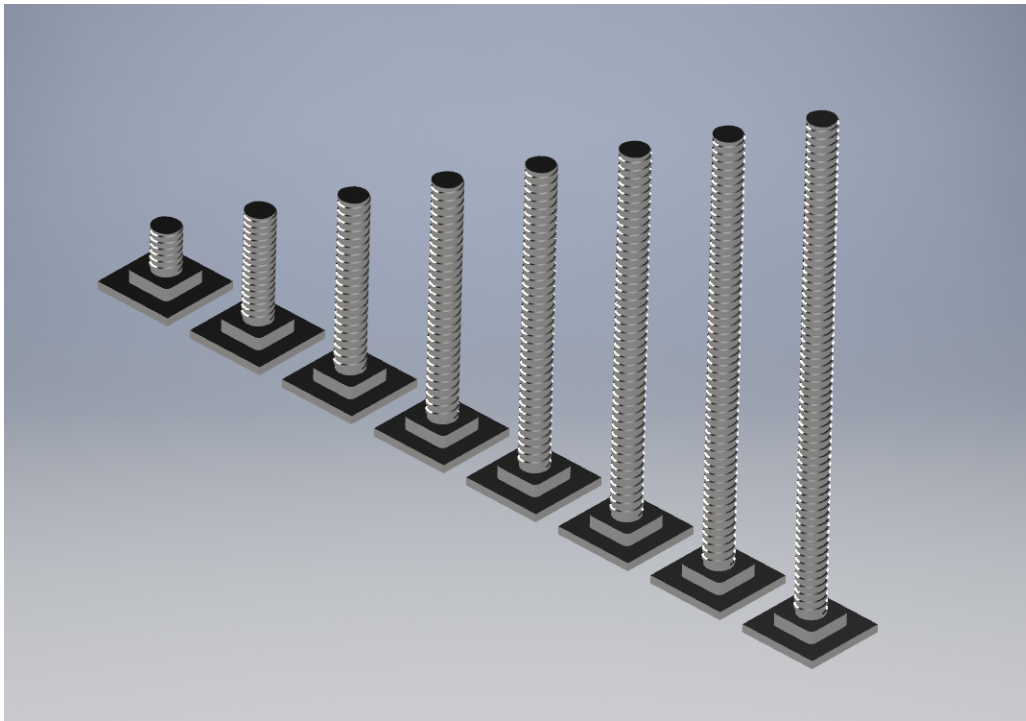


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# CARRIAGE BOLTS

MAKE IT REAL CAD ENGINEERING CHALLENGE



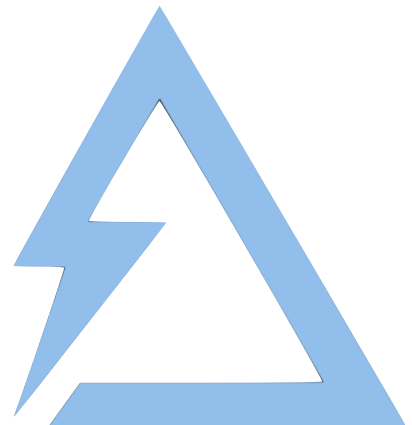
Delta Force 6008D

Prepared for: CAD Online Challenge

Prepared by: Logan Suiter & Avery Zwayer

January 2nd, 2019

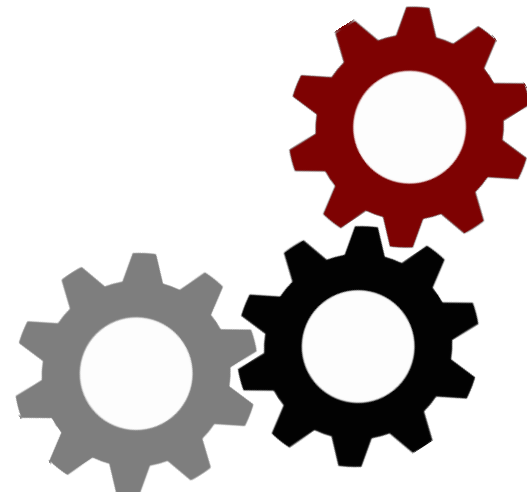
North Union Robotics



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# INTRODUCTION

Do you maintenance your robot constantly? Do screws constantly need retightened? Delta Force presents the Carriage Bolt, an improved part to increase the durability of robot designs.

## Solution

Designing a competitive robot in VEX Robotics is all about remaining consistent. Through our experience on a vex team, we have continuously run into the same inconsistencies in the form of vex parts. One of the biggest inconsistencies comes with a round screw in a square hole. Delta Force has designed a solution to this build concern which consists of a new screw design that allows it to be lined up and placed correctly into the square-shaped holes in a c-channel. This is a structure oriented concept, as the screw does not spin and cannot be used in any moving parts; it is designed to improve the connections on a robot frame for a durable build. In turn, this new screw concept will result in a durable robot build, a consistent robot, and thus a competitive design. This new concept reduces robot maintenance, not only improving the strength of designs, and increasing robot success in matches, but also improving time management.

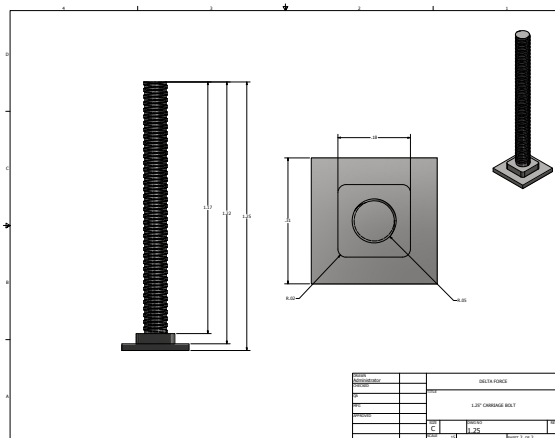
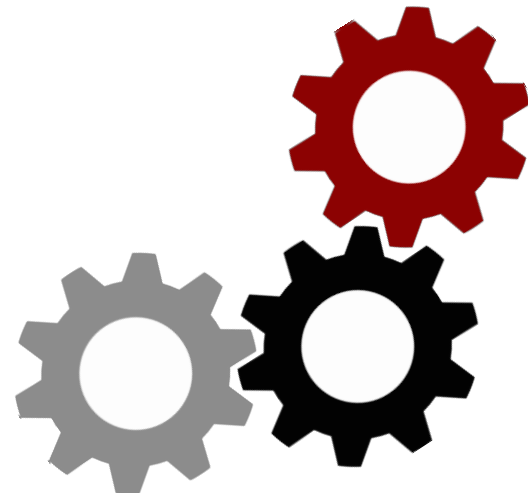


Fig 1. Carriage Bolt



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# COMPATIBILITY

The carriage bolt is compatible and adaptable. They were designed in various sizes for any build need. The purpose behind the Carriage Bolt was not to replace the vex screws all together, but was created for the function of building a consistent and durable structure, and the carriage bolts will only aid in that process. The thread on the screw are the same as current vex screws, which means that nylock nuts will continue to fashion tightly onto the carriage bolts themselves, and other parts can interact with this design. Over the years, with our abundant vex experience and countless competitions, we know these carriage bolts will improve the build quality and consistency of robots all over the world. These screws solve not only our problem, but a problem of the entire vex community. 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.

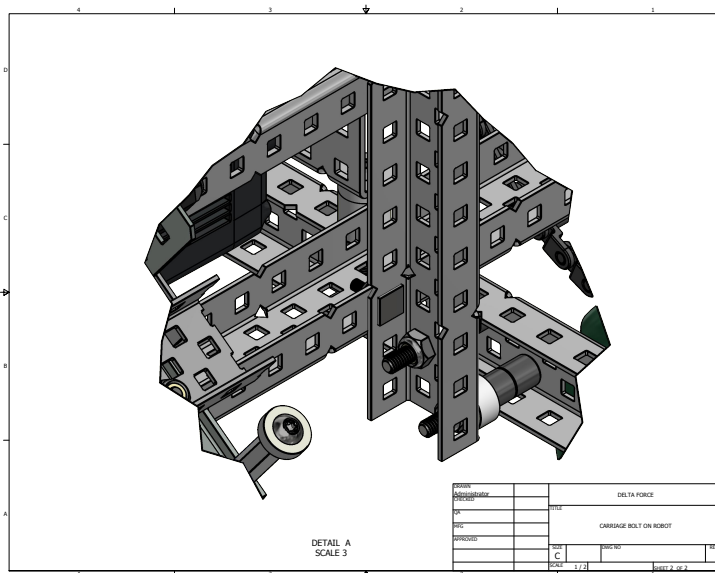
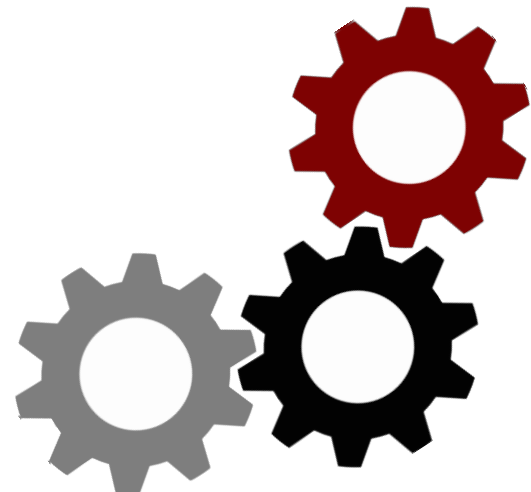


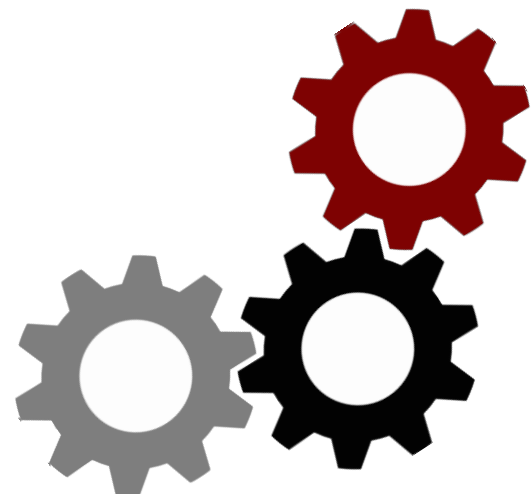
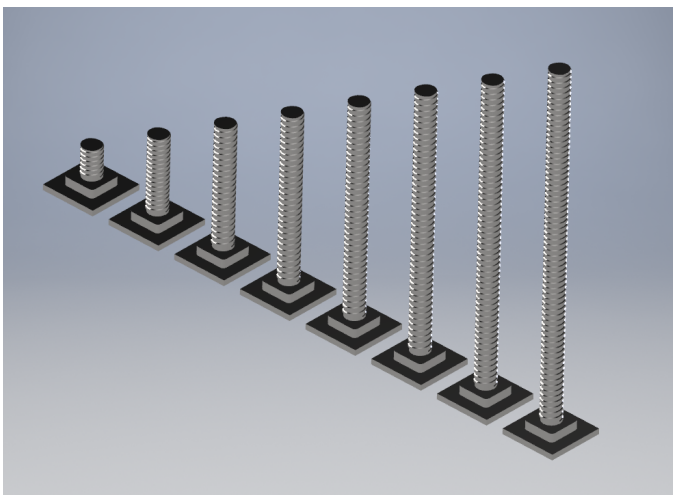
Fig 2. View on Robot



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# PART DESIGN

This part was created on Autodesk Inventor Professional 2019. 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 circular screws are not reliable to build a structure, causing routine maintenance. 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 a few concepts created and a design was chosen. The concept can then be modeled on any 3D modeling software (in this case Inventor 2019). The part can then be tested to review whether it fulfills all of your requirements before producing the product.



The creation of this design first included research and brainstorming. The current screw thread dimensions were measured to ensure this new concept would be compatible with current vex parts. Then the new concept was created in various sizes for numerous building needs.

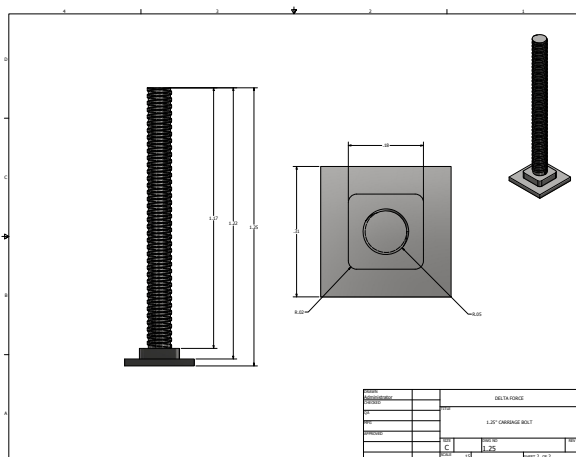


Fig 3. 1.25" BOLT

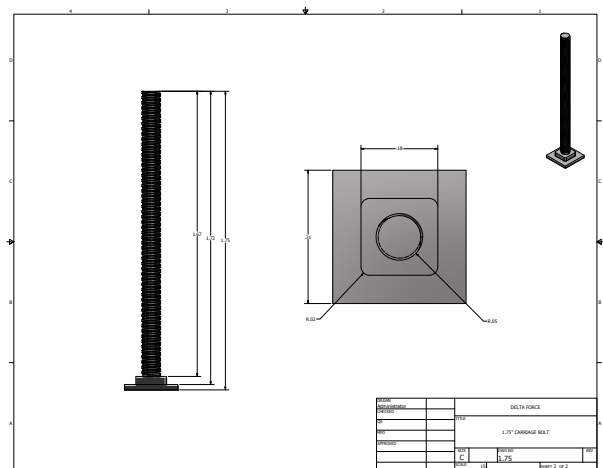


Fig 4. 1.75" BOLT

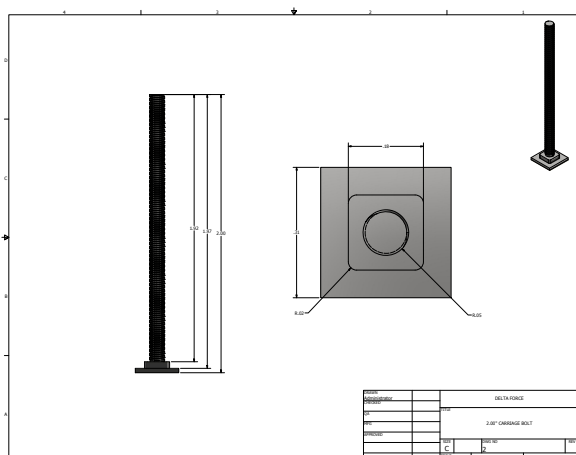


Fig 5. 2.00" BOLT

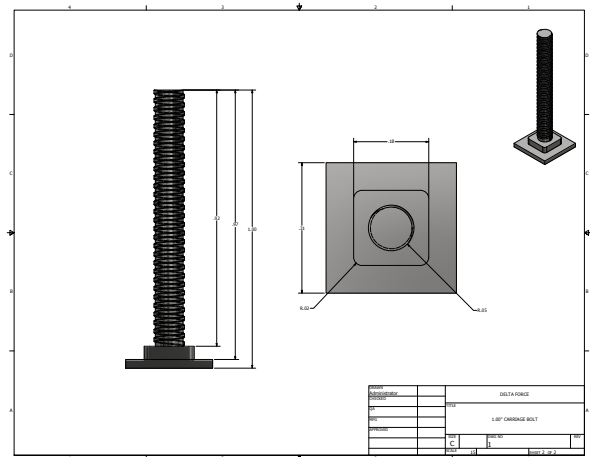


Fig 6. 1.00" BOLT

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# 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 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.