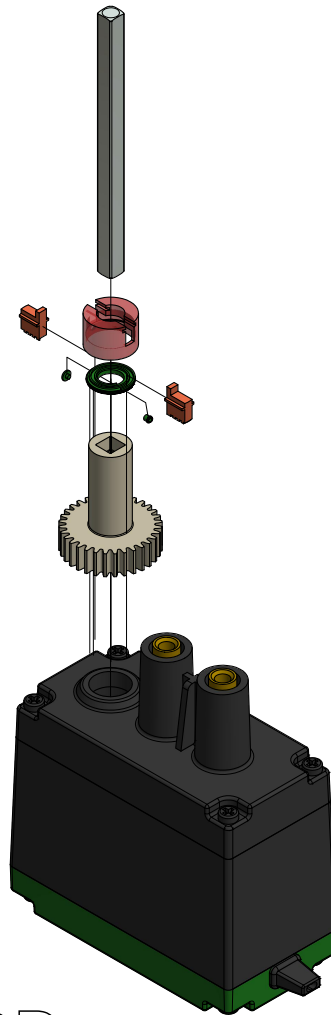


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# MOTOR CHUCK

MAKE IT REAL CAD ENGINEERING CHALLENGE



Delta Force 6008D

Prepared for: CAD Online Challenge

Prepared by: Logan Suiter & Avery Zwayer

November 13th, 2018

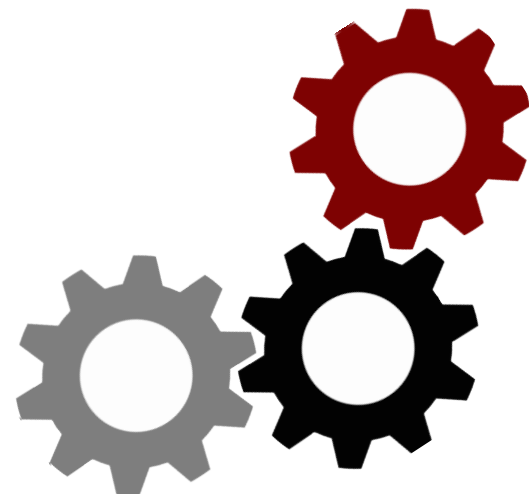
North Union Robotics



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# INTRODUCTION

Have you ever had an axle come out during a match? Causing an inoperable robot? Shaft collars come loose frequently? Lose the screws? Delta Force presents the Motor Chuck, an improved part to lock axles into the motor, inspired by the lathe chuck.

## Solution

The Motor Chuck is versatile, and will be beneficial to any robot design. It solves a problem that has occurred in all ten VRC challenges. It relieves mechanical errors during matches, improving robot efficiency. Not having to tighten and re-tighten shaft collars reduces robot maintenance, not only improving the strength of designs, and increasing robot success in matches, but also improving time management.

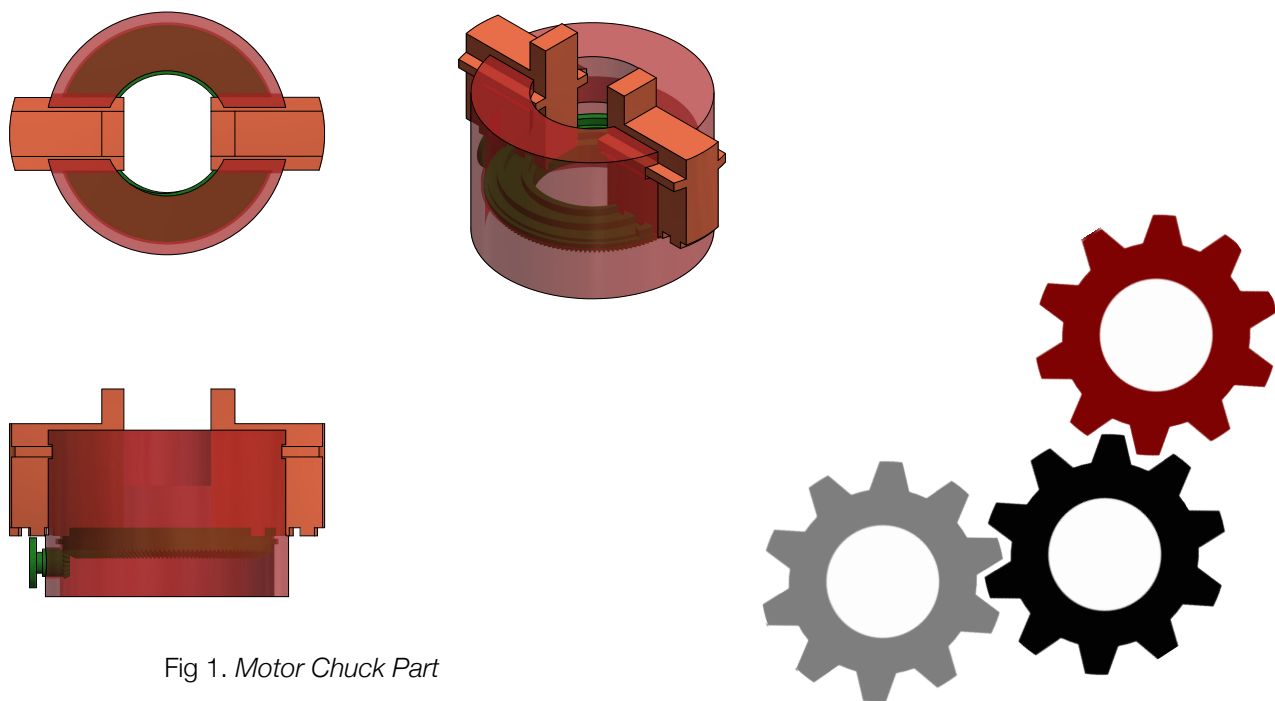


Fig 1. Motor Chuck Part

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# COMPATIBILITY

The purpose behind the Motor Chuck is to firmly lock the axle into the motor. During our time in Vex Robotics, loose and stripped shaft collars have caused numerous problems. The shaft collar was originally designed to lock onto the axle, however it requires maintenance and tightening throughout competitions and the season. It causes stress during matches when axles come loose and the robot becomes inoperable. With the Motor Chuck, these hassles are eliminated.

Not only does the Motor Chuck solve our problems, but also meets the Vex Robotics communities' needs. Regardless of your design, or what this years challenge requires, this part will be beneficial for years to come. This part will be valuable to students, whether you are a novice or expert builder.

The Motor Chuck will be used in many areas in the building process, any time an axle is used to operate a mechanism. When it was designed, it retained the original shaft collar shape, thus not taking up an exorbitant amount of space.

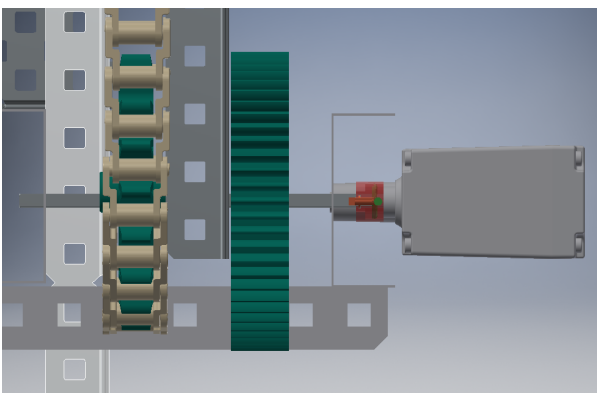


Fig 1. *Front View on Robot*

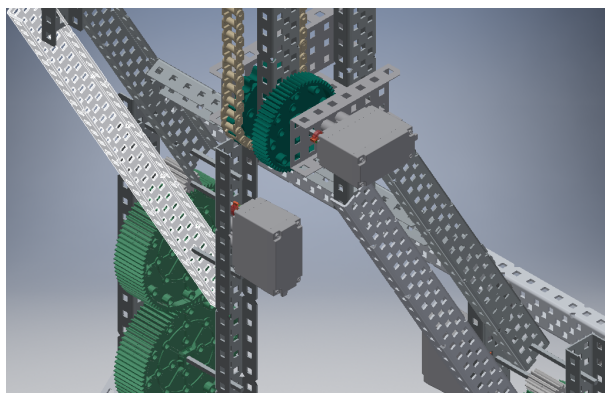
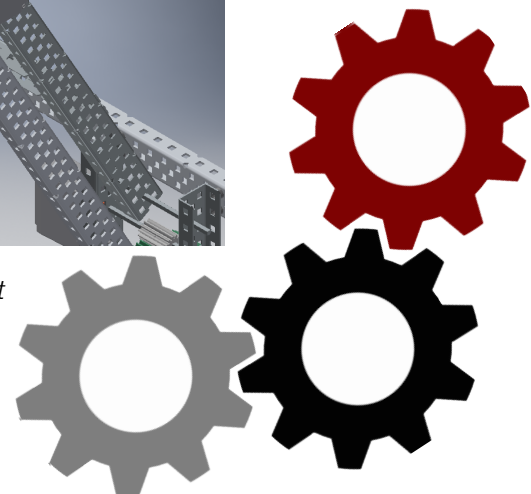


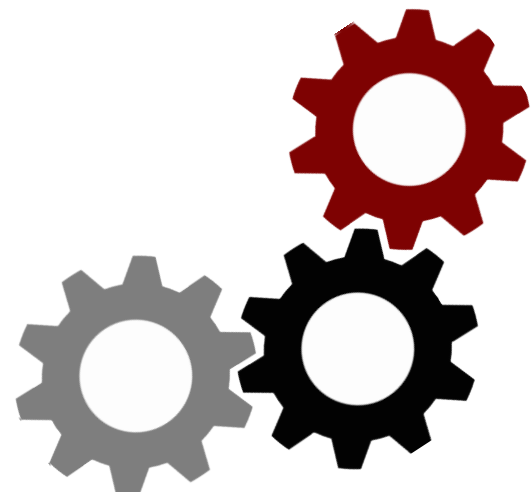
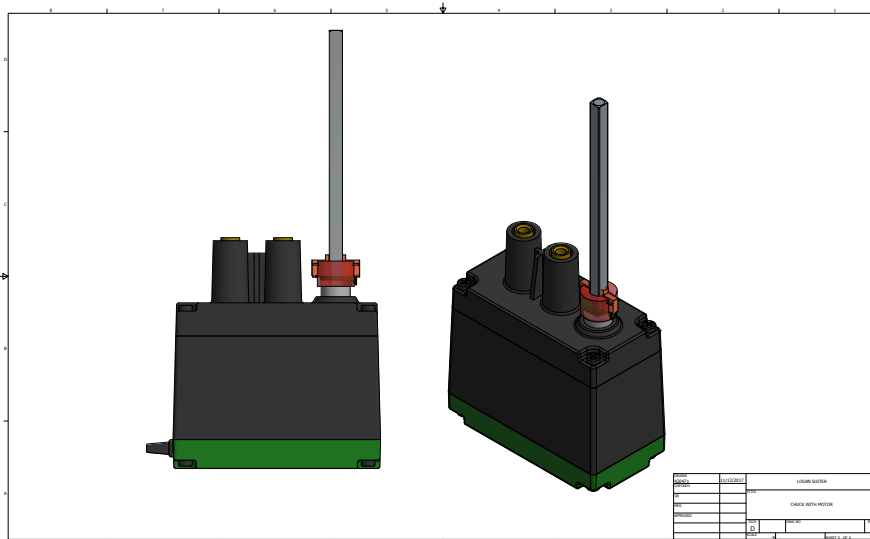
Fig 2. *Isometric View on Robot*



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# PART DESIGN

This part was created on Autodesk Inventor Professional 2017. Autodesk Inventor is a 3D modeling Computer Automated Drawing (CAD) software, that is also used in numerous careers to create drawings similar to this challenge's requirements. Inventor, among other 3D modeling software, is used in the real world to design a part that increases efficiency, or it can be used to create a solution to an imminent problem. The given problem in this instance, was the fact that shaft collars are not reliable, causing the axles to move. The big question was how do you prevent this from happening? To begin, brainstorming ideas and generating concepts to find a solution to this problem was crucial. There were 5-6 concepts created and a design was chosen. The concept can then be modeled on any 3D modeling software (in this case Inventor 2017). The part can then be tested to review whether it fulfills all of your requirements before producing the product.



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The creation of this design first included research and brainstorming. The concept of this part was inspired by a lathe chuck, which uses jaws to tighten and loosen the workpiece. After brainstorming, the next step was designing the part in relation to the dimensions of a Vex 2-wire 393 Motor. The individual parts were created and assembled in an assembly file. The parts were constrained without interference with other parts. Drive and angle constraints, such as rotation to rotation, and transitional constraints allowed the part to be animated. When the driving gear was driven the whole part moved along with it, illustrating the operation of the part.

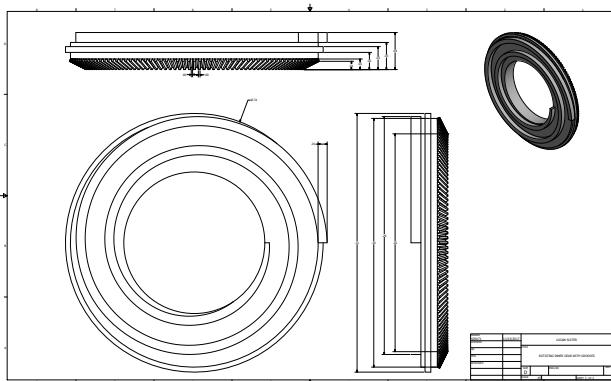


Fig 1. Rotating Inner Gear

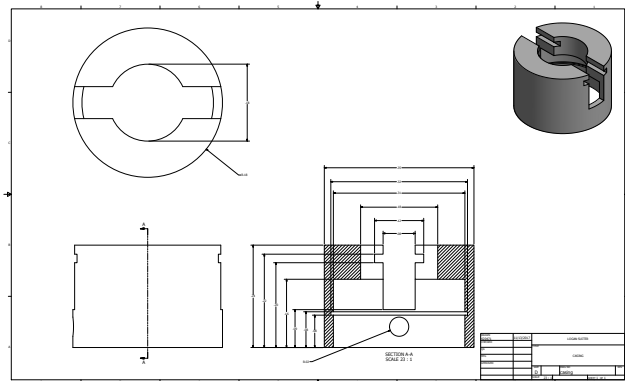


Fig 2. Chuck Casing

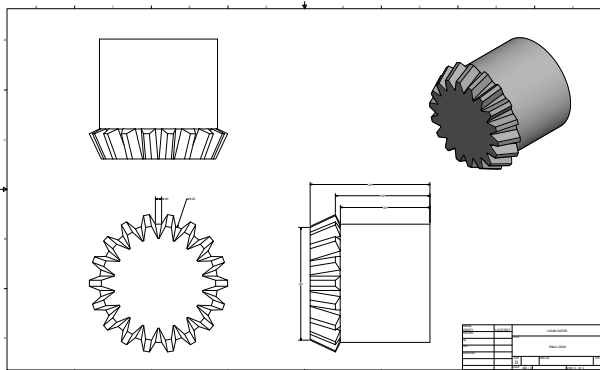


Fig 3. Small Gear

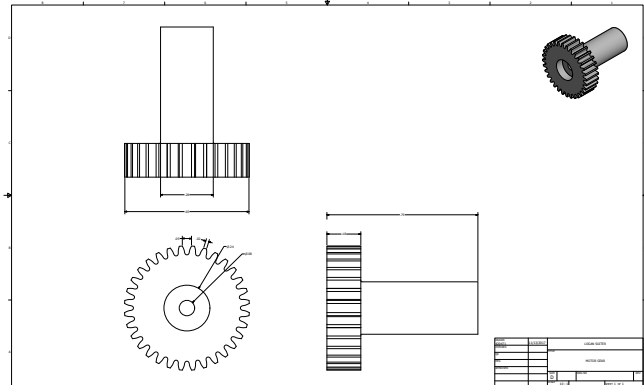


Fig 4. Motor Gear

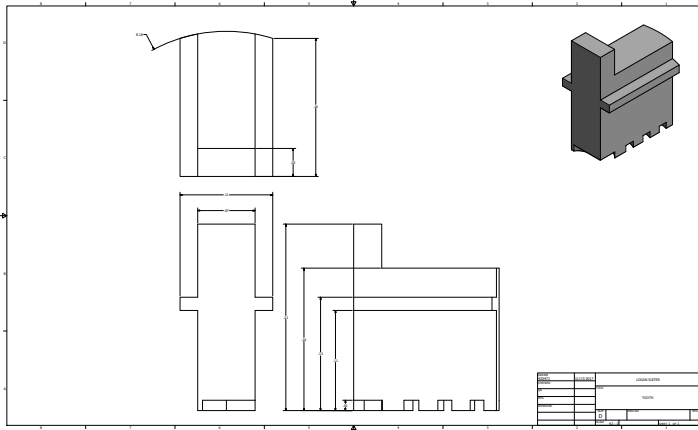


Fig 5. Tooth

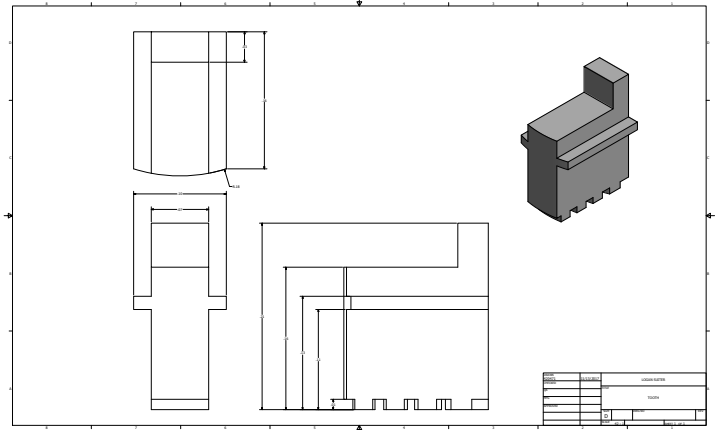


Fig 6. Opposing Tooth

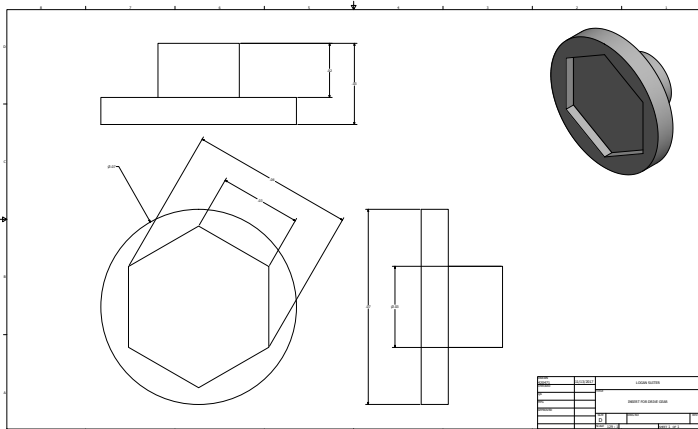


Fig 7. Insert for Drive Gear

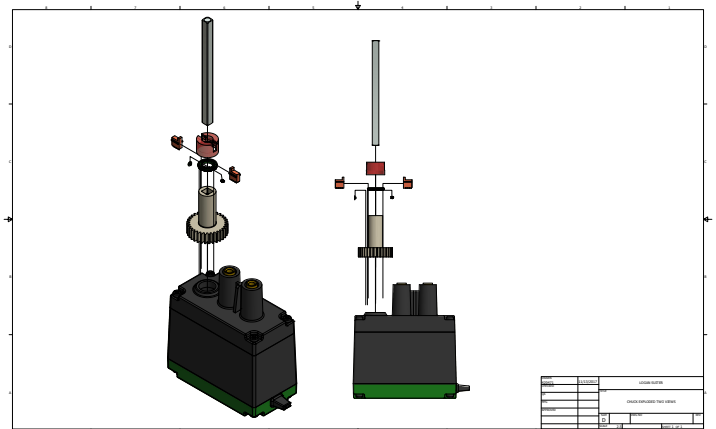


Fig 8. Part Explosion

# CONCLUSION

When designing this part we learned about patience and commitment to designing a workable solution. Mistakes were made and from those mistakes, lessons were learned. Entering this challenge, we had a basic understanding of the constraints available on Inventor. This challenge provided us with an opportunity to grow, seek innovation, and enhance our skills and ability, which will benefit us in robotics and all aspects of life. Today 3D modeling software is used in numerous occupations. With the knowledge gained from this

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challenge, we plan on furthering our success in robotics by creating a well-constrained robot. This experience not only allowed me to gain knowledge, but provided an opportunity to collaborate and practice to eliminate future errors when working with CAD. Inventor, and all 3D modeling software, is an important aspect of engineering and allows students to experience engineering at a young age.