CAD ENGINEERING CHALLENGE REPORT

TEAM NO. 750R

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SOUTH BRUNSWICK, NEW JERSEY

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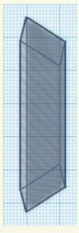
750R

Introduction

We are the 750 Royals VEX Robotics team from South Brunswick High School. As an experienced VEX team, we have encountered various tribulations during our competitions. After an extensive analysis of our matches, we came to one final conclusion - the weakness of our drive was holding us back. We saw that many teams had a Lexan/polycarbonate chassis surrounding their drive, which gave them extra **defensive capabilities**, **durability**, and were extremely **compact**. To achieve these goals, we decided to do what we do best: over-engineer a simple thing. We also included **shock absorption,** would be able to handle **direct impact**, and **did not interfere with the robot's function**. Below, we will detail the processes that allowed us to achieve our final design.

Our Design

Part	Purpose	Image
Truss	The truss is a common design utilized in engineering. It can handle force across its entire surface, and is incredibly stable.	
Triangle Flap	The triangle flap will cover the sides of the robot that are not the front or the back. It will cover the entire surface area of the outskirts	(Refer to the image above)

	of the robot and assure total protection.	
Trapezoid Flap	The trapezoid flap is meant for the front and back of the robot. This will be cut and placed so that it will not interfere with the actual functions of the bot. It can also be used as a wedge that can assist with defense.	
Spring	When hit, the chassis tends to bounce back, similar to how a person falls when you push them. To allow the chassis to fight back, we added springs. These springs will allow for the chassis to bounce back with an equal and opposite force (Newton's Third Law).	

Our Process

After realizing that we needed a chassis, we had to decide how we wanted to make it. We researched the most efficient shape for defense and shock absorption, and ended up with a truss. The truss distributes impact across the entire shape so that it remains sturdy and mighty. Then, in order to avoid the chassis breaking upon impact, we decided that we needed some sort of recoil, or response to the hit. Our minds immediately thought of springs. Then, our final obstacle was figuring out how to ensure that the front and back flaps do not interfere with the function of the robot. To do this, we needed a shape that could easily be cut and adapted to fit any and every robot. We decided on a trapezoid. Trapezoids can easily be cut and manipulated into many other shapes to cater to a bot:triangles, squares, etc.

To create the triangle side flaps, we used the pre-made triangle shape from Tinkercad. We made the big triangle an obtuse isosceles triangle. Then, within the big triangle, we simulated the holes in a truss by placing smaller isosceles triangles. They are colored differently to, once again, simulate gaps. Then, we used the community made spring shape. We adjusted the sizing until it was small, yet wide enough to cover enough surface area.

Using Autodesk Tinkercad

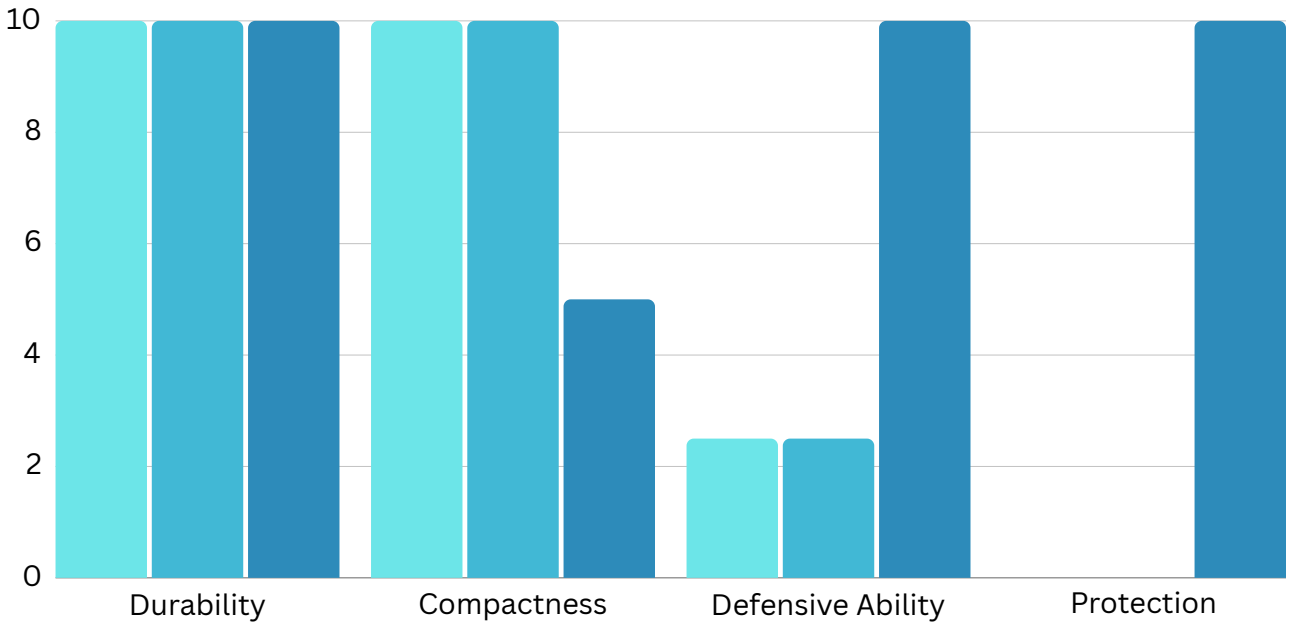
When using Tinkercad, our team was instantly wowed by the amazing user interface. Upon logging into the website, we were immediately greeted with tutorials and examples of how to CAD. When beginning to CAD our own part, we saw an array of shapes that we could use as building blocks, rather than beginning from scratch. Despite all of the other outstanding aspects of Tinkercad, our favorite one was the online community. Cadders have the opportunity to mingle and share projects and shapes over the same platform that they use to create them!

When would you use the Chassis?

Issues	How the chassis would solve them
Weak Drive	The truss and the triangle flap on the chassis would be able to withstand external forces on the drive as well as improve its stability
Poor Defense	The trapezoid flap can protect the front and back of the bot, as well as help with defense by acting as a wedge that can push other bots. Additionally, the springs on the chassis will allow the bot to bounce back from getting hit so it can fight back.

Designs

Design	Pros	Cons
Design 1: All Rectangles	Simple, could easily be replicated with Lexan/Polycarbonate, Compact	Thin, not durable, barely protects the robot
Design 2: All Trapezoids	Simple, could easily be replicated with Lexan/Polycarbonate, Compact	Was essentially the same as the Rectangles
Design 3: Current Design	Durable, has good defensive Ability, protects very well	Is not compact



Conclusion

As we worked on designing the CAD for the chassis, we learned things about Tinkercad and how to utilize its features. We enjoyed using this software and plan on using it to create Computer Aided Designs for our future robot designs. While working on this challenge, we also bonded as a team by discussing possible designs and evaluating their abilities. All in all, the chassis is a very useful part to use when building a drivetrain as it can add an extra boost to your performance!