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Socio-technical Synthesis: Design of Wind Turbine Blades and The *Challenger* Disaster

My technical project and my STS research paper are both connected through the field of mechanical engineering and the implications they have for future engineering design. Mechanical engineering is a field that uses engineering physics and mathematics to design, analyze, and manufacture mechanical systems. It is the most vital theme for both my technical work and my research paper. My technical project and my research paper differ in the ways they approach mechanical engineering. In my technical work I focus more on the design process within mechanical engineering, while in my research paper, I focus more on the future impact the design process in mechanical engineering has on society. Although both projects offer different perspectives toward mechanical engineering, the future of mechanical engineering and the design process are both relevant themes in my technical project and my research paper.

My technical project explores the idea of using mechanical engineering to design an efficient wind turbine blade. My capstone team and I tested different types of wind turbine blades to determine which one has the best efficiency. The wind turbine blades and the hub were designed and constructed using CAD (Computer-Aided Design) software and 3D-printing techniques. There were three types of blades produced in this project: plain, single slit, and double slit. The three different blade configurations were tested inside a subsonic wind tunnel where quantitative data of the blades were taken to determine the best efficiency. The goal of our technology is to promote the interest of mechanical engineering and its design process, particularly in the field of wind energy. We hope to inspire future engineers interested in

mechanical engineering by showing the different types of technology that could be produced using its principles.

My STS research paper also examines mechanical engineering by exploring the relationship between mechanical engineering and society. In particular, it explores the effect that engineering design and the skills required for an engineer to possess in their field has on technology created for society. The *Challenger* incident is one of the most disastrous events to occur in engineering history. The explosion was caused by technical failure of the O-rings in the solid rocket boosters. In my paper, I claim that the engineers lacked traits to become good moral characters as defined by virtue ethics that ultimately led to the technical design failure of the O-rings. I explore this claim using the evidence provided in the Congressional investigation of the *Challenger* incident and primary sources related to the incident. I also discuss how this can create a larger impact on society and emphasize the importance of prioritizing the safety of the public while promoting the profession. The goal of my research paper is to generate discussion on the importance an engineer holds in his or her position in society and how it is vital for an engineer to prioritize the safety of the general public when designing new technologies.

Simultaneously working on both the technical project and the STS research paper personally gave me a lot of value. When working on the technical project, I learned vital background technical information in mechanical engineering that would be important for me to learn and use in my research paper. Working on the research paper provided me an opportunity to learn the importance of the field of mechanical engineering in society. It also showed me how important it is to ensure that engineers should possess moral character traits and technical knowledge to protect the welfare of the public while promoting the industry. Working on both projects together inspired me to gain different perspectives in mechanical engineering.