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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Sociotechnical Synthesis

Analyzing the intersections of STS theory, sustainability, and the aerospace industry is necessary to understand the impact and influence these topics have on society. This research project aims to shed light on the complex dynamics that shape the aerospace industry and the concept of environmental justice and waste mitigation. The technical project will produce an advanced sound rocket with many engineering benefits while also aiming to be sustainable. The STS project will address the systemic issues that contribute to the unequal distribution of environmental benefits and burdens in society, but also the progress within these systems. By adopting a multidisciplinary perspective that draws from STS, sustainability science, and ethics, I aspire to provide insights into how the aerospace industry can better align its endeavors with sustainable practices. By understanding how science, technology, and society converge in the pursuit of sustainability, society can make informed decisions, take responsible actions, and develop policies and practices that balance the needs of the environment, the economy, and society.

Technical Project Summary

The engineering community is one that has shaped the world in many ways whether it is technology, road systems, the advancement of medicine, etc. In the dynamic realm of aerospace engineering, my capstone project takes flight as a visionary venture into spacecraft design. Focused on the creation of a sound rocket, this project is characterized by interdisciplinary collaboration, with distinct teams dedicated to body design, propulsion, and mechatronics. As we make progress on this project, the fusion of creativity, innovation, and technical prowess emerges as the guiding force propelling us towards a successful launch of this vehicle.

The body design team undertakes the challenge of crafting a vessel that not only goes through the atmosphere with minimal resistance but also ensures the payload's safety. Their focus

mainly is on materials science, aerodynamics, and structural engineering, as they analyze the trade-offs between weight, strength, and aerodynamic efficiency. The goal this team has is to produce a body that seamlessly integrates form and function. The propulsion team is tasked with the responsibility of engineering a propulsion system that not only propels the vehicle into the sky but does so with efficiency and precision. This team focuses on combustion dynamics, fluid mechanics, and propellant chemistry to optimize thrust-to-weight ratios and ensure a controlled burn throughout flight. The mechatronics team, which I am a part of, focuses on the control systems, sensors, and electronics that govern the behavior of the sound rocket. My role in this team involves integrating different technology to control and monitor critical parameters during the rocket's ascent and descent phases. From guidance systems to telemetry, our focus is on creating a responsive and adaptable spacecraft that navigates the complexities of the journey with ease. With all three teams collaborating, it ensures the overall design is cohesive and responsive.

STS Project Summary

This project critically examines the progression of environmental equity initiatives over the past decade, particularly within the University of Virginia (UVA) and its integration with the Charlottesville community. By focusing on waste mitigation, educational strategies, and stewardship, it evaluates these facets in terms of their environmental impact and societal significance, emphasizing their role in the Science, Technology, and Society (STS) framework. Beginning with an extensive review of literature, the project delineates the importance of waste mitigation systems within the context of sustainable development. It explores various strategies encompassed by waste management, ranging from recycling to waste-to-energy technologies, tracing their evolution and influence on environmental sustainability and awareness.

Subsequently, the analysis delves into the nexus between waste mitigation systems and environmental justice, elucidating how technical systems deployed in waste management address issues such as equitable distribution of waste facilities and pollution. Drawing upon pertinent programs and archival data, the project constructs a compelling argument while addressing potential counterarguments, thereby establishing a coherent narrative. The examination also highlights UVA's sustainability endeavors as a case study and offers recommendations for future research, stressing the need for ongoing efforts to enhance the efficacy of waste mitigation systems in advancing environmental justice. Furthermore, it underscores the pivotal role of academic institutions like UVA in leading sustainable initiatives and nurturing a culture of environmental stewardship.

Conclusion-Reflection

In conclusion, the journey of working on my capstone project and STS research paper has been an enlightening experience, showcasing the intricate web of connections between seemingly different subjects. While the topics I delved into may have diverged in their focal points, they ultimately converged at the intersection of sustainability. Through my exploration, I've come to realize that sustainability transcends disciplinary boundaries, encompassing both technical frameworks and socio-cultural perspectives.

Engaging in sustainability research for both my capstone project and STS paper compelled me to recognize the multifaceted nature of sustainability. It became evident that sustainability is not merely a matter of environmental conservation or technological innovation; rather, it is a complex interplay of ethics, values, and systemic thinking. By delving into the technical aspects of my capstone project and the socio-cultural implications explored in my STS research paper, I was able to grasp the interconnectedness of these dimensions within the broader

framework of sustainability. Furthermore, this interdisciplinary approach fostered a deeper understanding of the moral imperative inherent in sustainability efforts. Whether analyzing the environmental impact of a technological solution or examining the social dynamics surrounding its implementation, I realized that sustainability requires us to consider not only the immediate consequences but also the long-term implications for both humanity and the planet.

In essence, my journey through these projects underscored the notion that sustainability is a holistic concept that demands collaboration across disciplines. By bridging the gap between technical expertise and socio-cultural insights, I've gained a more nuanced perspective on the challenges and opportunities inherent in building a sustainable future. Moving forward, I am inspired to continue exploring the intersections of diverse fields, recognizing that it is through these connections that we can truly address the complex and interconnected issues facing our world today.