

The Smithinator: Recumbent Vehicle Design and Entry for the 2020 ASME Human-Powered  
Vehicle Challenge  
(Technical Report)

A Virtue Ethics Analysis of the Development of the Boeing 737 Max  
(STS Research Paper)

An Undergraduate Thesis Portfolio

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Bachelor of Science in Mechanical Engineering

By

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## Socio-technical Synthesis: Human Powered Vehicle and Boeing 737 Max

Although my technical and STS projects are not strongly related as they pertain to different technologies, working on both projects at the same time has allowed me to explore the importance of design in engineering applications. My technical work focuses on using engineering principles to design and manufacture a vehicle, while my research highlights the poor engineering design of an airplane and the morality of the company that built it. Though they differ in content, both my technical work and STS project do look at engineering design as I undergo the process of design in my technical work and look at the failure of design in my STS project.

My technical work focuses on the design and manufacturing of a Human Powered Vehicle. Human Powered Vehicles . My capstone team designed and worked on manufacturing a recumbent, tadpole tricycle. The vehicle, The Smithinator, was created from scratch, with our team designing and building the frame, drivetrain, steering, and fairing of the system in addition to designing electrical circuits for lights on the vehicle. The Smithinator is designed for high performance and comfortability and can be used by people of various heights. The Smithinator will be used by future Human Powered Vehicle capstone teams as an example of what can be improved upon in future designs. The goal of the vehicle is to use all the engineering principles we have learned in our mechanical engineering courses to design and manufacture a vehicle to compete in.

My STS research focuses on the implications of engineering design but in aviation. My case study explores the morality of the design choices behind the Boeing 737 Max that led to two fatal crashes. Aristotle's virtue ethics is utilized to analyze the morality of Boeing's actions. My

claim is that Boeing's actions were morally unacceptable as it failed its core values: safety, quality, and trust. My paper examines this claim and what can be learned from poor engineering choices. The goal of my paper is to show that to be virtuous values cannot just be stated but must be acted upon as well to prevent poor engineering choices.

Together, these two projects added to knowledge of design and what it means to be an ethical engineer. My technical work allowed me to experience and understand the design and manufacturing process for not only the vehicle but for smaller components that were a part of it as well. My research for my STS paper allowed me to see the importance of a company's values as well as consequences of poor designs in engineering. Both my technical project and STS research paper have motivated me to become an engineer that will design safe products that meet not only engineering values but the company's values as well. Overall, working on both my technical project and the STS research paper over the past year has allowed me to experience and examine engineering design and examine the morality of engineering decisions to prevent catastrophes from happening.