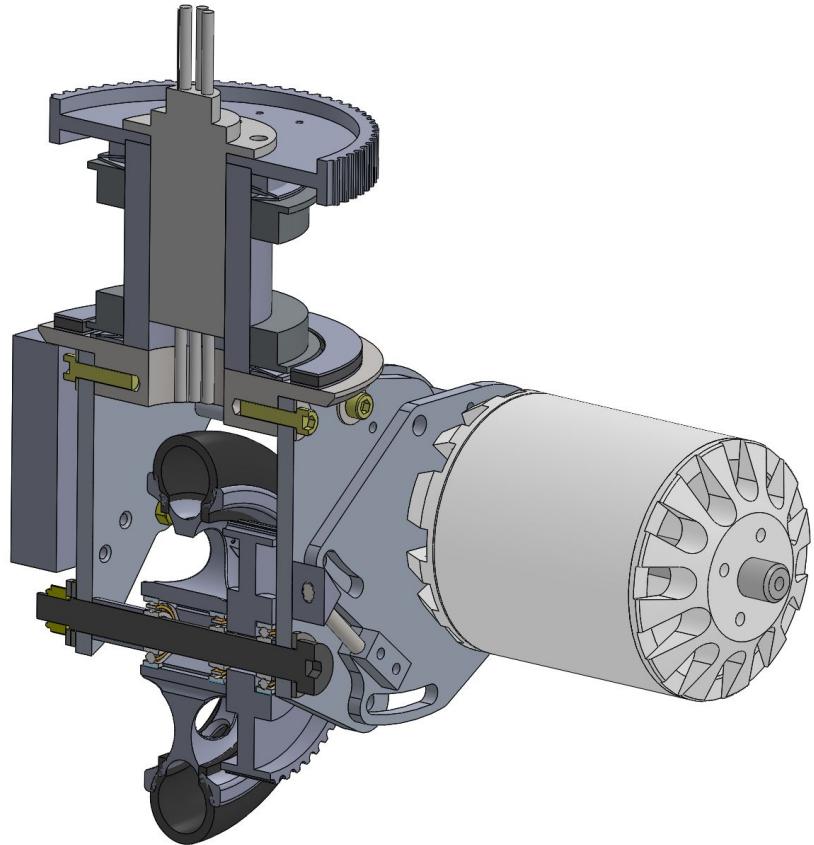
Chassis Design /
Manufacture

Wheel Assembly
Design / Manufacture

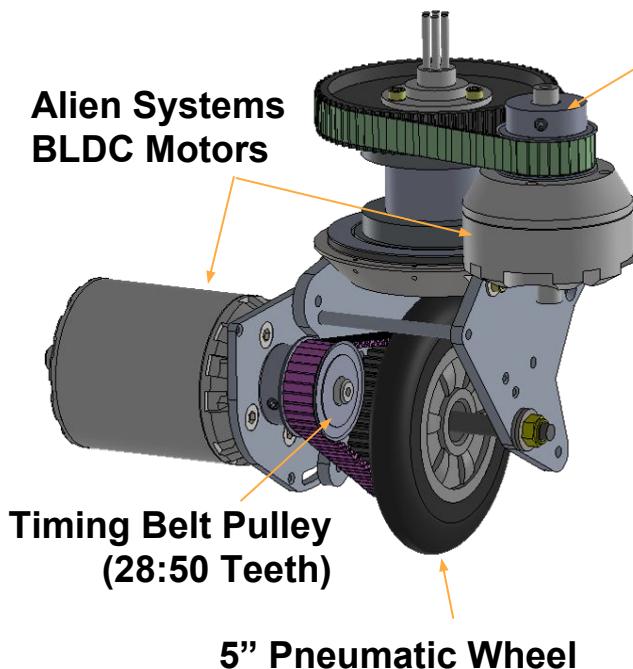
Swerve Assembly - Structural Components



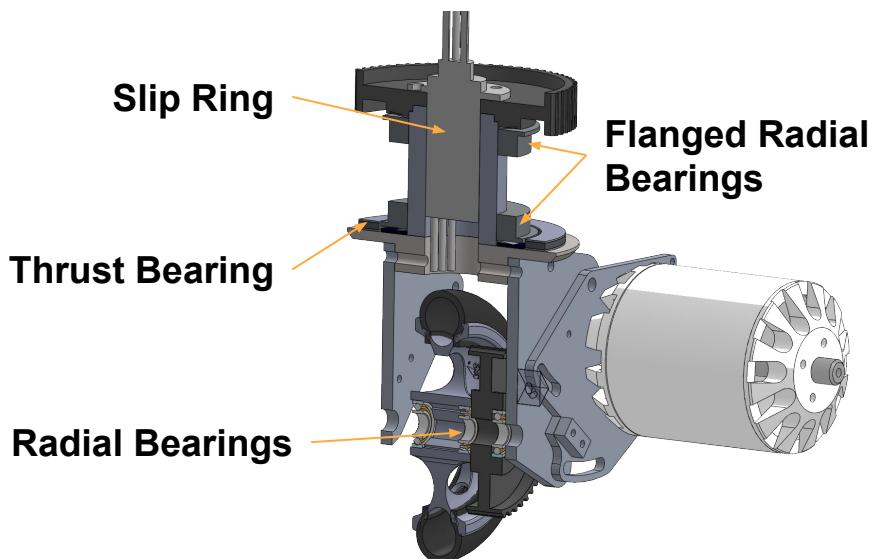
Swerve Assembly Manufacturing Plan



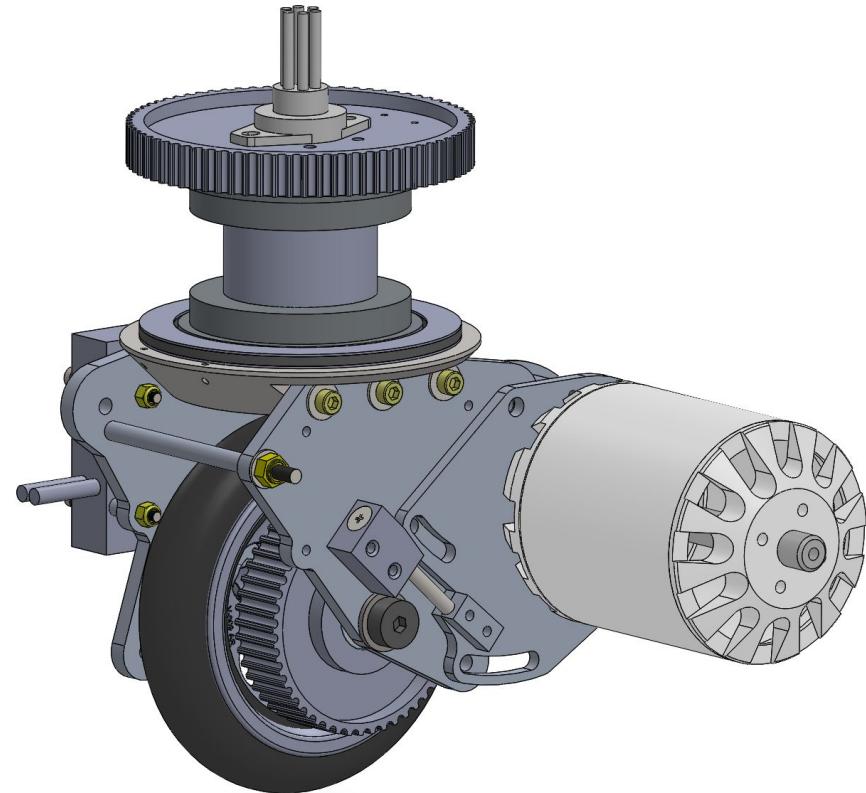
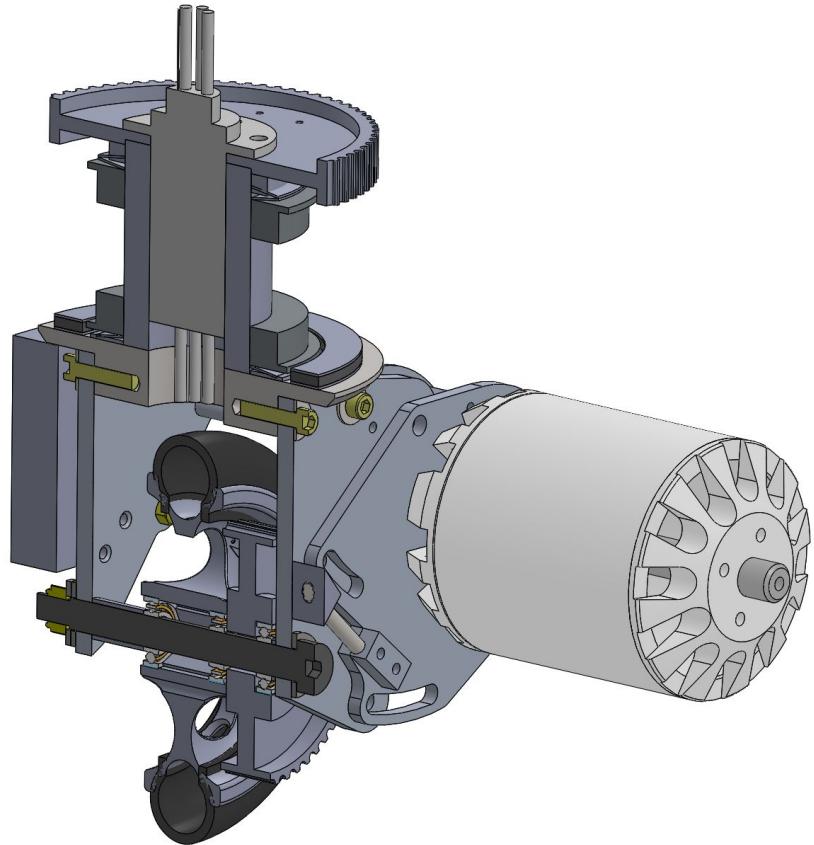
Swerve Assembly - Mechanical Components



Timing Belt Pulley (28:72 Teeth)



Swerve Assembly Mechanical Design



Swerve Assembly Mechanical Design

Wheel Structure Design

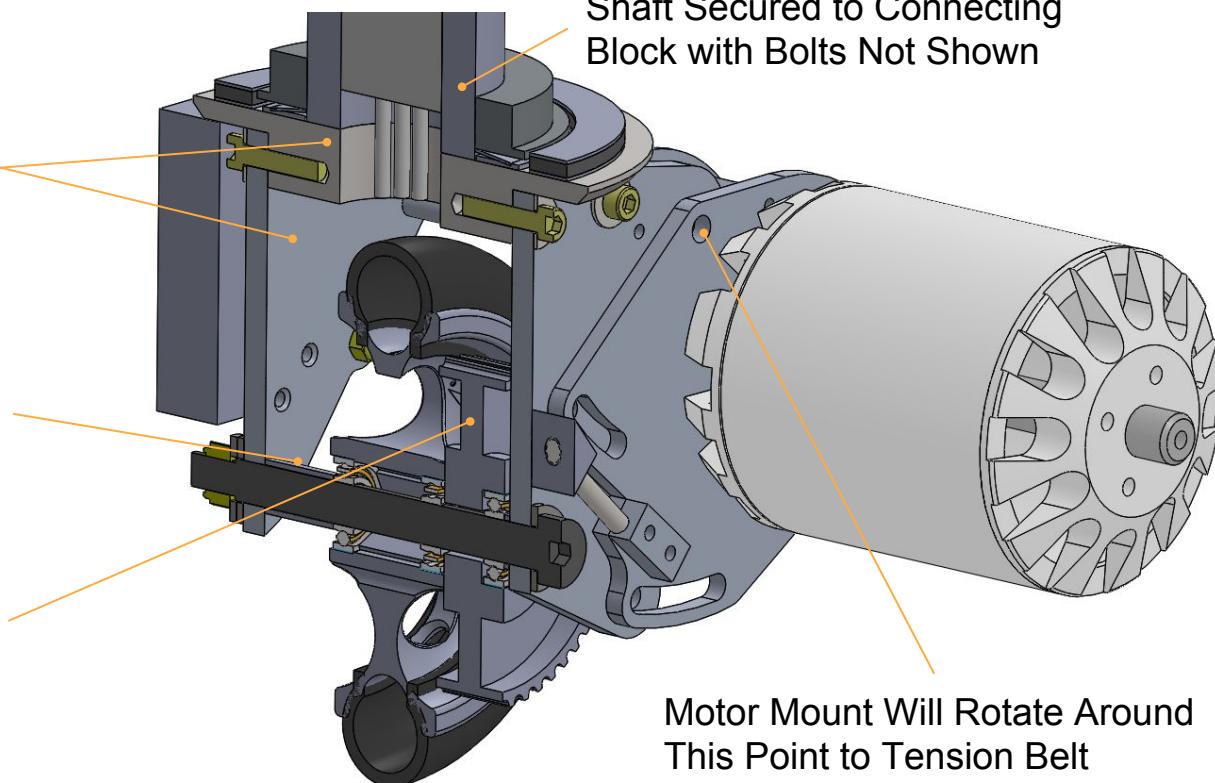
Connecting Block Secures Shaft to Side Plates of Wheel Structure

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



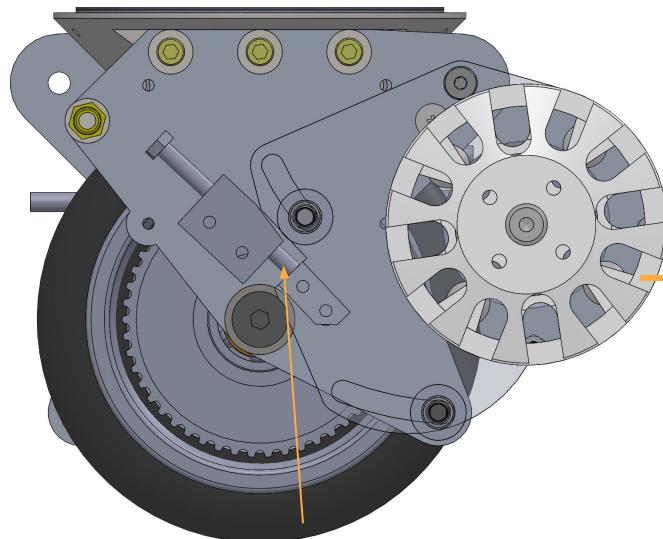
Swerve Assembly Mechanical Design

Belt Tensioning Design

Minimum Center to Center Distance: 3.14"

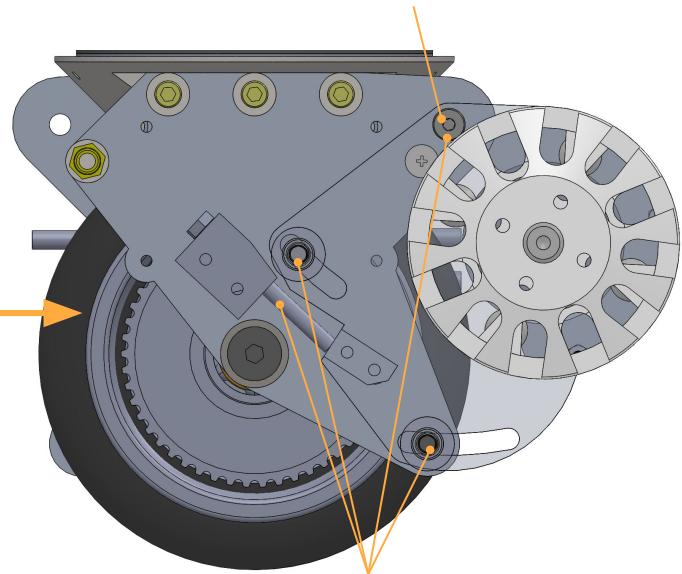
Maximum Center to Center Distance: 3.67"

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

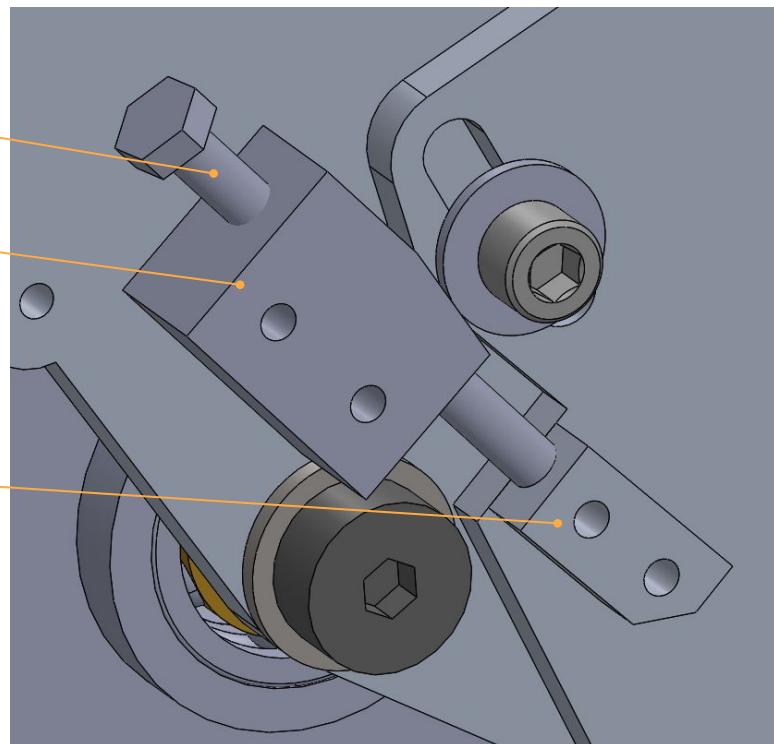
Swerve Assembly Mechanical Design

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

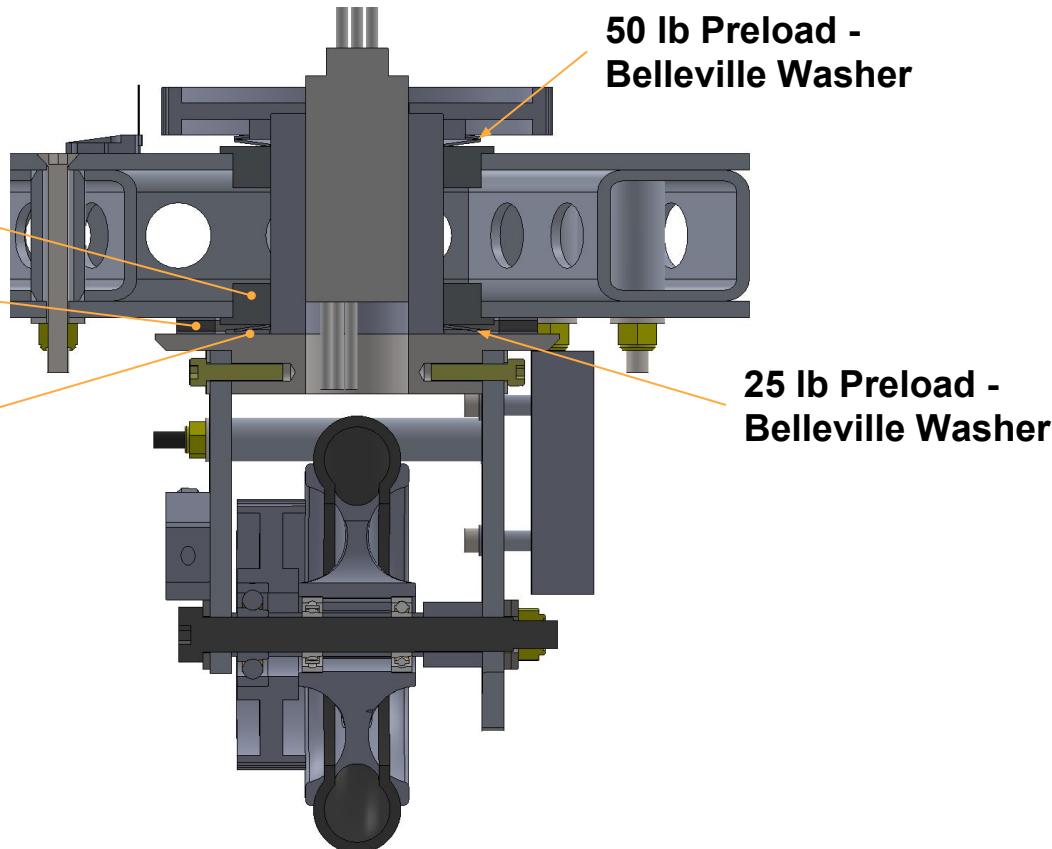
Swerve Bearing Design

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



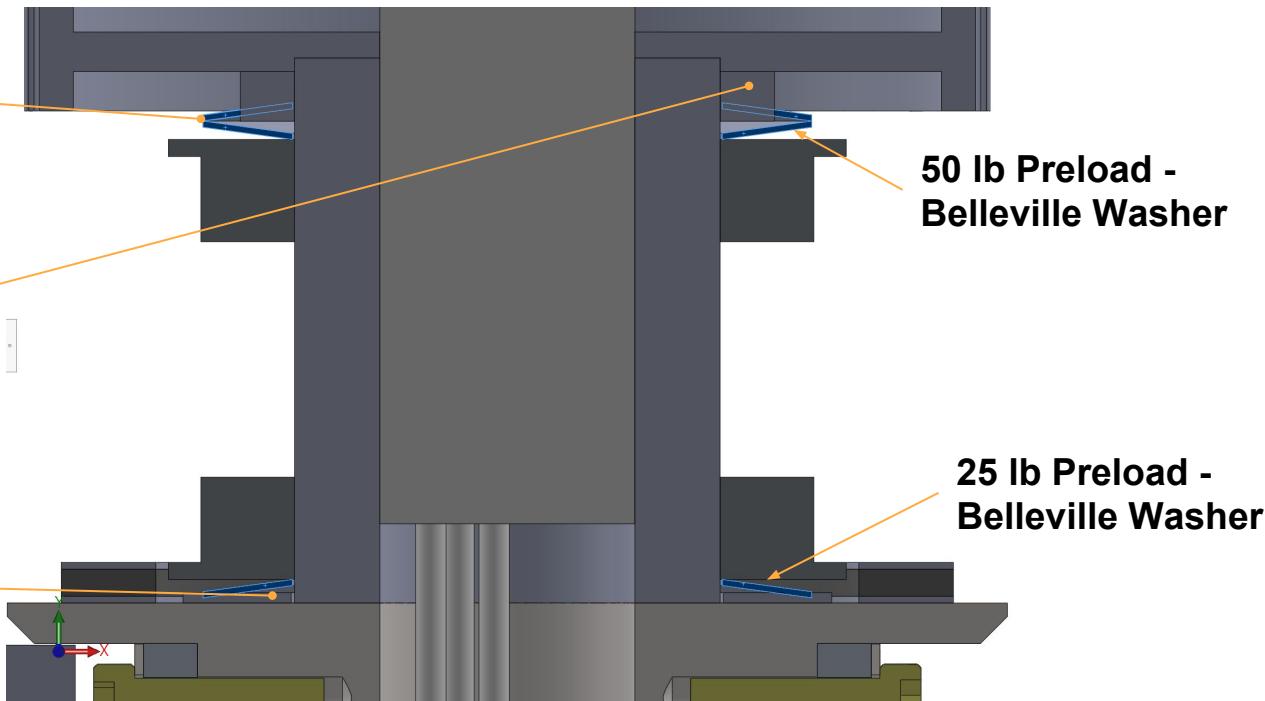
Swerve Assembly Mechanical Design

Swerve Bearing Design - Continued

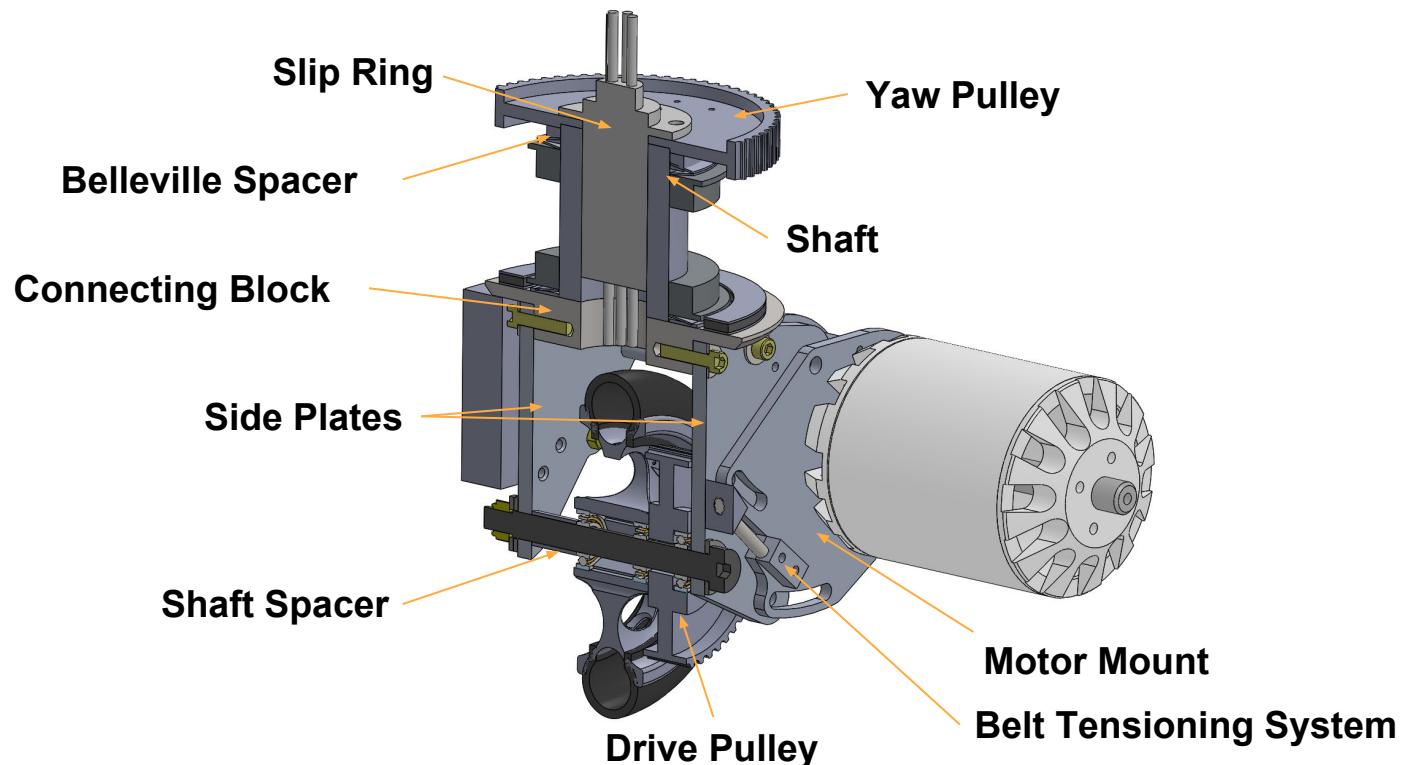
Two Belleville Washers in Series Provide the Same Force for Twice the Displacement

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

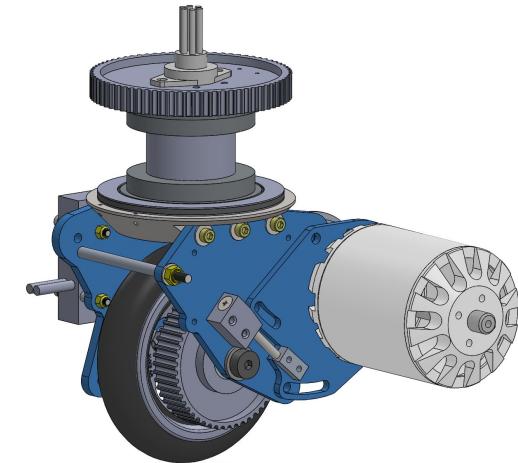
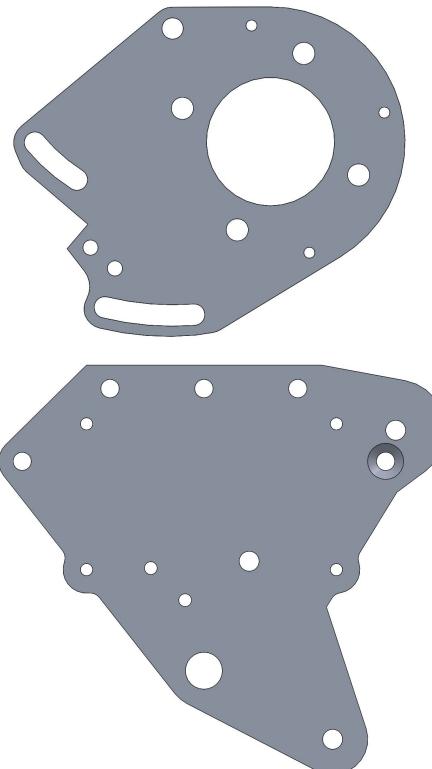


Swerve Assembly Manufacturing Plan

Side Plates & Motor Mount

Cut side plates from
3/16" thick Aluminum
plate stock
(Waterjet)

Add counter sink for
flat-head hardware
using counter sink bit
(Drill Press)



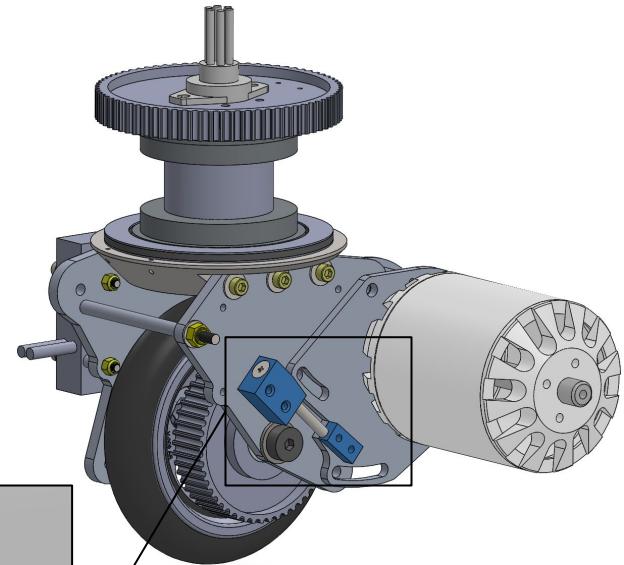
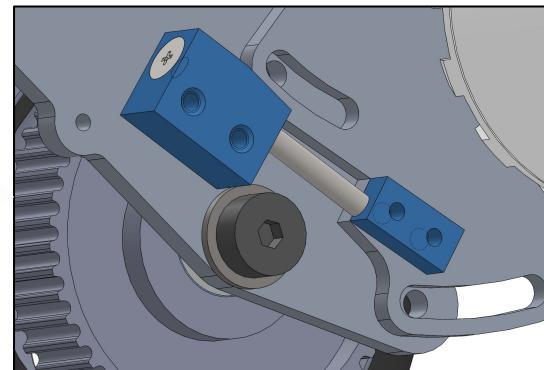
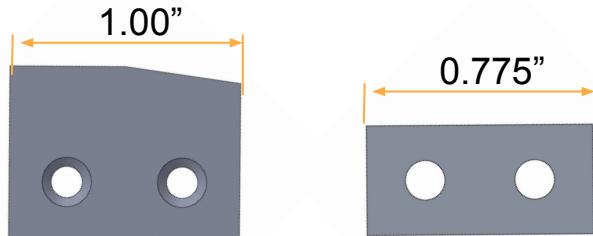
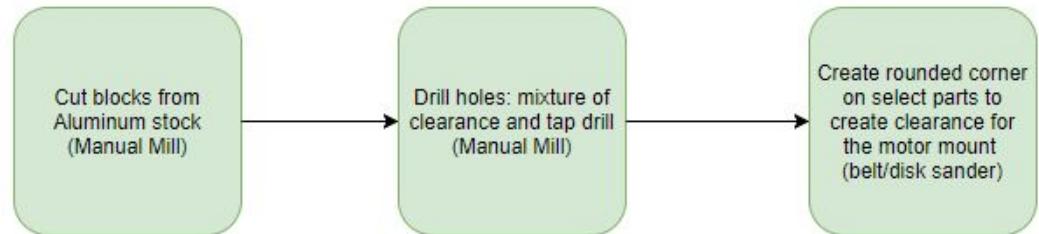
Next Fab
Maker Space
Required

Can be
completed
independently
within
machine shop

Drexel
Machinist
Required

Swerve Assembly Manufacturing Plan

Belt Tensioning System



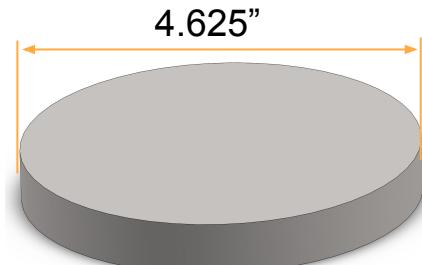
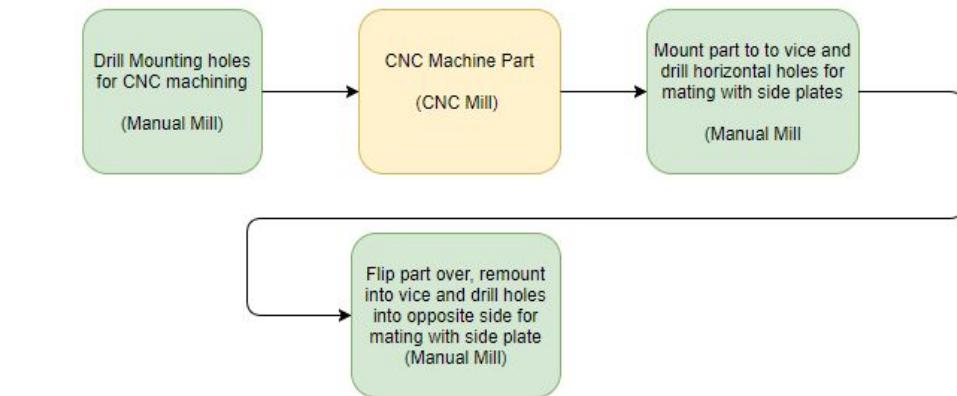
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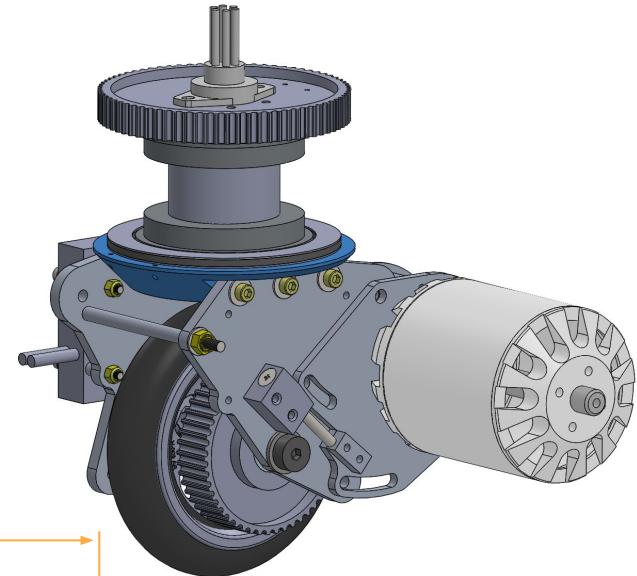
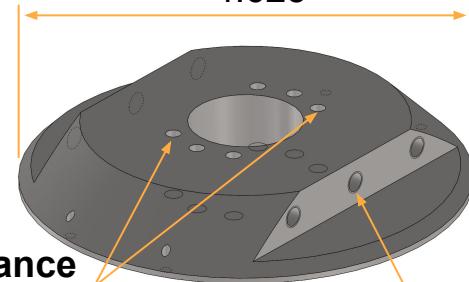
Drexel
Machinist
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Swerve Assembly Manufacturing Plan

Connecting Block



10-32 clearance mounting holes Horizontal Holes



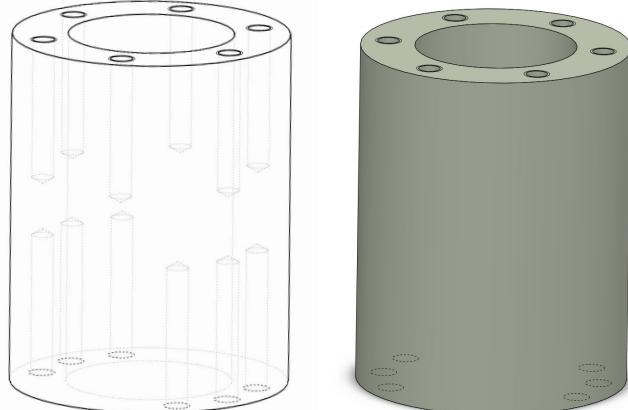
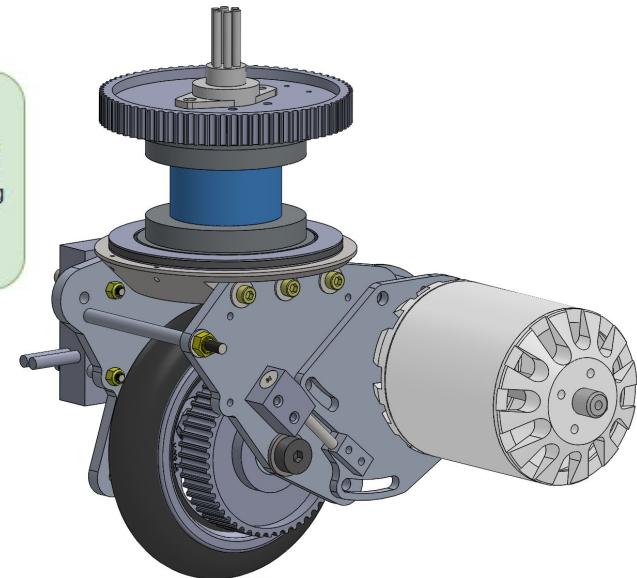
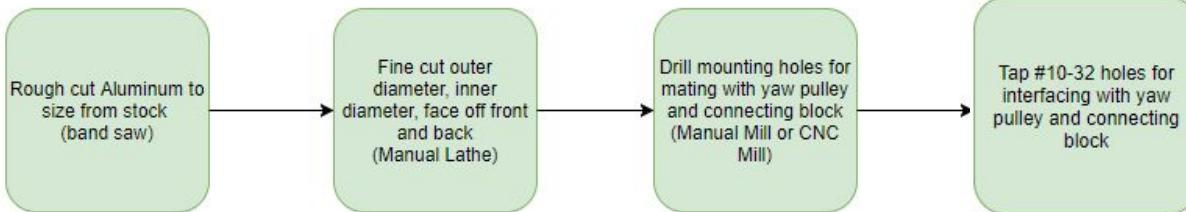
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Swerve Assembly Manufacturing Plan

Swerve Assembly Shaft



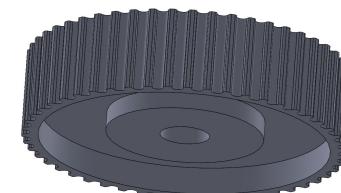
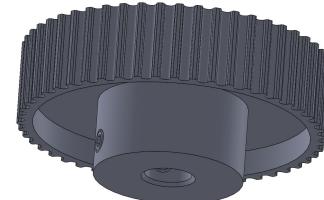
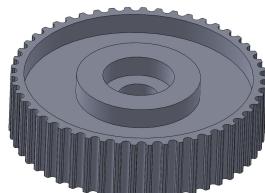
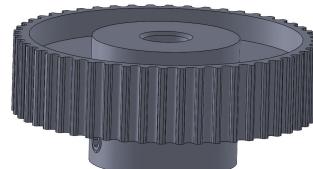
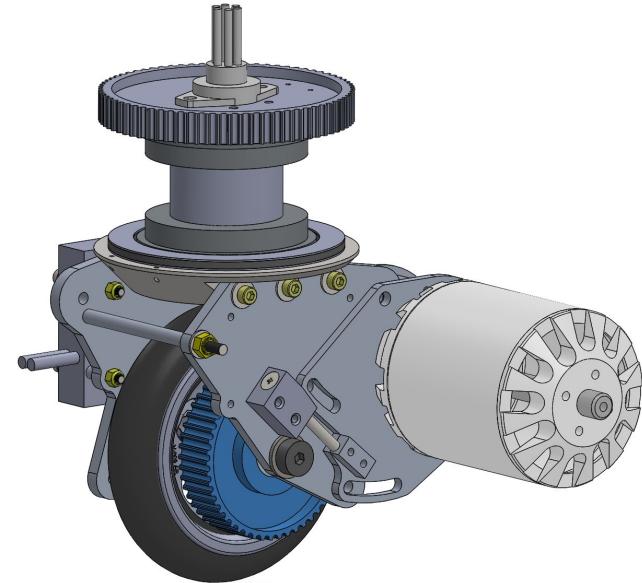
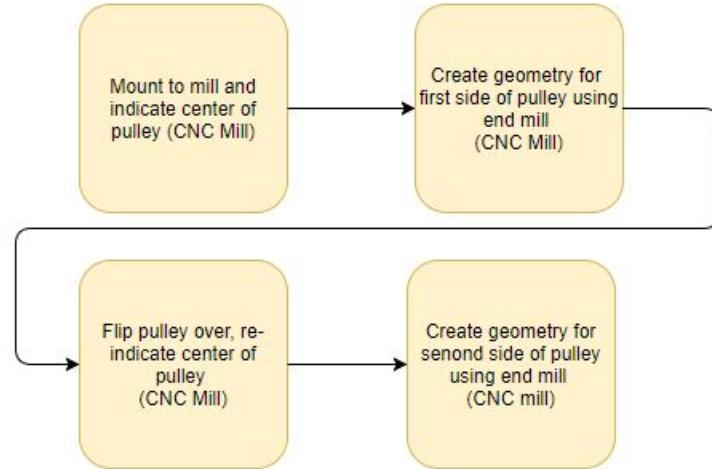
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Swerve Assembly Manufacturing Plan

Wheel Pulley



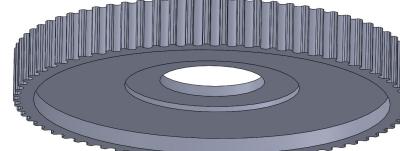
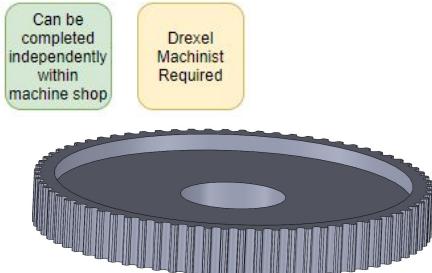
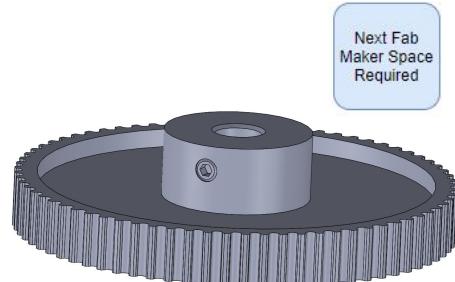
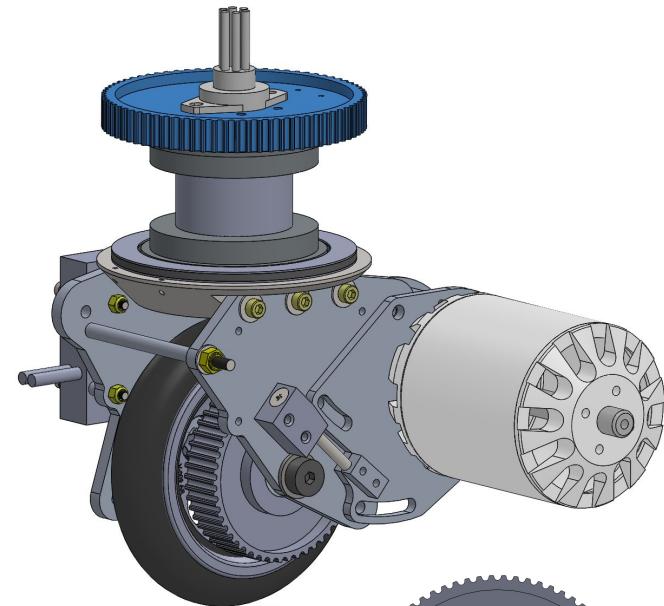
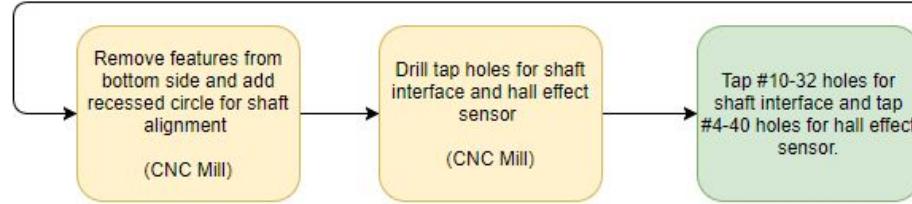
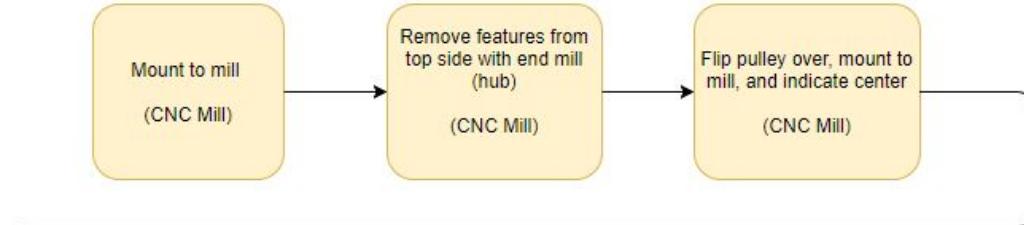
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Swerve Assembly Manufacturing Plan

Yaw Pulley



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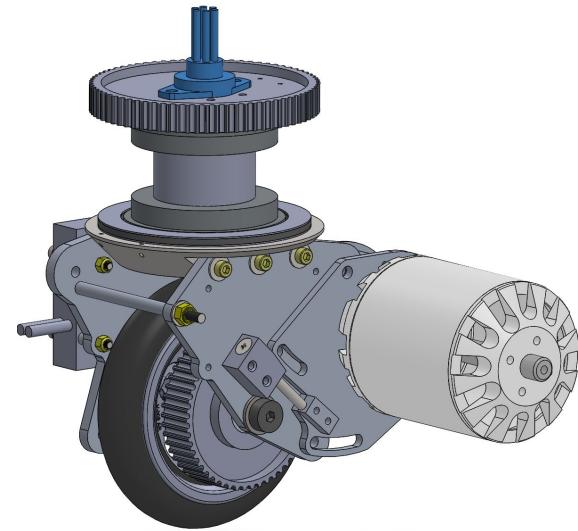
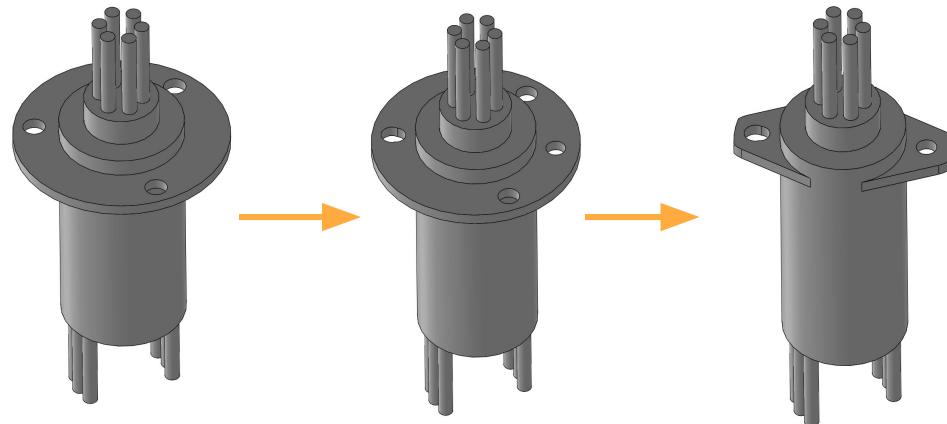
Drexel
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Swerve Assembly Manufacturing Plan

Slip Ring

Drill holes #10 clearance holes
(drill press)

Remove unnecessary material
from mounting flange
(disk/belt sander and/or rotary
tool)



Contact Us



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